Appendix A. Special Air Quality Studies

- **$PM_{2.5}$ Saturation Studies—Utah State University**

This page intentionally left blank for correct double-sided printing.

Cache Valley Air Quality Studies

A Summary of Research Conducted
(through 2006)

prepared by
Dr. Randy Martin
Department of Civil & Environmental Engineering
Utah State University
UMC 4110
Logan, UT 84322
rmartin@cc.usu.edu

August 2006

EXECUTIVE SUMMARY

The Cache Valley airshed is in serious threat of exceeding the U.S. National Ambient Air Quality Standard (NAAQS) for Particulate Matter less than 2.5 μm in diameter ($PM_{2.5}$). Although the local airshed approaches both the annual (15 μg m^{-3}) and the 24-hr standard (65 μg m^{-3}), it is the 24-hr standard that is in the greatest danger of exceedance. As of June 2006, the regulatory allowable 98th percentile value for 2006, roughly the eighth highest value) can only be 33.2 μg m^{-3} without exceeding the NAAQS. To date, this value has been exceeded four times. For comparison, the target value was exceeded 6, 41, and 39 times in the years 2003, 2004, and 2005, respectively. It should also be noted that the U.S. EPA is currently considering lowering the 24-hr standard to 35 μg m^{-3}.

The Cache Valley $PM_{2.5}$ is somewhat uniquely a wintertime problem, when low lying, persistent radiation and subsidence inversions set up, trapping pollutants in the Valley for extended periods of time, allowing photochemically-derived particulate material to become elevated. Chemical analysis by researchers at Utah's Division of Air Quality and Air Monitoring Center, as well as Utah State University, have shown that 50-95% of the $PM_{2.5}$ collected at the Logan site is composed of ammonium nitrate (NH_4NO_3).

In order to understand the local pollutant behavior and identify the most appropriate remediation scenarios, several sequential and parallel research programs have been conducted by Dr. Randy Martin and others at Utah State University. This document summarizes these efforts and attempts to coalesce these studies into a single report.

1) <u>PM Homogeneity</u>
   - Statistically (95% CI), the Cache Valley is homogeneous with regard to $PM_{2.5}$ concentrations during inversion episodes, although some site-to-site variation may exist. The areas which trended lower in concentrations were the extreme southeast (Hyrum) and west (Mendon) portions of the Valley. As a partial result of these studies, FRM regulated monitoring stations were established in Hyrum, UT, Amalga, UT, Prestion, ID, and Franklin, ID.

2) <u>Valley Ambient Ammonia</u>
   - Based on measurements at the Logan location, the Valley's wintertime formation of ammonium nitrate was found to be limited by the availability of nitrate, specifically nitric acid (HNO_3). The ambient Logan wintertime NH_3 averaged (24-hr) 9.2 μg/m^3 (13.9 ppb). Furthermore, following these data, the Cache Valley was found to be NH_3-rich by a factor of approximately two. Comparisons of wintertime ambient NH_3 concentrations between the Valley's urban area (Logan) and a rural location (Amalga), showed the rural area averaged ≈2.5 times the NH_3 of the urban site.

3) <u>On-road Automobile Emissions</u>
   - The study found that approximately 4.5% and 10.3% of the Valley's vehicles would fail inspections tests for NO_x and VOCs, respectively, and that these vehicles were responsible for 25.4% and 47.8% of the valley-wide emissions. The study also found

that the majority of the vehicles that would fail would be older than 1996. As of 2004, vehicle registrations from the Utah Department of Motor Vehicles showed the percentage of vehicles that are 1996 or newer be 49.4%, and, therefore, eligible for I & M testing with the simpler on-board diagnostic (OBD) method.

4) Public & Student Phone Survey

-

5) Inversion Heights (dT/dz)

6) Indoor/Outdoor $PM_{2.5}$ Concentrationss

7) Wintertime Vertical Ozone Profile

8) VOCs

Cache Valley on a "good" day (Feb. 25, 2002)

Cache Valley on a "moderate" day (Feb. 23, 2002: $PM_{2.5} \approx 40\ \mu g/m^3$)

Cache Valley on a "very bad" day (Feb. 16, 2004; $PM_{2.5} = 101.6\ \mu g/m^3$), viewed from adjacent 6300 ft asl ridge top

Installing a portable AirMetrics' MiniVol $PM_{2.5}$ sampler

Recovering a temperature sensor form the ridge above Logan

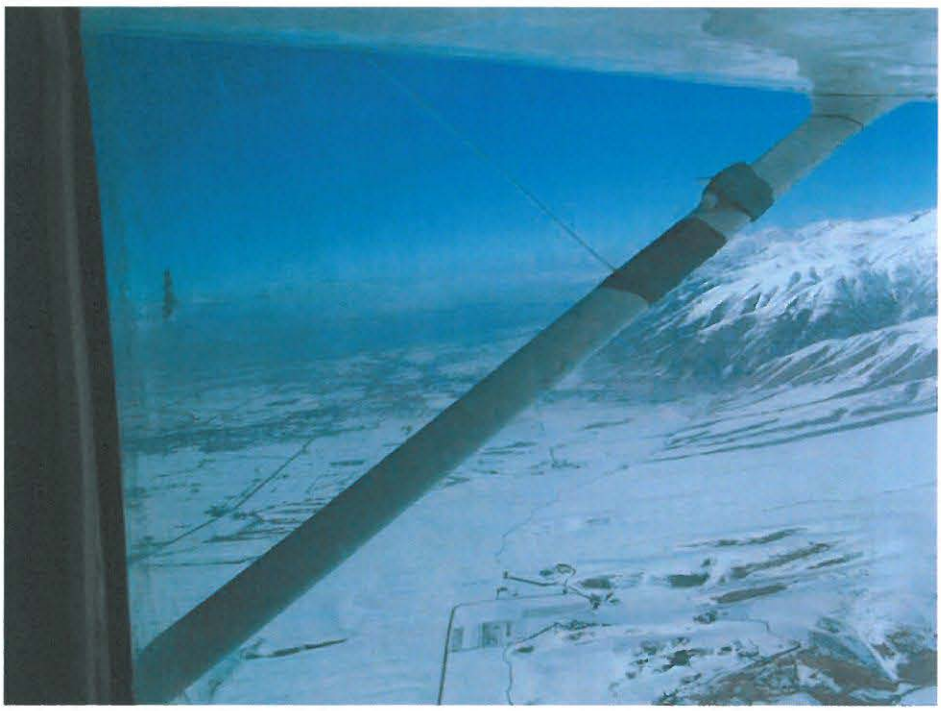
URG ammonia and acid gas denuder system installed at the Logan site.

Passive ammonia samplers (with and without rain cap)

Cache Valley on-road vehicle exhaust measuremnt

On-road "Red Day' notification signage Main Street in Logan

MiniVol samplers during indoor vs. outdoor studies



Teflon nozzle and tubing during ozone vertical profile flight (Feb. 9, 2006: 14:57) -- also note visible inversion layer

ACKNOWLEDGMENTS

The investigators would like to thank the State of Utah and Utah State University for partial funding under the Community/University Research Initiative (CURI) Grant program. Utah's Department of Environmental Quality's Division of Air Quality (DAQ) and Air Monitoring Center (AMC) are also to be gratefully thanked for funding several different aspects of the studies described within this document. Additional funding for personnel and supplies was obtained through the Utah Water Research Laboratory (UWRL).

The authors would also like to thank Bob Dalley, Neal Olson, Dave McNeill, Brock LaBaron, Tyler Cruckshank, Bruce Allen, Ran McDonald, Joe Thomas, Cheryl Heying, and Rick Sprott for their cooperation in supplying equipment, comparative data, and expertise. Personnel from the Bear River Health Department were also instrumental in the research described herein and are also owed a great deal of thanks and appreciation. Additional acknowledgements go to USU students Thomas Bradley, Hosam Jamal, and Demetrio Cabanillas for their participation in various aspects of this project.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii

ACKNOWLEGDEMENTS viii

OVERALL INTRODUCTION 1

VALLEY-WIDE PM_{10} AND $PM_{2.5}$ SATUARATION (HOMOGENEITY) STUDY 2

CACHE VALLEY AMBIENT AMMONIA STUDIES 17

ON-ROAD VEHICLE EMISSIONS IN CACHE VALLEY (2004) 30

VERTICAL TEMPERATURE PROFILE MEASUREMENT 51

INDOOR/OUTDOOR PARTICULATE MATTER IN THE CACHE VALLEY 59

WINTERTIME VERTICAL OZONE DISTRIBUTIONS 67

REFERENCES 78

OVERALL INTRODUCTION

The elevated wintertime levels of $PM_{2.5}$ in Utah's Cache Valley have been the subject of concern since measurements of the criteria pollutant began in the spring of 2000. As shown in Table 1, the airshed has flirted with exceeding National Ambient Air Quality Standard, especially the 24-hr value (65 $\mu g\ m^{-3}$), since the first complete 3-yr data set was obtained.

Table 1. Regulatory $PM_{2.5}$ values for Logan, UT (UDAQ, 2006).

Year	Annual Average	24-hr 98th Percentile
2001	15.6 $\mu g\ m^{-3}$	71.1 $\mu g\ m^{-3}$
2002	14.7 $\mu g\ m^{-3}$	58.4 $\mu g\ m^{-3}$
2003	8.4 $\mu g\ m^{-3}$	31.5 $\mu g\ m^{-3}$
3-yr Avg	**13.0 $\mu g\ m^{-3}$**	**54.8 $\mu g\ m^{-3}$**
2004	15.3 $\mu g\ m^{-3}$	101.5 $\mu g\ m^{-3}$
3-yr Avg	**12.8 $\mu g\ m^{-3}$**	**63.8 $\mu g\ m^{-3}$**
2005	13.0 $\mu g\ m^{-3}$	61.7 $\mu g\ m^{-3}$
3-yr Avg	**12.1 $\mu g\ m^{-3}$**	**64.9 $\mu g\ m^{-3}$**
2006 Allowable	----	33.2 $\mu g\ m^{-3}$

Compositional research conducted by Utah's Division of Air Quality (DAQ) and Air Monitoring Center (AMC), as well as investigators at Utah State University, showed that the bulk of the fine particulate material consisted of ammonium nitrate (NH_4NO_3) (UDAQ, 2006). During "typical" winter days, it was shown that average NH_4NO_3 content accounted for 50-60% of the particulate material, on elevated days (> 65 $\mu g\ m^{-3}$), the NH_4NO_3 fraction approached 80-95%.

The discovery of the elevated levels of $PM_{2.5}$ in the Cache Valley motivated several research studies to identify the dominant causes and potential areas of remediation. These efforts are described within this document. Specifically, this report summarizes research into Cache Valley's PM_{10} and $PM_{2.5}$ homogeneity, determination of ambient levels of gas-phase ammonia (NH_3) and it's role in limiting particulate formation, local on-road vehicle emissions, local attitudes toward potential particulate control scenarios, inversion heights, indoor vs. outdoor $PM_{2.5}$ concentrations, research into ambient (rural and urban) concentrations of volatile organic compounds (VOCs), and continuing research of vertical ozone profiles and indoor ammonia.

It should be noted that these research programs include funding through Utah's DAQ and AMC, but also other sources including Utah State University, The Utah Water Research Laboratory, and the Bear River Health Department.

VALLEY-WIDE PM_{10} AND $PM_{2.5}$ SATURATION (HOMOGENEITY) STUDIES

Contributing Authors

Dr. Randal S. Martin
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

Grant W. Koford
Bear River Health Department
Logan, UT

INTRODUCTION

Among the first projects studied in cooperation with the Utah's Division of Air Quality and Utah State Universities Air Quality Research Group within the Department of Civil and Environmental Engineering (CEE) and the Utah Water Research Laboratory (UWRL) was the examination of the potential homogeneity of PM_{10}, and then $PM_{2.5}$, throughout the Cache Valley. The impetus for this study began in the fall of 2001 with comparisons of ambient PM_{10} and $PM_{2.5}$ as measured at the Smithfield, UT residence of Dr. Randy Martin and those monitored by the DAQ at the Logan city sampling location (approximately 11 kilometers apart). Figures 1 and 2 show the 2002 comparisons for PM_{10} and $PM_{2.5}$, respectively.

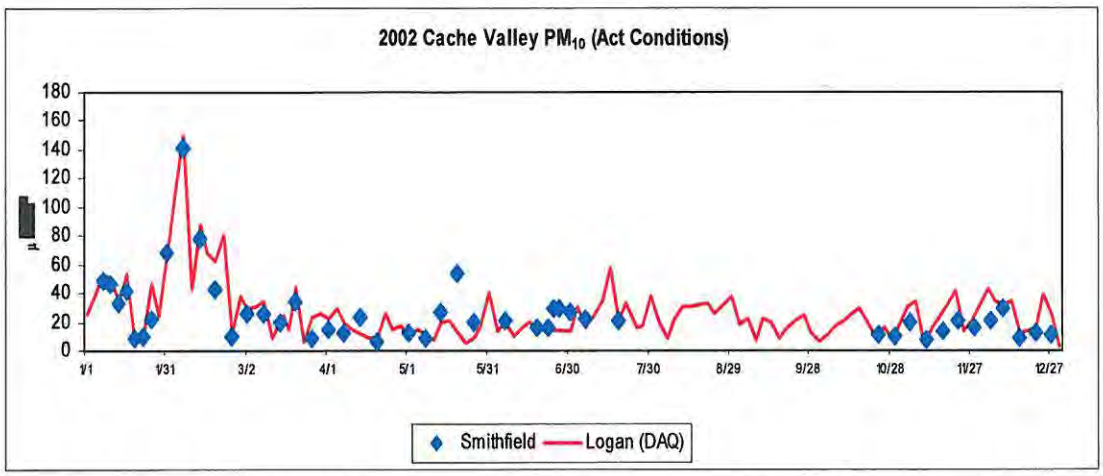


Figure 1. Comparison of Logan and Smithfield 2002 ambient PM_{10} concentrations.

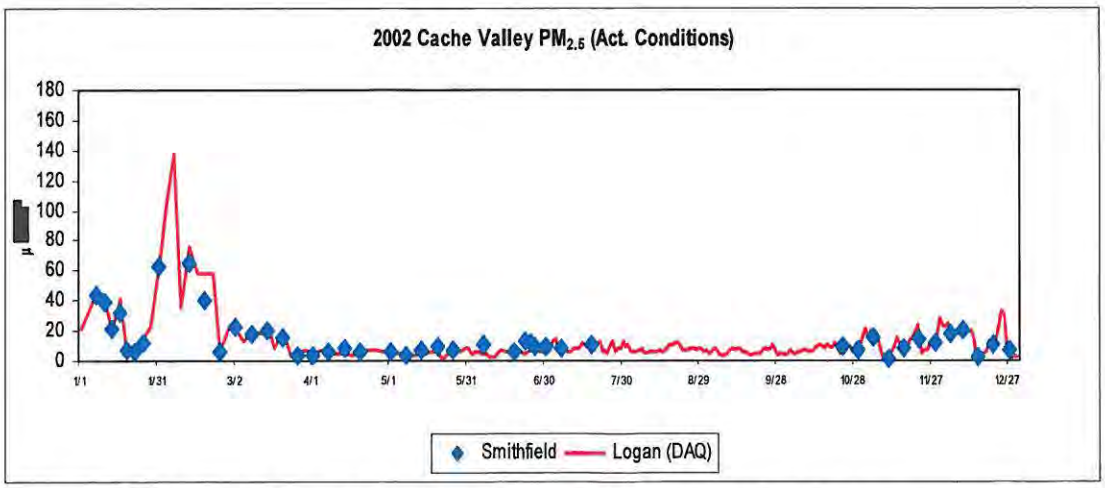


Figure 2. Comparison of Logan and Smithfield 2002 ambient $PM_{2.5}$ concentrations.

As is shown above, the concentrations trends and absolute values are very similar for both sites, including the elevated levels recorded during the wintertime inversion episodes. When similar data for the 2003 calendar year are included, the correlation (R^2) between the two sites was 0.819 and 0.923 for PM_{10} and $PM_{2.5}$, respectively. Although not statistically quantifiable, visual examination of the plotted data, for both size fractionations, seem to show a slight positive (greater than) difference at the Smithfield location in the summer and a slight negative (less than) difference in the winter. This could be a reflection of the somewhat more rural nature of the Smithfield location.

Cache Valley's high, "official" wintertime $PM_{2.5}$ concentrations, as measured at the single Logan city sampling site, the similar PM_{10} and $PM_{2.5}$ trends observed at the separate Smithfield location, the abundance of secondary material, and visual observations suggested that the particulate pollution was likely not an isolated problem centered around the Logan location, but more likely homogeneous throughout the Cache Valley. In order to investigate this hypothesis, five portable PM_{10} samplers were deployed throughout the Valley and operated during the winter of 2002/2003. These samplers were further compared to the DAQ operated Logan location and a paired set of federal reference method (FRM) PM_{10} and $PM_{2.5}$ samplers deployed at the Smithfield site.

As will be further discussed in following sections, the preliminary study conducted in during the winter of 2002/2003, at the (equipment) limited number of available sites, showed that the Valley's PM_{10} was statistically homogeneous across the compared locations. Although the data did suggest overall ambient particle homogeneity, the unexpectedly low particulate concentrations during the examined winter (refer back to Table 1), the variability in the relationship between PM_{10} and $PM_{2.5}$, and the limited number of available samplers left it uncertain as to whether the airshed was truly homogeneous with respect to $PM_{2.5}$, particularly at levels above the NAAQS. In order to more fully investigate this question, fifteen portable $PM_{2.5}$ samplers were deployed throughout the Cache Valley and operated during the winter of 2003/2004. Also as before, two federal reference method (FRM) $PM_{2.5}$ samplers were also deployed, including the Logan UDAQ regulatory and the Smithfield $PM_{2.5}$ sampling sites.

METHODOLOGY

2002/2003 PM_{10} Homogeneity (Saturation) Study

In an attempt to bracket typical wintertime conditions, the initial PM_{10} homogeneity study took place from October 24, 2002 through February 26, 2003, with a nominal sampling frequency of every six days. The samples were targeted to run for 24 hours, midnight to midnight, on each of the sample days. In addition to the Logan city sampling site (UTM 430309 E, 4619926 N, zone 12), six additional sites were established throughout Utah's Cache Valley. These sites were located 2.9 km ENE (USU Campus), 3.9 km S (Evan's Farm/Nibley), 5.5 WNW (Cache Valley Hunter Education Center), 9.5

km SSW (American Heritage West Center), 10.9 km N (Smithfield), and 17.1 km NW (Newton) of the Logan sampling location.

Five portable AirMetrics PM_{10} MiniVol samplers (Airmetrics, 2004) were borrowed from the Division of Air Quality of Utah's Department of Environmental Quality (DEQ). These instruments were deployed at all but the Smithfield location. At the time of the described study, equivalent $PM_{2.5}$ samplers were not available to the investigators. The MiniVol Samplers operate via a battery-powered pump, which draws air through an impactor specifically-designed to separate the larger particle fraction (>10 μm), allowing the PM_{10} material to be collected on a subsequent 47 mm Teflon filter. The filters were equilibrated at room temperature, in an air-tight desiccator, and weighed on a 5-place (gram-based) balance pre- and post-exposure until triplicate weights within 0.05 mg were obtained.

The samplers are designed to operate at an actual flowrate of 5 Lpm, with flow controlled via a manually set rotameter. Prior to sampling, each system was calibrated using a soap-bubble meter and a calibration equation was developed relating local temperature and pressure and the rotameter reading to the flowrate at actual conditions. For a given sampling run, the expected average temperature and pressure were estimated, the necessary rotameter setting for the required 5 Lpm (actual) was determined, and the flow was adjusted so that when the system's internal alarm initiated the sampling period, the proper flowrate would be obtained. An on-board elapsed time counter registered the actual duration of any given sampling period (some runs were abbreviated due to battery failure), which when combined with the rotameter flowrate, was used to determine the sample volume.

At the Smithfield location, a paired set of $PM_{2.5}/PM_{10}$ FRM Samplers (Andersen Instruments, RAAS 2.5-100) were operated by the investigators following the basic regulatory guidelines outlined in 40 CFR 50, Appendix L (40CFR50, 2003). The FRM samplers at the Logan site, the DEQ's official Cache Valley sampling location, were operated by DAQ and Bear River Health Department (BRHD) personnel, who shared the collected data with the project investigators.

Furthermore, the comparability, and the necessity of any potential correction factors, of the portable MiniVol samplers to the FRM samplers was examined via separate co-located sampling runs, in addition to the scheduled sampling periods. For this co-located investigation, the MiniVols were placed next to the Smithfield FRM samplers and each was operated as normal for four separate, 24-hour sampling periods.

2003/2004 $PM_{2.5}$ Homogeneity (Saturation) Study

As before, since Cache Valley's $PM_{2.5}$ problem is generally limited to winter periods, the next phase of the particle saturation study took place from November 11, 2003 through February 27, 2004, with a nominal sampling frequency of every six days. A significant inversion, and accompanying $PM_{2.5}$ episode, took place January 7-24, 2005 and during this period, the samplers were operated every other day. The samples were

targeted to run for 24 hours, midnight to midnight, on each of the sample days. In addition to the Logan city sampling site (UTM 430309 E, 4619926 N, zone 12), sixteen additional sites were established throughout the Cache Valley. The additional sites were located in or near surrounding Utah communities of Wellsville, Hyrum, USU's Animal Science Farm (ASF), USU's Evan's Farm, Mendon, Cache Valley Hunter Education Center (Hunter Ed), the Utah State University campus (USU), Ballard Junction, Smithfield, Amalga, Newton, Clarkston, Richmond, and Cornish. Two sites were also established on the Idaho side of the Cache Valley, at the towns of Franklin and Preston. Figure 3 shows the various sites' location in terms of UTM (NAD27) coordinates.

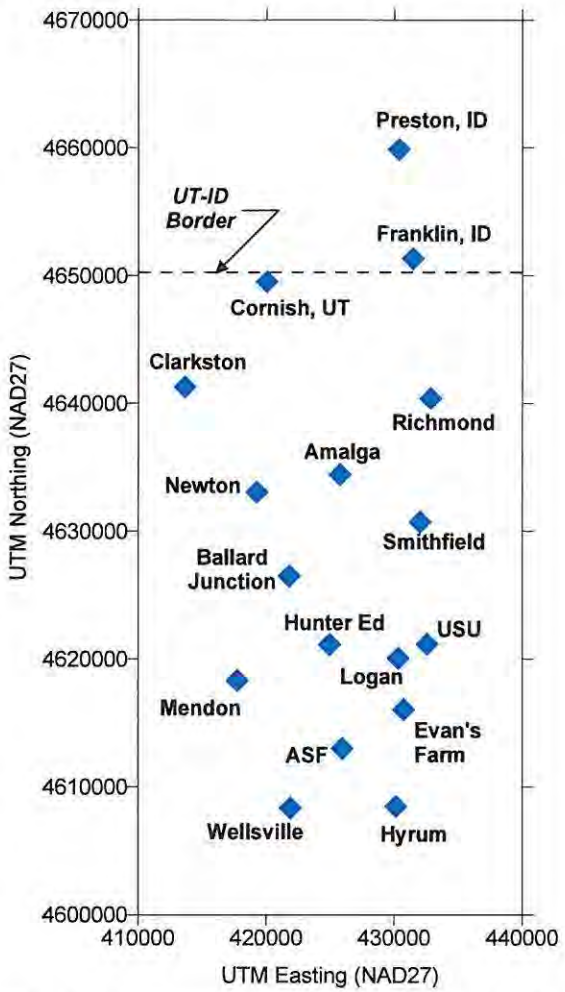


Figure 3. Relative Cache Valley sampling locations for the 20003-2004 $PM_{2.5}$ saturation study.

The fifteen portable AirMetrics $PM_{10/2.5}$ MiniVol samplers (AirMetrics, 2004) were obtained from the Air monitoring Center (AMC) of Utah's Department of Environmental Quality (DEQ). These instruments were deployed at all but the Smithfield location. The MiniVol samplers operate via a battery-powered pump, which draws air through an impactor specifically-designed to separate the larger particle

fraction (>2.5 μm), allowing the PM_{10} or $PM_{2.5}$ (depending on the sample head) material to be collected on a subsequent 47 mm Teflon filter. The filters were equilibrated at room temperature, in an air-tight desiccator, and weighed on a 6-place (gram-based) microbalance pre- and post-exposure until triplicate weights within 0.005 mg were obtained.

The samplers are designed to operate at an actual flowrate of 5 Lpm, with flow controlled via a manually set rotameter. Prior to testing, each system was calibrated using a soap-bubble meter and a calibration equation was developed relating local temperature and pressure and the rotameter reading to the flowrate at actual conditions. For a given sampling run, the expected average temperature and pressure were estimated, the necessary rotameter setting for the required 5 Lpm (actual) was determined, and the flow was adjusted so that when the system's internal alarm initiated the sampling period, the proper flowrate would be obtained. An on-board elapsed time counter registered the actual duration of any given sampling period (some runs were abbreviated due to battery or pump failure, programming errors, etc.) which, when combined with the calibrated rotameter flowrate, was used to determine the sample volume.

At the Smithfield location, a $PM_{2.5}$ FRM sampler (Andersen Instruments, RAAS 2.5-100) was operated by the investigators following the basic regulatory guidelines outlined in 40 CFR 50, Appendix L (40CFR50, 2003). The $PM_{2.5}$ FRM (Rupprecht and Patashnick) sampler at the Logan site, the DEQ's official Cache Valley sampling location, was operated by DAQ and BRHD personnel, who shared the collected data with the project investigators.

Once again, the comparability, and the necessity of any potential correction factors, of the portable MiniVol samplers to the FRM samplers was examined through four separate co-located test runs. For the co-located investigations, the MiniVols were placed adjacent to and at the same elevation as the Logan FRM sampler and operated to concurrent time periods.

RESULTS AND DISCUSSION

2002/2003 PM_{10} Homogeneity (Saturation) Study

Co-location of the MiniVol samplers with the Andersen FRM PM_{10} sampler showed the portable samplers consistently reported higher PM_{10} concentrations for all of five of the individual instruments. The overall average error was found to be +27%. As can be seen in Figure 4, the tested MiniVols over predicted the PM_{10} concentrations by approximately 15-40%. Given the magnitude of these percentages and the relative tightness of their individual confidence intervals, the final data analysis calculations for the describe saturation study included the appropriate individual instrumentation correction factors.

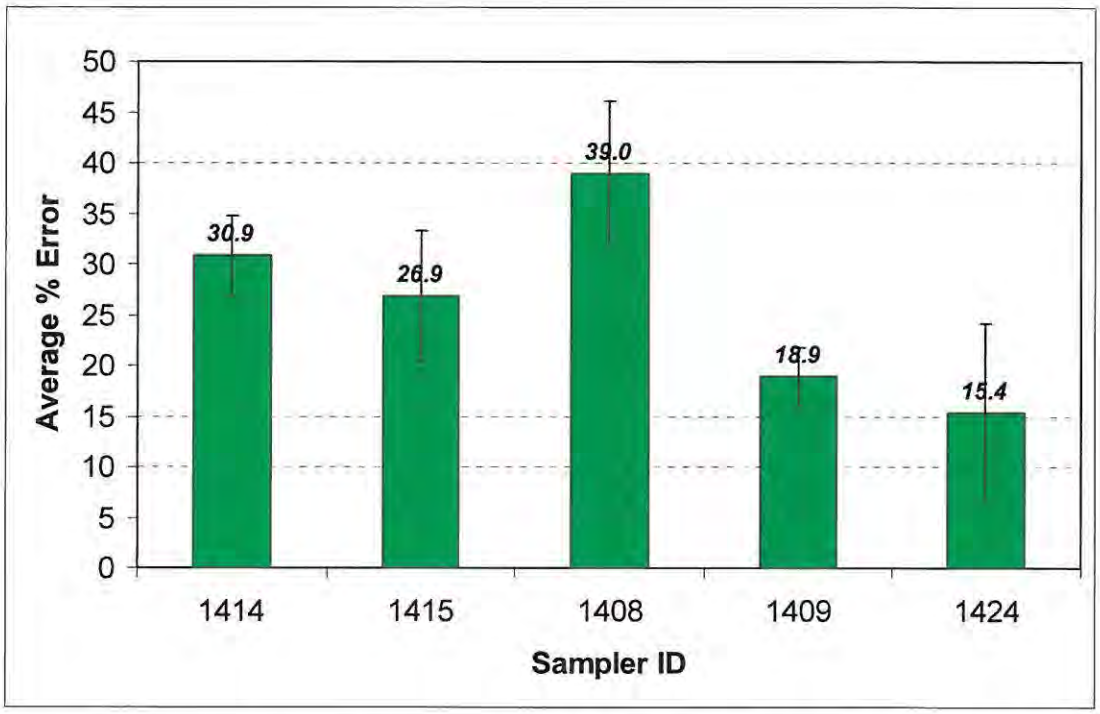


Figure 4. Average percent error for the tested MiniVol samplers when compared to a co-located FRM PM_{10} sampler (error bars represent the 95% confidence interval).

A total of 18 sampling days were observed for the period between October 24, 2002 and February 26, 2003 for the PM_{10} homogeneity study. Out of a potential total sample number of 126 samples (18 sample days x 7 sample sites), 13 (10.3%) individual samples were not obtained due to sampler failure or operator error. Typical explanations included battery failure or errors in setting of the on-board timer/alarm. Typical PM_{10} concentrations observed, as measured at the Logan city site, varied from 4 to 34 $\mu g\ m^{-3}$.

Although some day-to-day variations were observed in the geographical location of PM_{10} maximums, on average, the Cache Valley appeared to be quite homogeneous in terms of relative concentrations. However, at the 95% confidence level, the site located to the north of the Logan city center did show slightly lower PM_{10} concentrations, while the site at the south end of Cache Valley showed slightly higher PM_{10} concentrations. Figure 5 shows the overall average site-to-site PM_{10} concentration variations normalized to the PM_{10} concentrations measured at the Logan (FRM) site. In other words, on any given day, the PM_{10} concentration at any particular site was divided by the PM_{10} concentration measured at the Logan site. This approach was used to minimize potential biases when averaging all of the individual sites' data (e.g. not allowing differences on "low" days to be overshadowed by variations on "high" days). Although distinct trends can be seen in Figure 5, with inclusion of the 95% confidence intervals (error bars), the overall data set shows statistically homogeneous concentrations. For example, error bars

for the Smithfield and American Heritage West (AHW) concentrations overlap the Newton PM_{10} concentration error bars, which, in turn, overlap all of the remaining sites. However, the Smithfield and AHW error bars do not overlap, so their PM_{10} concentrations are statistically different from each other.

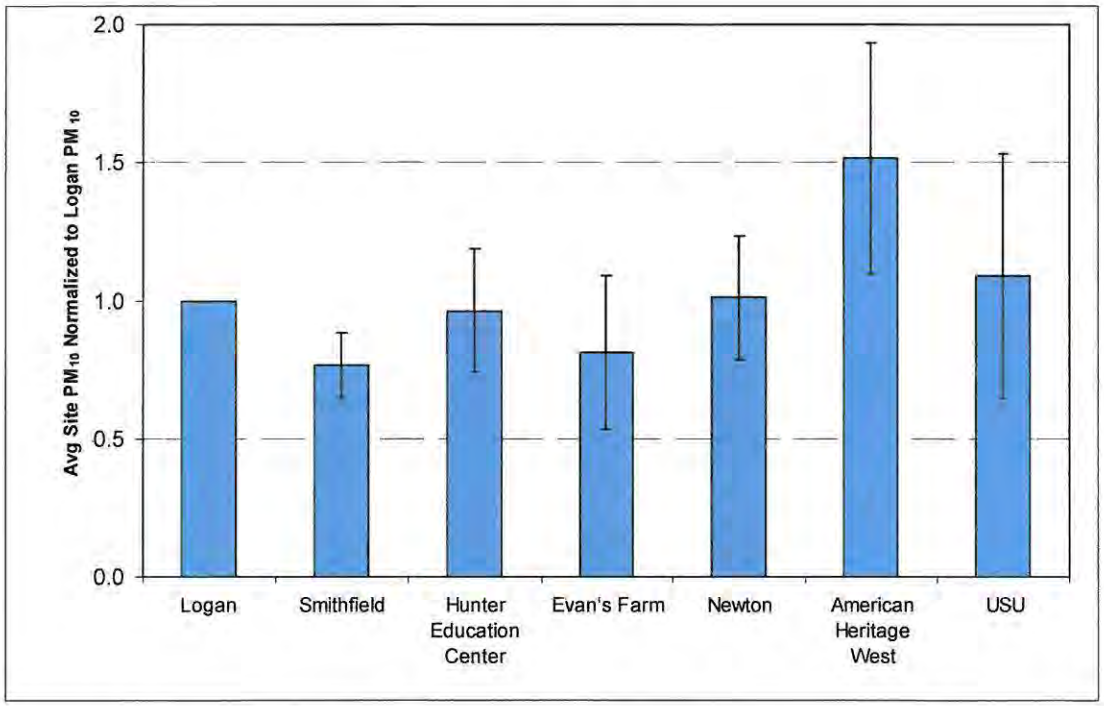


Figure 5. Average PM_{10} concentrations normalized to the observed Logan PM_{10} (error bars represent the 95% confidence interval).

Figure 6 shows the average normalized concentrations in relation to the sampling sites geophysical location. The contours were prepared via Golden Software's Surfer mapping software using a Kriging algorithm. As can be seen, on average there appears to be an identifiable increase in PM_{10} concentrations when moving from the northern end of Cache Valley to the southern end.

Paired PM_{10} and $PM_{2.5}$ samplers were only operated at the Logan and Smithfield locations. From these data, it was found that the $PM_{2.5}$ concentrations were an average of 67.5% ± 6.7 (±95% CI) of the PM_{10} concentrations. More interestingly, the Smithfield $PM_{2.5}$ values averaged 88.4% ± 12.0 (±95% CI) of the Logan $PM_{2.5}$ values, indicating no significant differences between $PM_{2.5}$ as measured at the two sites. This is not unexpected as $PM_{2.5}$ is a subset of the PM_{10} and the smaller $PM_{2.5}$ particles are much more likely to remain suspended in the atmosphere. For example, in still air, the settling velocity of a 2.5 μm diameter particle is sixteen times slower than a 10 μm diameter particle (Cooper and Alley, 2002).

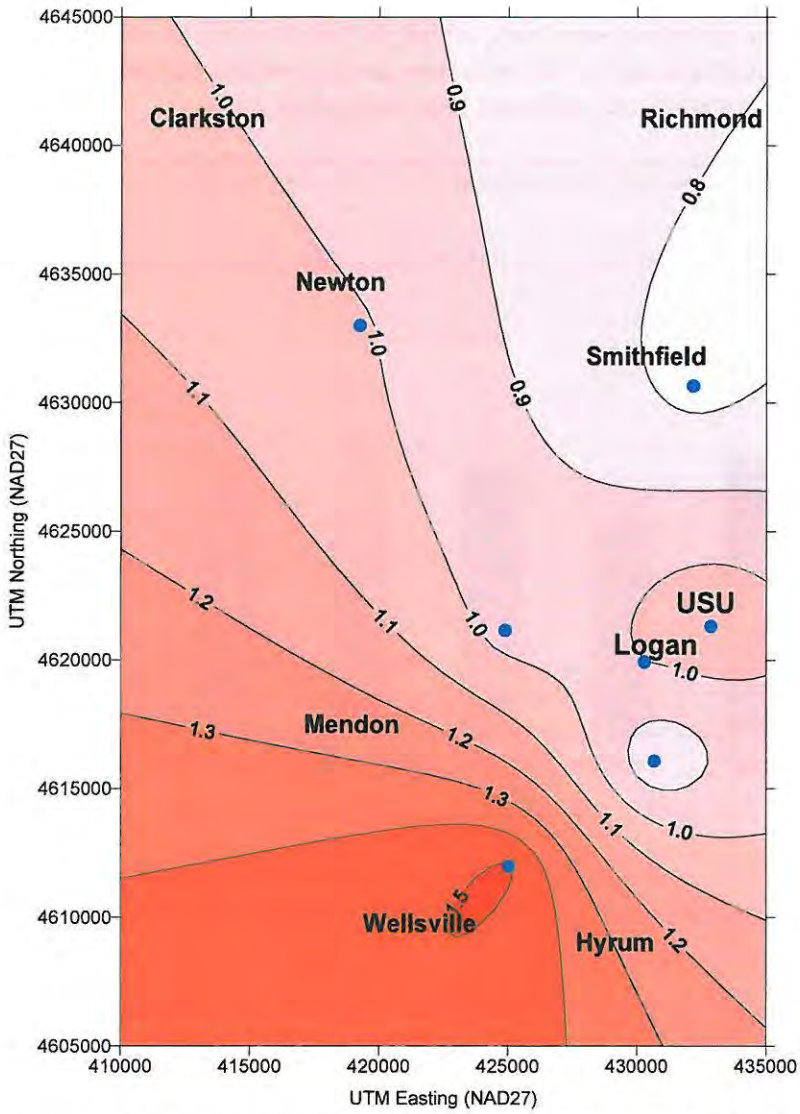


Figure 6. Normalized PM_{10} concentrations measured in northern Utah's Cache Valley, Oct. 2002 – Feb. 2003.

2003/2004 $PM_{2.5}$ Homogeneity (Saturation) Study

Co-location of the MiniVol samplers with the R&P (Logan site) FRM $PM_{2.5}$ sampler showed the portable samplers generally reported similar $PM_{2.5}$ concentrations. As can be seen in Figure 7, the tested MiniVols' measured $PM_{2.5}$ concentrations differed from those reported by the FRM sampler by approximately –21% to +47%. The overall average error was found to be a remarkable –0.9%. Given the magnitude and variability of these percentages and the relative tightness of their individual confidence intervals, the final data analysis calculations for the describe saturation study included the appropriate individual instrumentation correction factors.

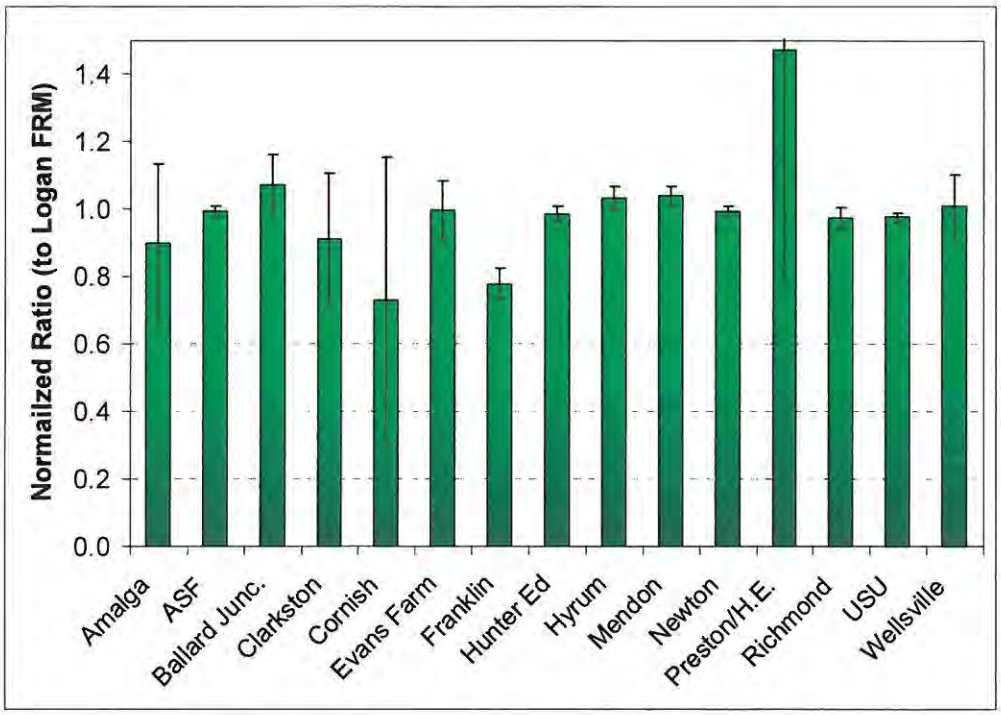


Figure 7. Average percent error for the tested MiniVol samplers when compared to a co-located FRM $PM_{2.5}$ sampler (error bars = 95% confidence interval).

A total of 22 sampling days were observed for the 2003/2004 winter sampling period. Out of a potential total sample number of 374 samples (22 sample days x 17 sample sites), 80 (21.4%) individual samples were not obtained due to sampler failure or operator error. Typical explanations included battery or pump failure, especially during extreme temperature events (< -10°C), or errors in setting of the on-board timer/alarm. $PM_{2.5}$ concentrations observed during the study, as measured at the Logan city site, varied from 3 to 128 $\mu g\ m^{-3}$.

Similar to the 2002/2003 PM_{10} homogeneity study, the Cache Valley appeared to be relatively homogeneous in terms $PM_{2.5}$ concentrations, although some day-to-day variations were observed in the specific location of $PM_{2.5}$ maximums and minimums. Figure 8 shows the average site-to-site $PM_{2.5}$ concentrations on good-to-moderate days (<65 $\mu g\ m^{-3}$) normalized to the Valley-wide $PM_{2.5}$ concentrations. In other words, on any given day, the $PM_{2.5}$ concentration at any particular site was divided by the overall Valley-wide $PM_{2.5}$ average concentration measured on that day. This approach was used to minimize potential biases when averaging all of the individual sites' data (e.g. not allowing differences on "low" days to be overshadowed by variations on "high" days). This differs from the approach used for the 2002/2003 PM_{10} saturation study, wherein the

concentrations were normalized to the Logan site. The new approach allowed for calculation of confidence intervals about the Logan site as well the other locations.

As can be seen, on the good-to-moderate days, some site-to-site variation did seem to exist; however, with inclusion of the 95% confidence intervals (error bars), the data set shows statistically homogeneous concentrations. For example, confidence intervals for Hyrum and Mendon overlap Evan's Farm and Newton $PM_{2.5}$ confidence intervals, which, in turn, overlap the confidence intervals of the remaining sites. However, the Smithfield and Hyrum error bars do not overlap, so their average $PM_{2.5}$ concentrations on these selected days are statistically different from each other, but not from the data set taken as a whole.

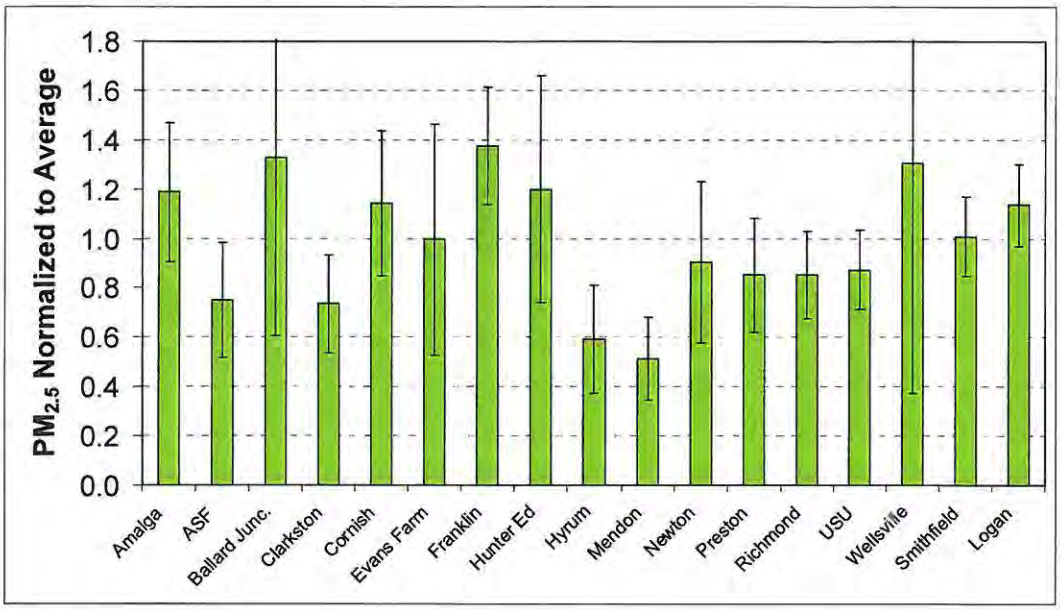


Figure 8. Average $PM_{2.5}$ concentrations normalized to the Valley-wide average $PM_{2.5}$ concentrations on days with $PM_{2.5}$ <65 μg m^{-3} (error bars = 95% confidence interval).

Figure 9 shows the normalized concentrations on days with $PM_{2.5}$ concentrations <65 μg m^{-3} in relation to the sampling sites geophysical location. The contours were prepared via Golden Software's Surfer mapping software using a Kriging curve-fitting algorithm. As can be seen, there appears to be an identifiable trend of increasing in $PM_{2.5}$ concentrations down the center of the Cache Valley, with the highest values recorded in the low population areas of Wellsville, Ballard Junction and Franklin (Idaho), as was also shown in Figure 8.

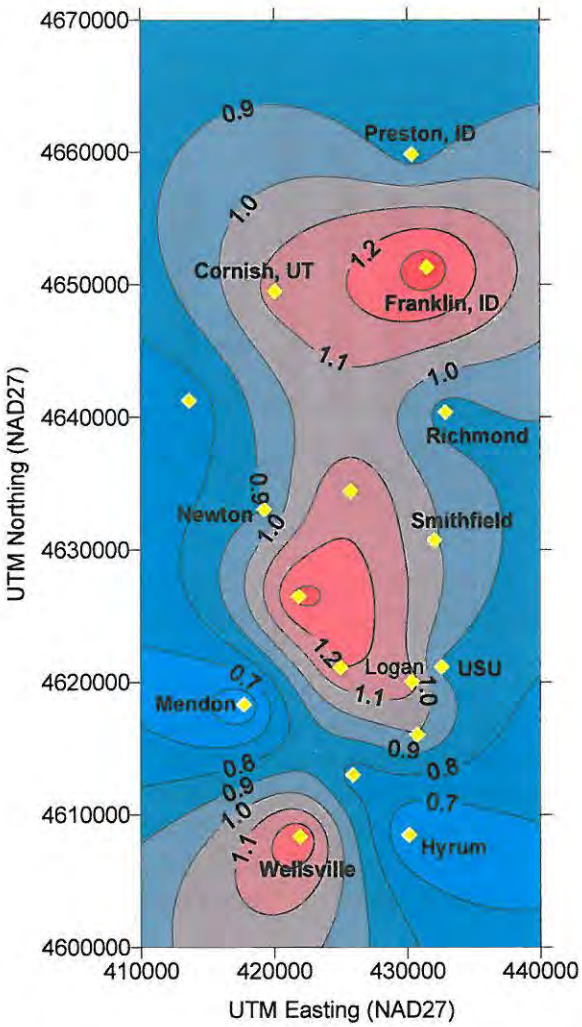


Figure 9. Normalized $PM_{2.5}$ concentrations measured in northern Utah's Cache Valley on good-to-moderate days (<65 μg m^{-3}).

On "unhealthy" $PM_{2.5}$ days (concentrations >65 μg m^{-3}), the data were more varied (larger confidence intervals), but overall more consistent in statistical homogeneity. As can be seen in Figure 10, only the Amalga and ASF sites, located essentially in the middle of the Cache Valley, were statistically different from the average on these high pollution days. Similarly, only the Hyrum and Preston (Idaho) sites, on the far south and north ends of the Valley, were statistically lower than the average. However, once again, taken in its entirety, the data set shows complete statistical overlap or $PM_{2.5}$ homogeneity. It should be noted neither the Ballard Junction or Clarkston samplers successfully operated during any if the high concentration episodes. Also, during these same periods the Newton and Hunter Ed instruments only collected one and two samples, respectively.

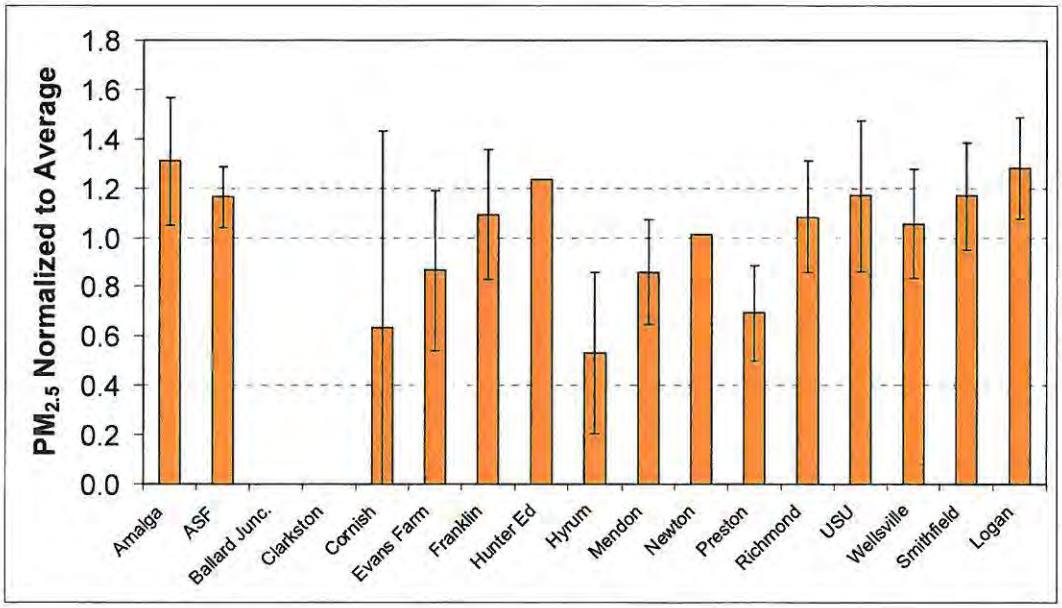


Figure 10. Average $PM_{2.5}$ concentrations normalized to the Valley-wide average $PM_{2.5}$ concentrations on days with $PM_{2.5}$ >65 μg m^{-3} (error bars = 95% confidence interval).

Similar to Figure 9, Figure 11 shows the normalized concentrations on days with $PM_{2.5}$ concentrations >65 μg m^{-3} in relation to the sampling sites geophysical location. As can be seen, there appears to be a more centralized zone of elevated $PM_{2.5}$ concentrations, but that zone encompasses much of the center of the Cache Valley and its main population centers. The lowest average concentrations are found in the southeast (Hyrum) and northwest and north (Cornish, UT and Preston, ID) corners of the Cache Valley.

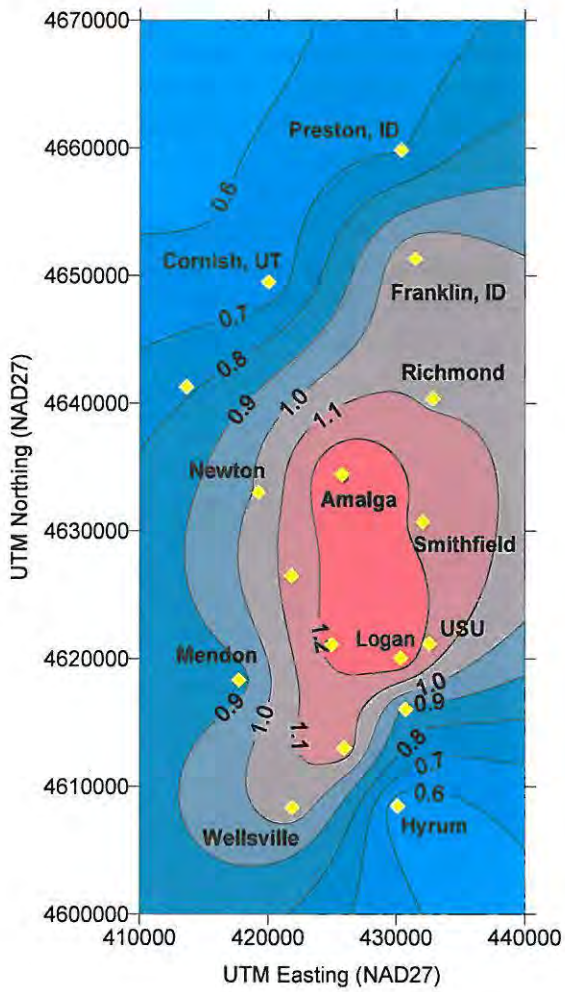


Figure 11. Normalized $PM_{2.5}$ concentrations measured in northern Utah's Cache Valley on "unhealthy" days (>65 μg m^{-3}).

PM_{10} AND $PM_{2.5}$ HOMOGENEITY CONCLUSIONS

From the 2002/2003 PM_{10} saturation study, although some slight areal variations may exist, within in a 95% confidence interval, the wintertime PM_{10} concentrations throughout northern Utah's Cache valley appear to be homogeneous. At the Logan and Smithfield sampling locations, which showed a statistically significant difference in their PM_{10} concentrations, no significant differences were observed in their $PM_{2.5}$ concentrations.

As with the previous winter's PM_{10} study, some site-to-site $PM_{2.5}$ variations were shown to exist; however, within in a 95% confidence interval, the wintertime $PM_{2.5}$ concentrations throughout northern Utah's Cache Valley appear to be homogeneous. On days with 24-hr $PM_{2.5}$ concentrations less then the 24-hr NAAQS (65 μg m^{-3}), the highest concentrations tended towards the center of the Valley, which generally tended to

correspond to the lower elevations of the local topography. On "unhealthy" days or days in which the $PM_{2.5}$ concentrations where greater than the 24-hr NAAQS, the Valley was once again found to be statistically homogeneous. However, during these episodes, the maximum concentration area was much broader and located over most of the population zones on the Utah side of the Cache Valley.

The homogeneity of the PM_{10} and $PM_{2.5}$ concentrations indicates that the particulate issue is not just a problem for the main population center, Logan, but for all of the communities of the Cache Valley. Therefore, the solution to the problem will have to involve all of the surrounding communities

CACHE VALLEY AMBIENT AMMONIA STUDIES

Contributing Authors

Dr. Randal S. Martin
Dongzi Zhu, M.S. Env. Eng. Candidate
Kori D. Moore, M.S. Env. Eng. Candidate
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

R. Neal Olson
Utah Air Monitoring Center
West Valley City, UT

INTRODUCTION

As was mentioned in the Overall Introduction, the nominal composition of the $PM_{2.5}$ particles in the Cache Valley is dominated by ammonium salts, with ammonium nitrate accounting for 50-95% of the total particulate mass. For comparison, $PM_{2.5}$ in most rural areas in the western United States are typically dominated by total carbonaceous mass and crustal materials (EPA, 2003). Urban areas in the western US, are typically dominated by carbonaceous material; however, nitrate salts appear to be a significant portion of the $PM_{2.5}$ in the southern California area (EPA, 2003). Both rural and urban areas in the eastern US are dominated by the sulfate salts, with a strong contribution from carbonaceous materials (EPA, 2003).

The dominance of secondary, ammonium-based particulate material in the Cache Valley suggested a likely abundance of ambient gas-phased ammonia (NH_3) in the local atmosphere. The strong dependency of the local economy on agriculture, especially livestock production, further supported this supposition. The most current Utah state economic report indicates that Cache Count, UT had total agricultural receipts in 2004 of $121.6 million, with 83.2% of that attributable to livestock production (UGOPB, 2006). The most recent data available for Franklin County, ID (2000) show that agriculture accounted for total cash receipts of $66.0 million, with livestock production accounting for 85.6% of the county's agricultural total (Sonoran Institute, 2006).

In order to investigate levels of ambient, gas-phase NH_3 and whether NH_3 is the limiting factor in NH_4NO_3 formation, an ammonia sampling station was co-located at the Logan city sampling site to establish overall ambient levels of gas-phase and particulate-phase NH_3, as well as the levels of associated anions and cations. Subsequent to this investigation, an additional a program was initiated in the Fall of 2004 to monitor real-time ambient ammonia concentrations at the downtown Logan, UT (urban) location, the site historically used for federal compliance monitoring, and a rural site, located away from significant, typical "city-related" pollutant sources. To be representative of the area, a rural site was sought out, such that it was in the proximity of locally-typical expected rural ammonia sources, such as small cattle operations ("mom and pop" dairies), working agricultural fields, and natural and constructed wetlands. The secondary site chosen was near Amalga, UT. The goal of the second study was to see if the Logan location was representative of valley-wide NH_3 concentrations or if there were significant differences between urban and rural locations.

METHODOLOGY

Ambient Gas- and Particulate-Phase Ammonia and Related Ions

The ambient gas-phase ammonia and acid sampling system was co-located at the Logan city sampling site and sampled on an every sixth day schedule. A URG, Inc. Model 3000C Annular Denuder System (ADS) (URG, 2000) was used for collection of 24-hour averaged gas- and particulate-phase samples. The full system operates at 10 Lpm and consists of a sharp-cut $PM_{2.5}$ cyclone, followed one or two acid gas (Na_2CO_3-

coated) denuders, followed by the NH_3 gas (citric acid-coated) denuder, followed by a 2-stage filter pack assembly. For the purpose of this study, the sampling was initiated in October of 2002 and continued through the end of 2003.

The NH_3 collection denuders were prepared prior to exposure by coating the inner surfaces with a 1% citric acid solution (1.0 g citric acid, 99 ml of methanol, 1 ml glycerol). For acid gas collection, 1% Na_2CO_3 solutions were prepared from 1.0 g Na_2CO_3, 1.0 g glycerol, 50 ml double-distilled, deionized water (DDW) and 50 ml methanol. Glycerol was used to make the denuder surface more adhesive and prevent oxidation of nitrite to nitrate by ozone. Within the ADS, air was drawn through the cyclone for large particle removal, then through the Na_2CO_3-coated denuder where acid gases were collected, and then through the citric acid-coated denuder where NH_3 (g) was absorbed to the walls. The air stream was then drawn through a filter pack to collect the particulate matter for mass and compositional determination, followed by the nylon backup filter. The system was enclosed in a weatherproof box, which was kept at a lower limit of 7 ^{0}C if the ambient temperature was less than 7^{0}C, or 2^{0}C above ambient temperature if the ambient temperature was greater than 7^{0}C. The system was connected to a pump with an accompanying mass flow controller and a dry gas meter. The mass flow controller allowed precise control of airflow through the annular denuder/cyclone assembly. The Gallus 2000 dry gas meter (Schlumberger, Reims Cedex, France) was also plumbed to the system and was calibrated before use to insure precise sample volumetric reading.

After exposure, the denuder tubes were separately eluted with 10 ml (NH_3) and 30 ml (acid gases) of double-distilled, deionized water. Additionally, 10 µL of concentrated H_2SO_4 was added to the NH_3 extract to acidify the sample, ensuring the collected gas-phase ammonia (NH_3) would remain in solution as the more soluble ionic species, ammonium (NH_4^+). The samples were stored in the dark at 4°C until the extract concentrations were quantified via ion chromatography. The Dionex IC system consisted of the following equipment: AS 40 Automated Sampler, CD 20 Conductivity Detector, GP 40 Gradient Pump, Membrane Suppressor, LC 25 Chromatography Oven, and an IonPac® AS4A-SC (4 mm) anion column or an IonPac® CS12A cation column, AG-4ASC anion guard column or CG12A cation guard column, depending on the ionic species of interest.

For anion analysis from the denuder washes, a 25-µL injection loop was used in the IC, while for cations analysis from the denuder washes, an 80-µL injection loop was used; and for filter extraction cations, a 195-µL loop was used. This was because the concentration of filtered extraction cations was much lower than that from denuder washes, and a larger loop allowed injection of more sample onto IC which allowed more consistent peak detection. For anions analysis, DDW filtered through a 0.2 µm filter was used as reagent water and 1.7 nM sodium bicarbonate and 1.8 nM sodium carbonate solution as the eluant. Stock standard solutions of 1000 mg/L of Cl^-, NO_3^-, NO_2^-, SO_4^{2-} were prepared from ACS reagent grade salts (Fisher, Fair Lawn, NJ). For cations analysis, 0.15 M H_2SO_4 was used as the eluant. Stock standard solutions of 1000 mg/L of Na^+, K^+, Mg^{+2}, Ca^{+2}, NH_4^+ were prepared from ACS regent grade materials.

Calibration curves were prepared using 1, 5, 10 mg/L (ppm) stock standard solutions and were verified on each working day and after approximately 20 samples. Blank and continuing calibration verification standards (CCV), such as 5 ppm standard anions or cations solutions, were tested approximately every 10 samples. Peak identification and data processing were performed using Dionex PeakNet Data Chromatography software (Version 2.0). Ambient air concentrations were calculated from the IC analytic results and sampled air volume.

Urban vs. Rural Ambient Gas-Phase Ammonia Study

This study began in November 2004 and went through April 2005, gapping the typical Cache Valley $PM_{2.5}$ "season". It should be mentioned that due to equipment problems the Logan city NH_3 system, sampling did not actually begin until Dec. 7, 2004. ThermoEnvironmental Instruments Model 17C Chemiluminescent Ammonia Analyzers were installed in climate controlled sampling trailers at the Logan site (41.7309°N, 111.8376°W, ele. 1380 m asl) and at a newly established site near Amalga, UT, approximately 15.1 km northwest of the Logan site, roughly near the center of the Utah portion of the Cache Valley. Within 3 km of the rural site are a number of agricultural fields, two small dairy operations (50-100 cows each), natural wetlands and an associated stream system, a waste lagoon, and a small cheese factory. The rural site specific coordinates are as follows: 41.8584°N, 111.8943°W, ele. 1355 m asl. All UTMs given are in NAD27 coordinates.

At both locations, sample air was transferred into the analyzers through glass sampling manifolds and Teflon® tubing. The Model 17C Analyzers operate through the sequential measurement of NO, NO_2, and NH_3 via ozone initiated chemiluminescence and surfaced catalyzed oxidation of the ammonia. The system first measures ambient NO and NO_2 as describe by typical federal reference method gas-phase chemiluminescence (40CFR50, App. F, 2006), as such the NO_x data are archived and available as well as the ammonia. The NH_3 analyzer adds an additional 775°C stainless steel converter to oxidize the NH_3 to NO. The 17C then measures the additional system response due to the newly created NO, which is then reported as ambient ammonia (TECO, 2004).

The instruments were calibrated or zero/span checked on an at least semi-weekly basis using commercially-purchased ammonia and zero gas standards. The instrument has a reported lower detectable limit of 1 ppb, a response time of 120 seconds, and a linearity of ±1% at ranges up to 20,000 ppb (TECO, 2004). Similar instrument characteristics were also reported via a separate independent study (Cowen et al., 2004). Additional operational details can be found at the manufacture's website (TECO, 2006).

RESULTS AND DISCUSSION

Ambient Gas- and Particulate-Phase Ammonia and Related Ions

Figure 12 shows the ambient, gas-phase ammonia concentrations measured at the Logan site from October 2002 through December 2003. The average overall concentration is 9.3 ppb ± 1.2 (95% CI). The minimum NH_3 concentrations were around 2.5 ppb, which were observed in the summertime, and the maximum concentrations approached 25 ppb, which were observed in the wintertime. This is well above what is typically considered tropospheric background levels (0.05 – 0.2 ppb) and compares to other areas of high agricultural activity (Robarge et al., 2000; Finlayson-Pitts and Pitts, 2000). The elevated ammonia levels are not unexpected due to the enclosed nature of the Valley's airshed, especially during wintertime inversion episodes, and the common nature of livestock production in the local region.

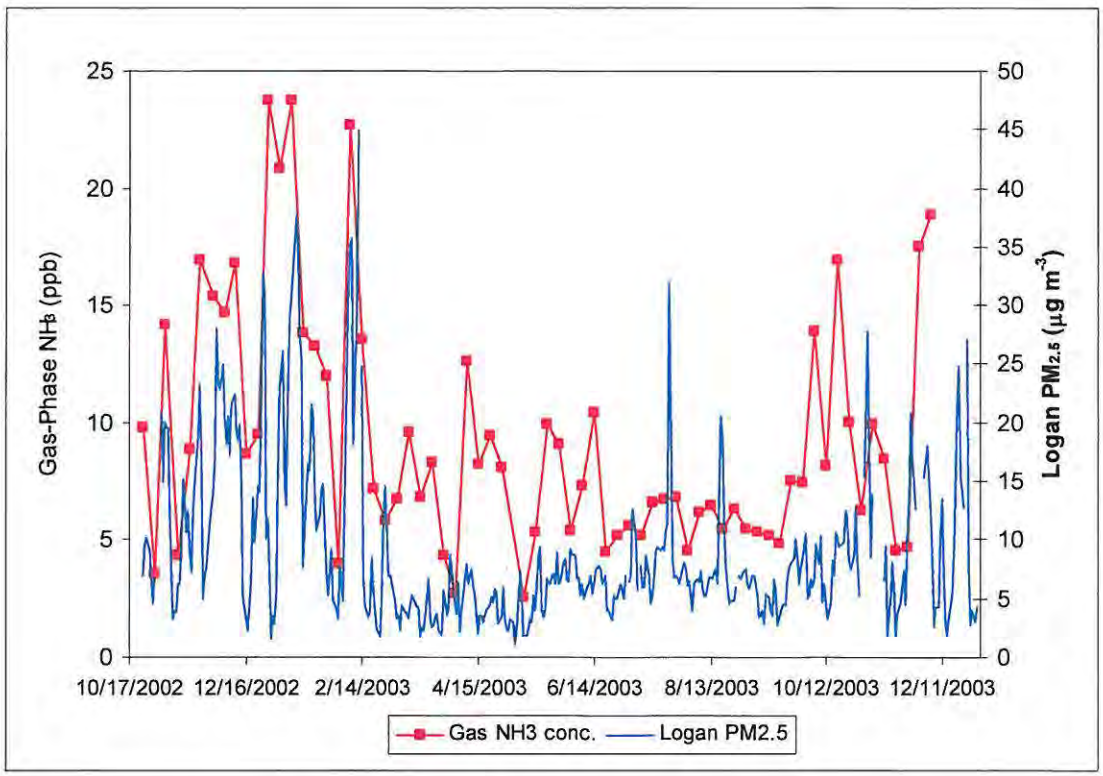


Figure 12. Ambient NH_3 and $PM_{2.5}$ measured in Logan, Utah.

Based primarily on the number of livestock in the Cache Valley, the Utah DAQ estimates daily (wintertime) emissions on the order of 4.8 metric tons (UDAQ, 2006). It is well recognized that current NH_3 emissions algorithms are considered highly uncertain (CAEAAFO, 2002; CENR, 2001; FAO, 2001); however, examination of these first order emissions estimates can give some insight into local atmospheric photochemical particle formation. The Utah DAQ has also estimated daily NO_x and SO_x emissions at 8.3 and 8.5 metric tons. Based on these numbers, there is easily enough available gas-phase NH_3 to neutralize the emitted SO_x. However, the NO_x-NH_3 particle conversion is more accurately represented as an equilibrium reaction, and as such, complete conversion would not be expected. Furthermore, the resultant ammonium nitrate particle formation

is favored during cold and humid (i.e. foggy) conditions as experienced during the Cache Valley's winter months. The high ambient NH_3 concentrations suggest the NH_3 is in excess and the emission estimates of all of the noted species may need to be revised.

The concurrent $PM_{2.5}$ concentrations from the Logan site are also shown in Figure 7 and it appears that the two parameters may be correlated. Linear regression analysis shows only a moderate correlation ($r^2 = 0.537$); however, it can be said that the higher $PM_{2.5}$ concentrations typically occurred during periods of elevated ambient ammonia. Further, the regression analysis proportionality constant, the "slope" term, is very nearly equal to unity (1.006), suggesting that in the local area, a 1 ppb increase or decrease in ambient NH_3 would be paralleled by a similar change in the $PM_{2.5}$ concentration. This is not to suggest that NH_3 emissions, and thereby particulate ammonium nitrate, increase in the winter months. More likely these increases are related to seasonal decreases in the atmospheric mixing volume and dilution rates.

On a seasonal basis, the winter months (Dec., Jan., Feb.) showed the highest NH_3 concentrations, averaging 13.9 ppb ± 2.99 (95% CI), which was statistically different from the remaining three seasons (see Figure 13). The spring (Mar., Apr, May), summer (Jun., Jul., Aug.) and fall (Sept., Oct., Nov.) NH_3 concentrations were not significantly different from each other. The overall average ambient NH_3 concentration for these three seasons was 7.7 ppb ± 0.94.

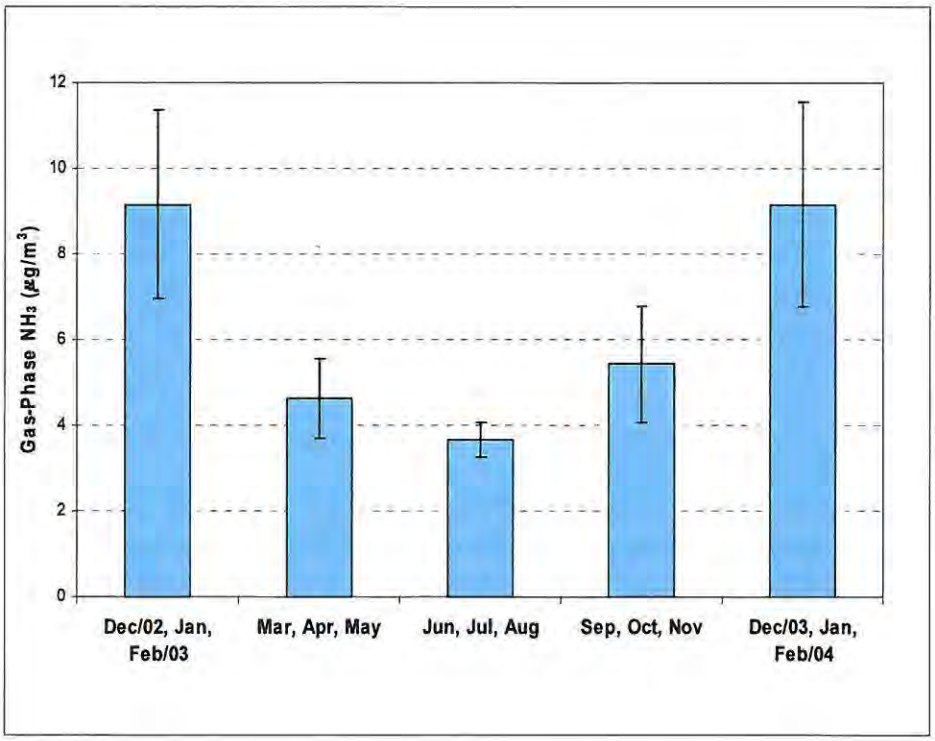


Figure 13. Seasonal variations of Cache Valley gas-phase ammonia (error bars represent 95% confidence intervals).

In order to more fully examine whether the gas-phase NH_3 is in abundance or deficit in relation to potential formation of particulate ammonium nitrate, three separate algorithms were applied to the collected ionic concentration data. The models used were the excess NH3 model of Blanchard et al. (2000), the particulate-to-total NO_3^- ratio model also by Blanchard et al. (2000), and Gas Ratio Analysis (free NH_3 to total HNO_3) model of Ansari and Pandis (1999). The details of these models, and their accuracy compared to more detailed atmospheric photochemical models, are given in the associated references, but in brief they all attempt to model the gas- and particulate phase ion balance. The average results of these three individual calculations can be seen in Figure 14.

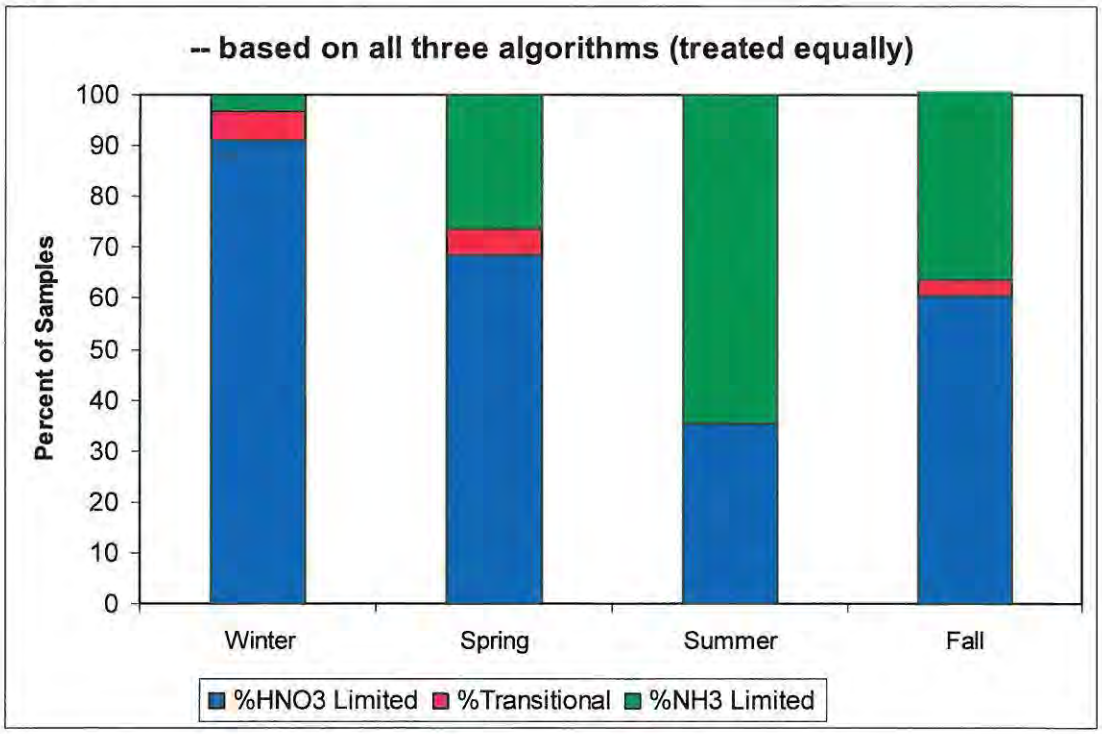


Figure 14. Seasonal determination of HNO3- or NH3-limited particulate ammonium nitrate formation.

As can be seen, during the critical wintertime periods, the NH_4NO_3 formation was limited by the availability of ambient nitric acid (HNO_3) for approximately 90% of the observed samples. Although not relevant to the Cache Valley's elevated wintertime $PM_{2.5}$ concentrations, the two of the three remaining seasons also should NH_3-rich (HNO_3-limited) atmospheres. Examination of the specific ionic concentrations and the particulate ammonium salts further suggest that the wintertime gas-phase NH_3 is in excess by as much as a factor of two (2x). More complete discussion of the above analysis can be found in Zhu (2005), and is presently in preparation for publication in a peer-reviewed journal.

Urban vs. Rural Ambient Gas-Phase Ammonia Study

As shown in Figure 15, the ambient NH_3, as measured at both the Logan (urban) and Amalga (rural) sites followed similar trends and paralleled elevated and depressed periods with the measured $PM_{2.5}$ concentrations. The Logan ammonia concentrations showed a moderate linear regression correlation with the collocated $PM_{2.5}$ concentrations with an R^2 value of 0.6543. The rural (Amalga) was statistically less well correlated showing an R^2 value of 0.4895. However, directly comparing the ambient ammonia concentrations between the two sites showed a correlation coefficient of 0.8255, with a proportionality constant of 2.5 and an intercept of 7.6 ppb (using the Logan concentration as the independent variable), indicating the rural ammonia concentrations were approximately 2½ times the average urban values.

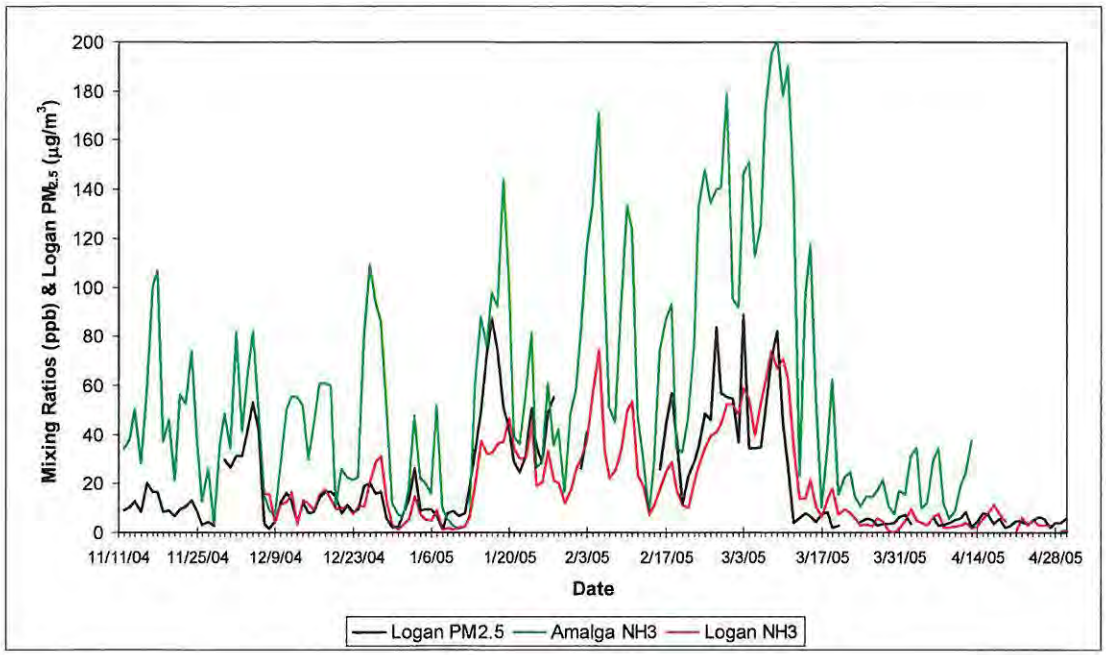


Figure 15. Logan and Amalga ambient NH_3 (24-hr avg) compared to Logan $PM_{2.5}$ (24-hr avg).

As can also be derived from Figure 15, the Logan site recorded a maximum 24-hr average value 74 ppb and a minimum value of <1 ppb, with a period daily average value of 19 ppb. This average value is remarkably consistent with that reported by Martin and Zhu (2004), 14 ppb, for the Logan location over the previous two winters using the previously described separate, denuder tube technique. The Amalga location showed much higher concentrations, with maximum, minimum, and average values of 200 ppb, 1 ppb, and 58 ppb, respectively. It is of interest to note that at the Amalga location, 1-hr average values >200 ppb were not unusual, particularly during strong inversion events and the maximum 1-hr NH_3 concentration observed was 373 ppb.

At the 95% confidence interval, the monthly ambient ammonia averages at the rural (Amalga) site were statistically higher than the concentrations observed at the urban (Logan) location (see Figure 16). This difference is believed to be due to the relative abundance of NH_3 sources near the rural location, and the increased likelihood of local photochemistry due to the increased presence of possible reactants at the urban site (NOx, VOC, etc.) due to increased nearby pollutant sources (especially automobile traffic). As with Figure 15, Figure 16 also shows the highest NH_3 concentrations occurred in January and February, when persistent inversions where present and high $PM_{2.5}$ concentrations were observed.

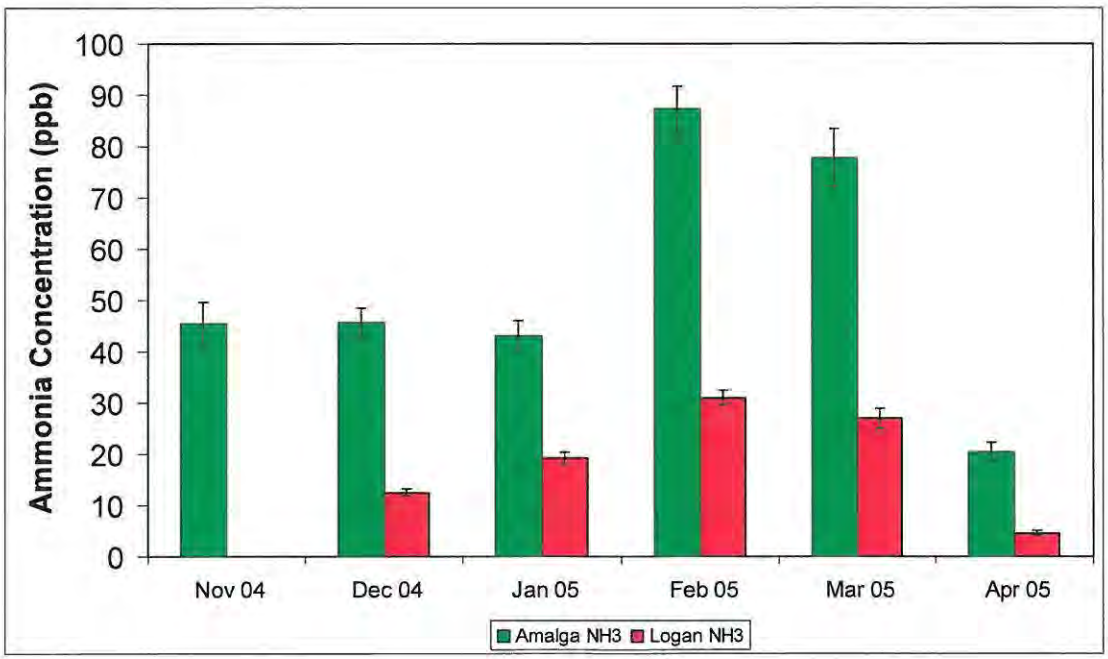


Figure 16. Monthly ambient ammonia averages for Logan (urban) and Amalga (rural), UT.

As can be seen in Figures 17 and 18, both the Logan and Amlaga NH_3 displayed noticeable diurnal patterns, with maximums typically occurring the morning hours (6 am to 10 am MST) and the minimum usually in the mid-afternoon to early evening (2 pm to 6 pm MST). The hour-to-hour diurnal difference appeared stronger, particularly at the rural location, when the ambient concentrations were at their highest in February and March.

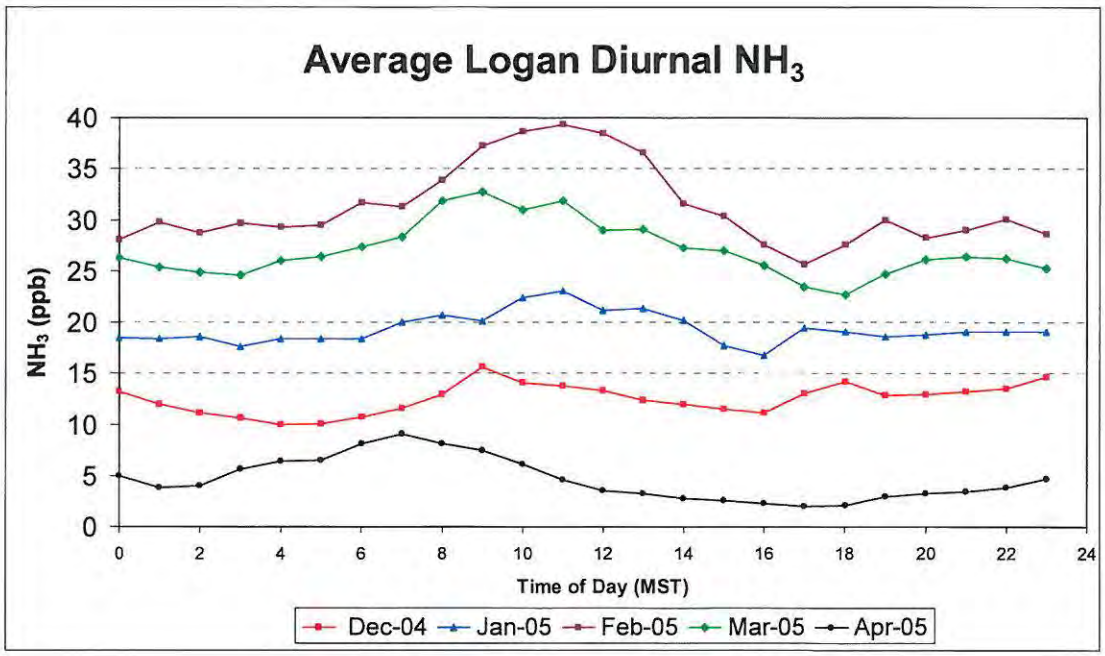


Figure 17. Logan (urban) diurnal ambient ammonia behavior.

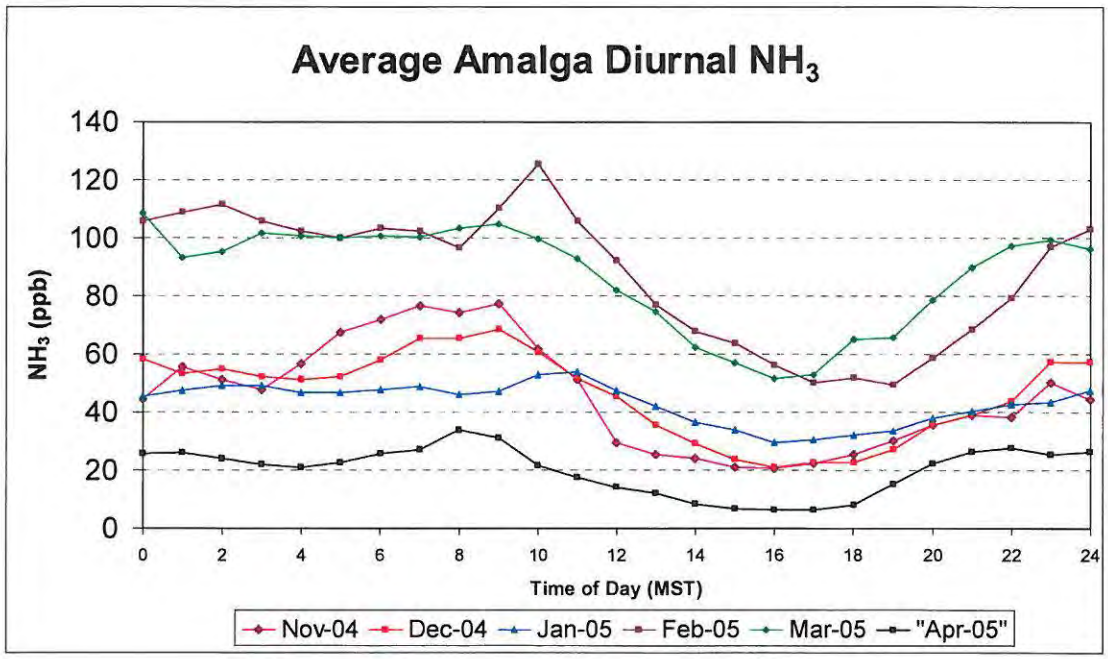


Figure 18. Amalga (rural) diurnal ambient ammonia behavior.

The abundance of ambient NH_3 at the rural location suggested that the site may be significantly impacted by an adjacent ammonia source. However, examination of observed NH_3 concentrations as a function of wind direction showed that the ammonia sources in the rural location seemed ubiquitous and the concentrations were consistent from most wind directions (see Figure 19). Furthermore, the data, averaged for wind direction, show complete statistical overlap (at the 95% confidence interval) within any given month. It should be mentioned; however, that during February and March, the average observed concentrations from the east and southeast, respectively, were statistically higher than some, but not all, of the other wind directions. While the previously mentioned cheese factory is approximately 1.4 km to the south-southeast, the land to east is mostly pasture land, agricultural fields, and natural wetlands/river areas. The dominant wind directions during the study period were north or northeast and south, southwest, or west, roughly following the topographical confines of the valley.

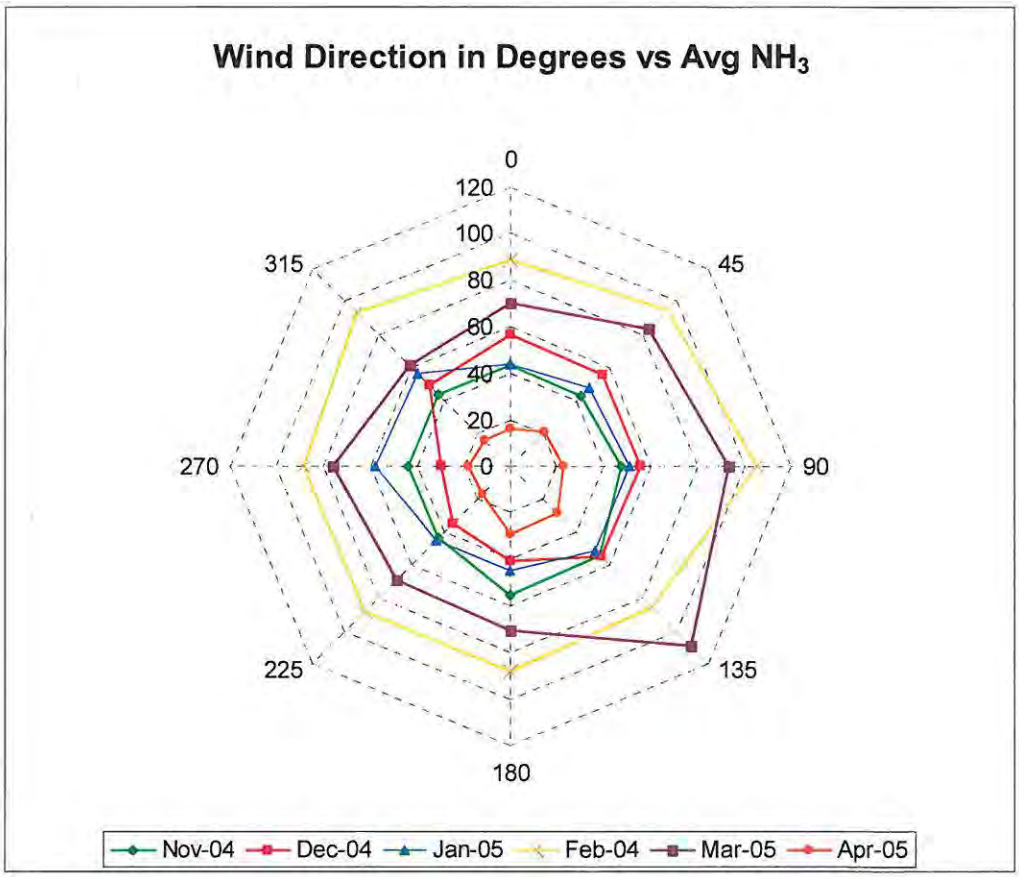


Figure 19. Amalga (rural) NH_3 concentrations as a function of wind direction.

AMBIENT AMMONIA CONCLUSIONS

Concentrations of ambient gas-phase ammonia reached values as high as 25 ppb during winter inversions, but averaged closer to 14 ppb. The gas-phase NH_3 concentrations in the two observed winter periods (2002/2003 and 2003/2004) were almost same, suggesting consistent pollutant wintertime emission rates and similar inversion-dominated pollutant trapping. Spring, summer, and fall NH_3 concentrations were significantly lower, averaging just over one half of the wintertime levels. The data showed only a moderate relationship between ambient NH_3 and $PM_{2.5}$ ($R^2 = 0.537$), but the overall trend suggested a one-to-one rate of change between the two parameters.

Applying an excess ammonia model, a particulate-to total-NO_3^- model and gas-ratio model, showed that all the of results indicated the Cache Valley's wintertime atmosphere was ammonia-rich or HNO_3-limited in reference of secondary NH_4NO_3 aerosol formation (using the Logan site as the refence location). Since Cache Valley's atmosphere has been proved to be ammonia rich, or HNO_3-limited through the herein described study, reduction on HNO_3 will produces a greater, more immediate, reduction of aerosol NH_4NO_3 than will an equivalent reduction of NH_3. Programs to be implemented could include vehicle inspection and maintenance (I&M) programs, increased public transit programs, car pooling, and other programs to reduce vehicle miles traveled.

The monthly average ambient ammonia concentrations at the urban varied from 5-31 ppb, with the highest values occurring in February and March, the same time periods when maximum $PM_{2.5}$ concentrations were observed. The highest daily average observed was 74 ppb and the test period (five month) average was 19 ppb. These values compare well to previous investigators reported values for the Logan area (Martin and Zhu, 2004; Mangelson et al., 1997) and are generally much higher than those reported for other urban areas, with the exception on Phoenix, AZ (Watson et al., 1994) and Riverside, CA (Yoong, 1981). The listed two urban areas reported ambient NH_3 concentrations on the same order as the Logan site.

The nearby rural (Amalga) site showed monthly average ammonia concentrations of 20 to 87 ppb, with the highest values occurring during the same months as those at the urban site. The overall correlation (R^2) between the two sites was 0.8255, with a derived relationship between locations as shown in Equation 1:

$$[NH_3]_{Rural} = 2.51 * [NH_3]_{Urban} + 7.58 \qquad \text{(Equation 1)}$$

where all concentrations are in parts per billion (ppb).

The highest daily average observed at the rural was 200 ppb and the test period (six month) average was 58 ppb. The maximum 1-hr NH_3 concentration observed for the rural location was 373 ppb. These values are well above those reported for non-agricultural, rural areas (Watson et al. 1994; Pryor et al. 2001; Thoni et al. 2003), but are

in line with rural sites collocated around strong agricultural production facilities (Mopunt et al., 2002; McCulloch et al., 1998).

Comparison of hourly ambient NH_3 concentrations with hourly averaged wind directions showed near complete statistical homogeneity, although there were a few direction-to-direction differences during the months of February and March. The independent nature of the ammonia concentrations in relation to the wind vectors suggests that the rural NH_3 sources are well-dispersed throughout the Cache Valley and it is likely the no single source (no one point, area, etc. source) dominates the local NH_3 emissions budget. It would seem more likely the high rural ammonia concentrations are due to a multitude of valley-wide sources.

Additionally, as shown in Equation 1, the rural ammonia levels are on the average 2.5x greater than the urban levels. As also mentioned above, as measured at the Logan site alone, was in ammonia excess by a factor of approximately two in regard to the photochemical formation of particulate ammonium nitrate. If indeed the Amalga location is representative of the other rural areas of the Cache Valley, the local atmosphere may be more ammonia-rich than previously assumed. This would, in turn, mean that the worth of potential NH_3 reduction scenarios would have to be very carefully examined.

ON-ROAD VEHICLE EMISSIONS IN CACHE VALLEY (2004)

Contributing Authors

Dr. Randal S. Martin
Mark Greenwood, B.S. Env. Eng. student
Lisa Kent, B.S. Env. Eng. student
Kori D. Moore, B.S. Env. Eng. student
Clint Rogers, B.S. Env. Eng. student
Angela Squires, B.S. Env. Eng. student
Lisa Kent, B.S. Env. Eng. student
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

INTRODUCTION

Research described within the ammonia section of this document showed that the local Cache Valley ambient air is ammonia-rich during the winter months, meaning that the limiting compound is the nitric acid (HNO_3) that combines with the gaseous ammonia (NH_3) to form NH_4NO_3. Nitric acid is photchemically formed in the atmosphere from precursor oxides of nitrogen (NO_x) compounds through a series of photochemical reactions involving other reactants such as ozone (O_3), hydroxyl radicals (OH), reactive volatile organic compounds (VOCs), and available solar radiation (insolation). The main source of NO_x and VOCs in Cache Valley is the transportation sector with over 80,000 vehicles registered in Cache County, UT and Franklin County, ID. The Cache County Assessor lists approximately 67,000 motor vehicles, half of which are 1995 or older, as being registered within the county (Cache County, 2004). Franklin County, ID, as of 2004, had 12,900 total registered motor vehicles of similar age structure (IDT, 2006).

A potentially effective way to control NO_x and VOC emissions is to control the emissions from automobiles, and this is typically accomplished through the implementation of an Inspection and Maintenance (I & M) Program that tests emissions on an annual or bi-annual basis. Vehicles that do not pass the test must be fixed before being allowed to register. This option for controlling pollutant emissions is currently being considered by Cache County, but information was lacking on what expected emissions of the current vehicle fleet and what fraction of the fleet may be expected to fail or pass an I & M Program. As such, a series of on-road emission tests were performed in May 2004 in and around Logan, UT.

METHODOLOGY

The vehicle emission testing was done using an MD-LaserTech RSD (remote sensing device) borrowed from Utah County. Additionally, a trained operator, Todd Rittle, from the Utah County Department of Health was on hand to operate and calibrate all of the test equipment. In brief, the system shot infrared and ultraviolet laser beams across a roadway, reflected of a polished mirror and returned to the transceiver, where wavelength-specific energy absorption was recorded. The concentrations of NOx, VOCs, CO, and CO_2 within the vehicle plume were the instrumental correlated with the laser attenuation. Additional information recorded included vehicle speed, acceleration, and license plate data (the latter recorded via a time-marked photograph. It should also be noted that a beam height of approximately 14" was selected, knowing this be height was a choice between measurement of typical car or typical pickup exhaust heights. The 14" was more typical of the passenger automobile.

The testing occurred at various roadside sites along high traffic areas throughout Cache Valley during the period of May 13-20, 2004. A relative map of the tested locations can be seen in Figure 20. Finally, the slope of the road at each site was subsequently measured by USU undergraduate Environmental Engineering students using standard surveying techniques and used to calculate a comparison parameter known as vehicle specific power (VSP).

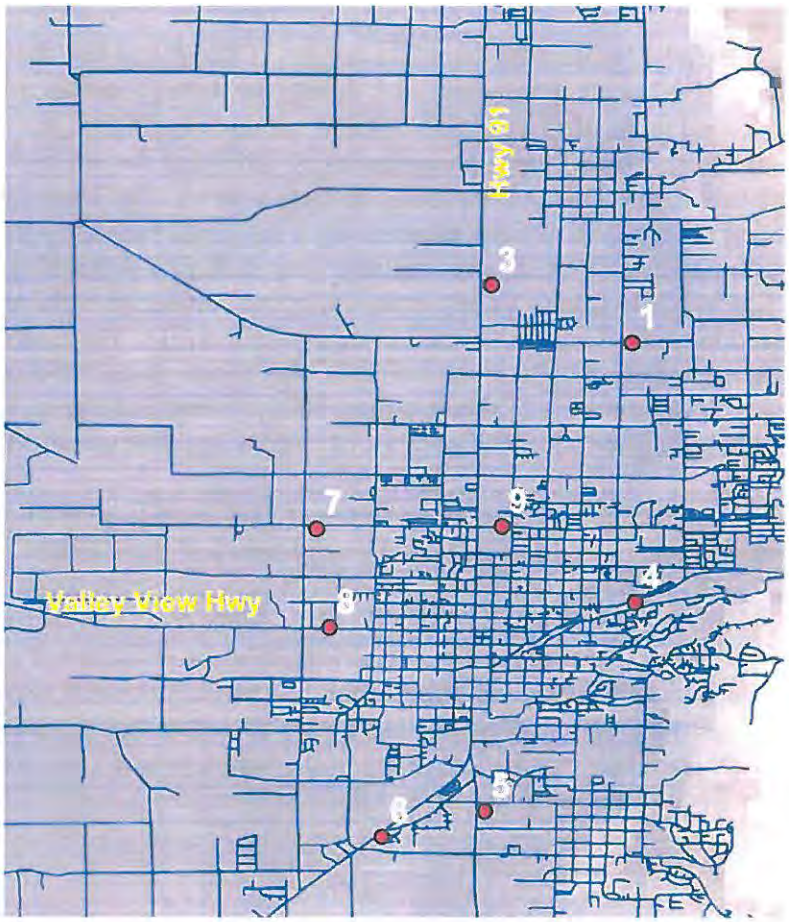


Figure 20. Locations of May 2004 Cache Valley on-road vehicle emissions study.

RESULTS AND DISCUSSION

The number of (valid) vehicles surveyed for exhaust emissions at all sites within Cache Valley was 12,464 at an average speed of 34.4 mph. The vehicles were separated into bins by vehicle year beginning with the year 1980 and continuing at five year increments until the last bin of 1996 and older. Figure 21 displays how the sample set of surveyed vehicles sorted by vehicle year compares with the total number of registered vehicles in the county also sorted by vehicle year. The two curves in this figure are very similar suggesting that the sampled data is a good descriptor of the general vehicle population.

Figure 22 shows the percentage of the total bin population represented in the sampling set. The majority of registered cars in Cache County have a vehicle year of 1990 or greater, and this division can be seen in Figure 22 as the 1990-95 and older than 1996 bins had the greatest percentage of total cars sampled.

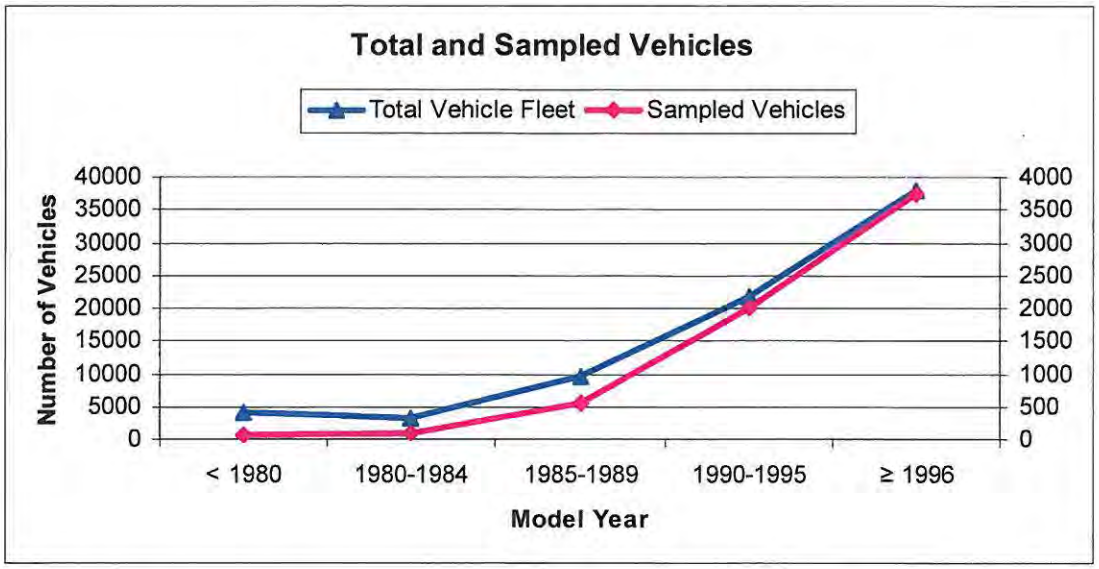


Figure 21. Vehicles surveyed with compared to total Cache County registered vehicles.

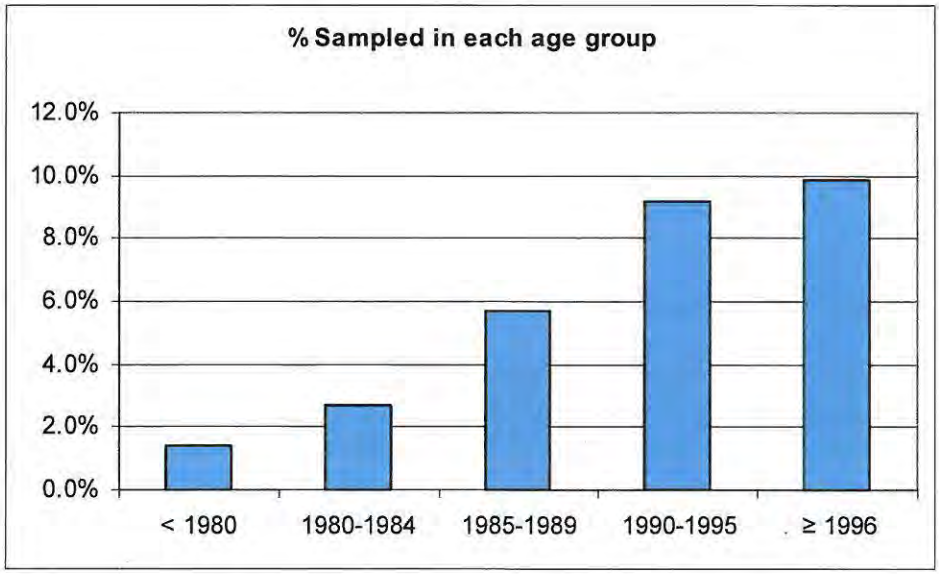


Figure 22. Surveyed vehicles grouped by vehicle year.

The data of exhaust emissions obtained from the surveyed cars were analyzed to see the percentage of cars in each vehicle year classification that would exceed the emission limits for carbon monoxide (CO), hydrocarbons (VOCs), and oxides of nitrogen (NO_x). Carbon dioxide (CO_2) was also monitored, but it is not reported here as it is not a presently regulated automobile emission pollutant. Each pollutant was evaluated

individually, which means that a single vehicle could potentially fail emissions testing based on one, two, or all three emission limits.

Figure 23 shows the percentage of vehicles by vehicle year that would fail an oxides of nitrogen emissions test, based on a concentration limit 1776 ppm. As seen in the figure, all of the age classes are below a 15% failure rate. This means that a low number of cars are failing for NO_x, which is the pollutant of concern for $PM_{2.5}$ formation. The percentage of vehicles that failed on the basis of NO_x is small compared to the results for CO and HC. Overall, 4.5% of the measured vehicles would presumably fail an inspection test, accounting for 25.4% of the total automobile NO_x emissions. The average tailpipe NO_x concentration measured was 396 ± 11 ppm.

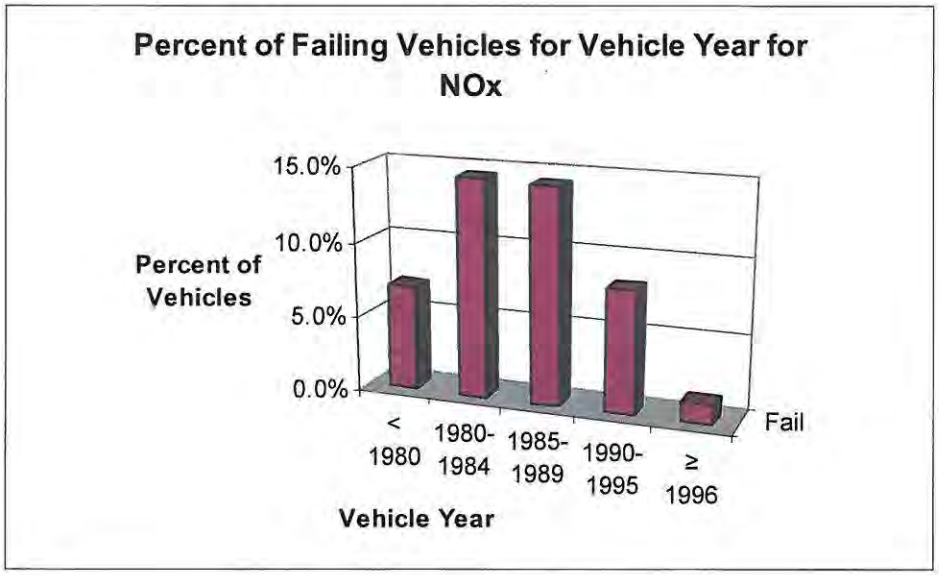


Figure 23. Percent of vehicles by vehicle year exceeding NO_x emission limits.

The older cars and newer cars result in a smaller percentage of failures than vehicles with a vehicle year of 1980 to 1989. It can be seen from Figure 24 that once again the average NO_x concentration for failing vehicles is not heavily dependent on vehicle year.

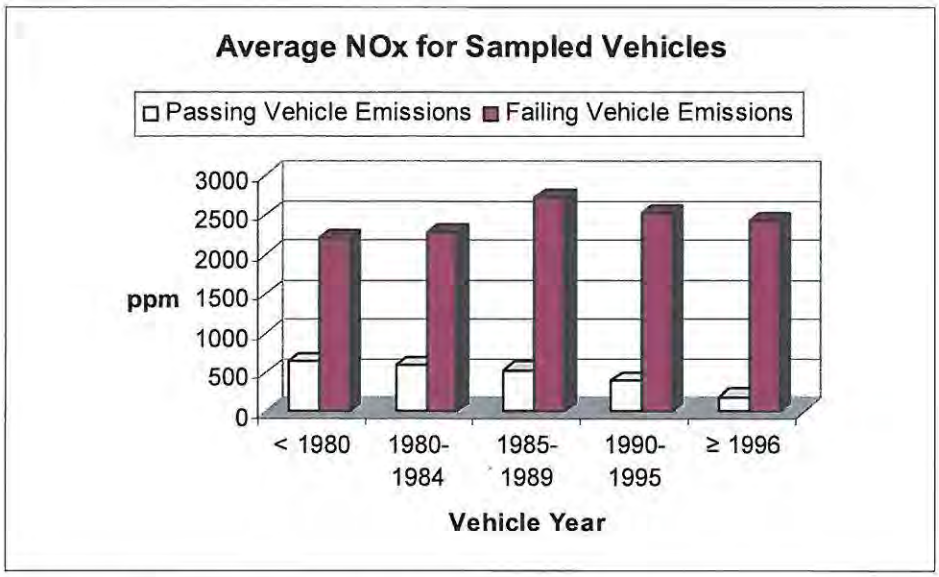


Figure 24. Average passing vehicle emissions versus average non-passing vehicle emissions for NO_x.

The data trends for hydrocarbons (VOCs) as shown in Figure 25 are similar to those of NO_x. Older vehicle year bins have a high percentage of emission failures, while newer vehicles have a smaller percentage of failures. The percent of failing vehicles for hydrocarbons is based on a failing limit of 225 ppm. The average tailpipe VOC concentration measured was 99.6 ± 14.2 ppm. Overall, 10.3% of the measured vehicles would presumably fail an inspection test, accounting for 47.8% of the total automobile NO_x emissions.

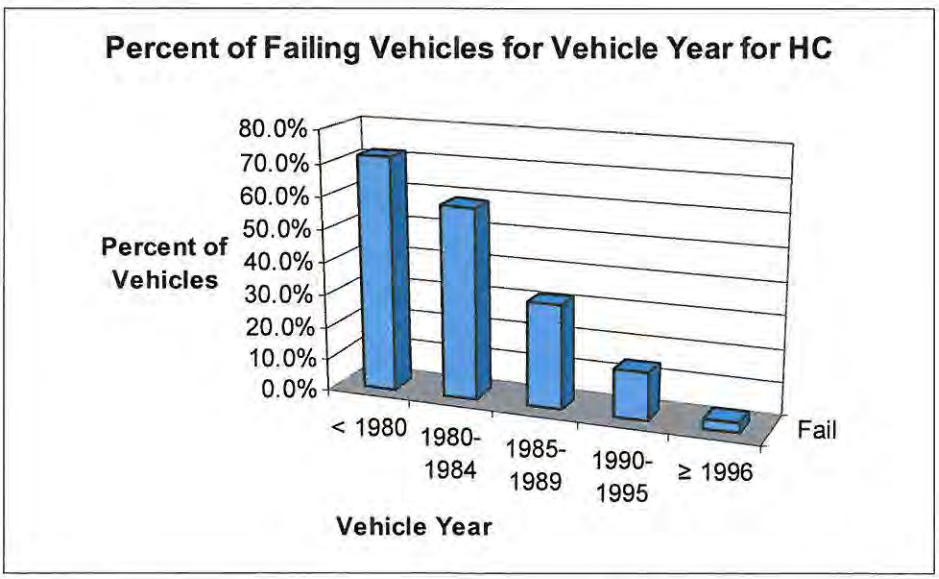


Figure 25. Percent of vehicles by vehicle year exceeding VOC (HC) emission limits.

From Figure 26, it can be seen that the failing vehicles emit on average 6 times more hydrocarbons than those that pass. Once again, the vehicle year does not have a big impact on the hydrocarbon concentration being emitted by the failing vehicles.

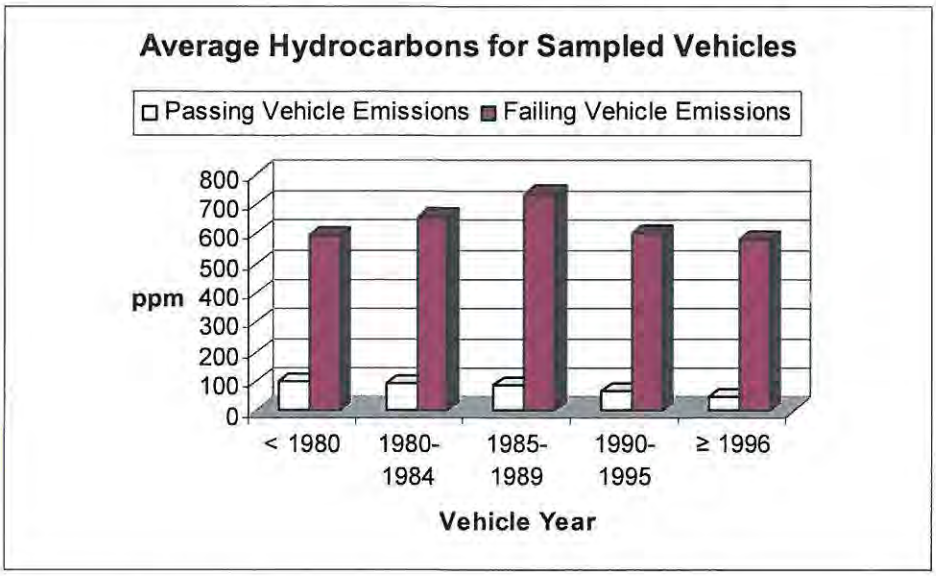


Figure 26. Average passing vehicle emissions versus average non-passing vehicle emissions for VOC (HC).

Although, not relevant to Cache Valley's $PM_{2.5}$ problem, nor a CO problem, it is interesting to examine the vehicle fleets CO emissions with respect to the number of "high" emitters. Overall, the average CO concentration was 0.61 ± 0.05% (at the 95% confidence interval). Figure 27 shows the percentage of vehicles sampled per vehicle year classification that would fail emissions test based on carbon monoxide with a limit of 1.14% CO. In total, 11.4% of the observed vehicle fleet would fail such an emissions test and these vehicles were responsible for 45.9% of the total measured CO. From Figure 27 it can also be seen that the highest percent of vehicles that would fail according to year are those that are older than 1985. It also shows that less than 10% of the vehicles that are newer than 1995 would fail an emissions test for CO.

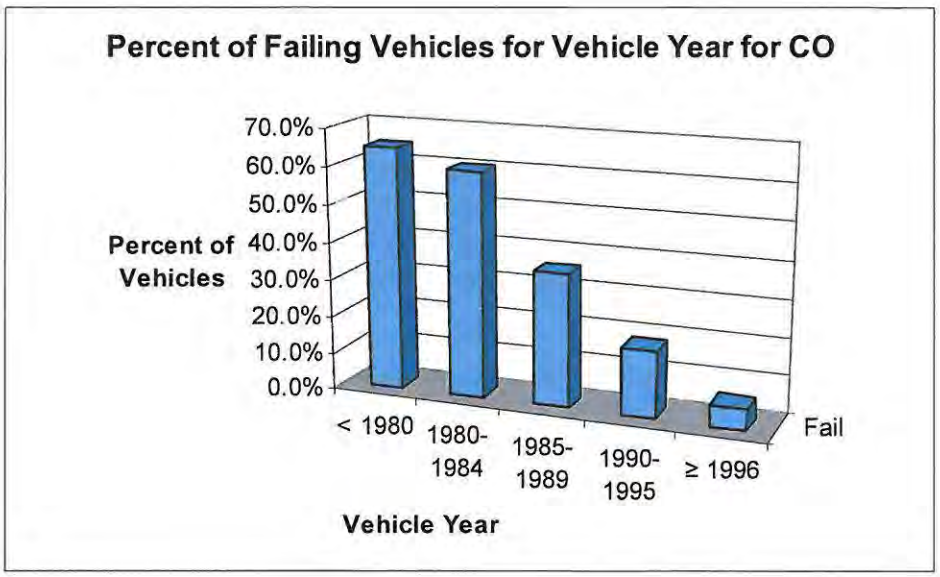


Figure 27. Percent of vehicles by vehicle year exceeding CO emission limits.

From Figure 28, it can be seen that the failing vehicles appear to emit on average of five to seven times more CO by percentage of total exhaust than the passing vehicles. It is important to note that the average CO concentration for the failing vehicles does not vary greatly with vehicle year. The 1996 and newer cars that would fail an emissions test are also significant emitters like the older cars.

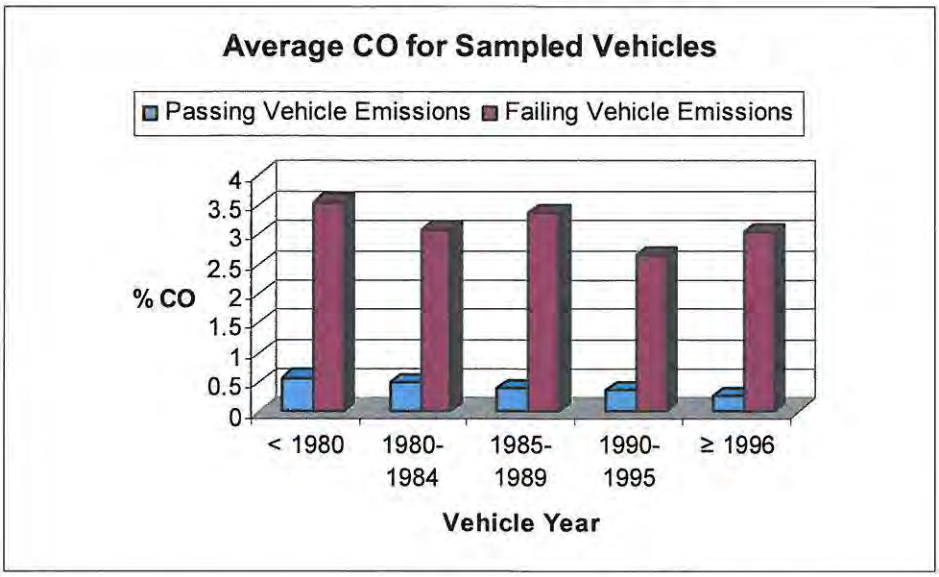


Figure 28. Average passing vehicle emissions versus average non-passing vehicle emissions for CO.

The percent of vehicles that would fail per age class for each pollutant was projected onto the Cache Valley fleet numbers and is shown in Figure 29. The greatest number of cars projected to fail emissions testing would do so because of CO emission violations, except in the vehicle year bin of 1980 and older, where more cars would fail due to VOC (HC) emission violations. The greatest number of potentially failed emissions tests would come from the vehicle bins 1985 through 1989 and 1990-1995. The percentages and totals of failing cars can not be summed because some of the vehicles would be counted more than once due to failing two or more emission tests.

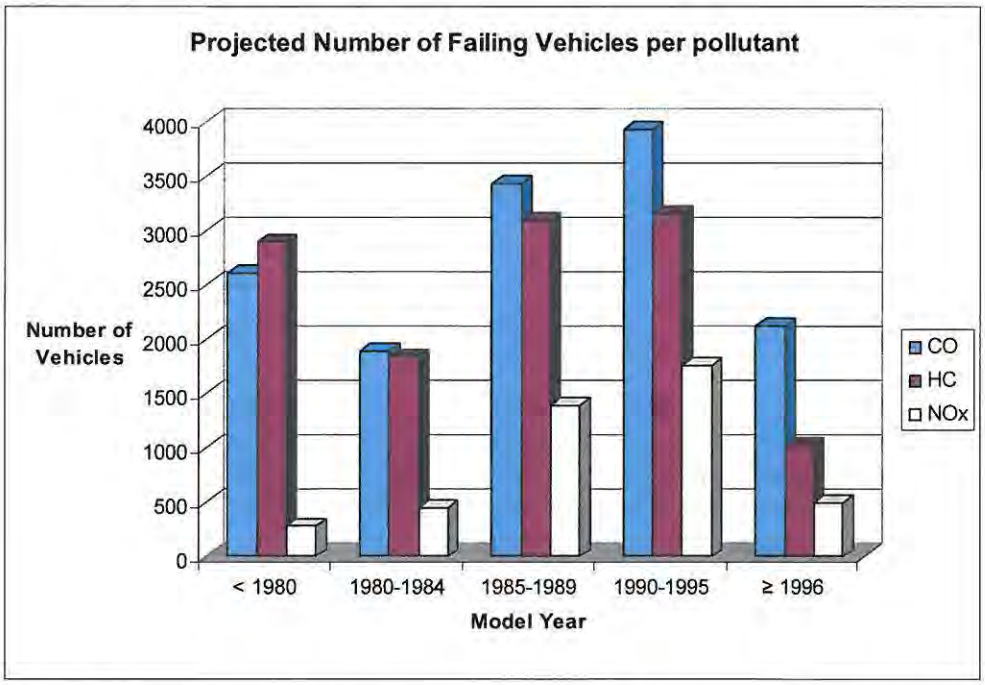


Figure 29. Projection of Cache County vehicles expected to fail emissions test based on CO, VOC (HC), and NO_x emission limits.

It is of interest to compare the average emission concentrations of the target pollutants from Cache Valley to a similar study conducted in Utah County during 2003. These results are shown in Figure 30. As can be seen, the average automobile emission concentrations for NO_x, VOCs (HC), and CO were all lower for the Cache County data set, even though an automobile I & M program is currently in place Utah County, but not Cache County. It should be noted from figure 30; however, that only the NOx emission concentrations showed a statistically significant difference (at the 95% confidence level). At this point, no explanation can be given for this apparent discrepancy. However, possible explanations could include differences in vehicle fleet structure, the possible inclusion of larger engine (pickup, SUV) vehicles in the Utah County study, or perhaps different test conditions (season, relative site locations, vehicle operating conditions).

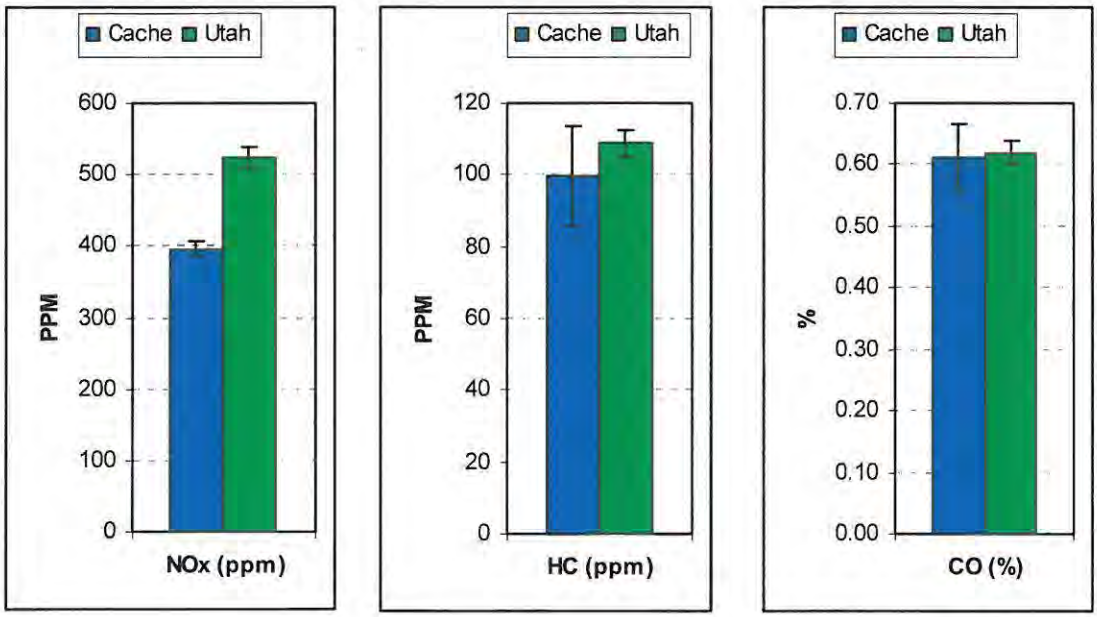


Figure 30. Average on-road vehicle emission concentration for Cache and Utah Counties.

The data that was obtained for the Cache Valley has been compared to similar data collected in Virginia in 2003. In order to compare the Cache Valley data to Virginia the vehicle specific power was calculated for each vehicle that was sampled. The pollutant concentration was then compared to the vehicle specific power to allow a common term in comparing pollutant concentrations. Virginia has an existing vehicle inspection and maintenance program, so by comparing the average pollutant concentrations per vehicle specific power one can obtain an approximation of the reductions in emitted pollutant concentrations from the vehicles.

Other researchers have suggested that a parameter referred to as vehicle specific power (VSP) may be a relevant way to relate vehicle emissions to engine operating conditions. VSP is defined as the vehicle's estimated engine power divided by the mass of the vehicle and is typically given in units of kilowatts per metric ton (kW/t). In practice, VSP can be found as using empirical relationship given by Klausmeier and McClintock (2003) as:

$$VSP = 4.364*\sin(\text{Grade in deg}/57.3)*\text{Speed} + 0.22*\text{Speed}*\text{Acceleration} + 0.0657*\text{Speed} + 0.000027*\text{Speed}^3$$

Klausmeier and McClintock (2003) reported for a Virginia study that NO_x emissions increase with VSP until a maximum occurred somewhere between 15 and 30 kW/t, depending on the age of the vehicles, with the older age vehicles reaching higher maximum NO_x emissions at lower VSP values. The Virginia hydrocarbon (VOCs) emission did not show as dramatic of variances with VSP; however, some decreasing

VOC emissions with increasing VSP were observed particularly for older (pre 1985) age class vehicles

Figure 31 shows the oxides of nitrogen emissions concentrations as compared to vehicle specific power for the different age classes observed in the Cache Valley study. The Cache Valley NO_x concentrations are generally greater (≈2x) for the given range of VSP than the Virginia data reported by Klausmeier and McClintock (2003), where a vehicle I & M program is in place. This may indicate that a vehicle I & M program would be beneficial in reducing the amount of NO_x emitted into the Cache Valley atmosphere by vehicles, but may also be caused by differences in vehicle fleet (although comparison to VSP and vehicle age should normalize that out.

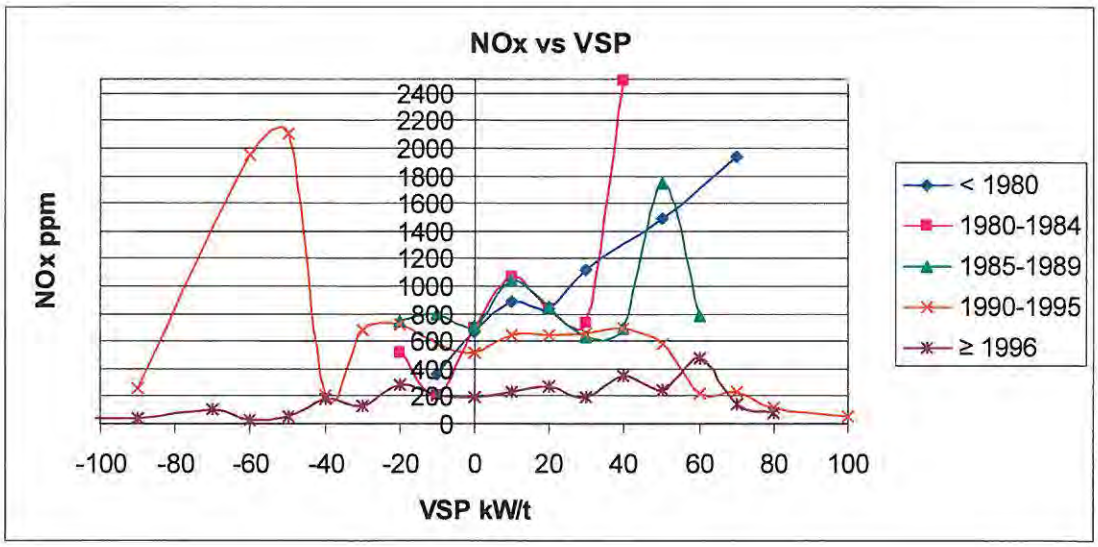


Figure 31. Cache Valley vehicle specific power compared to NO_x emission concentrations.

Figure 32 shows the hydrocarbon (VOC) emission concentrations as compared to vehicle specific power for the different vehicle age classes measured during the Cache Valley study. Comparing the data in Figure 32 to the previously mentioned Virginia data, it can be shown that the Cache Valley VOC concentrations are generally comparable to the Virginia hydrocarbon concentrations and both data sets show relatively little variation of VOC concentrations with VSP. This suggests that VOCs are not a strong function of the engines' workload, but rather a function of the engines' operating functions. an I/M program would not be very beneficial in hydrocarbon reduction.

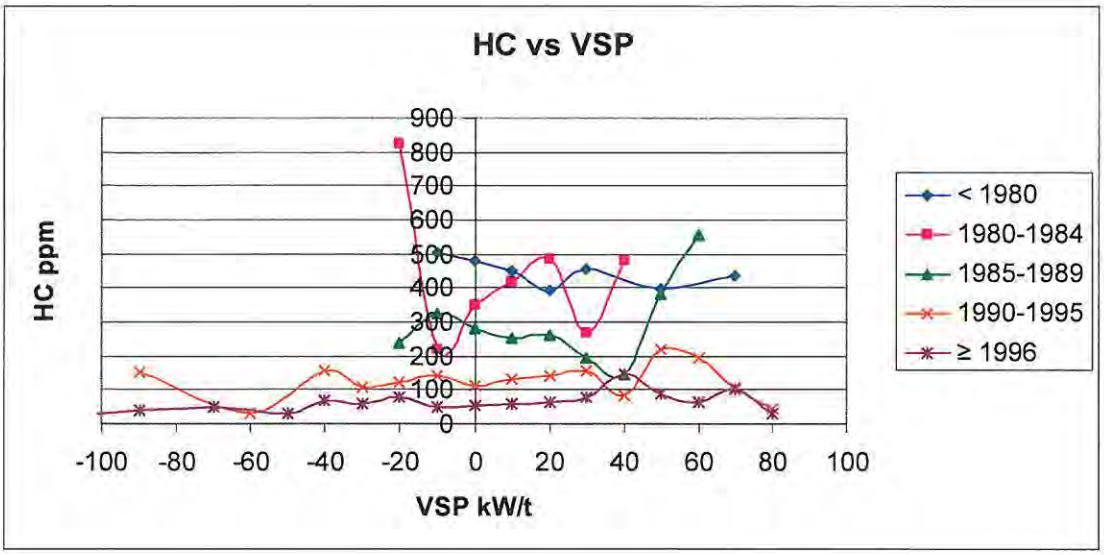


Figure 32. Cache Valley vehicle specific power compared to VOC emission concentrations.

ON-ROAD VEHICLE EMISSIONS STUDY CONCLUSIONS

From the information on registered vehicles that was obtained from the Utah Department of Motor Vehicles, the percentage of vehicles that are 1996 or newer was determined to be 49.4%. This means that approximately half of the registered cars in Cache Valley would be eligible for I & M testing with the OBD method.

The results of this study have also found that the majority of vehicles that would fail a vehicle inspection and maintenance test would do so for hydrocarbons (VOCs) and carbon monoxide (CO), although the latter is not presently of concern in the Cache Valley, and that the majority of the vehicles that would fail would be older than 1996. The study indicated that approximately 4.5% and 10.3% of the Valley's vehicles would fail inspections tests for NOx and VOCs, respectively, and that these vehicles were responsible for 25.4% and 47.8% of the valley-wide emissions. The study has also shown that the average pollutant concentration for failing vehicles does not vary greatly with vehicle year. The 1996 and newer vehicles that would fail an emissions test are significant pollutant contributors just like their older counterparts.

The comparison of the Cache Valley data to a similar study conducted in Virginia in an area with an I & M program suggests that the NO_x emission concentrations may be lowered with a local inspection program (based on the relationships between NO_x emissions and engine workload). A similar comparison with VOCs suggest an I & M program may not improve VOC emission rates.

CACHE VALLEY AIR QUALITY PHONE SURVEY

Contributing Authors

Dr. Randal S. Martin
Mark Greenwood, B.S. Env. Eng. student
Lisa Kent, B.S. Env. Eng. student
Kori D. Moore, B.S. Env. Eng. student
Clint Rogers, B.S. Env. Eng. student
Angela Squires, B.S. Env. Eng. student
Lisa Kent, B.S. Env. Eng. student
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

INTRODUCTION

A random public phone survey was conducted in order to understand the feelings of the general public concerning the air quality and potential remediation scenarios within Cache Valley. The survey was conducted in the Fall of 2004 by undergraduate Environmental Engineering students. The students randomly selected names and numbers from the the Cache County phone directory and called the residents until a total of 100 hundred response were obtained. As a separate, comparative exercise, a similar survey was given to the students Fall 2004 class of USU's CEE 3610 (Environmental Management).

THE PHONE SURVEY

The citizen phone survey began with explanation of what the survey was for and queried the respondent as to if they would like to participate. If they agreed they were asked the following ten questions:

1) How severe is Cache Valley's air pollution problem (not a problem, small problem, medium problem, large problem, severe problem)?

2) Would you support a vehicle emission and inspection program (yes or no)?

3) How much would you be willing to pay for an I & M program (county should pay, $10-$20, $20-$30, or $30-$40)?

4) Do you think all of your cars would pass such a test (would pass, some would pass, would not pass)?

5) How many vehicle and licensed drivers are in your household?

6) What are you willing to do to reduce vehicle miles traveled (nothing, car pool, public transit, alternative transportation, trip consolidation, stay home) -- you may pick more than one?

7) What is your home's primary source of heating?

8) Are there any additional sources of heating in your home? If so, what are they?

9) Do you comply with Cache Valley's current "No-Burn" days (not applicable, never comply, mostly comply, always comply)?

10) Have you experienced a respiratory illness during Cache Valley's elevated pollution episodes (yes or no)?

The student survey questions asked for the number and year of cars, what county each car is registered in, and what could be considered a "reasonable" price for emission

inspections. The results from this survey may be more biased since all students have a somewhat similar background and "stage-of-life" status.

THE SURVEY RESULTS

The Residents Phone Survey

The phone survey showed Cache Valley's opinion and desires for solving the air quality problem. Figure 33 shows a fairly even spread of opinions concerning the severity of the problem. The combination of severe problem and large problem account up to 41% of the population compared to 32 % that believe there is no problem or a small problem.

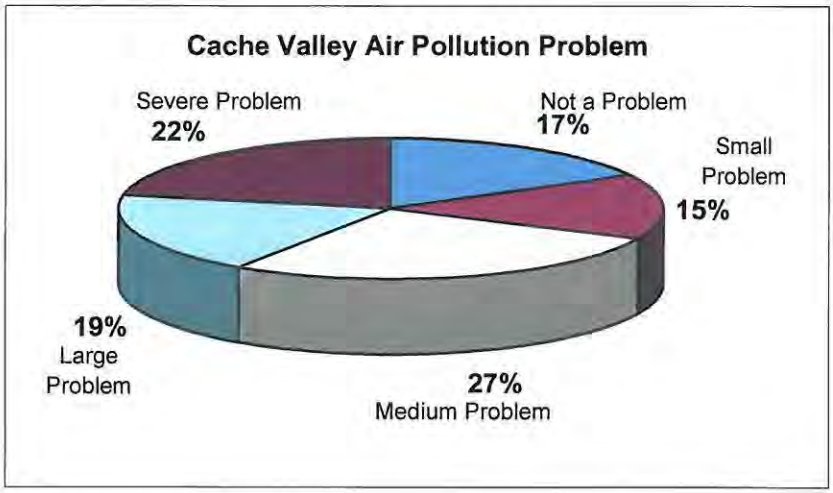


Figure 33. Q1: How severe is Cache Valley's air pollution problem?

Figures 33 and 34 illustrate the publics acceptance of an I & M program in Cache Valley and how much they would be willing to pay for it. Seventy four percent (74%) of the residents surveyed would support an I & M program and 54% would pay $10-$20, while 19% would pay $20-30$. It should be noticed that the percentage of people that would not support an I & M program (26%) is close to the percent of people who would prefer that the county tfund such a program (23%). This would likely indicate that those who would not support an I & M program, would prefer the county to pay for it. Figure 35 shows that most of the surveyed residents (82%) believed all of their vehicles would pass and I & M test, while only 2% believed there vehicles would fail.

Question 5 (How many vehicle and licensed drivers are in your household?) resulted in a ratio of 1.10 cars per licensed driver.

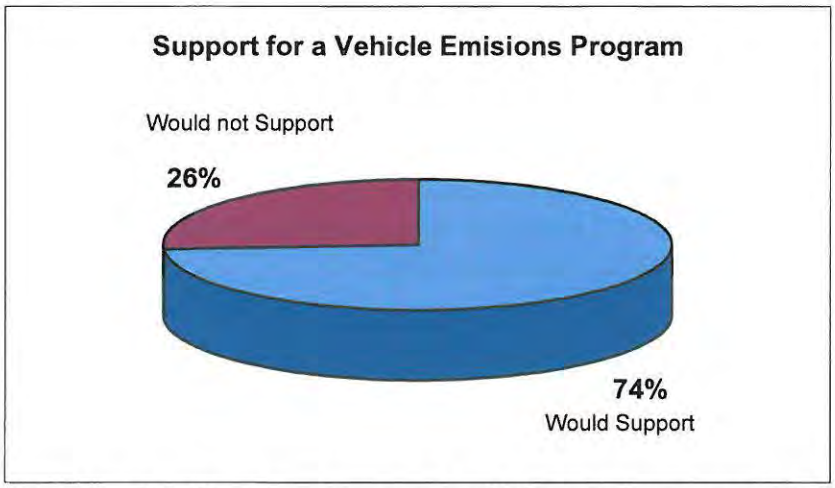


Figure 33. Q2: Would you support a vehicle emissions program?

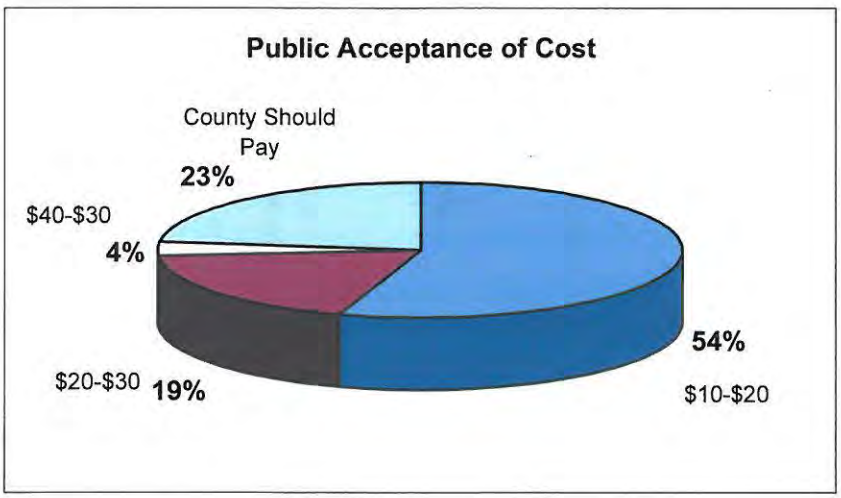


Figure 34. Q3: How much would you be willing to pay?

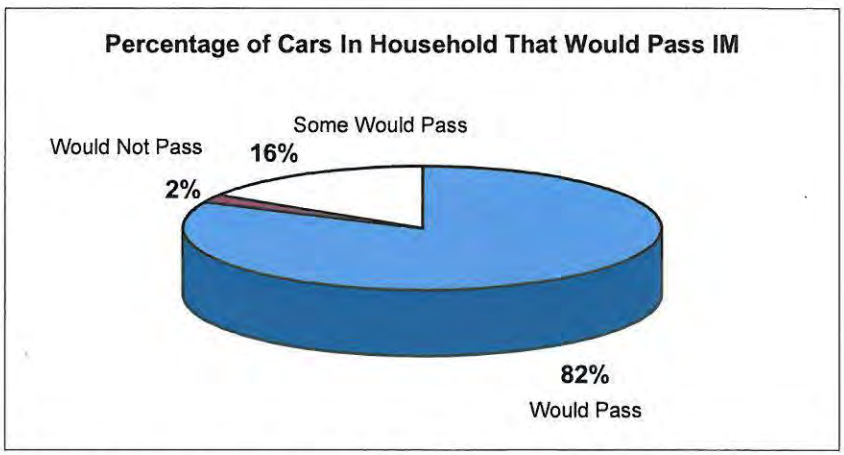


Figure 35. Q4: Do you think all of your cars would pass?

The public's acceptance of alternative ways to reduce Vehicle Miles Traveled (VMTs) was fairly evenly distributed between the presented options with only 5% of surveyed participants not willing to reduceVMTs (see Figure 36). This gives the County another option for increasing air quality in the valley by promoting items such as public and alternative transportation, and car pooling

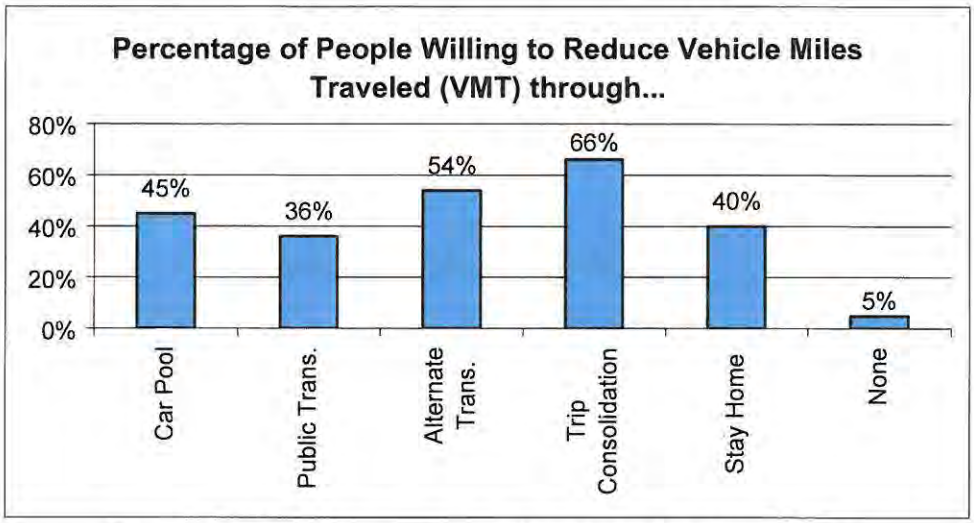


Figure 36. Q6: What are you willing to do to reduce VMTs?

Figures 37, 38 and 39 illustrate the public's means of heating their homes and compliance with county policies. Most all homes are primarily heated with a gas furnace (94%), while very few have a secondary source (total of 40%). Of the secondary sources, however, 27% were coal or wood burning stoves, the only heating source presenting a potential air quality problem. Of the all the people surveyed, 30% mostly complied with no burn policies, 11% always complied (59% were not applicable).

The final question asked if they had ever encountered any respiratory problems caused by the air quality in the valley and 11% of the people said they had (see Figure 40).

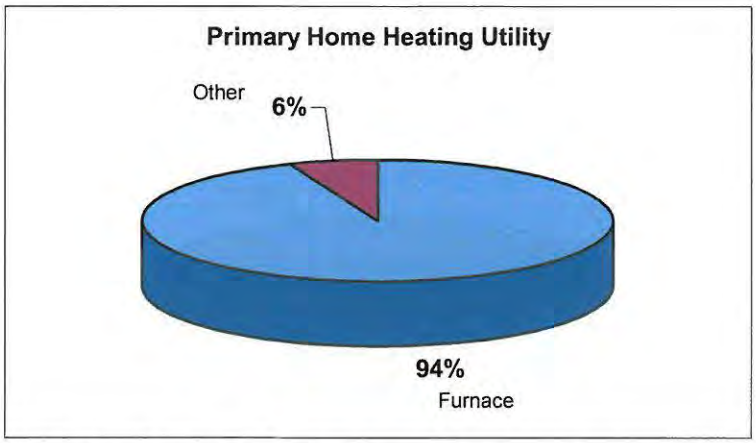


Figure 37. Q7: What is your home's primary source of heat?

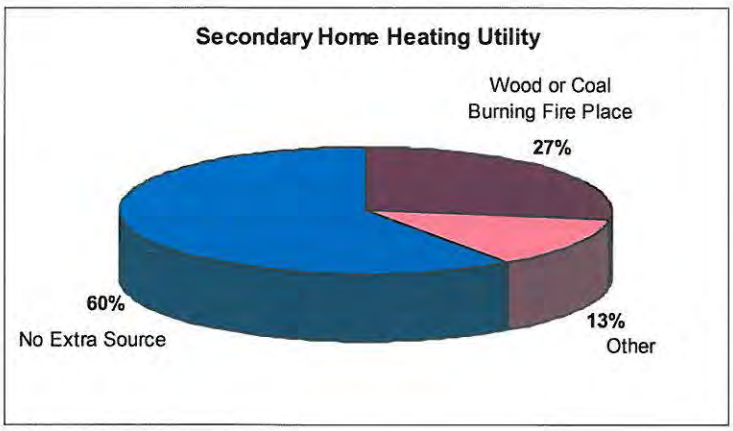


Figure 38. Q8: Are there any additional sources of heating in your home?

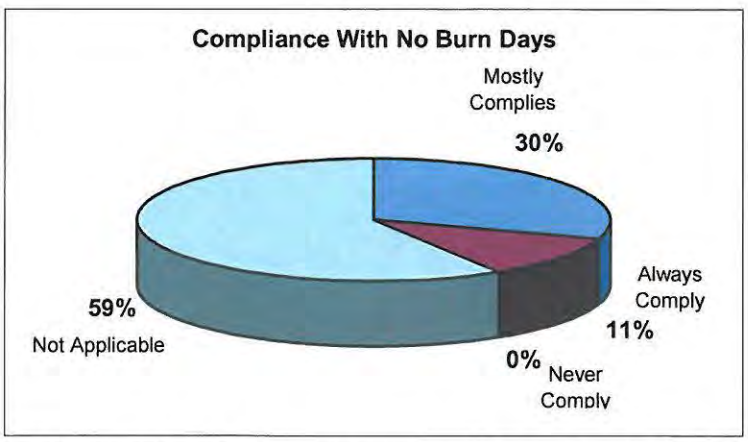


Figure 39. Q9: Do you comply with "no Burn" days?

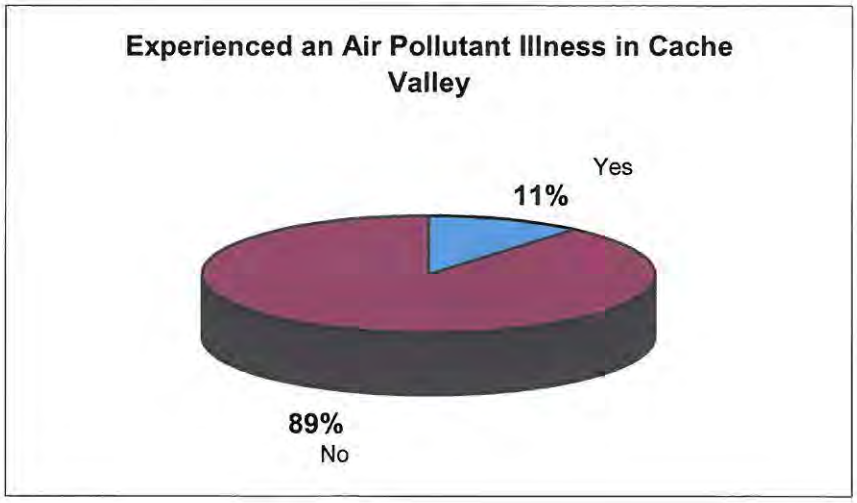


Figure 40: Q10: Have you ever experienced a respiratory illness during Cache Valley's elevated pollution episodes?

The Student Survey

The CEE 3610 Environmental Management class was surveyed with 79 students in attendance. The responses to the survey questions are shown in Figures 41 through 44. The average number of cars per student was calculated at 1.59, with one student responding that he/she did not own a car.

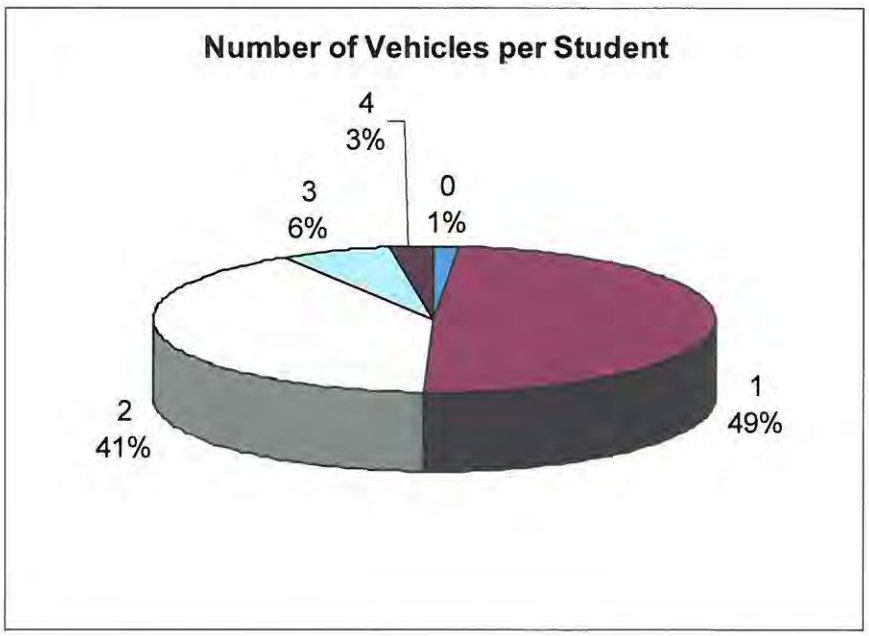


Figure 41. Number of vehicles per student (% of 79 students surveyed).

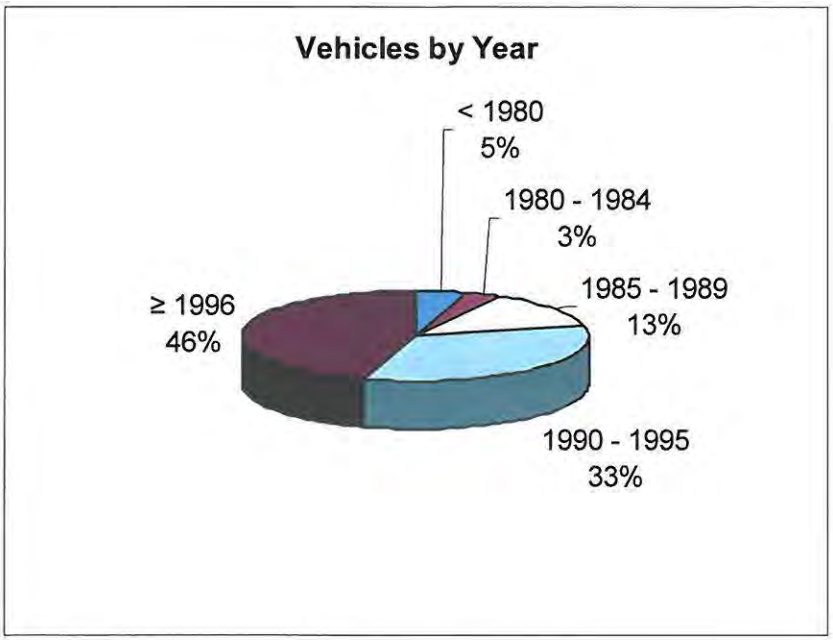


Figure 42. Student vehicles by age bin.

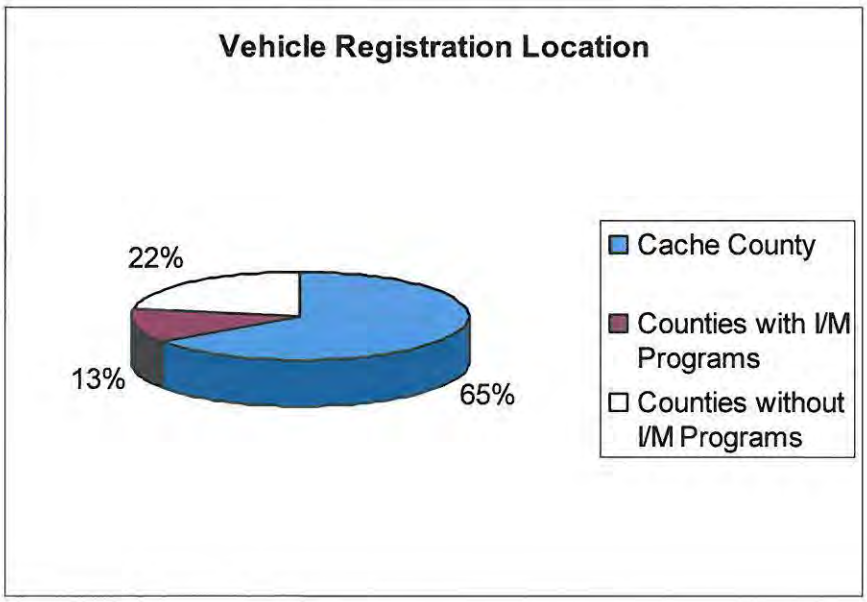


Figure 43. Student vehicle registration location.

Figure 44. Student responses to reasonable I & M costs

The student survey results varied from public phone surveys in responses to cost for an I & M program. Seventy four percent (74%) of students agreed to pay $10-$20 for a program would be reasonable, while the public percentage was 54% (refer to Figure 34 and 44). This could possibly be due to the average student income is significantly lower than the public average.

The number of vehicles used per student (not vehicles per licensed driver) can be evaluated in that, the majority of students (49%) used only one car and the next largest category being two cars. This can be explained by the percentage of married and single students in USU's engineering program. It can likely be assumed that the percentage of students with two cars are married (vehicles/ driver = 1) and the single students have only one vehicle. The age of vehicle distribution between students and the general public are almost identical

SURVEY CONCLUSIONS

Based on the above survey, the Cache County residents believe a significant air quality problem exists in the Cache Valley (68%) and are in support of a vehicle inspection and maintenance programs (54%). Furthermore, they would be willing to pay $10-20 for this service (74%). The public is also willing to take other measures to cut down on vehicle miles traveled in order to cut down on vehicle pollution. These measures include trip consolidation (66%), alternate transportation (54%), and car pooling (45%).

VERTICAL TEMPERATURE PROFILE MEASUREMENT

Contributing Authors

Dr. Randal S. Martin
Kori D. Moore, B.S. Env. Eng. student
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

INTRODUCTION

In order to better understand the inversions that occur in Cache Valley, small HOBO® H1 temperature sensors/data loggers were deployed beginning in the spring of 2003 at selected elevations along an east-west transect from the valley floor up a steep mountainside to a point above the expected inversion heights. Through the use of the data loggers, the establishment, growth, and duration of inversions within Cache Valley were monitored over the period of one year. Data analysis shows the presence of low-level radiation inversions with diurnal and seasonal variations in the shape, steepness, and longevity of the vertical temperature profile. Comparison with measured $PM_{2.5}$ values has shown a strong correlation between the duration of a temperature inversion and the ambient $PM_{2.5}$ concentration.

Background

Cache Valley is part of the transition between the basin and range topography of Nevada and Utah and the mountainous topography of the Rocky Mountains. It has a total area of about 300 square miles. Cache Valley is bounded on the west, south, and east sides by mountains and by hills on the north. The valley floor has an average elevation of 4500' asl, and the surrounding mountains reach a height of 9900' asl. The surrounding topography essentially creates a protected pocket or bowl of Cache Valley.

In a normal vertical temperature profile of the atmosphere just above the earth's surface, temperature decreases with increasing altitude. In such conditions, turbulence and wind can readily mix a given pollutant throughout the vertical profile. A temperature inversion, on the other hand, is a positive change in temperature with increasing altitude, or can be defined as a layer of lighter, warmer air on top of a layer of more dense, colder air. The warm air essentially places a cap on the lower air, trapping below the colder air and any pollutants therein. If the inversion persists, the concentration of pollutants in the trapped layer of colder air increases as more pollutants are added (Masters, 1998).

An example of an inversion is shown in Figure 45, obtained by driving up a canyon adjacent (east) to Cache Valley. There is a strong temperature inversion at about 5000' asl for both sampling periods. Two important things to note are that the sampling dates occur during the winter and that they are two years apart, suggesting the 5000' asl mark is a common inversion depth. In Cache Valley, winter-time temperature inversions occur due to the reflection of the sun's energy by the snow, which allows the air above to warm up faster than the snow covered ground, thus creating a positive change in temperature with increasing altitude at a point above groundlevel. High pressure cells create extended periods of clear skies, and these clear skies combine with snow cover (high albedo) to produce strong temperature inversions over Cache Valley that can last for several days (see Figure 46). The surrounding topography contains the colder air trapped below, much like air trapped in a closed jar. Pollutants released within the valley become concentrated, often causing a haze. A low pressure front is required to break a persistent inversion, and the precipitation that sometimes follows clears the air of most of the particulate matter.

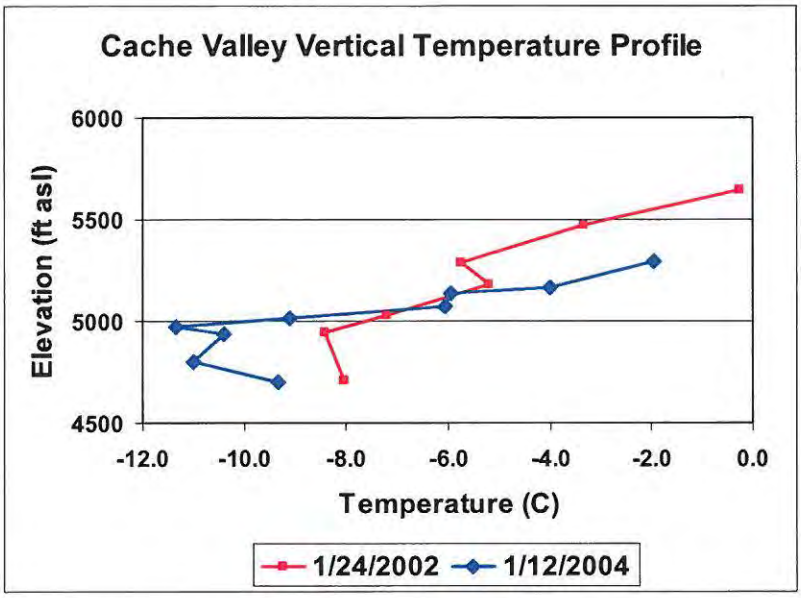


Figure 45. Temperature profile of Cache Valley obtained by driving up an adjacent canyon.

Figure 46. Cache Valley inversion as seen from an adjacent mountainside (ele. 6300' asl). The city of Logan, UT is faintly seen in the center.

METHODOLOGY

Typical measurements of temperature inversion heights, persistence, and growth are achieved through the periodic release of radiosondes or the use of a tethersonde (Arya, 1999). A radiosonde consists of a small, light-weight radio transmitter connected to temperature, pressure, and humidity sensors that are all attached to a helium-filled balloon. The balloon is released, and, as it ascends into the atmosphere, the radio

transmitter sends the measured data back to a receiver connected to a computer which interprets the data and stores it. A tethersonde differs from a radiosonde in that the balloon is attached to the ground via a tether. Sensor/transmitter systems may be dispersed along the tethering line, and may be used for longer periods of time than with a radiosonde. These methods provide very time-limited data, are time intensive, and require costly equipment. Other methods of obtaining inversion measurements include the use of acoustic and thermal adsorption techniques, which provide more time resolved data, but require complex and expensive equipment and can be time-intensive.

There are currently several commercially available temperature sensors/data loggers that have been developed for both scientific and commercial uses (Whiteman *et al.*, 2000). One such data logger, the HOBO® H1 (Figure 47) developed by Onset Computer of Bourne, MA, is a small, inexpensive unit consisting of a circuit board in a plastic case; waterproof cases are available for protection from water and sunlight. A similar product of Onset Computer, the HOBO® H8 Pro was found to be effective and accurate for meteorological applications by Whiteman *et al.* (2000). These systems require minimal attention and have a user-friendly software program. The HOBO® H1 data loggers were used to measure temperature inversion characteristics in Cache Valley.

Figure 47. HOBO® H1 temperature sensor/data logger and protective case.

Nine HOBO® H1 temperature sensor/data loggers were utilized to record ambient temperatures at separate locations and elevations. The sensors/data loggers were first calibrated to one another through the use of four co-located sampling periods. Derived calibration equations were used to adjust each respective data set. Since the data collected were only compared to one another to obtain relative temperature differences and not to obtain the actual temperature, it was not necessary to calibrate the sensors/data loggers with a Hg-thermometer. The sensors measured the temperature on a continuous basis, and the hourly average temperature was stored as a data point. The data were collected every six to eight weeks. The temperature sensors within the protective case were placed 2-3 meters above ground and in open areas to minimize terrestrial heating and ensure ventilation, respectively. The elevation of each sensor was based upon site accessibility and vertical spacing, and the final elevations are as follows: 4562', 4646', 4865', 5024', 5338', 5513', 5735', 6287', and 6576'.

RESULTS

The HOBO® H1 temperature sensors/data loggers obtained reliable data that were used to determine the characteristics of temperature inversions in Cache Valley. As a whole, they adequately measured the actual ambient temperature when compared with available, nearby meteorological stations.

The use of vertical temperature profiles averaged over a period of weeks or a month provides a good indication of the existence and characteristics of inversions, as can be seen by the average values for March 2003 in Figure 48. At 6:00 AM, just before the sun rises, there is a strong temperature inversion between about 4500' and 5400', but above that the temperature profile looks normal, except a possible existence of an upper level inversion at 6300'. After the sun rises, the valley floor begins to warm up, and by 9:00 AM the inversion is almost gone. As the day progresses, the valley increases in temperature and at about 3:00 PM the temperature profile almost mirrors the dry adiabatic lapse rate shown by the black dotted line. As the sun sets, the valley cools at a much faster rate than the air mass above, causing a temperature inversion to begin forming again before midnight. The cooling continues through the night as the diurnal evolution of the temperature profile comes to an end, completing the daily cycle. Also, note the broad range of temperature values over the entire profile. Similar results were produced through the analysis of data for spring, summer, and fall months.

On the other hand, if the averaged temperatures for the first half of January 2004 are examined, it is apparent that the temperature inversion doesn't form and break up each day, rather it is more diurnally consistent (Figure 49). Only during the warmest times of the day is the inversion seemingly affected by the surface warming. The range of temperatures throughout the vertical profile is also much smaller than that of March 2003, especially at higher elevations. This would suggest that winter months have more persistent inversions, as the first of January 2004 demonstrates.

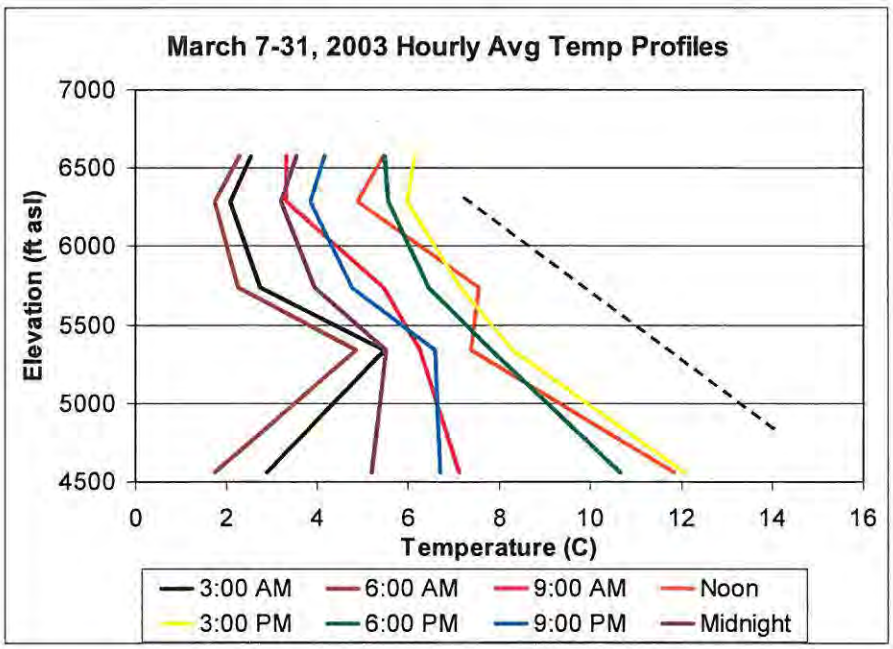


Figure 48. Average vertical temperature profile of Cache Valley for March 7-31, 2003.

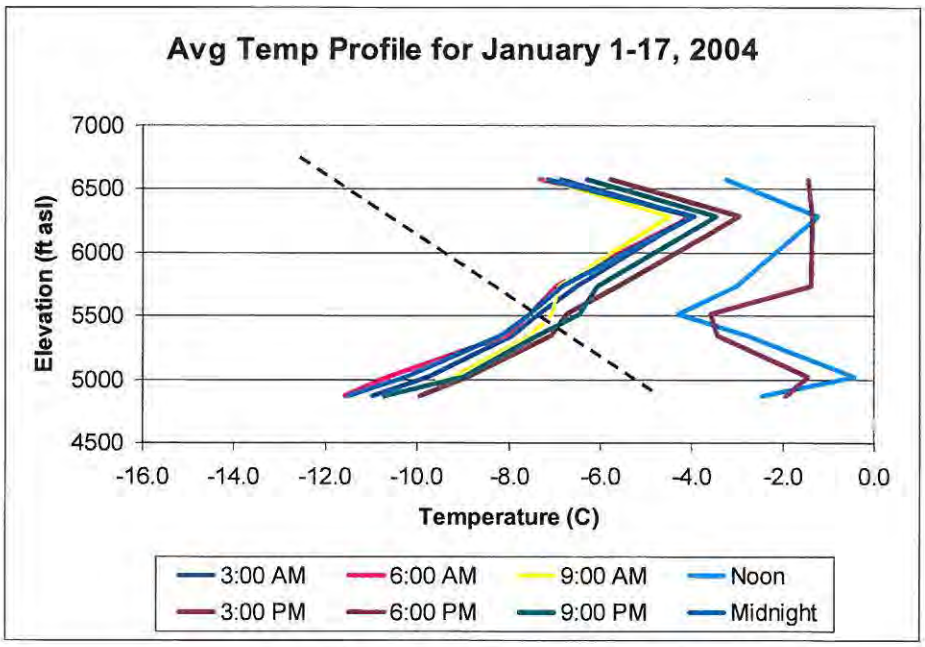


Figure 49. Vertical temperature profile over Cache Valley for January 1-17, 2004.

The data collected from the HOBO® sensors also proved very useful in examining the day to day changes in the temperature inversion. This day to day change can be seen for the month of January 2004 in Figure 50, with red representing warm temperatures, getting brighter as the temperatures grow warmer, and blue representing cold temperatures, growing brighter as the temperature decreases. It should be noted that the value of 2 is the first number on the x-axis, but it really represents midnight between January 1st and 2nd; there is not a day 32, instead it is midnight of the 31st. Early in January, data from the lowest sensor were not available, causing the blue patch on the bottom until the 18th.

From Figure 50, it can be seen that during the first couple of days of January 2004, it was fairly warm and no inversion was observed, or the cold air was above the warm air. However, the air temperatures dropped over several days and on about the 6th a temperature inversion began to appear, with warmer air above cooler air. As time progressed, the temperature difference between the air masses above and below increased, causing the temperature inversion to strengthen and become deeper. Just after the middle of the month, a couple of weak low pressure cells passed through the region, decreasing the temperature difference, but not completely breaking up the Cache Valley inversion. The inversion began building after each frontal system on the 18th and the 23rd. At the end of the month, a strong low pressure cell, with an accompanying snow storm, moved in to break up the inversion and provide some relief from the 20-day capping lid sitting over Cache Valley. The temperature profile returned to normal with cooler air above and warmer air below.

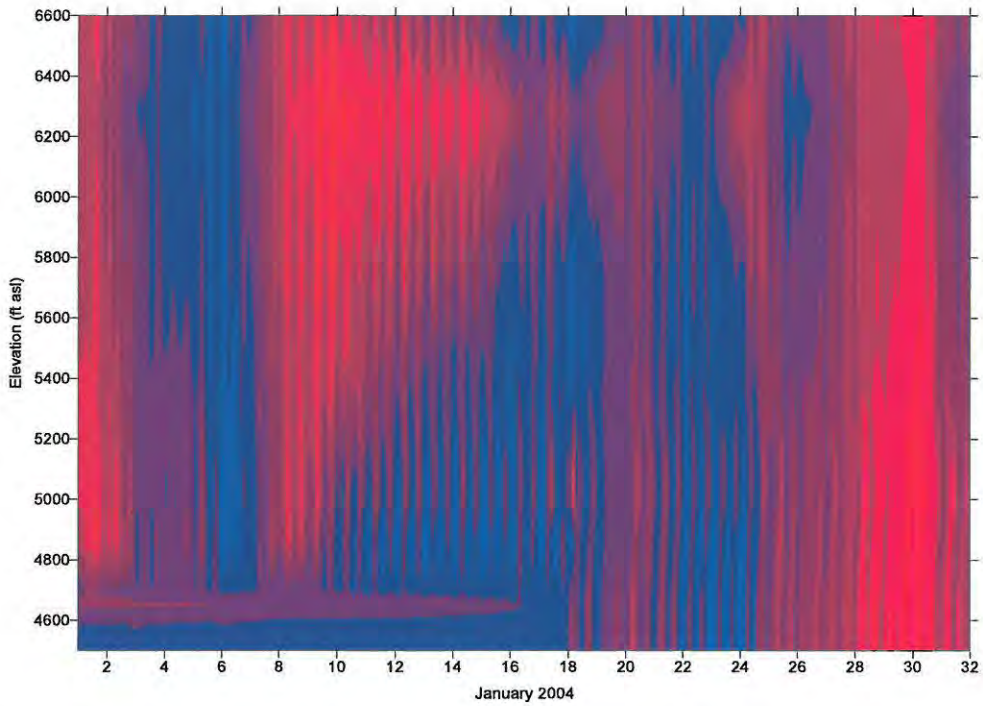


Figure 50. Temperature contour map of the air above Cache Valley with respect to elevation and time for the month of January 2004.

The temperature contour map clearly shows the growth and persistence of the inversion layer. To examine the affects of an inversion on the pollution concentration, the $PM_{2.5}$ concentrations for the month of January 2004 were overlaid on the temperature contour map in Figure 51. The solid yellow line represents the ambient $PM_{2.5}$ concentration as measured at the Logan city sampling location and the dotted green line represents the National Ambient Air Quality Standard (65 $\mu g/m^3$). The concentration of ambient $PM_{2.5}$ began fairly low, but as the temperature inversion started and strengthened, the concentration reached values double the national standard. Concentrations dropped when the inversion layer begins to break up due to the two weak low pressure systems, but continued to increase after each system passed. It was not until the strong low pressure system passed through at the end of the month that the $PM_{2.5}$ concentrations dropped below the NAAQS.

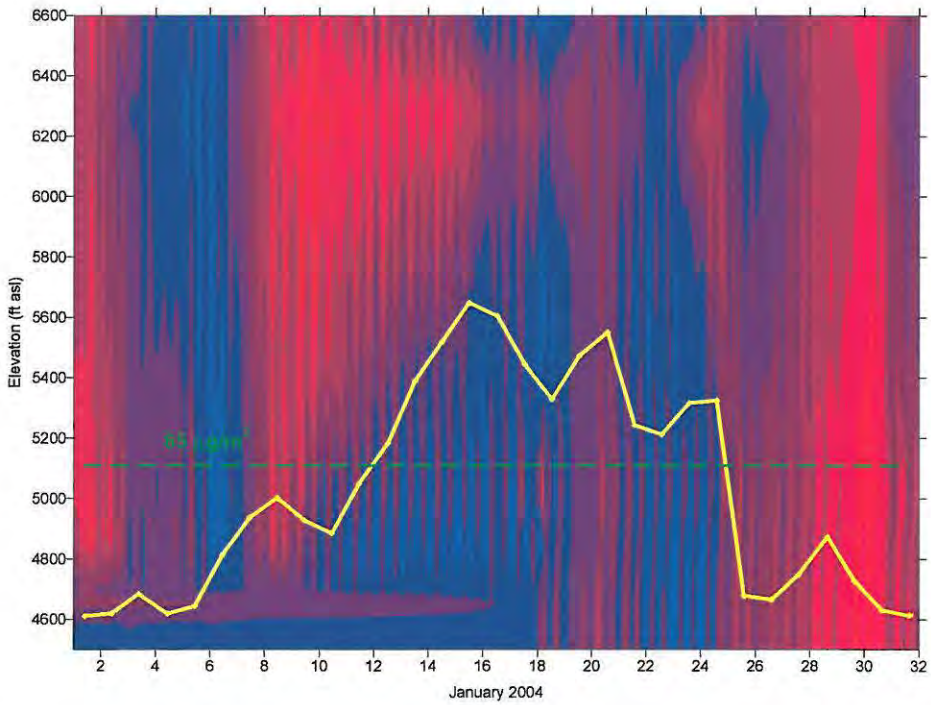


Figure 51. January 2004 temperature contour map with $PM_{2.5}$ concentration (yellow) and National Ambient Air Quality Standard (green).

CONCLUSIONS

The HOBO® H1 temperature sensors/data loggers were able to distinguish differences in the Cache Valley vertical temperature profile, including the evolution of temperature inversions. Despite being ground-based, the sensors/data loggers were sensitive and accurate enough to produce reliable data. Through data analysis, it was been found that diurnally fluctuating inversions dominate the vertical temperature profile for all but the colder months of winter, such as December, January, and February. The sensors/data loggers proved extremely useful in understanding the evolution of persistent inversions that occur in Cache Valley, as well as clearly demonstrating their effects on ambient $PM_{2.5}$ concentrations. This understanding will allow for better prediction of high pollution events and, therefore, aid in current and future pollution prevention efforts.

INDOOR/OUTDOOR PARTICULATE MATTER IN THE CACHE VALLEY

Contributing Authors

Dr. Randal S. Martin
Kori D. Moore, B.S. Env. Eng. Student
Vishal Doshi, M.S. Env. Eng. Candidate
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

INTRODUCTION

The health concern for $PM_{2.5}$ is because the particles are small enough to be breathed into the deep lung tissue and become deposited. Larger particles are filtered out in the nose and throat. The affects of the deposited particles depend on particle composition, dose, and the current health status of the individual. Daily (24-hr) averaged $PM_{2.5}$ levels as high as 133 and 138 $\mu g/m^3$ in the Cache Valley have been recorded during prolonged wintertime temperature inversions. Such high levels are strictly a winter-time problem for Cache Valley, as can be seen in Figure 52. During the spring, summer, and fall, the average is around 10 $\mu g/m^3$. As previously discussed in earlier sections, chemical analysis of the $PM_{2.5}$ in Cache Valley has shown that it is dominated by ammonium salts, which contribute 60-90% of the total particle mass, and that ammonium nitrate (NH_4NO_3) is the largest fraction by mass (Martin and Zhu, 2004; UDAQ, 2006). Ammonium salts are secondary pollutants as they form in the atmosphere through photochemical reactions, such as is generalized in the following:

$$NH_3\ (g) + HNO_3\ (g) \leftrightarrow NH_4NO_3\ (s) \qquad \text{(Equation 1)}$$

As this is an equilibrium reaction, temperature greatly affects the formation, or dissociation, of ammonium nitrate, causing a difference in K_{eq} values of greater than two orders of magnitude between 0 and 20°C. Solid particles are favored at cold temperatures and gases are favored at warm temperatures (Seinfeld and Pandis, 1998).

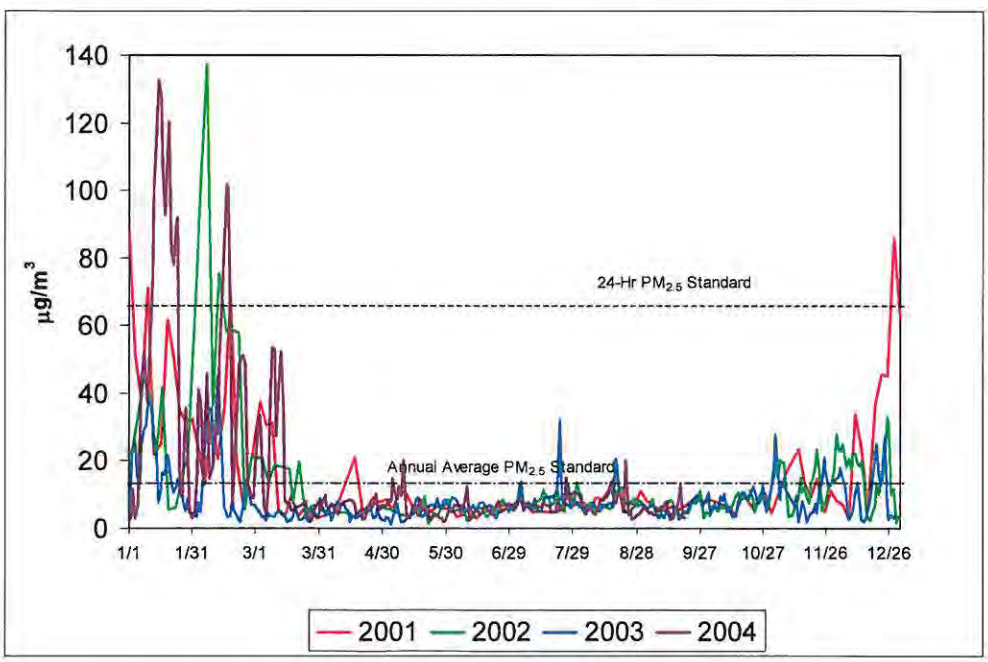


Figure 52. Cache Valley $PM_{2.5}$ concentrations as recorded for 2001-2004.

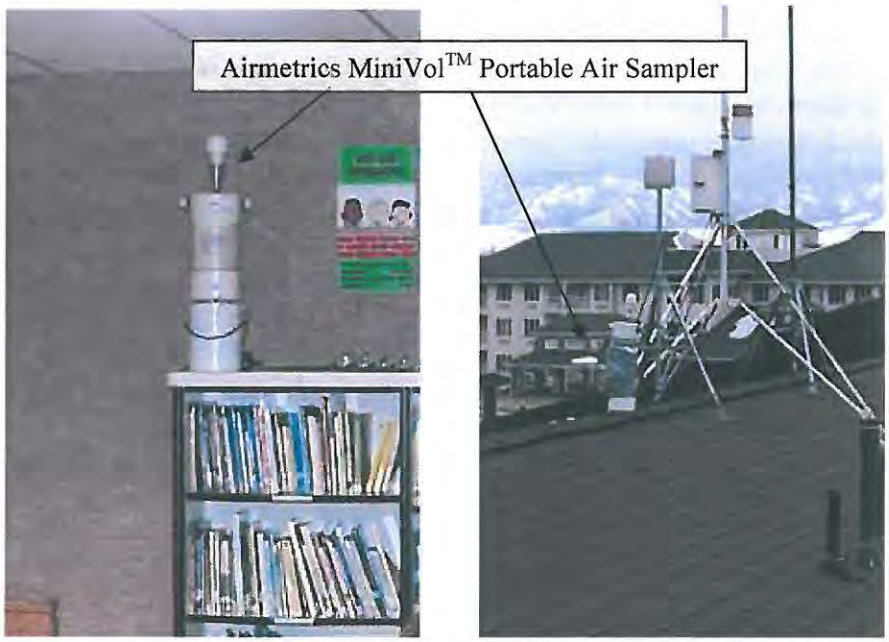
The average adult begins to feel the health affects of $PM_{2.5}$ at 65 $\mu g/m^3$, but those with compromised immune systems such as children, the elderly, and the ill may have noticeable affects at 40 $\mu g/m^3$. The Bear River Health Department (BRHD), in conjunction with the Utah Department of Air Quality (DAQ), has developed a public notice system to alert citizens of Cache Valley of the current air quality during winter months using the following color scale: "green" – good air quality, continue activities as normal; "yellow" – poor air quality, reduce vehicle mileage and those with compromised immune systems are recommended to remain indoors; "red" – bad air quality, reduce vehicle mileage and everyone is recommended to remain indoors. The $PM_{2.5}$ concentrations that divide green and yellow and yellow and red are 40 and 65 $\mu g/m^3$, respectively. The BRHD also suggests that school children remain inside during recess and lunch time on red days. However, the quality of the indoor air, with respect to $PM_{2.5}$, in comparison to the ambient air quality in the area schools was unknown. Therefore, it was also unknown if it was actually better to keep the children inside on high pollution days. This study was designed to determine the indoor air quality and answer the question as to whether it is best to keep the children inside or not.

Past research on indoor air quality versus outdoor air quality has shown that indoor $PM_{2.5}$ is usually less than outside, ambient levels. Sawant *et al.* (2004) found that indoor:outdoor ratios of $PM_{2.5}$ concentrations in schools in Mira Loma, CA during the fall of 2001 and winter of 2001-2002 averaged 38%. Chemical analysis further showed that the highest portion of $PM_{2.5}$ was organic carbon and that the indoor:outdoor ratio of nitrate was the smallest of all the chemical species (Sawant *et al.*, 2004). El-Abssawy (2003) confirmed that indoor particle concentrations were dependent on outdoor particle concentrations, indoor activities, and on particle size.

Based on these past studies and owing to the dominance of ammonium nitrate in the local $PM_{2.5}$, it was expected that local $PM_{2.5}$ concentrations would be lower indoor as compared to outdoor. Therefore, a study was initiated to examine any such differences.

METHODOLOGY

Three elementary schools and one high school in Cache Valley were chosen as sampling sites. Filter-based sampling was conducted using 0.45 μm Teflon filters with AirMetrics MiniVol impaction samplers. Paired samplers were placed both inside and outside of each school, as seen in Figure 53, and operated at simultaneous times to obtain comparable data. Sample times were during school hours, Monday through Friday from 8:00 AM to 4:00 PM local time and were collected over two to four day periods. Table 2 lists the school name, the location of both samplers, and the sampling dates. The UDAQ sampling site is located one block from Logan High School. The filters were analyzed for mass by comparing average pre-weights and post-weights. Anion chromatography was performed on solutions of the collected particles for nitrate (NO_3^-), sulfate (SO_4^-), nitrite (NO_2^-), and chloride (Cl^-).



a) b)

Figure 53. $PM_{2.5}$ samplers at Greenville Elementary a) in the library and b) on the roof.

School	Sample Dates	Sampler	Location
Greenville Elementary	Jan. 24, 2005 – Feb. 18, 2005	Inside	Library
		Outside	Roof
Summit Elementary	Jan. 11, 2005 – Feb. 11, 2005	Inside	Library
		Outside	Roof
Sunrise Elementary	Jan. 11, 2005 – Feb. 8, 2005	Inside	Library
		Outside	Roof
Logan High School	Feb. 9, 2005 – Feb. 25, 2005	Inside	Classroom
		Outside	UDAQ Sampling Site

Table 2. Sampling locations and dates by school.

RESULTS AND DISCUSSION

The results of the mass concentration analysis from both the indoor and outdoor samplers for each school are shown in Figure 54. The linear fit and R^2 value for each data set are also shown. Examination of the data show that while outdoor $PM_{2.5}$

levels nearly reached the 24-hr NAAQS of 65 $\mu g/m^3$, the indoor concentration at each of the four schools was well below the 40 $\mu g/m^3$ at which sensitive populations are suspected to be affected. In the data for Logan High School, one apparent outlying value caused a low R^2 value, but the data are otherwise well grouped. Without the outlier, an R^2 value of 0.5747 would be produced. The low slope values in the linear fit equations suggest that the indoor $PM_{2.5}$ is slightly affected by the outside concentration, but that most of the $PM_{2.5}$ is apparently removed.

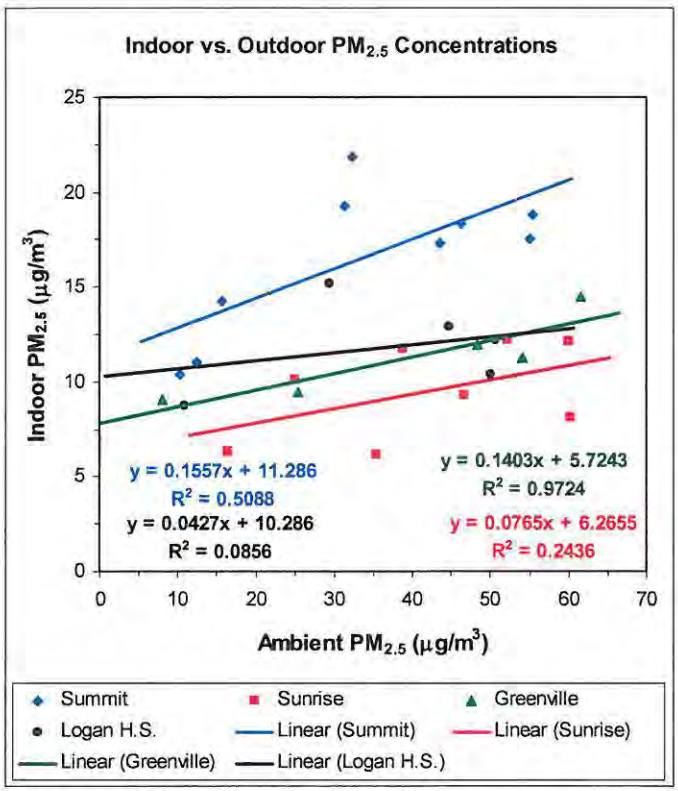


Figure 54. Indoor air quality versus outdoor air quality for all four schools.

The average measured ambient and indoor $PM_{2.5}$ concentrations are shown in Figure 55, along with the ratio of the indoor levels to the outdoor levels as a percent. The error bars show the 95% confidence intervals for each average value. The average outdoor concentrations for each school were not found to be statistically different from one another. The high variability seen in the outdoor values is expected due to changes in ambient temperatures and in the vertical mixing ability of the ground-level air mass caused by vertical temperature inversions, and by deposition of the particles during precipitation events. The indoor $PM_{2.5}$ concentrations are fairly constant as demonstrated by the low variability. Sunrise Elementary, Greenville Elementary, and Logan High School indoor averages were statistically the same, but Summit Elementary had a

statistically significant higher average concentration than the other three. Summit Elementary also had the highest average indoor:outdoor concentration ratio at 61.2%. This, however, was not statistically different than the average for both Greenville Elementary and Logan High School. The average indoor:outdoor concentration ratio for Sunrise Elementary was not statistically different than the averages for Greenville Elementary and Logan High School, but was significantly different from the average of Summit Elementary.

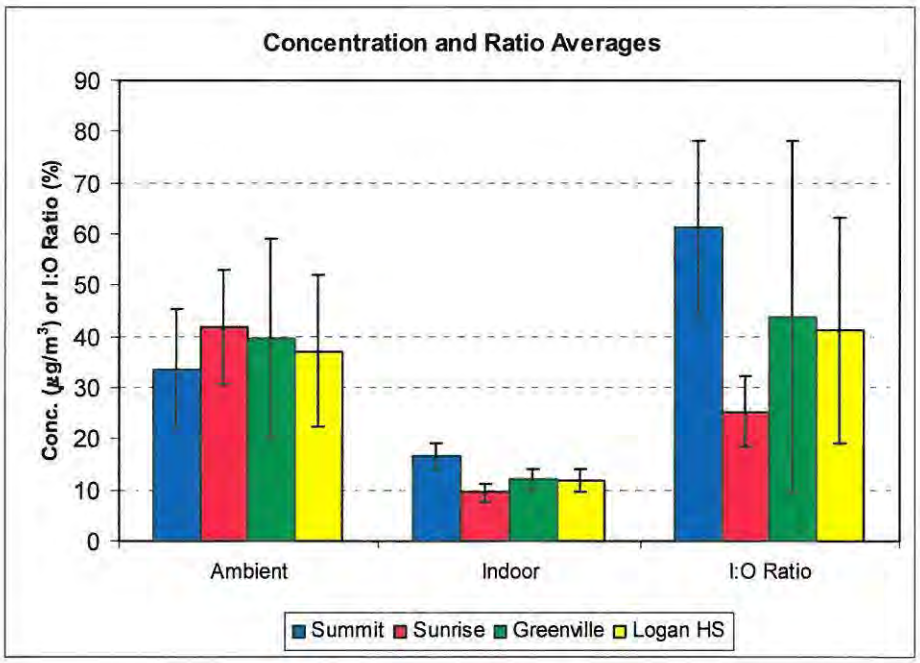


Figure 55. Average $PM_{2.5}$ levels and indoor:outdoor ratio by school.

It is believed that the mechanism used by the heating system in each school may affect the indoor $PM_{2.5}$ concentrations. Greenville Elementary, Sunrise Elementary, and Logan High School heat the buildings by passing air through a heater and blowing the heated air throughout the building (central heating). Summit Elementary uses steam heaters to heat the air in some of the rooms, producing less air circulation than the other schools. Circulation of the heated air provides a more uniform air temperature and mixes suspended particles more uniformly as well. As mentioned earlier, air temperature greatly affects the formation and volatilization of ammonium nitrate. The difference in heating mechanisms between Summit Elementary and the other three schools would have an affect on the total particle mass due to the volatilization of ammonium nitrate.

The chemical analyses of the particles collected on the filters through anion chromatography confirmed that nitrate dominates the outdoor particle composition (Figure 56). It also revealed that the average concentration of NO_3^- in the indoor air of

the three elementary schools was six times less than the outdoor concentrations, producing an average indoor:outdoor nitrate concentration ration of 17%. The indoor and outdoor nitrite (NO_2^-) levels were below the method detection limit. The particulate concentration of Cl^- was twice as high indoors as outdoors, which could be due to sources within the building. The SO_4^- concentrations were much closer than either the NO_3^- or the Cl^- with an average indoor:outdoor ratio of 85%. Cation chromatography was not performed because the complimentary cation for SO_4^- and NO_3^- is believed to be ammonium (NH_4^+). The differences in the indoor:outdoor particle composition ratios between elementary schools is found in Figure 57. Due to the dominance of ammonium nitrate in the particle mass, only the NO_3^- anion indoor:outdoor ratio was examined. The error bars represent the 95% confidence interval. The average indoor:outdoor NO_3^- ratios are not statistically different with the small number of data points collected, but there appears to be an higher concentration trend in data collected at Summit Elementary, the school that uses steam heaters to heat the building. More data collection at all sites is required to more completely quantify any difference in NO_3^- levels.

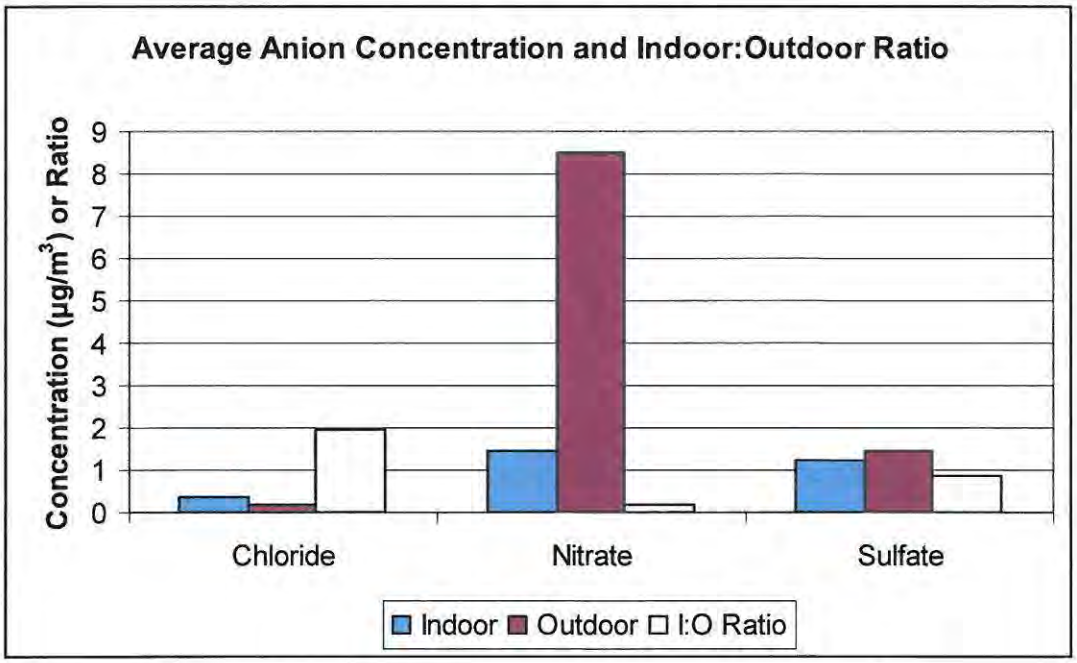


Figure 56. Anion concentrations in indoor and outdoor $PM_{2.5}$.

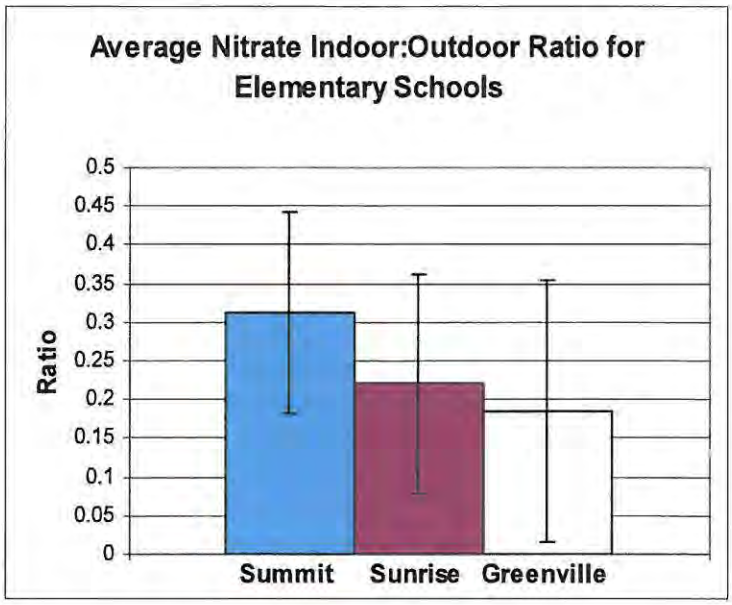


Figure 57. Average nitrate indoor:outdoor ratios for the Elementary Schools

CONCLUSIONS

Winter-time $PM_{2.5}$ concentrations above the national standard in Cache Valley have led area schools to keep children inside during recess and lunch time on "red" days as suggested by the Bear River Health Department. Indoor $PM_{2.5}$ concentrations versus ambient $PM_{2.5}$ were studied in four area schools and chemically analyzed in order to quantify indoor concentrations and particulate composition.

The average measured indoor $PM_{2.5}$ concentrations at the four schools was 12.5 $\mu g/m^3$, well below the 40 $\mu g/m^3$ level at which children start to be affected, even when ambient concentrations approach and exceed the national standard of 65 $\mu g/m^3$. Anion analysis of the collected particles confirmed that ammonium nitrate is the dominant chemical species in ambient $PM_{2.5}$, but the indoor NO_3^- concentrations are on average 17% of the outdoor concentrations. This difference in NO_3^- concentrations is likely due to ammonium nitrate volatilization as the temperature increases from ambient temperature to room temperature. The indoor $PM_{2.5}$ levels were, therefore, found "safe" in all four schools at the ambient concentrations measured. Keeping the children inside during high pollution days was in their best interest and protected them from exposure to unhealthy levels of particulate matter.

WINTERTIME VERTICAL OZONE DISTRIBUTIONS

Contributing Authors

Dr. Randal S. Martin
Crystal Viator, B.S. Env. Eng. Student
Dept. of Civil & Environmental Engineering
Utah State University
Logan, UT

INTRODUCTION

Research discussed in previous sections showed that the main contributor to the $PM_{2.5}$ in the Cache Valley was photochemically derived ammonium-nitrate (NH_4NO_3). Along with the precursor compounds of ammonia (NH_3) and oxides of nitrogen (NO_x), the formation of ammonium-nitrate is fueled by ozone and sunlight. Although considerably more reactions are involved, Equations 1-4 show the basic NH_4NO_3 formation mechanisms.

$$O_3 + sunlight \rightarrow O^1D + O_2 \qquad (Eq\ 1)$$

$$O^1D + H_2O \rightarrow 2OH \qquad (Eq\ 2)$$

$$OH + NO_2 \rightarrow HNO_3 \qquad (Eq\ 3)$$

$$HNO_3 + NH_3 \rightarrow NH_4NO_3 \qquad (Eq\ 4)$$

As shown above ozone (O_3) reacts with available incoming solar radiation (insolation) of about 310 nm, or less, to form O singlet D (O^1D), an excited oxygen atom, as well as diatomic oxygen (O_2). The O^1D then reacts with water vapor to form two hydroxyl radicals. Hydroxyl radicals are highly reactive and readily combine with any available nitrogen dioxide (NO_2), produced from car emissions and other combustion sources, to give nitric acid (HNO_3), which when combined with gas-phase ammonia forms NH_4NO_3. Furthermore, ozone is known to accelerate the oxidation of hydrocarbons and other pollutants in quantities as low as 20 ppb which can complicate and accelerate the above reactions (Woods Hole, 2006).

Ozone is also the product of a complex series of reactions strongly dependent on available sunlight ($\leq$420 nm) as summarized in Equation 5:

$$NO_2 + NMHCs + sunlight \rightarrow O_3 + products \qquad (Eq\ 5)$$

where NMHCs represents non-methane hydrocarbons. Typically these reactions are expected to be dominant in the summertime when there is plenty of available sunlight. However, Cache Valley's global location (41.8°N) and frequent wintertime clouds, storms, and fog episodes, were not thought to allow enough insolation to produce enough ozone or to adequately drive Equations 1 and 5.

Uncertainty in the local wintertime ozone levels led investigators (Dr. Martin) to establish an ozone monitoring site in downtown Logan, situated in the heart of Cache Valley, from February to April of 2004. Previously, ozone had only been monitored in Logan for regulatory purposes by the Utah Division of Air Quality (UDAQ) during the summer months; however, since the brief study of Martin, the UDAQ has established year-round ozone monitoring at the specified location. As shown in Figure 58, wintertime ozone concentrations peaked as high as 70 ppb, with average peak values

around 45-55 ppb. The overall daily averages were on the order of 25-35 ppb. These unexpectedly high wintertime ozone values indicate sufficient oxidation potential to initiate the previously discussed reaction pathways toward ammonium nitrate formation (Refer to Equations 1-5).

The source of the observed high concentrations of O_3 was still uncertain, particularly in regards to the lack of available insolation. However, somewhat in support of these high wintertime values Lefohn *et al.* (2001) reported finding hourly average ozone concentrations greater than or equal to 50 and 60 ppb during photochemically quiescent months in the winter and spring at several rural sites across southern Canada, the northern United States (Wyoming), and northern Europe.

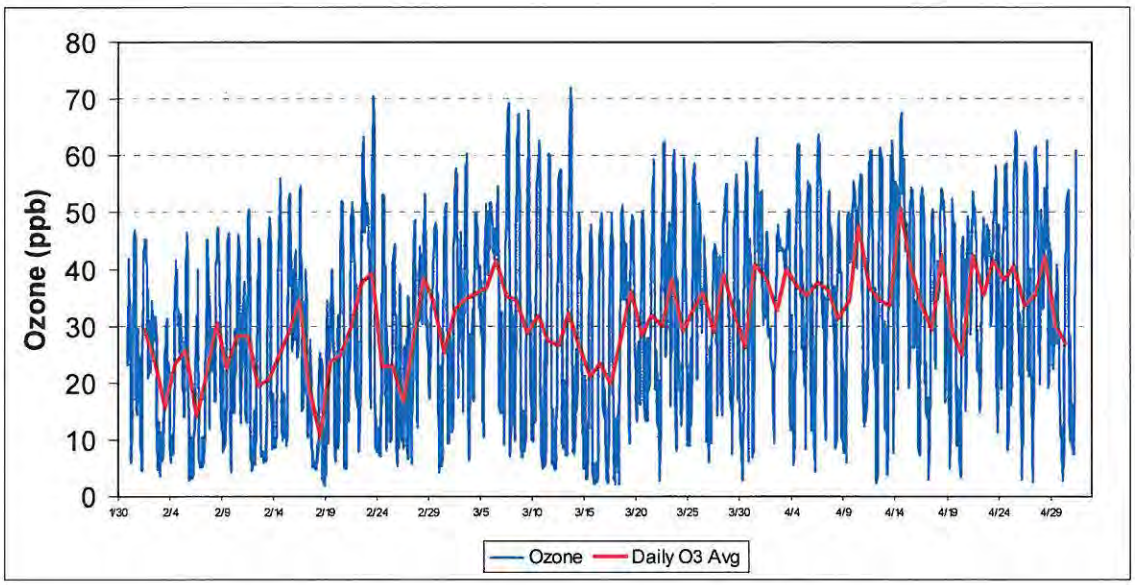


Figure 58. Logan O_3 February-April 2004.

For the Cache Valley situation, it was speculated that free tropospheric ozone could be the source of the elevated ground level ozone, assuming the possibility or likelihood of sufficient downward mixing. As such, an experiment was designed to measure the local wintertime vertical ozone profile. If elevated concentrations were observed above the ground level or the inversion heights, the upper level ozone may be the source for the unexpectedly high concentrations recorded at the Logan station.

METHODOLOGY

In order to measure the vertical ozone concentrations a small airplane was outfitted with an ozone monitor, a temperature monitor, a GPS system, and two flights were conducted. The first flight was in the mid-afternoon of February 9, 2006 (13:41-15:32). The second flight was in the early morning, just after sunrise, on February 11, 2006 (7:02-8:59). A four meter Teflon tube with an outer diameter of ¼" was attached to

the wing strut of a Cessna 182 airplane. The tube ran to the inside of the plane and was attached to a ThermoEnvironmental Model 49C UV Photometric O_3 Analyzer. Before the initial flight, the ozone monitor was calibrated using a ThermoEnvironmental Model 49C Primary Standard O_3 Calibrator. The data were averaged over one minute intervals and corrected for system sampling and instrument response time lags (approximately one minute). A HOBO temperature sensor was attached to the opposite strut and programmed for 15 second averaging periods. A Garmin Etrex Vista handheld GPS was used to track aircraft position and altitude. The flights were on a north-south transect along the length of the valley at above sea level elevations of around 1460 m, 1600 m, 1950 m, and 2770 m, or above the valley floor elevations of approximately 90 m, 300 m, 600 m, 1400 m. A sample flight path (February 9) can be seen in Figure 59. The flight path for the second profile (February 11) was similar.

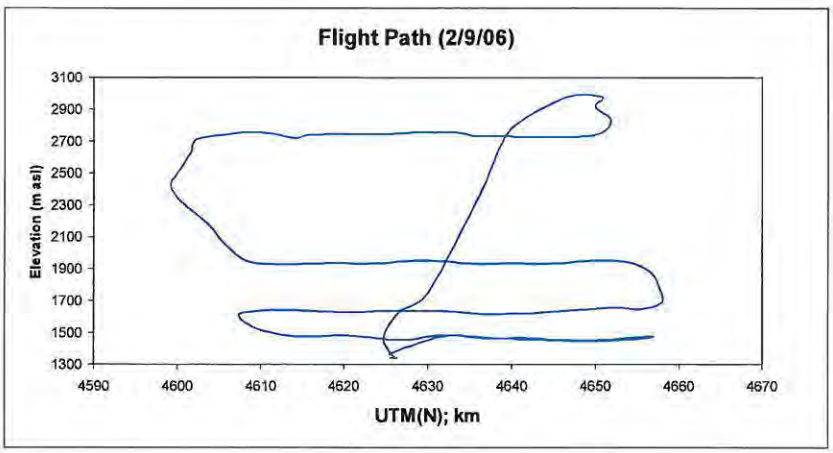


Figure 59. Flight path for February 9, 2006.

RESULTS

During the first flight ground level ozone concnetrations measured just before takeoff and after landing, were found to average approximately 35 ppb. At the UDAQ Logan station, approximately 5.6 km from the airport location, during the same time period ground level ozone was measured to be approximately 34-48 ppb (UDAQ, 2006). The ozone concentrations along the flight path are shown in Figure 59. The different elevation transects above the valley floor are shown in different colors (see legend on Figure 59). For most of the elevations flown, ozone concentrations were moderately consistent varying between 40-50 ppb. However, at the lower two transects, 90 m and 300 m above ground level, the ozone concentrations displayed a noticeable decrease when flying over the mid-to-south end of the valley, the most densely populated area of the valley. Additionally, it should be noted that there was a 1.4 – 1.9 m/s wind blowing out of the Northwest. The investigators theorize that the reason the "Logan Dip," as it was referred to, was not seen at the third and fourth transects (600 m – 1400 m) is because these final two transects were above the inversion height. Figure 60 shows a

photograph taken from an elevation of approximately 1900 m (asl) clearly showing the inversion layer.

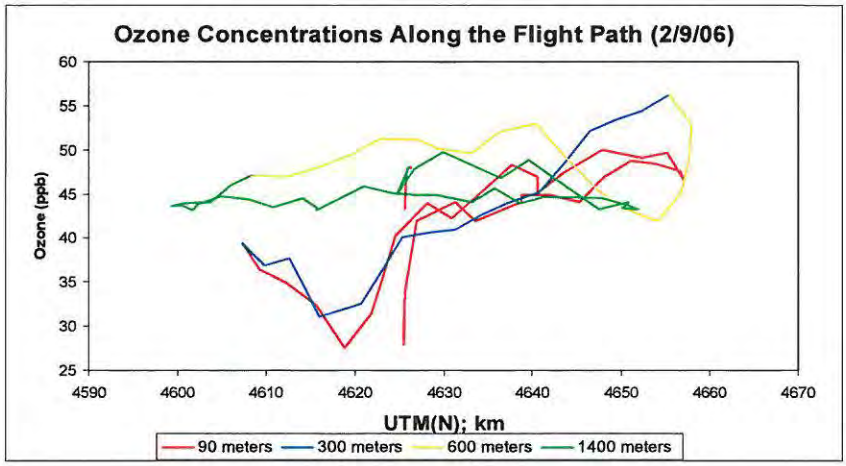


Figure 59. Ozone concentrations along February 9, 2006 flight path (elevation transects are above ground level).

Figure 60. Photograph of inversion above Cache Valley, Utah taken 2/9/06 at 1900 m (asl).

The valley-wide average vertical ozone profile from the same day is shown in Figure 61. The ozone concentrations were low at ground level and rose to values approaching 50 ppb, then began to decrease at above sea level elevations of around 2000 m. The 95% confidence intervals have a higher degree of variability at lower elevations. This coincides with the variability owing to the "Logan Dip" seen in Figure 59.

However, above the inversion layer the 95% confidence intervals are small because the ozone was essentially the same horizontally (north-to-south) through the measured troposphere.

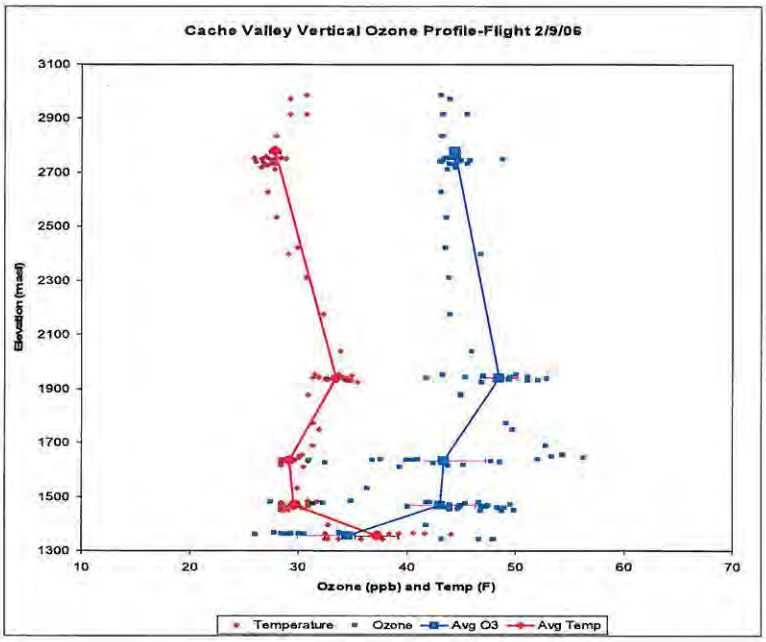


Figure 61. Vertical temperature and ozone profile February 9 flight (error bars represent the 95% confidence interval).

Also shown in Figure 61 is the vertical temperature profile for the February 9th flight. As described by Cooper and Alley (2002), an inversion is when temperature increases with altitude as opposed to the typical case of temperature decreasing vertically. A very pronounced inversion can be seen clearly delineated at approximately 650 m above ground level (2000 m asl). Most of the locally emitted reactive pollutants remain trapped under the inversion layer and are more concentrated at the south end of the valley due to population density and wind direction. This is also evidenced by the "Logan Dip" in Figure 59.

The second flight in the early morning of February 11, 2006 found that ground level ozone was between 16-31 ppb. UDAQ reported that on that morning the Logan station ground level ozone was measured to be approximately 19-33 ppb (UDAQ, 2006). The ozone concentrations along the flight path are shown in Figure 62. As with the previous flight (Figure 59) the different elevation transects above the valley floor are shown in different colors (Figure 62). On the morning of the 11th, ozone concentrations were more consistent in regards to north-south variability and generally increased with elevation.

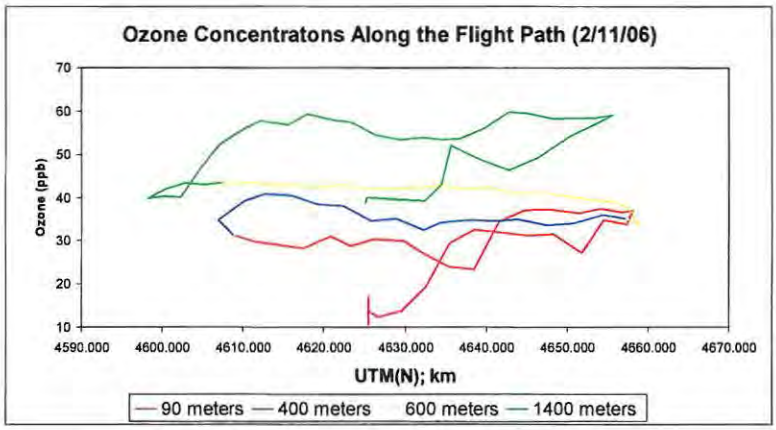


Figure 62. Ozone concentrations along February 11, 2006 flight path (elevation transects are above ground level).

Figure 63 shows the vertical temperature and ozone profiles for the February 11th flight. As elevation increased, there was a gradual increase in ozone up to approximately the same background concentration as observed on the February 9th afternoon flight. Once again the observed ground level ozone showed the highest degree of variability, which is likely due to different concentrations observed between the start (take-off) and ending (landing) of the flight period.

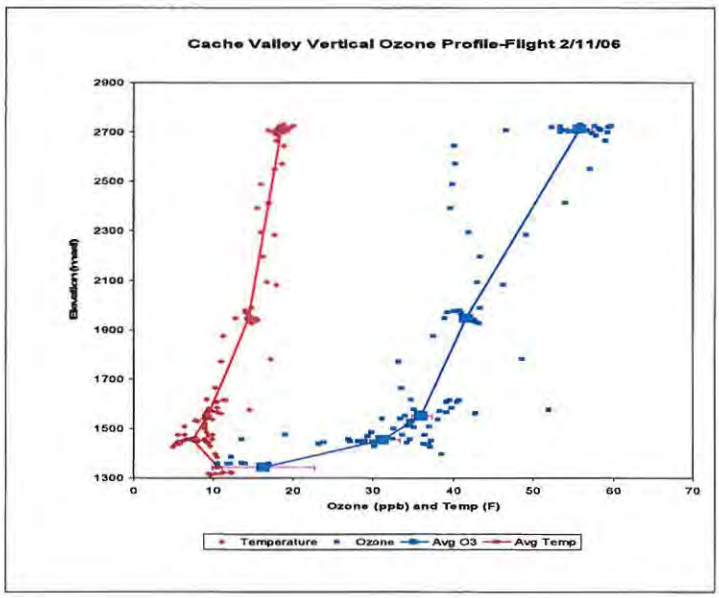


Figure 63. Vertical temperature and ozone profile February 9 flight.

This flight started before sunrise, at which point ground level ozone had had sufficient time overnight to titrate out by reacting with hydrocarbons and oxides of nitrogen. Upon landing the sun had risen and ozone formation chemistry had already

begun (more insolation). The temperature profile (Figure 63) showed that there was a moderate, continuous inversion from ground level to the highest elevation.

CONCLUSIONS

Upon analysis of the data it was concluded that the wintertime high levels of ozone in Utah's Cache Valley could indeed be a result of downward mixing from ozone aloft. The upper-level available ozone is likely being utilized at ground level, as well as produced, through the previously mentioned photochemical reactions to form particulate-phase ammonium nitrate.

Figure 64 directly compares the ozone concentrations from both flights. The ground level ozone was low in the morning hours compared to the afternoon flight due to reactions previously discussed.

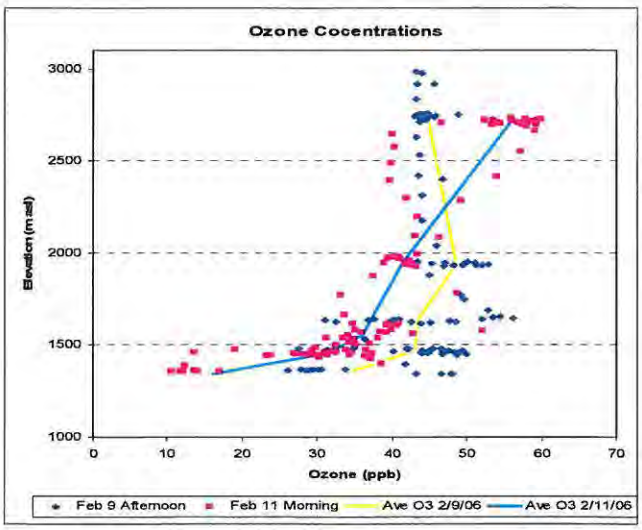
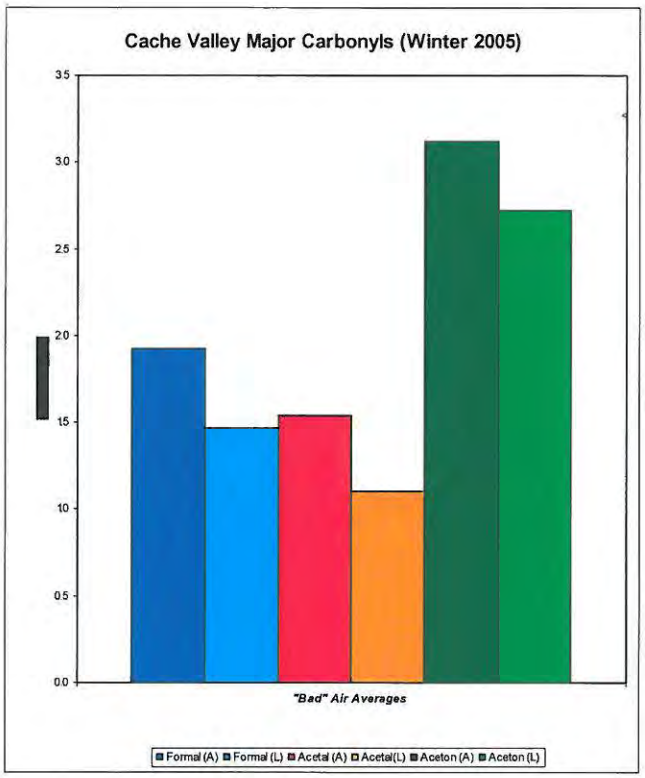
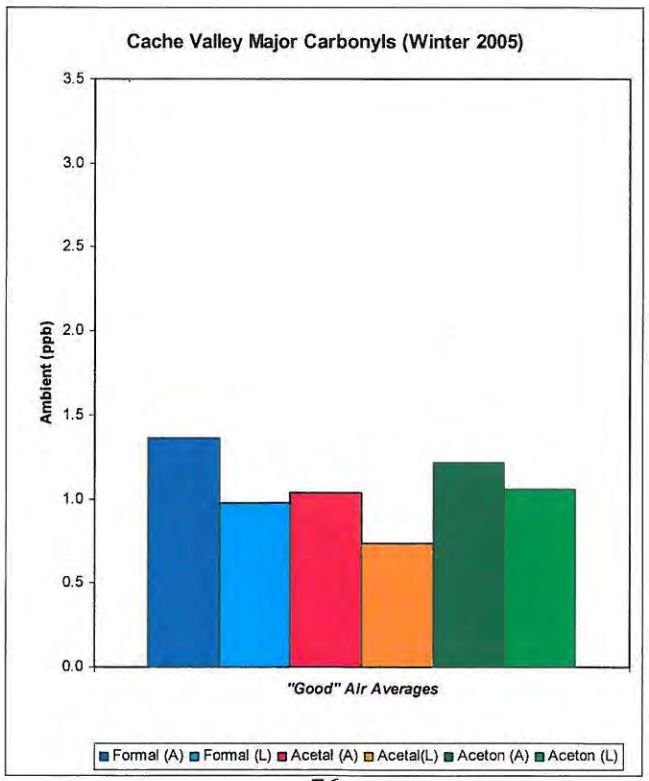


Figure 64. Ozone Concentration-both flights.

In the afternoon, a very pronounced dip in ozone concentrations over Logan served as evidence that the ozone is reacting with pollutants within the inversion boundary. The ozone concentrations were similar (45-55 ppb) above the inversion and generally increased with elevation. Although this study gives strong indication that free tropospheric ozone may supply sufficient concentrations to initiate photochemical reactions in Northern Utah's Cache Valley, it is recommended that additional vertical ozone profiles be measured to determine if these results are typical throughout the winter period. Airplane transects are expensive and time consuming. It is suggested that other methods, such as radio sondes or tether sondes, be used for further analysis.

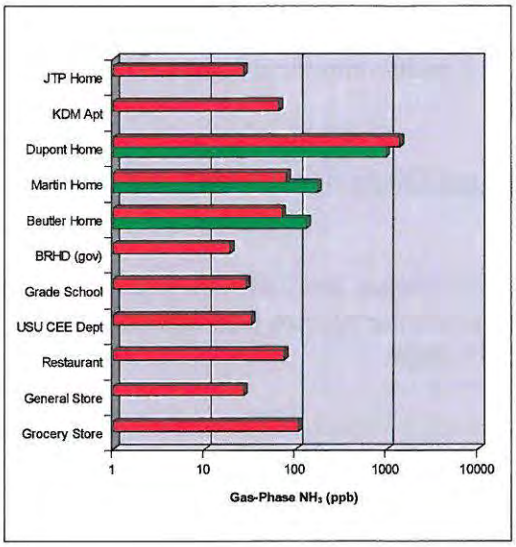
VOCs

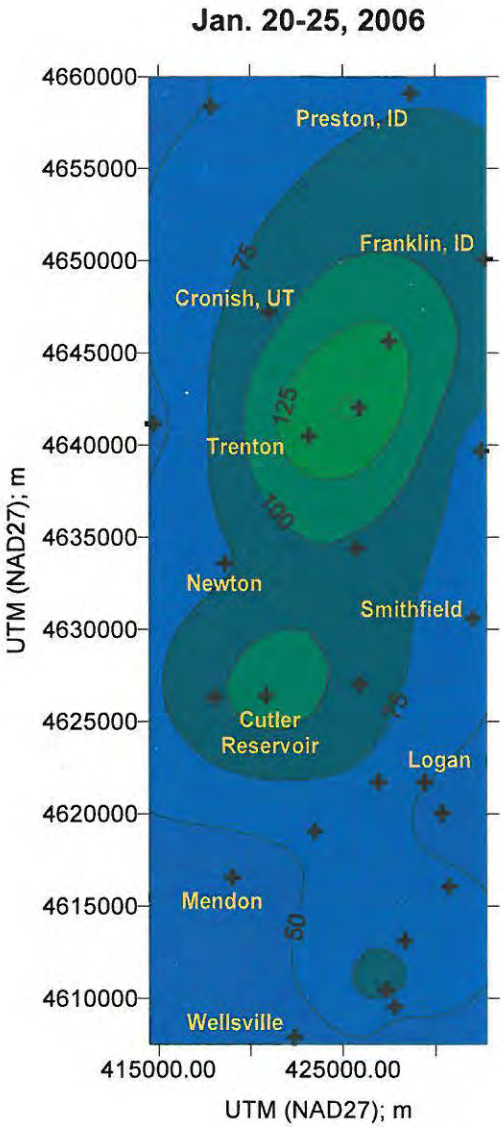

Cache Valley Major Carbonyls (Winter 2005)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
"Bad" Air Averages
Formal (A) Formal (L) Acetal (A) Acetal(L) Aceton (A) Aceton (L)


Cache Valley Major Carbonyls (Winter 2005)
Ambient (ppb)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
"Good" Air Averages
Formal (A) Formal (L) Acetal (A) Acetal(L) Aceton (A) Aceton (L)

NEW RESEARCH

Indoor NH3,
Valley-wide NH3





REFERENCES

40CFR50, Title 40 Code of Federal Regulations, Part 50, Appendix L (2003), Reference Method for Determination of Fine Particulate Matter as PM2.5 in the Atmosphere, www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv2_03.html, accessed December 2003.

40CFR50, App. F (2006), Title 40 Code of Federal Regulations Part 50, National Primary and Secondary Ambient Air Quality Standards, Appendix F, Measurement Principle and Calibration Procedure for the Measurement of Nitrogen Dioxide in the Atmosphere, accessed at *washingtonwatchdog.org/documents/cfr/title40/part50.html*.

AirMetrics (2004), MiniVol Portable Air Sampler Operators Manual, www.airmetrics.com/products/minivol/index.html, accessed January 2004.

Ansari A.S.and S.N. Pandis (1999), Prediction of multicomponent inorganic atmospheric aerosol behavior, *Atmos. Environ.*, 33:745-757

Arya, S. Pal (1999), Air Pollution Meteorology and Dispersion, Oxford University Press, Inc.: New York City, NY. 310.

Blanchard, C.L., P.M. Roth, S.J. Tanenbaum, S.D. Ziman, and J.H. Seinfeld (2000), The Use of ambient measurement to identify which precursor species limit aerosol nitrate formation, *J. Air Waste Manage. Assoc.*, 50:2073-2084.

Cache County (2004), Utah, Assessor's Office, Motor Vehicle Registration, personal communication.

CAEAAFO (2002), The Scientific Basis for Estimating Emissions from Animal Feeding Operations, Interim Report, Committee on Air Emissions from Animal Feeding Operations, Division of Earth and Life Sciences, National Research Council, National Academy Press.

CENR (2001), Atmospheric Ammonia: Sources and Fate, A Review of Ongoing Federal Research and Future Needs, Committee on the Environment and Natural Resources, air Quality Research Subcommittee, NOAA Aeronomy Laboratory, Boulder, CO, June 2000.

Cooper, D.C. and F.C. Alley (2002), Air Pollution Control: A Design Approach, Waveland Press, Inc., Prospect Heights, Ill., U.S.

Cowen, K., A.L. Sumner, A. Dindal, K. Riggs, Z. Willenberg, J. Hatfield, R. Pfieffer, and K. Scoggin (2004), Thermo Electron Corporation Model 17C Ammonia Analyzer, Environmental Technology Verification Report, ETV Advanced Monitoring Systems Center, Battelle, Columbus, OH, July 2004.

El-Abssawy, A.A. (2003), Indoor-outdoor relationship of suspended particulate matter and its chemical composition at different sizes, *Intern.l J. of Environ. and Pollut.*, 19: 615-634.

EPA (2003), Air Trends: Particulate Matter, www.epa.gov/airtrends/pm.html, accessed Feb. 2003.

FAO (2001), Global Estimates of Gaseous Emissions of NH_3, NO, and N_20 from Agricultural Land, International Fertilizer Industry Association, Food and Agricultural Organization of the United Nations, Rome, 2001, ISBN 92-5-104698-1.

Finlyason-Pitts, B.J. and J.N. Pitts, Jr. (2000), Chemistry of the Upper and Lower Atmosphere: Theory, Experiments, and Applications, Academic Press, San Diego, CA, pp 583.

IDT, Idaho Transportation Department (2006), Idaho Vehicle Count and Registration Revenue: Calendar Year 2004, *itd.idaho.gov/econ/VehicleRegistration/REG04.htm* (accessed Jan. 2006).

Klausmeier, R and P. McClintock (2003), Virginia Remote Sensing Device Study - Final Report, ESP, Tucson, AZ.

Lefohn A.S., Oltmans S.J. , Dann T. , and Singh H.B. (2001), Present-day variability of background ozone in the lower troposphere. *J. Geophys. Res.*, 106 (D9):9945-9958.

Mangelson, N.F., L. Lewis, J.M. Joseph, W. Cui, J. Machir, D.J. Eatough, L.B. Rees, T. Wilkerson, and D.T. Jensen, (1997), The contribution of sulfate and nitrate to atmospheric fine particles during winter inversion fogs in Cache Valley, Utah. *J. Air Waste Manag. Assoc.*, 47:167-175.

Martin, R.S. and D. Zhu (2004), Gas- and Particulate-Phase Ammonia in Northern Utah's Cache Valley, No.72, presented at the Joint Regional Meeting of the Northwest and Rocky Mountain Sections of the American Chemical Society, Logan, UT, June 6-9, 2004.

Masters, Gilbert M. (1998), Introduction to Environmental Engineering and Science, Second Edition, Prentice-Hall, Inc.: Upper Saddle River, NJ: 651.

McCulloch, R.B., G.S. Few, G.C. Murray, and V.P. Aneja, (1998), Analysis of ammonia, ammonium aerosols, and acid gases in the atmosphere at a commercial hog farm in eastern North Carolina, USA, *Environ. Pollut.*, 102:263-268.

Mount, G.H., B. Rumburg, J. Havig, B. Lamb, H. Westberg, D. Yonge, K. Johnson, and R. Kincaid (2002.), The measurement of atmospheric ammonia at a dairy using differential optical absorption spectroscopy in the mid-ultraviolet, *Atmos. Environ.* 36:1799-1810.

Pryor, S.C., R.J. Barthelmie, L.L. Sorensen, and B. Jenson (2001), Ammonia concentrations and fluxes over a forest in the midwest USA, *Atmos. Environ.*, 35:5645-5656.

Robarge, W., J. Walker, G. Murray, and W. Cure (2000), Ambient Concentrations of Ammonia in Eastern North Carolina, presented at the EPA Great Waters Program Workshop: Airsheds and Watersheds: The Significance of Ammonia to Coastal & Estuarine Areas, Nov. 15-16, 2000, Dewey Beach, Delaware.

Sawant, A.A., K. Na, X. Zhu, K. Cocker, S. Butt, C. Song, D.R. Cocker III (2004), Characterization of $PM_{2.5}$ and selected compounds at multiple indoor and outdoor sites in Mira Loma, California, *Atmos. Environ.*, 38: 6269-6278.

Seinfeld, J.H. and S.N. Pandis (1998), Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, John Wiley & Sons, Inc. New York, New York, 1326.

Sonoran Insitute (2006), Population, Employment, Earnings, and Personal Income Trends: Franklin County, Idaho, Sonoran Institute, Bozeman, MT, *www.sonoran.org/programs/data/IDFranklin.pdf* (accessed Jan. 2006).

TECO (2004), ThermoEnvironmental Instruments, Model 17C Chemiluminescent Ammonia Analyzer, Operations Manual.

TECO (2006), ThermoEnvironmental Instruments, website, *thermo.com/com/CDA/Category/All_Sub_Child_Category/0,2211,15,00.html*, accessed April 2006.

Thoni, L., E. Seitler, A. Blatter, and A. Neftel (2003), A passive sampling method to determine ammonia in ambient air, *J. Environ. Monit.*, 5(1), 96-99.

UGOPB (2006), Utah's 2006 Economic Report to the Governor, Governor's Office of Planning and Budget, *www.governor.state.ut.us/dea/ERG/ERG2003/ERG2003*.pdf (accessed Jan. 2006).

URG (2000), Model 3000C/3000CA Operation Manual, URG, Chapel Hill, NC.

Utah Division of Air Quality (2006), personal communication.

Watson, J.G., J.C. Chow, F.W. Lurmann, and S.P. Musarra (1994), Ammonium nitrate, nitrate acid, and ammonium equilibrium in wintertime Phoenix, Arizona, J. *Air Waste Manag, Assoc.*, 44:405-412.

Whiteman, C. D., J. M. Hubbe, and W. J. Shaw (2000), Evaluation of an inexpensive temperature datalogger for meteorological applications, *Journal of Atmospheric and Oceanic Technology*. 17: 77-81.

Woods Hole Oceanographic Institution (2006), Ozone Measurements in the Marine Boundary Layer from Ocean Buoys, http://www.whoi.edu/MCG/facilities/hintsa_ozone/background.html, accessed May 2006.

Yoong, M. (1981), Measurement of ambient ammonia concentrations in Southern California, Final Report, prepared for the California Air Resources Board, Contract A7-188-30, Rockwell Internationl, Newberry Park, CA.

Zhu, Dongzi (2005), Analysis of Wintertime Gas- and Particulate-Phase Ammonia in Assocation with PM2.5 Formation in Cache Valley, M.S. Thesis, Utah State University, Logan, UT, June 2005.

Appendix B. Emissions Inventory and Technical Support Document—Utah Department of Air Quality

- **Excerpts (highlighted in yellow) from the Technical Support Document for the $PM_{2.5}$ Attainment SIPs Emissions Inventory—prepared by Utah Division of Air Quality**

  Technical Support Document: http://www.airquality.utah.gov/Public-Interest/Current-Issues/pm2.5/SIP-TSD/TSD_for_Public_Comment_10-1-2012/index.html

  Interactive Data Explorer: http://www.airquality.utah.gov/Public-Interest/Current-Issues/pm2.5/presentations/index.html

This page intentionally left blank for correct double-sided printing.

Technical Support Document for the PM2.5 Attainment SIPs

DRAFT

Public Comment Period: 10/1/2012 - 11/1/2012

Table of Contents

1) Inventory, General

a) Overview
b) Inventory Preparation Plan
c) Multi-State Nonattainment Area Considerations

2) Episodic Inventories

a) General

i) Overview and Emissions Distribution

ii) SMOKE Output Summary tables

A. Episode Summary: SMOKE Output - all Categories Tons/Episode Day

I. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
II. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
III. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

B. Summary by Non-Attainment Area: SMOKE Output - all Categories Tons/Average Episode Day

I. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
II. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
III. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

C. SMOKE Profiles

I. States/County Area in Modeling Domain (IPP Table 4)
II. County Populations in Modeling Domain (IPP Table 5)
III. Profile Codes

b) Point Sources

i) Overview
ii) Summary Tables

A. Point Emissions Summary by Non-Attainment Area: SMOKE Output-Tons/Average Episode Day

I. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
II. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
III. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

B. Point Source Summary by Company - Non-Attainment Area: SMOKE Output-Tons/Average Episode Day

I. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
II. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
III. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

iii) Point Source Inventory Development Details (pre-SMOKE processing)

A. Table by source of 2008 point source actual annual emissions
B. Table of sources that stayed unchanged according to questionnaire responses
C. Table of sources that changed according to questionnaire responses by episode
D. Table of sources that reported breakdown/excess emissions according to questionnaire responses by episode

E. Appendix 1: Employment Data and Methods

I. Development of Projection Data and Episode Inventories

II. Employment Projection Data

F. Appendix 2: Questionnaire Letters and Data

I. First Form Questionnaire Letter
II. Second Form Questinnaire Letter
III. Episode Breakdown & Excess Emissions
IV. Episode Production Calculations

c) Area Sources

i) Overview
ii) Summary tables

A. Area/Nonpoint Sources by NA: SMOKE Output-Tons/Average Episode Day

I. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
II. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
III. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

B. Area/Nonpoint Sources by Sector: SMOKE Output-Tons/Average Episode Day

I. Area/Nonpoint Sources by Sector: SMOKE Output-Summary of All Pollutants

1. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
2. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
3. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

II. Area/Nonpoint Sources by Non-Attainment Area - Sector

1. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
2. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
3. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

III. Area/Nonpoint Sources by NA - County - Sector - with Temporal Profile Codes by SCC

1. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
2. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
3. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

IV. Area/Nonpoint Sources by NA - by Pollutant - Sector

1. Episode 1: 1/11/2007 - 1/20/2007 (10 days)

a. PM2.5
b. NOX
c. VOC
d. NH3
e. SO2
f. CO

2. Episode 2: 2/14/2008 - 2/18/2008 (5 days)

a. PM2.5
b. NOX
c. VOC
d. NH3
e. SO2
f. CO

3. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

a. PM2.5
b. NOX
c. VOC
d. NH3
e. SO2
f. CO

C. SMOKE Distribution/Apportionment Tables

I. States/County Area in Modeling Domain (IPP Table 4)
II. County Populations in Modeling Domain (IPP Table 5)
III. Temporal Profile Codes

iii) Estimation Methods

A. Area Activity Data Sources

iv) 2007-2010 Episode Years

A. Annual Emissions Summary Tables
B. Area Source Categories

d) Non-Road Mobile Sources

i) Non-Road Sources by NA: SMOKE output-tons/average episode day

A. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
B. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
C. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

ii) Non-Road Sources by Sector: SMOKE Output-tons/average episode day

A. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
B. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
C. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

iii) Non-road Emission Sources and Models

e) On-road Mobile Sources

i) On-road Sources-Episode Summary: SMOKE Output-Episode-tons/average day

A. Episode 1: 1/11/2007 - 1/20/2007 (10 days)
B. Episode 2: 2/14/2008 - 2/18/2008 (5 days)
C. Episode 3: 12/8/2009 - 1/20/2010 (44 days)

ii) Overview - EPAMOVES2010a Overview (revised: 7/7/11)
iii) PM2.5 Emissions Inventories for PM2.5 SIP Base Years

3) Baseline and Projected Inventories

a) General

i) Overview
ii) Summary Tables (2008, 2014, 2017, 2019)

b) Point Sources

i) Baseline Overview and Methods

A. 2008 Pre-SMOKE Point Source Data Tables

ii) Projections Overview and Methods

A. 2008 Pre-SMOKE Point Source Projection Data Table
B. Sources Reporring Site Specific Growth Factors and Data
C. 2014 Projected Annual Emissions (Condensables and RACT included)
D. 2017 Projected Annual Emissions (Condensables and RACT included
E. 2019 Projected Annual Emissions (Condensables and RACT included

iii) Summary Tables Post-SMOKE: 2008, 2014, 2017, 2019
iv) Appendix 1 - Employment by Area and Industry

c) Area Sources

i) Overview
ii) Summary Tables (2008, 2014, 2017, 2019)
iii) Estimation Methods

A. Data Tables
B. Sources

iv) 2008 - 2019 Baseline & Projected Years

A. Emissions Summary Tables
B. Category Tables
C. Idaho Livestock Projection Data

d) Non-Road Mobile Sources

i) Overview and Emissions Inventories - Baseline and Projected Years
ii) Summary Tables (2008, 2014, 2017, 2019)

e) On-Road Mobile Sources

i) MOVES Overview
ii) Summary Tables (2008, 2014, 2017, 2019)
iii) On-Road Mobile Sources: PM2.5 Emissions Inventories for PM2.5 SIP

4) Air Quality Modeling

a) Meteorological Modeling
b) CMAQ Modeling
c) SMOKE Modeling
d) MATS

5) Control Strategies

a) Background
b) Area Sources

i) R307-302 Residential Fireplaced and Solid Fuel Burning Devices
ii) R307-303 Commercial Cooking
iii) R307-307 Road Salting and Sanding
iv) R307-309 Fugitive Emissions and Fugitive Dust
v) R307-312 Aggregate Processing Operations
vi) R307-334 Industrial Baking Ovens
vii) R307-335 Degreasing and Solvent Cleaning Operations
viii) R307-343 Emission Standards for Wood Furniture Manufacturing Operations
ix) R307-344 Paper, Film and Foil Surface Coatings
x) R307-345 Fabric and Vinyl Coatings
xi) R307-346 Metal Furniture Surface Coatings
xii) R307-347 Large Appliance Surface Coatings
xiii) R307-348 Magnet Wire Coatings
xiv) R307-349 Flat Wood Panel Coatings
xv) R307-350 Miscellaneous Metal Parts and Products Coatings
xvi) R307-351 Graphic Arts
xvii) R307-352 Metal Container, Closure, and Coil Coatings
xviii) R307-353 Plastic Part Coatings
xix) R307-354 Automotive Refinishing Coatings
xx) R307-355 Control of Emissions from Aerospace Manufacture and Rework Facilities
xxi) R307-356 Appliance Pilot Light

c) Point Sources

i) Summary Tables
ii) ATK Launch Systems
iii) Big West Oil, LLC
iv) Bountiful City Light and Power
v) Brigham Young University
vi Central Valley Water Reclamation Facility
vii) CER Generation II, LLC
viii) Chemical Lime Company: Grantsville Plant
ix) Chevron Products Company
x) Geneva Nitrogen
xi) Geneva Rock Products
xii) Great Salt Lake Minerals
xiii) Hexcel Corporation
xiv) Hill Air Force - Main Base
xv) Holly Corp: HRMC and HEP Woods Cross Operations
xvi) Interstate Brick Company
xvii) Kennecott Utah Copper Corp: Mine and Concentrator
xviii) Kennecott Utah Copper Corp: Power Plant
xix) Kennecott Utah Copper Corp: Smelter and Refinery
xx) Murray City Power
xxi) Nucor Steel
xxii) Olympia Sales
xxiii) Pacific States Cast Iron Pipe Company
xxiv) PacifiCorp Energy: Gadsby Power Plant
xxv) PacifiCorp: Lake Side
xxvi) PacifCorp: Little Mountain
xxvii) Payson City Power
xxviii) Pepperidge Farm Incorporated
xxix) Proctor and Gamble
xxx) Provo City Power
xxxi) Silver Eagle Refining and Marketing Company
xxxii) Springville City Power
xxxiii) Tesoro Refining and Marketing Company
xxxiv) University of Utah
xxxv) Utility Trailer
xxxvi) Vulcraft
xxxvii) Wasatch Integrated Waste Management District
xxxviii) R307-312 Aggregate Processing Operations Development

d) Non-Road Mobile Sources
e) On-Road Mobile Sources

6) CD of Inventory Data Files

MATS Input Files
PM2.5 MOVES files
Dust Baseline and Projection Years
Dust Episode Days 2007 - 2010

Inventory Overview

Much of the technical work done to support the modeled attainment demonstration of the State Implementation Plan (SIP) for $PM_{2.5}$ is the collection of accurate emissions inventories.

There are essentially two such inventories: an *episodic* inventory that is an assessment of actual emissions paired in time with the episodes of elevated $PM_{2.5}$ concentrations used to validate the air quality model, and a *projection* inventory that represents the bulk of assumptions concerning population growth and economic development as well as various controls on emission rates. This is an oversimplification of course, as the episodic inventory will be prepared to represent each day within a collection of separate episodes incurred in different years, and the projection inventory is actually a test of assumptions against a baseline inventory that is projected into the future. This *baseline* inventory is prepared to represent typical conditions at a recent point in time (2008 for this SIP), and becomes the basis for all projections into the future. As such, there are actually many inventories used in the SIP analysis.

Each inventory includes estimates for the following criteria pollutants: $PM_{2.5}$, SO_x, NO_x, VOC, CO, and NH_3.

Each inventory also includes contribution from a number of sectors. The Utah Division of Air Quality (UDAQ) routinely considers emissions from the following generalized source groupings:

- Large industrial *point sources*;
- *Area sources*, which include smaller, and more numerous, industrial sources as well as activities like space heating that may be well approximated by surrogate indicators such as population;
- *On-road mobile sources;* and
- *Non-road mobile sources.*

As mentioned, these inventories represent a great deal of the technical basis for the $PM_{2.5}$ SIPs. As such, they occupy a large portion of this Technical Support Document (TSD.)

To assist the reader, the inventory portion of the TSD is organized using the categorizations discussed above.

The episodic inventory is presented first and begins with a comprehensive summary table for each modeled episode. Following that is more in depth information for point sources, area sources, and mobile sources.

The 2008 baseline inventory is presented next and includes summary tables and additional information concerning each of the various source groups.

UTAH DIVISION OF AIR QUALITY

$PM_{2.5}$ EMISSION

INVENTORY PREPARATION

PLAN

January 13, 2011

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS iii
TABLES vi
FIGURES vii
POLICY STATEMENT 1

I. INTRODUCTION 3

A. Purpose of Inventory 3
B. Scope 5
C. Objectives 6

II. NON-ATTAINMENT AND MAINTENANCE AREAS 7

III. AREAS OF RESPONSIBILITY 10

IV. EMISSION INVENTORY TRAINING PROGRAM 13

V. POINT SOURCE EMISSION INVENTORY DATA COLLECTION 13

A. Threshold Values for Point Sources in Tons Per Year – Base Year 13
B. Emission Inventory Source Categories 13
C. Identification of Point Sources 14
D. 2008 Point Source Emission Inventory Collection 15
E. Point Source Episode Day Emissions Inventory Data 16
F. Point Source Projection Inventory Data 17

VI. AREA SOURCE INVENTORY DATA COLLECTION 17

A. Area Emission Inventory Source Categories 17
B. Method of Calculation of Area Source Categories 19
C. Sources of Activity Level Information 25
D. Collection of Area Source Information 26
E. Area Source Emission Apportionment for Partial Counties within the Domain 26
F. Area Source Projection Inventory Data 29

VII. ON-ROAD MOBILE INVENTORY DATA COLLECTION 31

A. Utah Methodology 31
B. Idaho Methodology 32
C. Re-entrained Road Dust 33
D. Agencies Responsibilities 33
E. IPP Acronym Definitions 34

VIII. NON-ROAD MOBILE INVENTORY DATA COLLECTION 35

A. Non-road Mobile Source Categories 35
B. Sources of Non-road Emission Inventory Data 36
C. Collection of Non-road Emission Inventory Data 36
D. Methods of Calculation 37
E. Non-road Emission Apportionment for Partial Counties within the Domain 38
F. Non-road Mobile Sources Projection Inventory Data 39

IX. EMISSIONS INVENTORY DATA ANALYSIS 39

A. Emission Data Quality 39
B. Emissions Inventory Data Validation 40
C. Evaluation of the Uncertainty of Emission Estimates 41
D. Emission Factors 42
E. Control Device Efficiency 43
F. Rule Effectiveness and Rule Penetration 44

X. SIP DEMONSTRATION MODELING 44

A. Temporal and Spatial Allocation and Speciation of the Annual Inventory 44
B. Seasonal Temperature Adjustments 44
C. Typical Operating Day Emission Rates 45

XI. DATA HANDLING 45

A. Data Recording and Coding 45
B. Data Tracking 46

XII. EMISSION INVENTORY REPORTING 47
A. Raw and Summarized Data 47
B. Inventory Supporting Documentation 47

XIII. INTERNAL AND EXTERNAL QUALITY ASSURANCE AUDITS 48

A. Internal Quality Assurance Audits 48
B. External Quality Assurance Audits 49

REFERENCES 50

ACRONYMS AND ABBREVIATIONS

AADT	Average annual daily traffic
AP-42	Compilation of Air Pollutant Emissions Factors
APCA	Air Pollution Control Association
ATP	Anti-tampering Programs
AWKDT	Average weekday traffic
AWKNDT	Average weekend day traffic
BTU	British thermal unit
C	Control device efficiency (in percent) if the EF does not include a level of control
CEM	Continuous Emission Monitor
CFR	Code of Federal Regulations
CH_4	Methane
CMAQ	Community Multi-scale Air Quality Modeling System
CMPO	Cache Metropolitan Planning Organization
CO	Carbon monoxide
CO_2	Carbon dioxide
CTG	Control Technique Guidelines
E	Emissions estimate (at process level)
Ed.	Edition
EDMS	Emissions and Dispersion Modeling System
EF	Emission factors
EIIP	Emissions Inventory Improvement Program
EIS	Emission Inventory System
EPA	Environmental Protection Agency
GHG	Greenhouse gas
GIS	Global Information Systems
GOPB	Governor's Office of Planning and Budget
GUI	Graphical User Interface
Hg	Mercury
HPMS	Highway Performance Monitoring System
Hr	Hour
IM	Inspection and Maintenance Program
IPP	Inventory Preparation Plan
kW	Kilowatt
lb	Pound
MACT	Maximum Achievable Control Technology
MAG	Mountainland Association of Governments

Max	Maximum
Min	Minimum
$\mu g/m^3$	Micrograms per cubic meter
MOVES	Motor Vehicle Emissions Simulation
MPO	Metropolitan Planning Organization
N_2O	Nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NC	North Carolina
Neg	Negligible
NEI	National Emissions Inventory
NESHAP	Emission Standards for Hazardous Air Pollutants
NH_3	Ammonia
NMIM	National Mobile Inventory Model
NOAA	National Oceanic and Atmospheric Administration
NOx	Oxides of nitrogen
NSPS	New Source Performance Standards
NWS	National Weather Service
O_3	Ozone
OBD	On-board diagnostics
Pb	Lead
PM_{10}	Particulate matter with aerodynamic diameters less than or equal to 10
$PM_{2.5}$	Particulate matter with aerodynamic diameters less than or equal to 25
ppmw	Parts per million by weight
psi	Pounds per square inch
QA	Quality Assurance
QC	Quality Control
R	Activity level
RACM	Reasonably Available Control Measures
RACT	Reasonably Available Control Technology
RE	Rule effectiveness
RP	Rule penetration
RVP	Reid Vapor Pressure
SCCs	Source Classification Codes
SIC	Standard Industrial Classification Code
SIP	State Implementation Plan
SMOKE	Sparse Matrix Operator Kernal Emissions Model
SO_x	Oxides of sulfur
TDMs	Travel demand models
TTC	Technician Training and Certification Credit

UDAQ	Utah Division of Air Quality
UDOT	Utah Department of Transportation
USEPA	United States Environmental Protection Agency
VMT	Vehicle miles traveled
VOC	Volatile organic compounds
Vol.	Volume
WFRC	Wasatch Front Regional Council

TABLES

Table		Page
1	Minimum Point Source Reporting Thresholds by Pollutant	2
2	Level of Detail Used in the PM2.5 Inventory	3
3	Area Source Emission Calculation Methods	19
4	Area in Modeling Domain	27
5	Population in Domain	28
6.	Growth Factors for Projecting Emissions of Area Source Categories	29
7	Data Sources	34
8	Non-road Emission Calculation methods	37
9	Growth Indicators for Projecting Emissions of Non-Road Source Categories	39

FIGURES

Figure		Page
1	Inventory Data Flow Through the Agencies	7
2	PM2.5 Modeling Domain	9
3	UDAQ SIP Staff and IDEQ SIP Staff	11
4	UDAQ Areas of Responsibility and IDEQ Areas of Responsibility	12

UTAH DIVISION OF AIR QUALITY AND IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY EMISSIONS INVENTORY PREPARATION PLAN (IPP)

POLICY STATEMENT

The objective of the air pollution source emissions inventory for the State of Utah and State of Idaho is to compile an accurate and comprehensive database of annual and periodic emissions from point, area, mobile, biogenic, and geogenic sources as required by the Clean Air Act amendments of 1990. The Environmental Protection Agency (EPA) has developed two categories of point sources (Type A and Type B). Table 1 identifies the threshold levels for Type A and Type B point sources. The inventories will be developed annually for Type A point sources, every three years for Type B point sources, and every three years for point, area, mobile, biogenic, and geogenic sources statewide. In general, they will address all areas in the state and specifically all areas that are designated as non-attainment or maintenance areas.

To ensure that an emissions inventory is of acceptable quality for the various levels of inventories, the Utah Division of Air Quality (UDAQ) and Idaho Department of Environmental Quality (IDEQ) will implement an emission inventory quality assurance (QA) program which will implement certain quality control (QC) procedures at various points in the inventory process. Resources, including trained personnel, will be allocated for this purpose. UDAQ and IDEQ, in general, will follow the procedures outlined in the EPA, "Emissions Inventory Improvement Program (EIIP), Office of Air Quality Planning and Standards, MD-14, EPA-454/R-97-004a" guidance document for the preparation of the various levels of emission inventories. For a detailed breakout of the individual inventory levels impacted by this plan, see Table 2. The details of the QA program are discussed in the following sections.

UDAQ Quality Assurance Coordinator	IDEQ Quality Assurance Coordinator
UDAQ Division Director	IDEQ Air Division Administrator

TABLE 1[1]
MINIMUM POINT SOURCE REPORTING THRESHOLDS BY POLLUTANT
(Potential to Emit in Tons/year)

Pollutant	Annual cycle (Type A sources)	Three-year cycle Type B Sources
Oxides of Sulfur (SO_x)	$\geq$ 2500	$\geq$ 100
Oxides of Nitrogen (NO_x)	$\geq$ 2500	$\geq$ 100
PM_{10}	$\geq$ 250	$\geq$ 100
$PM_{2.5}$	$\geq$ 250	$\geq$ 100
Carbon Monoxide (CO)	$\geq$ 2500	$\geq$ 1000
Volatile Organic Compounds (VOC)	$\geq$ 250	$\geq$ 100
Ammonia (NH_3)	$\geq$ 250	$\geq$ 100
Lead (Pb)		$\geq$ 5

1 Table 1 reflects reporting requirements outlined in the Air Emission Reporting Rule (AERR). The inventories used in this $PM_{2.5}$ SIP will be collected using the reporting requirements outlined in 40 CFR Part 51 Subpart A § Parts 51.15 through Part 51.50.

TABLE 2
LEVEL OF DETAIL USED IN THE PM 2.5 INVENTORY

Inventory Category	Description of Inventory	Reason(s) for Classification
Level II	CAA-mandated State Implementation Plan (SIP) inventories	Site-specific information is gathered for point sources with stringent QA/ QC requirements. Results may be used to support strategic decision-making, standard setting, or to evaluate the effectiveness of regulations.
	National inventories developed in support of National Emission Standards for Hazardous Air Pollutants (NESHAP), New Source Performance Standards (NSPS), and Maximum Achievable Control Technology (MACT) Standards	Data is used to develop and evaluate emission reduction/control strategies. Site-specific data is generally required, but not necessarily direct source sampling.

I. INTRODUCTION

A. Purpose of Inventory

On September 21, 2006, EPA promulgated revisions to the National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$. It retained the primary annual standard at 15 micrograms per cubic meter ($\mu g/m^3$), but lowered the 24-hour standard from the 1997 level of $65\mu g/m^3$ to 35. Secondary standards were set for each averaging period at the same levels as the respective primary standards. The effective date for these standards was December 18, 2006.

On December 14, 2009, EPA effectively designated Salt Lake, Davis, and portions of Box Elder, Cache, Tooele, Utah and Weber counties in Utah as non-attainment for the federal 24-hr PM2.5 standard, and in Idaho a portion of Franklin County that makes up the northern portion of the Logan UT/ID area.

The areas include the following:

1. Cache County west of and including any portion of the following townships located within Utah: Township 15 North Range 1 East; Township 14 North Range 1 East; Township 13 North Range 1 East; Township 12 North Range 1 East; Township 11 North Range 1 East; Township 10 North Range 1 East; and Township 9 North Range 1 East.

2. In Idaho, Franklin County (part) - Begin in the bottom left corner (southwest) of the nonattainment area boundary, southwest corner of the PLSS-Boise Meridian, Township 16 South, Range 37 East, Section 25. The boundary then proceeds north to the northwest corner of Township 15 South, Range 37 East, Section 25; then the boundary proceeds east to the southeast corner of Township 15 South, Range 38 East, Section 19; then north to the Franklin County boundary at the northwest corner of Township 13 South, Range 38 East, Section 20. From this point the boundary proceeds east 3.5 sections along the northern border of the county boundary where it then turns south 2 sections, and then proceeds east 5 more sections, and then north 2 sections more. At this point, the boundary leaves the county boundary and proceeds east at the southeast corner of Township 13 South, Range 39 East, Section 14; then the boundary heads north 2 sections to northwest corner of Township 13 South, Range 39 east, Section 12; then the boundary proceeds east 2 sections to the northeast corner of Township 13 South, Range 40 East, Section 7. The boundary then proceeds south 2 sections to the northwest corner of Township 13 South, Range 40 East, Section 20; the boundary then proceeds east 6 sections to the northeast corner of Township 13 South, Range 41 East, Section 19. The boundary then proceeds south 20 sections to the southeast corner of Township 16 South, Range 41 East, Section 30. Finally, the boundary is completed as it proceeds west 20 sections along the southern Idaho state boundary to the southwest corner of the Township 16 South, Range 37 East, Section 25.

3. Utah County west of the Wasatch Mountain Range including the cities of Provo and Orem with an eastern boundary for Utah County as the following townships: Township 3 South Range 1 East; Township 4 South Range 2 East; Township 5 South Range 3 East; Township 6 South Range 3 East; Township 7 South Range 3 East; Township 8 South Range 3 East; Township 9 South Range 3 East; and Township 10 South Range 2 East.

4. Box Elder County including Brigham City and the following townships: Township 7 North Range 2 West; Township 8 North Range 2 West; Township 9 North Range 2 West; Township 10 North Range 2 West; Township 11 North Range 2 West; Township 12 North Range 2 West; Township 13 North Range 2 West; Township 9 North Range 3 West; Township 10 North Range 3 West; Township 11 North Range 3 West; Township 12 North Range 3 West; Township 13 North Range 3 West; Township 13 North Range 4 West; Township 12 North Range 4 West; Township 11 North Range 4 West; Township 10 North Range 4 West; Township 9 North Range 4 West; Township 13 North Range 5 West;

Township 12 North Range 5 West; Township 11 North Range 5 West; Township 10 North Range 5 West; Township 9 North Range 5 West; Township 13 North Range 6 West; Township 12 North Range 6 West; Township 11 North Range 6 West; Township 10 North Range 6 West; Township 9 North Range 6 West; Township 7 North Range 1 West (portion located in Box Elder County); Township 8 North Range 1 West (portion located in Box Elder County).

5. Davis County.

6. Salt Lake County.

7. Tooele County including Tooele City and the following townships: Township 1 South Range 3 West; Township 2 South Range 3 West; Township 3 South Range 3 West; Township 3 South Range 4 West; Township 2 South Range 4 West; Township 2 South Range 5 West: Township 3 South Range 5 West; Township 3 South Range 6 West; Township 2 South Range 6 West; Township 1 South Range 6 West: Township 1 South Range 5 West: Township 1 South Range 4 West: Township 1 South Range 7 West: Township 2 South Range 7 West; Township 3 South Range 7 West; all sections in Township 4 South Range 7 West except for Sections 29, 30, 31, and 32; Township 4 South Range 6 West; Township 4 South Range 5 West; Township 4 South Range 4 West; and Township 4 South Range 3 West.

8. Weber County that lies west of the Wasatch Mountain Range with an eastern boundary for Weber County to be defined as the following Townships (or portion thereof) extending to the western boundary of Weber County: Township 5 North Range 1 West; Township 6 North Range 1 West; all Sections within Township 7 North Range 1 West located within Weber County except for Sections 1, 2, 3, 4, 11, 12, 13, and 24; Township 7 North Range 2 West (portion located in Weber County).

For this new State Implementation Plan, UDAQ, in consultation with the State of Idaho, EPA Region 8, and EPA Region 10 and will perform a photochemical grid modeling analysis using Community Multi-scale Air Quality (CMAQ) modeling system based on a Level II emissions inventory (see Table 2).

The purpose of this plan is to provide procedures in enough detail to compile a reasonably accurate, representative, and complete emissions inventory for the modeling process for all the $PM_{2.5}$ SIPs. Furthermore, it is through this plan that EPA can determine the quality and completeness of the inventory data collected by UDAQ and IDEQ.

B. Scope

The procedures and quality assurance criteria contained in this plan are based on the "Clean Air Fine Particle Implementation Rule" (40 CFR Part 51) updated July 1, 2007, EPA's "Emission Inventory Improvement Program," "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations" dated August 2005, "Guidance on the Use of

Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze" dated April 2007, and "Guidance for Creating Annual On-Road Mobile Source Emission Inventories for $PM_{2.5}$ Non-attainment Areas for Use in SIPs and Conformity" dated August 2005. These documents help to facilitate the collection of point, area, mobile, biogenic, and geogenic emission inventory data.

All criteria pollutants and ammonia will be included in the modeling process for the $PM_{2.5}$ modeling domain. The amounts will be reported as annual emissions. The state will follow the policy approach for addressing each $PM_{2.5}$ precursor as required in 40 CFR Part 51.1002.

Temporal allocation of the annual point source inventories, to other time scales, will be made while preprocessing the inventories for modeling. These adjustments are based on profiles contained in the SMOKE emissions preprocessor. Reports generated by SMOKE for 24-hr averaging periods will be made available for review.

On-road mobile source emission inventories will be prepared for each episode day based on temperatures, absolute humidity, and Vehicle Miles Traveled (VMT) conversion factors for weekday, weekend day, and average daily to average winter daily traffic.

This inventory preparation plan states the planned methods for completion of data estimation and gathering, quality control and quality assurance, and proper documentation and record keeping. Any updates to regulations and guidelines, roadblocks, or events that prompt methodology changes during the emissions inventory will be annotated in the final report. This Inventory Preparation Plan is divided into thirteen sections due to the relative complexity of the subject matter. Section I explains the purpose, scope, and objectives of the manual. Section II defines the modeling domain area. Section III identifies areas of responsibility. Section IV addresses staff training needed for developing the inventory. Section V explains point source data collection. Section VI describes area source data collection. Section VII covers on-road mobile inventory data collection, and Section VIII covers non-road emissions data collection. Emission inventory data analysis is explained in Section IX. Section X describes the modeling approach for the SIP maintenance demonstration. Section XI explains data handling. Section XII describes inventory reporting. Section XIII looks at internal and external quality assurance audits.

C. Objectives

This Emission Inventory Preparation Plan has been compiled to give the reviewer a basic understanding of the emission inventory procedures and QA programs implemented by UDAQ and IDEQ. It is designed to inform the reader of the methodology used to collect and analyze the data, of QC checks applied to assess reasonableness of the information collected, and of independent checks performed to estimate the effectiveness of the program. Most importantly, it is designed to provide every inventory staff member with the necessary information on how QC must be applied to each task performed. The inventory staff is required to follow the procedures outlined in this document in every detail to assure uniformity in all aspects of data collection, analysis and reporting, and to

produce data that is as correct as possible and legally defensible. The flow of data through the agencies is illustrated in Figure 1.

Figure 1

INVENTORY DATA FLOW THROUGH THE AGENCIES

TECHNICAL ANALYSIS SECTION STAFF

1. Data Collection
2. Data Analysis
3. Data Handling
4. Data Reporting
5. Data Quality Control
6. Data Quality Assurance

↓

TECHNICAL ANALYSIS SECTION MANAGERS

1. Review of Completed Inventory
2. Acceptance of Data Report

↓

AGENCY HEADS

1. Review of Completed Inventory
2. Certification of Inventory

↓

US EPA
PUBLIC

←→

QA COORDINATORS

1. Approval of Q.A., Q.C. Procedures
2. Internal Audit of Inventory Program Procedures
3. Assessment of Data Quality and Completeness

II. Nonattainment and Maintenance Areas

In general, the emission inventory will address all air pollution sources in the $PM_{2.5}$ modeling domain. The air quality modeling domain consists of all of Box Elder, Cache, Davis, Juab, Morgan, Rich, Salt Lake, Summit, Tooele, Utah, Wasatch, and Weber Counties and portions of Carbon, Duchesne, Emery, Millard, and Sanpete counties. A map of the area is shown in Figure 2. Salt Lake, Davis, and portions of Box Elder, Cache, Tooele, Utah and Weber counties are currently designated non-attainment under the federal $PM_{2.5}$ standard (see Federal Register, "Air

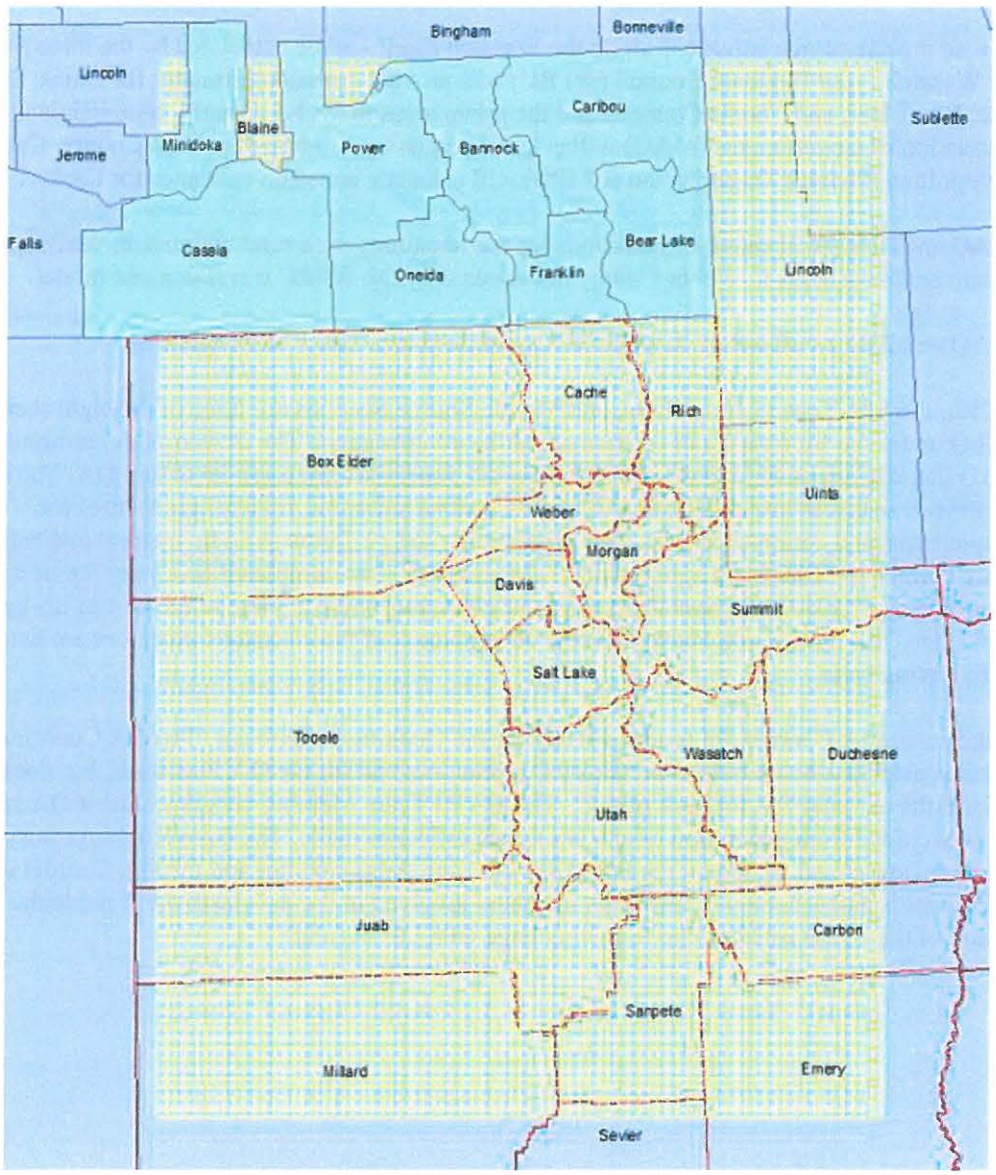
Quality Designations for the 2006 24-Hour Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards; Final Rule, November 13, 2009).

The modeling domain includes portions of Idaho and also Wyoming. Portions of Franklin County, Idaho, are included in the Logan UT/ID nonattainment area. Idaho DEQ will provide an inventory for areas in the State of Idaho within the modeling domain, and UDAQ will provide emissions estimates for the portions of the domain in Wyoming (with concurrence from Wyoming.)

Figure 2

$PM_{2.5}$ MODELING DOMAIN

The domain includes areas outside the current non-attainment areas in order to ensure that all pollutants, including short-range transported pollutants, are included in the modeling process. See the $PM_{2.5}$ SIP modeling protocol for information on how the domain was determined.



III. AREAS OF RESPONSIBILITY

For UDAQ, The Technical Analysis Section is assigned to compile the point and area source emission inventories. In Idaho, the Emissions Inventory and Technical Services groups will compile all but mobile source data for Franklin County and the modeling domain. The UDAQ Mobile Source staff will compile the non-road inventory for Utah. For the Logan UT/ID nonattainment area, a joint Mobile Source Team composed of the Bannock County Metropolitan Planning Organizations (MPO), UDAQ, and IDEQ staff will complete the on-road mobile source emissions inventory.

On-road mobile source emissions along the Wasatch Front will be calculated by the three MPOs. The Wasatch Front Regional Council (WFRC) will provide emission estimates for Davis, Salt Lake, Box Elder, and Tooele Counties and the urban areas in Weber County. Mountainland Association of Governments (MAG) will calculate emission estimates for Utah County. Cache Metropolitan Planning Organization (CMPO) will calculate emission estimates for Cache County.

UDAQ and IDEQ will calculate emissions for the remaining nine rural counties in the $PM_{2.5}$ SIP domain and rural areas in Weber County not covered by the WFRC travel demand model.

UDAQ and IDEQ staff will review the MPO mobile source emission inventories.

In Utah, the SIP, Technical Analysis, and Mobile Source Sections are three of the eight sections of UDAQ under the supervision of environmental health managers. The division QA coordinator, who is directly responsible to the division director, supervises emission inventory QA. The QA coordinator oversees implementation of quality control measures, reviews procedures for completeness and compliance with EPA regulations, and performs periodic internal audits to assure correct and consistent application of QA methods. The completed inventory report will be certified by the UDAQ division director as being accurate and complete to the best of his/her knowledge. The individuals involved in the development of the emissions inventory are listed on the following page.

In Idaho, the QA Coordinator works directly for the Department Director. The QA Coordinator provides oversight on emissions inventory QA practices and for the QA Plan itself, but does not perform the external QA for each project. The QA EI Team Member completes these QA steps and is excluded from generation of any emissions estimates made. The completed inventory report will be reviewed and signed by the IDEQ Air Division Administrator and the QA Coordinator for completeness and accuracy. IDEQ team members involved in the development of the Idaho portion of the EI are listed on the following page with UDAQ staff.

Figure 3

UDAQ SIP Staff

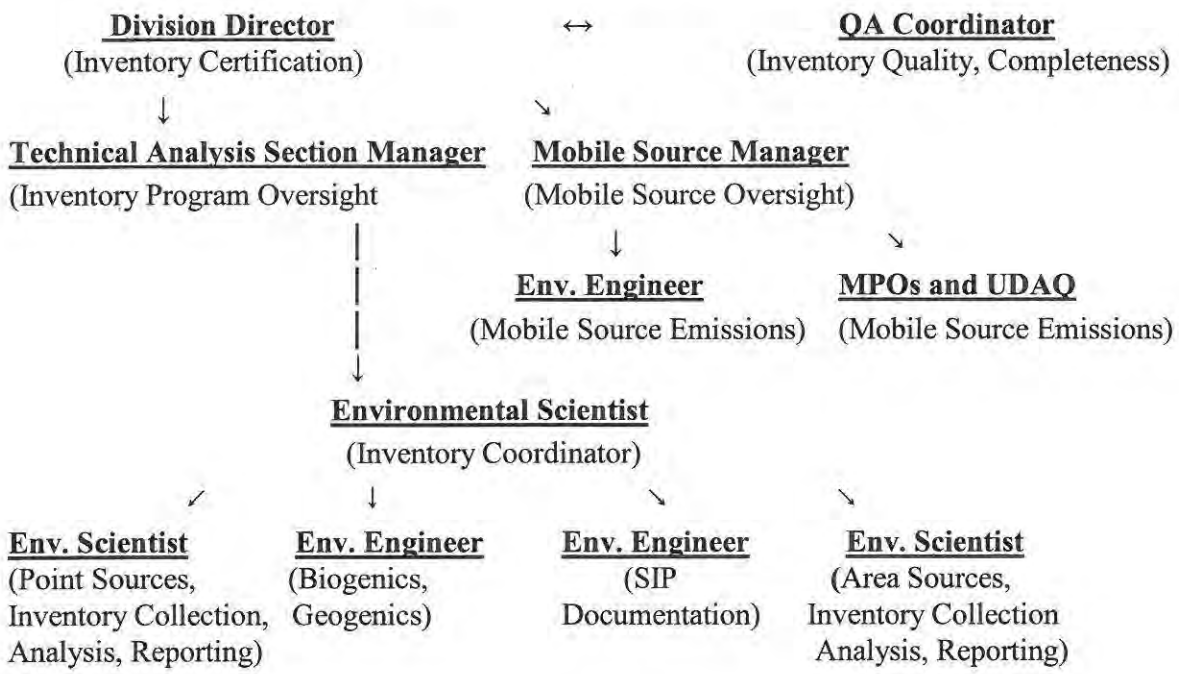
Name	Title	Task	Phone
Bryce Bird	Director UDAQ	Final Approval	(801) 536-4000
Brock LeBaron	Manager	Technical Analysis	(801) 536-4006
Joe Thomas	Manager	Mobile Sources	(801) 536-4175
Kimberly Kreykes	Environmental Scientist	Quality Assurance	(801) 536-4076
Scott Hanks	Environmental Engineer	Point Sources	(801) 536-4066
Jim Schubach	Environmental Engineer	Point Sources	(801) 536-4001
Carol Nielsen	Environmental Scientist	Coordinator/Area Sources	(801) 536-4073
Kip Billings	Transportation Planner	On-road Mobile Sources – WFRC areas	(801) 363-4230 Ext. 115
Susan Hardy	Transportation Planner	On-road Mobile Sources – MAG areas	(801) 229-3842
Jeff Gilbert	Transportation Planner	On-road Mobile Sources – CMPO areas	(435) 755-1634
Richard McKeague	Environmental Scientist	On-road Mobile Sources – Rural areas	(801) 536-4025
Peter Verschoor	Environmental Scientist	On-road Mobile Sources – Rural areas Non-road Mobile Sources-statewide	(801) 536-4186
Ping Xi	Environmental Scientist	On-road Mobile Sources – Rural areas Non-road Mobile Sources-statewide	(801) 546-4071
Patrick Barickman	Environmental Scientist	Bio/Geogenics	(801) 536-4004
Bill Reiss	Environmental Engineer	SIP Documentation	(801) 536-4077

IDEQ SIP Staff

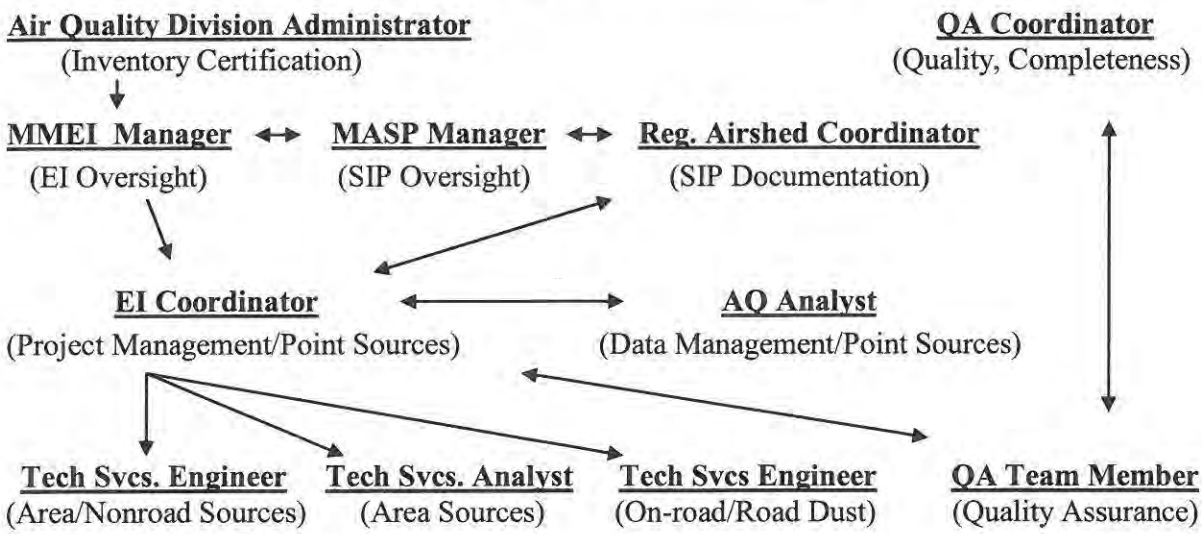
Name	Title	Task	Phone
Martin Bauer	Air Division Administrator	EI Final Approval	(208) 373-0502
Robert Wilkocz	MASP Manager	SIP Oversight	(208) 373-0502
Melissa Gibbs	Regional Airshed Coordinator	Pocatello Region SIP Documentation	(208) 236-6160
Mike Edwards	MASP SIP Coordinator	State Office SIP Oversight	(208) 373-0502
Sue Richards	Air Quality Analyst	SIP Support	(208) 373-0502
Chris Ramsdell	EI Coordinator	Project Management Point Sources	(208) 373-0502
Gary Reinbold	Air Quality Analyst	Data Management Point Sources	(208) 373-0502
Darcy Sharp	Tech Services Scientist	Quality Assurance	(208) 373-0502
Stephanie Carroll	Tech Services Engineer	Area Sources Nonroad Sources	(208) 373-0502
Angela Fisher	Tech Services Analyst	Area Sources	(208) 373-0502
Jennifer Cole	Tech Services Engineer	On-road Mobile Sources Road Dust	(208) 373-0502
Sara Strachan	GIS Specialist	GIS support	(208) 373-0502
Don Bledsoe	QA Coodinator	QA support	(208) 373-0502
Rick Hardy	Tech Services Discipline Lead	Modeling/Biogenic Sources	(208) 373-0502
Wei Zhang	Tech Services Analyst	Modeling	(208) 373-0502

Figure 4

UDAQ Areas of Responsibility



IDEQ Areas of Responsibility



IV. EMISSION INVENTORY TRAINING PROGRAM

UDAQ and IDEQ will not compile an official training manual for collecting emission inventories. The "Emissions Inventory Improvement Program (EIIP)," "Handbook for Criteria Pollutant Inventory Development: A Beginners Guide for Point and Area Sources" and "Preparation of Fine Particulate Emission Inventories" APTI Course 419B will be used as reference manuals.

Individuals that acquire expertise in the different areas of the inventory program will provide training to other staff on an as-needed basis.

V. POINT SOURCE EMISSION INVENTORY DATA COLLECTION

A. Threshold Values for Point Sources in Tons per Year – Base Year

For the SIP base-year inventory, UDAQ and IDEQ will use the definition of a major source used under Title V of the Clean Air Act (as specified in 40 CFR 51.20) to define the thresholds for reporting actual emissions. These thresholds are the potential to emit annual emissions of 100 tons for all relevant criteria air pollutants except CO, for which it is 1000 tons. The 2008 periodic, three-year inventory will be used to make this assessment. Emissions from sources under the above thresholds will be included in the area source base-year inventory.

B. Emission Inventory Source Categories

1. The point source categories inventoried include:

    a. External combustion sources

    b. Stationary internal combustion sources

    c. Hot mix asphalt plants

    d. Cement manufacturing

    e. Pharmaceutical manufacturing

    f. Petroleum and related industries

    g. Pipeline transport of natural gas

    h. Construction

    i. Machinery products

j. Paper manufacturing

k. Semiconductor manufacturing

l. Solid waste disposal

m. Surface coating

n. Printing and graphic arts

o. Organic chemical process industry

p. Inorganic chemical industry

q. Food and agricultural industries

r. Wood processing industries

s. Mining and quarrying

t. Chemical manufacturing

u. Secondary metal processing

v. Metallurgical industries

w. Plastic products manufacturing

x. Miscellaneous sources

2. Point source categories whose emissions vary significantly based on ambient air temperature will be identified, including waste treatment facilities and storage tanks. Ambient and operating temperature for other source categories may be considered when developing emission factors for EPA's "Compilation of Air Pollutant Emissions Factors" (AP-42).

C. Identification of Point Sources

1. For Utah, a list of point sources will be compiled by querying the existing UDAQ emission inventory database for domain point sources. In Idaho, the point sources in the counties making up the modeling domain will be surveyed directly for 2008 annual emissions.

2. Sources of information reviewed routinely to identify additional point sources in the modeling domain include:

a. Existing emissions inventories

b. Division permit and compliance files

c. Industrial directories

d. Telephone directories

e. Professional publications

f. EPA Control Technique Guidelines (CTG) source listings

g. Standard industrial classification code (SIC)

h. Departments of Transportation

i. State Tax Commissions

j. State Data Center publications

k. State Office of Planning and Budget publications

l. State Energy Commission publications

m. Federal agencies

n. Local trade associations

o. Toxic Release Inventory

3. The assembled list will be checked against the source listings to make sure that all existing sources are addressed. In cases where information is incomplete, telephone and/or site visits will be used to verify if the source is still in existence.

4. Basic information pertaining to each source (e.g., source name, current mailing address, county, contact person, etc.) will be entered into the emission inventory database and updated on an ongoing basis as new information becomes available.

D. 2008 Point Source Emissions Inventory Collection

1. For Utah, all forms, Excel spreadsheets, and corresponding instructions applicable to each point source category are found at the following website: http://www.airquality.utah.gov/Planning/Emission-Inventory/Inventory_Forms.htm. For Idaho, point sources are collected using a Web interface and SQL server database, the Point Source Survey Tool (POSST). All Idaho point source information and emissions data will be stored in POSST upon collection.

2. The UDAQ forms, Excel spreadsheets, and instructions are reviewed annually to make sure they are current, self-explanatory, and detailed enough to provide adequate information. The instructions and questions are designed for people without specialized technical training. The electronic pages of Idaho's POSST are updated annually, as are the user's manual, and help messages, to ensure ease of use.

3. Both UDAQ and IDEQ send a letter to each source known or suspected to cause air pollution above the threshold values specified in Section V.A of this document using the correct mailing address and the name of the plant manager or contact person if available.

   The letters contain reasons for the inventory, instructions on how to obtain necessary forms, Excel spreadsheets, or how to use POSST, return addresses, the date by which the forms or data must be submitted, and UDAQ and/or IDEQ contacts.

4. The source name and mailing date for each letter sent is recorded by UDAQ or IDEQ.

5. Current addresses for any undeliverable letters are researched and the letters are resent by certified mail.

6. The mailing lists are reviewed to verify that each source returns appropriate forms or makes a data submittal.

7. All sources that do not return the forms or make a data submittal by the specified date are contacted by phone or e-mail to verify their receipt of the project letter. If they did not receive the letter, their mailing address is verified and another letter is sent out certified. At that time, the possibility of penalties is explained and a new deadline of 30 days from the time of the call or e-mail is set.

8. The completeness of information on the returned forms, Excel spreadsheets, or electronic pages in POSST is checked and any additional information is requested either by phone, e-mail, or letter, depending on the importance of the information requested.

9. In Utah, inspectors are sent to sources that appear to provide misleading information on the forms. Site emission points and accuracy of data provided are verified. Calculations and assumptions are reviewed with the contact person at the facility. In Idaho, data in POSST is quality assured and questionable data is discussed directly with facility contacts via telephone or e-mail for correction or verification.

E. Point Source Episode Day Emissions Inventory Data

1. Emissions inventories will be prepared for the episodes to be identified in the modeling protocol.

2. A letter will be sent to point sources requesting date-specific information for the $PM_{2.5}$ SIP episode days. UDAQ will contact sources throughout its portion of the modeling domain, while IDEQ will only consider sources located in the nonattainment area.

3. The 2008 annual inventory will be adjusted to include changes in source operations during the episode days.

F. Point Source Projection Inventory Data

Point sources categorized as Type-B major facilities within the modeling domain will be modeled in the projection years at their permitted maximum emission rates.

VI. AREA SOURCE INVENTORY DATA COLLECTION

A. Area Emission Inventory Source Categories

The following area source categories have been identified in Utah and Idaho and will be inventoried. Stationary sources of emissions not included in the point source inventory will be included in the 2008 area source inventory. Seasonal adjustments will be made to various area source categories to reflect operations during cold pool meteorological conditions.

1. Combustion Sources

a. Stationary sources using fossil fuel, e.g., wood, natural gas, fuel oil, kerosene, LPG, and coal

- Residential
- Commercial and institutional
- Industrial (excluding point source overlap)

b. Other combustion sources

- Forest fires (including wild and prescribed burning)
- Agricultural burning
- Open burning (including yard waste, brush, and household waste)
- Cremation (animal and human)
- Structural fires

- Vehicle fires
- Charcoal grilling/broiling

2. Evaporative Loss

a. Fuel distribution (gasoline and aviation fuel)

- Fuel truck at bulk terminal
- Fuel trucks in transit
- Underground tank breathing
- Refueling

b. Stationary source solvent and other chemicals

- Dry cleaning
- Solvent cleaning and degreasing
- Household and commercial consumer products
- Graphic arts
- Cutback/Emulsified asphalt paving
- Surface coating
  - Architectural
  - Automobile refinishing
  - Traffic markings
  - Other small industrial
- Pesticides
  - Agricultural
  - Non-agricultural, residential

c. Waste management practices

- Treated and untreated sewage waste
- Municipal and other non-hazardous waste landfill
- Livestock wastes
- Wild animal wastes

- Domestic animal wastes
- Human respiration, perspiration & cigarettes
- Industrial point source (ammonia only)
- Bakery yeast

d. Fugitive dust sources

- Agricultural land preparation
- Agricultural harvesting
- Agricultural unpaved road travel
- Non-agricultural unpaved road travel
- Construction site travel, roads and buildings
- Road dust

B. Method of Calculation of Area Source Categories

The calculation methods for the above area source categories have been identified and are listed in Table 3.

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
Agricultural Burning	"Documentation for the Final 2002 Nonpoint Sector (Feb 2006 version) National Emission Inventory for Criteria and Hazardous Air Pollutants," Appendix A-111, Utah State University survey, "Inventory of Agriculture Burning in Utah." Idaho: AP-42 Chapter 2.5, WebFIRE, EPA's SPECIATE 4.2 profile number #8746.
Agricultural Harvesting	Chapter 10, Agricultural Harvesting of the "WRAP Fugitive Dust Handbook," dated September 7, 2006. Idaho: "Preparation of Fine Particulate Emission Inventories Student Workbook," Chapter 7 – WESTAR.

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
Agricultural Land Preparation	"Agricultural Soil Preparation Fugitive Dust Emissions," CARB, Patrick Gaffney Idaho: "Preparation of Fine Particulate Emission Inventories Student Workbook," Chapter 7 – WESTAR.
Agricultural, Livestock	"Development And Selection Of Ammonia Emission Factors," R. Battye et al. Idaho: "Emissions from Animal Feeding Operations" (EPA 2001), "National Emission Inventory - Ammonia Emissions from Animal Husbandry Operations" (EPA 2004), methane from AP-42 Table 14.4-2.
Agricultural, Unpaved Roads	"Reconciling Urban Fugitive Dust Emissions Inventory And Ambient Source Contribution Estimates: Summary of Current Knowledge and Needed Research," John Watson and Judith Chow Idaho did not calculate emissions for this category, as unpaved roadway dust is not a significant contributor during winter months.
Agricultural, Country Grain Elevators	Idaho: AP-42 Chapter 9.9.1.
Animals, Domestic	"Development of the Ammonia Emission Inventory for the Southern California Air Quality Study," Radian Corp Idaho did not calculate emissions for this category, as this source is not a significant contributor.
Animals, Wild	"Technical Support Study 15: Evaluation and Improvement of Methods for Determining Ammonia Emissions in the San Joaquin Valley." Idaho did not calculate emissions for this category, as this source is not a significant contributor.
Asphalt Paving	EIIP, Vol. III, Chapter 17, "Asphalt Paving," Alternative Method 2 Idaho: EIIP, Vol. III, Chapter 17, "Asphalt Paving," Alternative Method 3. Assumed 98% emulsified and 2% cutback.
Auto Body Refinishing	EIIP, Vol. III, Chapter 13, "Auto Body Refinishing" Idaho: EIIP, Vol. III, Chapter 13, "Auto Body Refinishing," Alternative Method 1.
Bakery Yeast	EIIP, Vol. III, "Area Source Category Method Abstract – Bakeries"

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
	Idaho did not calculate emissions for this category, as this source is not a significant contributor.
Biogenic Decay in Soils	BEIS3 software model Idaho did not calculate emissions for this category, as this source is zeroed-out for modeling purposes.
Charcoal Grilling	EIIP, Vol. III, "Area Source Category Method Abstract – Charbroiling" Idaho: "Emissions from Street Vendor Cooking Devices (Charcoal Grilling)" (EPA 1999), VOC species EFs = SPECIATE4.2 - profile #5563 (Biomass Burning - Charcoal Burning).
Combustion, Kerosene	EIIP, "Area Source Category Method Abstract – Fuel Oil and Kerosene Combustion," and supplemented with AP-42, Section 1.3, "Fuel Oil Combustion" Idaho did not calculate emissions for this category, as this source is not a significant contributor.
Combustion, Coal	"Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants" Idaho: EIIP Volume III Area Source Category Abstracts, WebFIRE.
Combustion, LPG	"Documentation for the Final 2002 Nonpoint Sector (Feb. 2006 version) National Emission Inventory for Criteria and Hazardous Air Pollutants" Idaho: EIIP Volume III Area Source Category Abstracts, WebFIRE.
Combustion, Natural Gas	"Documentation for the Final 2002 Nonpoint Sector (Feb. 2006 version) National Emission Inventory for Criteria and Hazardous Air Pollutants" Idaho: EIIP Volume III Area Source Category Abstracts, WebFIRE.
Combustion, Oil	"Documentation for the Final 2002 Nonpoint Sector (Feb. 2006 version) National Emission Inventory for Criteria and Hazardous Air Pollutants" Idaho: EIIP Volume III Area Source Category Abstracts, WebFIRE.

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
Combustion, Wood	EPA Workshop April 2, 2004, "Session VII: Combustion Area Sources - Residential Wood Combustion" and EIIP, Vol. IV, Chapter 2, "Residential Wood Combustion," Preferred Method; with Paria Group survey Idaho: EIIP Volume III Area Source Category Abstracts, WebFIRE, RWC_Inventory Version 7 July 1 2008.mdb.
Construction, Buildings	AP42, Chapter 13.2.3, "Heavy Construction Operations," (1/95 ed.), Chapter 13.2.4, "Aggregate Handling & Storage Piles," (1/95 ed.) and "Documentation for the Final 2002 Nonpoint Sector (Feb. 2006 version) National Emission Inventory for Criteria and Hazardous Air Pollutants." Idaho: "Preparation of Fine Particulate Emission Inventories Student Workbook," Chapter 7 – WESTAR.
Construction, Roads	"Documentation for the Final 2002 Nonpoint Sector (Feb. 2006 version) National Emission Inventory for Criteria and Hazardous Air Pollutants" Idaho: "Preparation of Fine Particulate Emission Inventories Student Workbook," Chapter 7 – WESTAR.
Cremation (animal and human)	Chapter 2.3 of EPA's AP-42. Utah did not calculate emissions for this category, as this source is not a significant contributor.
Dry Cleaning	"Procedures for Emission Inventory Preparation," Vol. III: Area Sources, (9/91 edition), Section 5.3.2, "Dry Cleaning" Idaho: EIIP, Vol. III, Chap 4, Alternate Method 2.
Fires - Forest, Wild, and Prescribed	AP-42, Section 13.1, (10/96 edition), "Wildfires and Prescribed Burning" Idaho. Did not submit Wildfire for 2008 EI. Prescribed burning emissions based on AP-42, Chapter 13.1, "Estimating Ammonia Emissions from Anthropogenic Non-Agricultural Sources" (EPA 2004), SPECIATE 4.2 profile #8743 (Forest Fires – Composite).
Fires, Structural	EIIP, Vol. III, (1/27/99 edition), Chapter 18, "Structure Fires"

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
Fires, Vehicle	EIIP, Vol. III, (5/15/00 edition), "Area Source Category Method Abstract - Vehicle Fires"
Fuel Distribution	EIIP, Vol. III, Chapter 11, "Gasoline Marketing (Stage I and Stage II);" AP-42, Chapter 5.2, "Transportation and Marketing Of Petroleum Liquids;" and "Procedures For The Preparation Of Emission Inventories For Carbon Dioxide and Precursors Of Ozone" Idaho: EIIP, Vol. III, Chapter 11, "Gasoline Marketing (Stage I and Stage II) Alternate Method 1," VOC EFs from WebFIRE, gasoline sales based on motor vehicle registrations.
Graphic Arts	EIIP, Vol. III, Chapter 7, "Graphic Arts" Idaho: EIIP, Vol. III, Chapter 7, "Graphic Arts," Alternate Method 1, Profile #2570 of EPA's SPECIATE 4.2, "Estimating Ammonia Emissions from Anthropogenic Non-Agricultural Sources" (EPA 2004).
Human Perspiration, Human Respiration, and Cigarette Smoking	"Development of the Ammonia Emission Inventory for the Southern California Air Quality Study," Radian Corp, Appendix G Idaho did not calculate emissions for this category, as this source is not a significant contributor.
Landfills	LANDFILL software model Idaho: LANDGEM, EIIP Vol. III, Chapter 15, Alternative Method 3.
Leaking Underground Storage Tanks	Nominal source, therefore assumed worst probable scenario per Utah Rule R307-6 and DAQ engineer, Tim Blanchard Idaho did not calculate emissions for this category, as this source is not a significant contributor.
Non-agricultural, Unpaved Roads	"Reconciling Urban Fugitive Dust Emissions Inventory and Ambient Source Contribution Estimates: Summary of Current Knowledge and Needed Research," John Watson and Judith Chow, Desert Research Institute Idaho did not calculate emissions for this category, as unpaved roadway dust is not a significant contributor during winter months.
Non-road Aircraft Maintenance	DAQ's 1992 phone survey of aircraft maintenance staff in Salt Lake County

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
	Idaho did not calculate emissions for this category, as airports are very limited in size and traffic within the modeling domain.
Open Burning	"Emission Inventory Improvement Program (EIIP)," Vol. III, Chapter 16, "Open Burning," (January 2001 ed.), page 16.4-3
Pathological Waste, Human and Animal	Idaho: AP-42 Chapter 2.3.
Pesticide Applications	"Emission Inventory Improvement Program (EIIP)," Vol. III, Chapter 9, "Pesticides - Agricultural and Nonagricultural," (1/31/01 ed.), EIIP Vol. III, Chapter 5, Consumer and Commercial Solvent Use," Idaho: EIIP Vol. III, Chapter 9, USDA's NASS Agricultural Chemical Use Database.
Sand and Gravel	Emissions from nonpoint sand and gravel sources that submit inventory summaries triannually Idaho did not receive emissions reporting from any nonpoint sources for this category.
Sewer Treatment Plants & etc.	"1997 Gridded Ammonia Emission Inventory Update For The South Coast Basin," Charles Botsford et al; and also, Sonoma Tech Inc., Dana Coe, 6/2/00 E-mail Idaho: AP-42 Chapter 4.3, SPECIATE 4.2 using profile number #3003.
Solvent, Cleaning & Degreasing	EIIP, Vol. III, Chapter 6, "Solvent Cleaning," Alternative Method 2
Solvent, Consumer Use	EIIP, Vol. III, Chapter 5, "Consumer And Commercial Solvent Use," Preferred Method
Solvent, Recovery	Idaho: EFs calculated using fugitive air emissions from 2008 and published in Toxic Release Inventory (TRI). Emissions/#Employees per industry = lb/Employee.
Surface Coatings, Architectural	EIIP, Vol. III, Chapter 3, "Architectural Surface Coating" Idaho: EIIP, Vol. III, Chapter 3, Alternative Method, SPECIATE 4.2 profile #3140, EIIP Volume III abstract "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources" (EPA 2004).
Surface Coatings, Industrial	EIIP, Vol. III, Chapter 8, "Industrial Surface Coating," Alternative Method 2

TABLE 3
AREA SOURCE EMISSION CALCULATION METHODS

CATEGORY	METHOD
	Idaho: EIIP, Vol. III, Chapter 8.
Surface Coatings, Traffic Markings	EIIP, Vol. III, Chapter 14, "Traffic Markings" Idaho: EIIP, Vol. III, Chapter 14, "Traffic Markings," Alternative Method 1, profile #3135 SPECIATE 4.2.
Tank Cleaning	AP42, Chapter 4.8, "Tank and Drum Cleaning," (2/80 ed.) Idaho did not calculate emissions for this category, as this source is not a significant contributor.

C. Sources of Activity Level Information

1. Sources of activity level information will be identified for each area source category. The EIIP guidance documents will be used to identify the appropriate source of information for each category, whenever possible. Activity level information will be requested from sources such as Departments of Transportation, State Tax Commissions, State Data Centers, State Offices of Planning and Budget, State Energy Commissions, federal agencies such as the U.S. Census Bureau, county and local government agencies, airports, natural gas suppliers, and local trade associations.

2. Examples of Activity Level Data Collected

   a. Agricultural activity data from Utah and Idaho state or the federal departments of agriculture; "Utah Agricultural Statistics, Annual Report;" Utah State University Records; "Idaho Agricultural Statistics Report" USDA National Agricultural Statistics Service (NASS)

   b. Forest fire statistics from the state and US Forest Service or EPA; "National Forest Fire Report"; "Eastern Idaho Interagency Fire Center's 2008 "Annual Report"

   c. Ambient air data from the National Weather Service records

   d. Location and size of public schools for Utah and Idaho from the state offices of education

   e. Consumption of natural gas from Questar Corporation and the US Department of Energy

f. Coal, propane, kerosene, LPG, distillate, and fuel oil consumption from numerous Department of Energy, Energy Information Administration, and Department of Natural Resources publications

g. Other energy consumption from the multiple information sources listed above

D. Collection of Area Source Information

1. The appropriate source of information will be contacted for each area source category by consulting the information lists maintained by UDAQ and IDEQ.

2. The Internet will be reviewed for needed information. Any documents will be printed, the date indicated, and saved electronically or in hard copy.

3. Contact will be made with the person designated to provide information not available on the Internet.

4. The importance of the inventory will be explained and the request will specify a date by which all the information is to be received. The person submitting the records will be asked to transmit them to UDAQ or IDEQ by letter over their signature.

5. All records received will be logged in.

6. All sources of information that have not responded to the information request by the specified date will be called, e-mailed, or visited to make sure the information is being collected. At that time, a new deadline of 30 days from the time the source is re-contacted will be set.

7. Completeness and accuracy of information received will be checked and additional information will be requested, if needed.

E. Area Source Emission Apportionment for Partial Counties within the Domain

The $PM_{2.5}$ modeling domain includes only portions of some counties. The air model will be used to apportion the emissions over the partial counties within the domain. Both population, for human-related activities such as fuel combustion, and land area, for activities such as agriculture, will be used for the apportionment of county-level area source emissions in these counties where only a fraction falls within the modeling domain. Excepted from this approach are the three counties in Wyoming. All of the emissions from each of these counties will be included in the modeling. For more information, see Section 2.7.4 of the Modeling Protocol.

The domain includes the following percentage of Utah, Idaho, and Wyoming counties:

Table 4

AREA IN MODELING DOMAIN			
County	Total Sq. Km.	Area in Domain	% in Domain
Bannock (Idaho)	2973	2303	77
Bear Lake (Idaho)	2719	2719	100
Bingham (Idaho)	5485	67	1
Blaine (Idaho)	6871	550	8
Box Elder			100
Cache			100
Carbon	3844	2460.16	64
Caribou (Idaho)	4666	3105	67
Cassia (Idaho)	6669	6208	93
Davis			100
Duchesne	8405	4706.8	56
Emery	11546	2193.74	19
Franklin (Idaho)	1731	1731	100
Jerome (Idaho)	1557	534	34
Juab			100
Lincoln (Idaho)	3120	527	17
Lincoln (Wyoming)			
Minidoka (Idaho)	1982	1199	61
Millard	17708	4604	26
Morgan			100
Oneida (Idaho)	3110	3110	100
Power (Idaho)	3730	3171	85
Rich			100
Salt Lake			100
Sanpete	4147	2654.08	64
Sublette (Wyoming)			
Summit	4867	4331.63	89
Tooele			100
Twin Falls (Idaho)	4995	75	2
Uinta (Wyoming)			
Utah			100
Wasatch			100
Weber			100

The population of the counties inside the modeling domain is as follows:

TABLE 5
POPULATION IN DOMAIN

Apportionment by 2008 Utah Population inside the Modeling Domain and by 2000 Idaho and Wyoming Populations

County	State	County Total Population	County Population inside Domain
Bannock	Idaho	74,377	36,316
Bear Lake	Idaho	5,714	5,714
Bingham	Idaho	39,710	206
Blaine	Idaho	17,501	26
Box Elder	Utah	48,712	48,712
Cache	Utah	111,841	111,841
Carbon	Utah	19,841	17,431
Caribou	Idaho	6328	6,294
Cassia	Idaho	19,459	19,127
Davis	Utah	301,915	301,915
Duchesne	Utah	16,765	7,106
Emery	Utah	10,610	6,187
Franklin	Idaho	10,424	10,424
Jerome	Idaho	17,491	1,643
Juab	Utah	10,039	10,039
Lincoln	Idaho	3,490	84
Lincoln	Wyoming	14,053	10,399
Minidoka	Idaho	19,982	19,982
Millard	Utah	13,550	6,355
Morgan	Utah	9,645	9,645
Oneida	Idaho	3,499	3,499
Power	Idaho	6,652	6,168
Rich	Utah	2,278	2,278
Salt Lake	Utah	1,030,519	1,030,519
Sanpete	Utah	26,960	21,645
Sublette	Wyoming	5,887	1,472
Summit	Utah	39,951	37,063
Tooele	Utah	58,214	58,214
Twin Falls	Idaho	62,625	294
Uinta	Wyoming	20,304	18,274
Uintah	Utah	30,446	30,446
Utah	Utah	519,632	519,632
Wasatch	Utah	22,845	22,845
Weber	Utah	224,536	224,536

F. Area Source Projection Inventory Data

The growth factors that will be used for the area source projections are contained in Table 6.

TABLE 6
GROWTH FACTORS FOR PROJECTING EMISSIONS OF AREA SOURCE CATEGORIES

Source Category	Growth Factors	Information Sources
Agricultural Burning, Land Preparation, Harvesting, Livestock, Pesticide Applications (Agricultural), Travel on Unpaved Farm Roads	Agricultural employment growth rate and long-term agricultural averages	Governor's Office of Planning & Budget website; Idaho State Department of Agriculture (ISDA); National Agricultural Statistics Service (NASS); and local agriculture extension offices
Structure and Vehicle Fires, Graphic Arts, Human Respiration and etc., Landfills, Sewer Treatment and etc., Solvent Cleaning and Degreasing, Architectural and Industrial Surface Coatings, Domestic Animals, Auto Body Refinishing, Bakery Yeast, Charcoal Grilling, Kerosene Combustion, LPG combustion, Natural Gas Combustion, Oil Combustion, Pesticide Applications (consumer), Wood Combustion, Building Construction, Dry Cleaning, Open Burning	Human population growth rate; Forecast based on all resources available to the states primary growth planning agency	Governor's Office of Planning & Budget website; and US Census Bureau data
Fuel Distribution	Growth in VMTs for gasoline and forecast of historic trends for aviation fuel	Utah State Tax Commission website; US Department of Energy; and ITD
Traffic Markings, Asphalt Paving, Road Construction	Construction employment growth rate applied to lane miles	Utah Governor's Office of Planning & Budget website; US Department of Energy asphalt data; and local Idaho Highway Districts
Wild Animals	Forecast of historic trends combined with Department of Natural Resources goals and state-level data allocated to counties based on surrogates	Utah Department of Natural Resources, Division of Wildlife Resources website; and the Carnegie Mellon University NH3 model (Strader, et al., 2004)

TABLE 6
GROWTH FACTORS FOR PROJECTING EMISSIONS OF AREA SOURCE CATEGORIES

Source Category	Growth Factors	Information Sources
Coal Combustion	Forecast of historic consumption trends of coal	Utah Department of Energy, "Utah Energy Abstract," Annual Reports from their website; and the Annual Energy Outlook (AEO) published by the Energy Information Administration (EIA) (EIA, 2010)
Biogenic Decay in Soils	No growth; Fixed to total land area and current natural distribution of foliage	Land area mapping, Global Information Systems (GIS)
Leaking Underground Storage Tanks	Growth rate from previous year	Utah Department of Environmental Quality, Division of Response and Remediation website
Forest and Range Fires	Forecast of average acres burned during previous years	Utah Department of Natural Resources, Division of Forestry, Fire & State Lands; US Forest Service; Western Regional Air Partnership (WRAP); and National Interagency Fire Center
Travel on Non-Agricultural, Unpaved Roads	Estimate of change in VMT due to change in area without paved access	Utah Department of Transportation and review of current "Utah Official Highway Map" - Not included in Idaho EI
Aircraft engine maintenance	Estimates of aircraft emissions from the Emissions and Dispersion Modeling System (EDMS) 5.1.2, November 2009, used in conjunction with the UDAQ aircraft maintenance survey information	EDMS run by UDAQ Mobile Section - Not included in Idaho EI
Sand and Gravel	Mining employment growth rates	Utah Governor's Office of Planning & Budget website - Not included in Idaho EI
Building Construction	Forecast of historic trend of new dwelling units or "housing starts"	Bureau Of Economic and Business Research website; and US Census Bureau's County Business Patterns

VII. ON-ROAD MOBILE INVENTORY DATA COLLECTION

The Motor Vehicle Emissions Simulator (MOVES2010a) is the EPA designated model for on-road mobile emission inventory for the PM2.5 SIP. The on-road mobile inventory will be compiled utilizing MOVES according to the Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity (April 2010).

A. Utah Methodology

The on-road mobile inventory will be compiled through the Interagency Consultation Team following consultation procedures detailed in Section XII of the Utah Transportation Conformity Consultation SIP. The interagency consultation team is primarily used to discuss and decide what MOVES modeling inputs should be utilized with the SIP modeling domain. The interagency consultation team includes representatives from EPA, FHWA\FTA, UDOT, UTA, WFRC, MAG, CMPO, and UDAQ.

Necessary inputs for the MOVES model are assembled into a database called the County Data Manager. Inventories for the SIP will be compiled representing both base and future year scenarios. In some cases the MOVES input data collected will differ depending on where the inventory is being collected. The SIP modeling domain contains both urban and rural counties. Data supplied for these areas may differ depending on the area type.

The state of Utah will adjust the MOVES model core database to be scaled to allow for daily vehicle miles traveled and separate local road facilities. The EPA Office of Transportation and Air Quality has approved this scale modification of the core MOVES database for SIP and Transportation Conformity purposes. MOVES data output will be expressed in units of tons per day by Standard Classification Code. Finer resolution for the purposes of air quality modeling will convert the daily emissions to hourly utilizing the MOVES default hourly VMT profile.

Meteorology – Base year inventories will include hourly temperature and relative humidity data by county for each episode day from a representative weather station in each county. Future year inventories will be based on meteorology from the base-year episode that is selected for the modeled attainment demonstration.

Ramp Fractions – Base and future year ramp fractions for rural freeways will be set to 1% for all rural counties. The MPO's urbanized freeways ramp fraction for base and future years will be determined for each specific urbanized county by their federally approved Travel Demand Model (TDM).

Road Type Distribution, VMT, and Average Speed Distribution – The MOVES model has been modified to allow local roads to be modeled separately for both urbanized and rural counties.

For urbanized areas the MPO's base year and future year calculations for road type distribution, VMT, and average speed distribution will be based on TDM data adjusted to Highway Performance Modeling System data (HPMS).

For rural areas the base year calculations for road type distribution and VMT for the rural counties will use HPMS AADT VMT (average annual daily traffic). Future year calculations for road type distribution and VMT for the rural counties will be based on future population growth trends. Rural county average speed distributions will be computed using the FHWA "Easy Mobile Inventory Tool", or "EMIT" model.

Both urban and rural areas will utilize VMT factors provided by UDOT to adjust for calendar year, month and day of week.

Inspection and Maintenance (I/M) Programs – For the urbanized areas there are four separate I/M programs currently operating in Utah: Davis, Salt Lake, Utah and Weber. UDAQ consulted extensively with the I/M managers to discuss the exact details of test procedures. The I/M managers then provided written documentation of test procedures, applicable vehicle types and model years.

Age Distribution and Source Type Population – The Utah Tax Commission Division of Motor Vehicles will provide base year inventory data for age distribution and source type population by county for the following vehicle types: motorcycle, light-duty passenger car and light truck. Future year data will be derived from MOVES default growth rates for all vehicle types. Base and future year data for heavy-duty vehicles will be obtained from the MOVES default database.

Fuel Supply and Formulation – MOVES default data base contains incorrect default fuel data for Utah regarding ethanol blends. The MOVES fuel data base has been corrected to reflect the fact that E-10 was not distributed within Utah prior to April 2010. Future year data will be derived from the MOVES default fuel supply and formulations.

B. Idaho Methodology

The on-road mobile inventory for Idaho counties in the modeling domain will be compiled by the Idaho Department of Environmental Quality (IDEQ) with input from ITD, BPO, CMPO, EPA, FHWA and UDAQ and will be reviewed through an Interagency Consultation process.

The state of Idaho will be using the standard unmodified MOVES model core database with four roadway classifications. Inventories for the SIP will be compiled representing both base and future year scenarios for 11 Idaho counties within the SIP modeling domain. The methodology for base year scenario is shown below. For future year scenario, Idaho will review UDAQ growth factors for rural counties and intends to remain consistent with UDAQ unless Idaho population or industrial projections suggest that there may be a significant difference in Idaho counties.

Meteorology – Base year inventories will be modeled using hourly temperature and relative humidity data by county for each episode day from a representative weather station for each county. In the event that a representative station provides an incomplete data set, data sets from 1 to 3 other nearby stations will be used to gap-fill the original data set. After gap-filling the originally selected data set, if there are still isolated missing observations not more than 3 hours long, linear interpolation will be used to estimate data values for temperature and relative humidity.

Ramp Fractions – Base and future year ramp fractions for rural freeways will be set to 1% for 11 Idaho counties in the SIP modeling domain to remain consistency with UDAQ. The MOBILE6 8% default ramp fraction will be used for the small portion of urban interstate in Bannock County (Pocatello).

Road Type Distribution, Vehicle Type VMT and Average Speed Distribution – Road type distribution, vehicle type VMT and average speed distribution will use ITD link-based AADT and VMT and ATR-based length classification data adjusted to match HPMS VMT totals for each road type. Average speed distribution will also be based on ITD link-based AADT and VMT, ATR-based length classification data

and the updated BPR method for average speed estimates as recommended by EPA for rural areas where travel demand models are unavailable (Guidance for the Development of Facility Type VMT and Speed Distributions, USEPA, 1999, EPA 420-P-99-004).

Inspection and Maintenance (I/M) Programs – None of the Idaho counties included in the modeling domain have current or planned Inspection and Maintenance Programs.

Age Distribution – Age distribution inputs for passenger vehicles will be developed using existing MOBILE6.2 age distributions developed for each county by Sierra Research in 2005, however the distribution will be updated using Idaho DMV passenger vehicle registration data to adjust the more detailed Sierra Research distributions to properly reflect the 2007, 2008 and 2009 model years. MOVES national defaults will be used for heavy duty and motorcycle age distributions. An EPA MOBILE6.2 converter program will be used to convert the MOBILE6.2 age distribution into MOVES format.

Source Type Population – ITD will provide light duty vehicle registration data for each county in the modeling domain which will be used to determine the light duty source type populations. Heavy duty vehicle populations will be estimated using the MOVES national default populations by county.

Fuel Supply and Formulation – 11 Idaho counties will be modeled using fuel supply and fuel formulation inputs identical to those used by CMPO for Cache County in Utah.

C. Re-entrained Road Dust

PM10 and PM2.5 Fugitive Dust from Paved Roads – PM fugitive dust from paved roads (re-entrained road dust) is computed by EPA AP-42 (2006), Chapter 13.2.1, "Paved Roads".

D. Agency Responsibilities

The following table indicates what agencies are responsible for providing data sources for inputs for the MOVES model. The following agencies are responsible for MOVES modeling in different regions of the modeling domain.

Utah County(-ies) with TDM Models	MPO
Cache	Cache MPO
Davis, Salt Lake and Weber	Wasatch Front Regional Council
Utah (County)	Mountainland Association of Governments

The remaining twelve Utah counties and all Idaho counties in the $PM_{2.5}$ modeling domain are not covered by a TDM. For these counties, average speed distributions will be obtained as follows:

Utah Counties without a TDM Model	Responsible Agency
Box Elder, Tooele	Wasatch Front Regional Council

Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit, Wasatch	UDAQ
Idaho Counties without a TDM Model Franklin, Bear Lake, Caribou, Oneida, Bannock, Power, Cassia, Minidoka, Jerome, Lincoln, Blaine (Twin Falls and Bingham Co. with insignificant portions of rural area in the domain, will be excluded from MOVES modeling).	Responsible Agency IDEQ

TABLE 7
DATA SOURCES

MOVES Input Parameter	Utah Data Source	Idaho Data Source
Meteorology	UDAQ	IDEQ
Ramp Fractions	MPO, UDOT	UDAQ estimate[1]
Road Type Distribution	MPO, UDOT	ITD, FHWA
Vehicle Type VMT	MPO, UDOT	ITD, FHWA
I/M Programs	Davis, Salt Lake, Utah, and Weber County Health Departments; Currently no I/M program in Cache county or other counties.	Not applicable in any Idaho counties within the modeling domain
Age Distribution/Source Type Population	Utah DMV	Idaho DMV, Sierra Research (2005)
Average Speed Distribution	MPO, UDOT, FHWA	ITD
Fuel Supply/Fuel Formulation	Utah Dept. of Agriculture, Utah Petroleum Association.	UDAQ[1], CMPO

1 Utah DAQ and CMPO are specified as potential sources of input for the Idaho side of Cache Valley since they obtain fuel from the same distributors and ramp fractions should be similar throughout this region

E. IPP Acronym Definitions:

- CMPO - Cache Metropolitan Planning Organization
- DMV - Department of Motor Vehicles
- FHWA - Federal Highway Administration
- FTA - Federal Transit Administration
- ITD - Idaho Transportation Department
- MAG - Mountainland Association of Government
- MPO - Metropolitan Planning Organization

- UDAQ - Utah Division of Air Quality
- UDOT - Utah Department of Transportation
- UTA - Utah Transit Authority
- FHWA - Federal Highway Administration
- FTA - Federal Transit Administration
- WFRC - Wasatch Front Regional Council
- IDEQ – Idaho Department of Environmental Quality

VIII. NON-ROAD MOBILE INVENTORY DATA COLLECTION

NOTE: EPA requires that the 2008 National Emission Inventory (NEI) and the Emission Inventory System (EIS) inventory place aircraft emissions under the Point Source inventory and in the Nonroad Source category, EPA requires locomotive emissions be placed in the Area Source data. The Mobile Sources and Transportation Section will compute these emissions and report them to Point Source inventory staff. Aircraft emissions at point sources should use the release point type code "fugitive". See Sections 6, 7, and 12 of the 2008 NEI/EIS Implementation Plan (http://www.epa.gov/ttn/chief/net/neip/index.html) for details.

A. Non-road Mobile Source Categories

The following non-road mobile source categories, as well as those categories in EPA's NONROAD model, will be included in the emission inventory:

1. Aircraft
2. Railroad locomotives
3. Non-road vehicles and equipment
    - Agricultural
    - Airport
    - Commercial
    - Construction and mining
    - Industrial
    - Lawn and garden
    - Marine
    - Logging
    - Pleasure craft
    - Recreational

The NONROAD2008a model (July 2009) will be run using EPA defaults for each county in the domain. This model includes numerous source categories not listed above. In-depth nonroad source surveys are not planned. If, as the inventory is compiled, it appears that a given nonroad source is significant, additional research may be warranted to refine activity data for the emissions inventory.

B. Sources of Non-road Emission Inventory Data

The following list includes some of the activity-level information sources identified for estimation of the nonroad mobile source categories:

1. State Office of Planning and Budget

2. State UDOT Division of Aeronautics

3. Federal agencies (Bureau of Transportation Statistics, Federal Aviation Administration)

4. County and local government agencies

5. Airports

6. Railroad companies

7. EPA NONROAD2008a model

C. Collection of Non-road Emission Inventory Data

1. The appropriate source of information will be contacted for each non-road source category by consulting the information lists maintained by UDAQ and IDEQ.

2. Contact will be made with the persons designated to provide the information.

3. The importance of the inventory will be explained and the request will specify a date by which all the information is to be received. For UDAQ, the person submitting the records will be asked to transmit them to UDAQ by letter over their signature. IDEQ will accept telephone and e-mail provided data for this source type and will retain documentation as necessary.

4. All records received will be logged in.

5. All sources of information that have not responded to the information request by the specified date will be contacted or visited to make sure the information is being collected. At that time, a new deadline of 30 days from the time the source is re-contacted will be set.

6. Completeness of information received will be checked and additional information will be requested if needed.

7. This data will include the following, as well as the information provided by the NONROAD2008a model run for the sources contained therein:

   - Number and types of airports in the modeling domain such as: commercial, civil, and military
   - Total takeoffs and landings of each type of aircraft e.g., single, twin, and jet engine, and, when known, the specific plane and engine type
   - Air ground equipment
   - Number of railroads operating in the domain
   - Rail trip length through the individual counties
   - Type of locomotive
   - Railroad locomotive maintenance equipment
   - Locomotive fuel consumption

D. Methods of Calculation

The methods of calculating the non-road mobile source categories have been identified and are listed in Table 8.

TABLE 8
NON-ROAD EMISSION CALCULATION METHODS

CATEGORY	METHOD
*Nonroad, Aircraft Engines	UDAQ - Emissions and Dispersion Modeling System (EDMS 5.1.2, November 2009) software model; EPA guidance for aircraft emissions inventories: "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emissions Inventory," vol. I, Methodology, EPA Contract No 68-D-02-063, Work Assignment No 3-01, September 2005. IDEQ – Will accept EPA estimates for military, commercial, and civilian aircraft for the 2008 NEI. IDEQ will generate in-house data using the Department of Transportation's Federal Aviation Administration Airport Data (Form 5010), airport schedules where known, and turbo-prop time-in-mode data from Table 5-1 of EPA's "Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources." Aviation gas consumption in Idaho will be gathered from the Energy Information Administration for ammonia

CATEGORY	METHOD
	estimates.
*Nonroad, Aircraft Maintenance	UDAQ - EDMS 5.1.2 software model indirectly IDEQ – Will be gathered in the Area Sources under paint and solvent use, as no airports in the domain warrants the running of EDMS.
*Nonroad, Railroad Engines	UDAQ - Procedures for Emission Inventory Preparation, Vol. IV: "Mobile Sources;" "Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Non-road Components of the National Emissions Inventory," vol. I, Methodology, EPA Contract No 68-D-02-063, Work Assignment No 3-01, September 2005. IDEQ – Procedures for Emissions Inventory Preparation, Vol. IV: "Mobile Source" and updated emissions factors will be gathered from EPA's Office of Transportation and Air Quality April 2009 Technical Highlight titled "Emissions Factors for Locomotives" and from "Revised Inventory Guidance for Locomotive Emissions" prepared for Southeastern States Air Resource managers, prepared in June 2004 by Sierra Research.
Other Non-road Mobile Sources	UDAQ and IDEQ - Run the EPA NONROAD2008a model and make appropriate adjustments to the output (for month of year modeled).

*Category not included in EIIP.

E. Non-road Emission Apportionment for Partial Counties within the Domain

1. Airport activity

For UDAQ, the method to apportion airport activity in counties in the domain will be determined by the Technical Analysis Section using the location of each airport. The activity and emissions from each incoming and outgoing airplane will be assigned to the GIS grid square(s) that contain(s) the airport. All aircraft maintenance emissions will be presumed to occur on or very near the airport property so these emissions are effectively located at the airport itself. The IDEQ Technical Services Division will do the same as UDAQ within the domain.

2. Railroad activity

Locomotive diesel fuel consumption is reported to UDAQ from railroad companies and must show fuel consumption by county. Emissions will be calculated by UDAQ using EPA guidance. Emissions will be apportioned throughout the domain by the Technical Analysis Section. The IDEQ Technical Services Division will do the same using fuel consumption data gathered.

3. Other non-road mobile sources

Apportionment of other non-road mobile sources within partial counties will be determined by the Technical Analysis Section using population data (see Section

VI.F of this document). The IDEQ Technical Services Division will use the same method as UDAQ.

F. Non-road Mobile Source Projection Inventory Data

Table 9 indicates the growth factors and other changes that will be included in the non-road mobile source projection inventories.

TABLE 9
GROWTH INDICATORS FOR PROJECTING EMISSIONS OF NON-ROAD SOURCE CATEGORIES

Source Category	Growth Indicators	Information Sources
Railroad	Activity growth forecasted on the basis of fuel consumption between 1999 and 2008 and fleet turnover forecasts based on EPA documentation	Union Pacific nationwide fuel consumption data
Aircraft flights	Estimates of aircraft emissions from the Emissions and Dispersion Modeling System (EDMS) 5.1.2, November 2009; and the Federal Aviation Administration (FAA)	EDMS run by UDAQ Mobile Section; and FAA Terminal Area Forecast (TAF) (FAA, 2008)
Miscellaneous Nonroad Engines	Directly from EPA's NONROAD 2008s (July 2009) model; Every year run separately, 1995-2050	2008 NONROAD model

IX. EMISSION INVENTORY DATA ANALYSIS

A. Emissions Data Quality

As Table 2 indicates, the 2008 emissions inventory must be a Level II inventory because it will provide support for a SIP. Therefore, the following quality control procedures will be followed:

1. The date of each questionnaire will be checked to verify that the inventory submitted by a source is for the year specified. Data from a previous year will be accepted only if no data is available for the inventory year and the data is representative.

2. The professional capability of the source's emissions data collector to accurately complete the inventory forms will be assessed. Some smaller sources will not have the expertise to provide all of the required information. Assistance will be provided to these sources within the limit of available UDAQ/IDEQ resources.

3. Emissions estimates for each point source and area source category will be compared to the most recent inventory. For a point source, if the difference is large and no new permit has been granted for the process, the facility will be inspected or contacted directly for data verification. For an industrial area source category, if the difference is large and no records of substantial change in growth exist, the area source will be revisited for data verification.

4. Each point source and area source category collection technique used to compile the data will be analyzed. If the technique does not apply to the source category or is inaccurate, the data will not be accepted.

5. Double counting occurs when emissions from a source are included in both the area source and point source emissions. To avoid this, known point source emissions associated with combustion of fuels will be subtracted from area emissions. For example, after the total natural gas consumption is calculated from utility records, the known point source consumption will be subtracted from the area source natural gas use total. The difference is the area source contribution and the contribution of missed or unidentified point sources.

B. Emissions Inventory Data Validation

Excel spreadsheets are used to do emission calculations for many of the inventoried sources. These calculations were checked for reasonableness and accuracy when the spreadsheet was developed for various sources. The calculations are locked to provide assurance that the calculations will not be changed. This provides an automatic QC for each source.

The following steps will be done to validate the inventory data for sources not submitting verified Excel spreadsheets:

1. The data will be reviewed for the following errors:

   a. Use of incorrect equations

   b. Transposition of digits

   c. Decimal errors

   d. Incorrect emission factor applications

   e. Use of incorrect or inconsistent measurement units

   f. Incorrect units and unit conversions

   g. Incorrect entry of numbers into the calculator

   h. Accuracy of Source Classification Codes

i. Use of proper EPA pollutant codes

2. Emission estimates will be checked for the following:

   a. Imprecise emission factors

   b. Errors in throughput information

   c. Improper interpretation of combined sources

   d. Faulty assumptions about control device efficiency

3. Data outside the acceptable range (outliers) will be checked. This includes things such as:

   a. Claiming 100 percent control efficiency

   b. No emissions while the facility was operating

   c. Very high or very low emissions not characteristic for a source category (decimal placement errors)

4. The ratio of normal to maximum production rates should be checked to see that they approximate the ratio of normal to maximum emission rates. Where these proportions differ, the emissions calculations will be rechecked for errors.

Most of the errors listed in 1 through 4 above can be identified by looking for unreasonable emission estimates (data outside of the acceptable range) not typical for a particular type of source or area source category. For confirmation of unreasonable emission estimates, a review engineer familiar with the source category will be consulted. The accuracy of the calculations provided by a source will be determined by the staff members designated to recalculate and enter emission estimates into the emissions inventory database.

C. Evaluation of the Uncertainty of Emission Estimates

UDAQ and IDEQ will use the Data Quality Ranking System or some elements of it as suggested in Volume VI of the EIIP provided that adequate resources are available. Since the more sophisticated approaches suggested in the guidance require expertise and additional staff time, it is not likely that any of them will be implemented in the near future. However, UDAQ and IDEQ are committed to adjusting emission uncertainty assessment methods upward as resources become available. The most likely methods to determine emissions uncertainty will be qualitative discussions and some subjective data quality rating.

The general steps used for QA will be as follows:

The reasonableness of the inventory data will be assessed by determining how much quality control effort has been applied to each step during the emissions inventory development. The relative accuracy of the emissions data will be prioritized by assigning the highest accuracy to data collected with CEMs or determined from stack test results, less accuracy when using AP-42 emission factors, and least accuracy when based on engineering judgment. Data completeness will be addressed by cross-referencing known facilities to other sources of information. Some completeness assessment will also be made using responses to questionnaires and information requests. Data consistency will be determined by compiling documentation showing that procedures are followed as written and that methodologies applied during the inventory development for all sources in a source category are identical.

D. Emission Factors

1. Availability of emission factors

Whenever CEMs data or emission factors developed from representative source test data is not available, emission factors contained in the most recent update of AP-42 will be used. This document covers most of the common emission sources. If emissions factors are not available in AP-42, the following sources will be checked:

a. Manufacturer's Specifications

b. EIIP

c. NSPS

d. EPA Control Technique Guidelines

e. EPA Factor Information Retrieval (FIRE) Software

f. Source assessments and other EPA studies aimed at relating process parameters to emissions of specific industrial processes

g. Proceedings of conferences sponsored by EPA, the Air Pollution Control Association (APCA), and other ecological organizations

Emission factors will be prioritized by assigning the highest accuracy to emission factors developed from representative source test data and less accuracy to emission factors contained in AP-42 and other publications. Source test data will be used only if the test was performed according to EPA's specifications.

2. Development of emission factors

If no AP-42 or other emission factors are available for a process, emission factors will be developed using material balance or engineering estimates.

To use material balance, exact quantities of materials entering and exiting the process will be needed at all emission points.

Engineering estimates are based on an analogy with similar processes. The estimates will be made by visiting the plant to observe the process, by estimating emissions on site, and by observing stack emissions.

3. Calculation of emissions using emission factors

   a. The following equation will be used to calculate emissions estimates:

      $E = R \times EF \times [1-(C/100)]$

      Where:

      E = emissions estimate (at process level)

      R = activity level (such as throughput)

      EF = uncontrolled emission factor (such as pounds emitted per throughput)

      C = control device efficiency (in percent) if the EF does not include a level of control

   b. The individual input parameters will be reviewed to make sure they are reasonably accurate.

   c. All assumptions and engineering judgments used in the calculations will be documented on a prepared form or in the computer and will be kept as a permanent record available for review.

E. <u>Control Device Efficiency</u>

1. Control device efficiency may be determined by source testing, or provided by the facility in direct surveying.

   a. Pollutant concentrations will be measured before and after the control device.

   b. The age of the control device will be taken into account since component deterioration may reduce efficiency.

   c. The permit file or the review engineer will be consulted to verify that the control device is the proper size for the operation.

2. Control device efficiency may be determined by using literature (AP-42 or EIIP).

a. The control device efficiency listed in literature should be reasonably applicable to control devices employed at the inventoried facility.

b. The size of the control device should be analyzed to make sure it is the proper size for the process under consideration.

c. When using manufacturer's design specifications to assess control efficiency, the possibility of obtaining the efficiency under actual conditions should be studied. Excessive maintenance and upset conditions will also affect control efficiency and will be taken into account.

F. Rule Effectiveness and Rule Penetration

Rule effectiveness (RE) and rule penetration (RP) will not be applied to the point source inventories because the source controls are based on permits, not general rules. For Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM) that affect area and mobile sources, RE and RP will be applied. The percentages used in calculating RE and RP will be determined in consultation with EPA Region 8 and Region 10.

X. SIP DEMONSTRATION MODELING

UDAQ will perform a photochemical grid modeling analysis using CMAQ modeling system for the purpose of the $PM_{2.5}$ attainment demonstration. This will involve the entire domain, including portions of Utah, Idaho, and Wyoming. See page 8 for a map of the domain area.

A. Temporal and Spatial Allocation and Speciation of the Annual Inventory

The software model, SMOKE modeling system, will be used for the following functions:

1. Import the inventory

2. Spatially allocate emissions to a photochemical or aerosol modeling grid

3. Temporally allocate emissions from the annual emissions inventories

4. Speciate emissions for some chemical mechanism

5. Output emissions for an air quality model

A more detailed discussion concerning the spatial and temporal allocations of annual emissions data is provided in the modeling protocol at section 2.7, "Emissions Inputs."

B. Seasonal Temperature Adjustments

The model makes the temperature adjustments based on National Weather Service (NWS) data from appropriate meteorological sites.

On-road Mobile Sources

A separate on-road mobile source emission inventory will be prepared for each separate episode day. Inputs for temperature and absolute humidity will be obtained from representative monitors in each county. The University of Utah Department of Meteorology MESOWEST database or an equivalent source will be used to obtain meteorological data by county.

In addition, all input parameters that are used in MOVES will be appropriate for a winter inventory. These parameters may be different from those used by the MOBILE model (e.g., absolute humidity, RVP of gasoline, ultra-low sulfur diesel (15 ppmw), hourly or daily min/max temperatures, and month of evaluation).

Finally, in the computation of tons per winter weekday or winter weekend day, the appropriate conversion factors from AADT to winter AWKDT or winter AWKNDT will be included. These factors are obtained from the MPO travel demand models when available.

C. Typical Operating Day Emission Rates

SMOKE will be used to calculate peak $PM_{2.5}$ season typical operating day emission rates.

1. Point sources

   SCC profiles will be used to adjust the actual annual emission rates to actual daily or hourly emission rates.

2. Area sources

   SCC profiles will be used to adjust the annual emission rates to actual daily or hourly emission rates.

3. On-road mobile sources

   A separate on-road mobile source emissions inventory will be created for each $PM_{2.5}$ episode day. Each daily inventory will be broken down using the following hierarchy of parameters (in order): calendar year, county, road type, pollutant type, and vehicle type. The daily inventories will then be converted into a compatible format for the SMOKE pre-processor. SMOKE will be used to allocate the emissions spatially and temporally and to speciate the emissions.

XI. DATA HANDLING

A. Data Recording and Coding

1. The verified emissions data for point sources and calculated emissions for area source categories will be summarized according to pollutants. Enough information will be included so that the data can be arranged and presented according to:

    a. Source category

    b. Non-attainment areas

    c. Attainment/maintenance areas

    d. Counties

    e. Area sources

    f. Point sources

    g. County and state totals

2. After entry, all information will be checked to verify that it was entered correctly.

3. The surveys and data-gathering Web applications will be checked for missing and incomplete data overlooked during the initial verification. This data will be retrieved if possible.

4. Each emissions estimate value will be coded according to the method of collection. Examples of collection methods include value estimation, source testing, AP-42 emission factors and locally determined emission factors.

B. Data Tracking

1. Tracking of raw data

    a. All surveys, workbooks, and area source activity level information will be retained and filed.

    b. Important correspondence and logs of phone calls will be filed as permanent, but easily retrievable records.

    c. The raw data will be stored in the emission inventory database that is backed up on a regular basis.

    d. Records of unusual but valid emissions data will be identified and stored for future reference.

    e. The need for updating the emission inventory database will be assessed annually.

f. A list of all new sources will be kept.

g. A record of the following will be retained in the source file:

- Emission estimates
- Calculations
- Pertinent notes and references

2. Tracking of Corrected Data

a. Records of all corrections performed on the raw data will be retained.

b. Reasons for the corrections will be included.

3. Tracking of missing data

a. A record of all missing data will be kept.

b. Reasons for missing data will be explained.

c. A list of methods used to estimate values for missing data will be retained.

XII. EMISSION INVENTORY REPORTING

A. Raw and Summarized Data

1. An electronic and a hard copy report will be compiled containing the following information:

a. A letter of certification signed by the director of UDAQ and by the IDEQ Air Quality Division Administrator stating that the inventory is complete and accurate to the best of their knowledge and collected according to established procedures contained in regulations and guidelines

b. An introduction to the report explaining the reason for collecting the inventory, the reporting format, including graphs, charts, tables and trends, time intervals, etc., the geographical area involved, and the estimated reliability of the inventory

Source categories for which the emissions are negligible will be listed as "neg." Source categories for which there are no emissions in the study area will be listed as "0."

B. Inventory Supporting Documentation

The following inventory supporting documentation will be submitted:

1. Map of the geographic area covered by the inventory

2. Specific methods used to collect the inventory including:

    a. Sources of information for point, area, and mobile sources

    b. Sample questionnaires or data-gathering Web application screen captures

    c. Sources of emission factors including emission factors developed by the agency

    d. Methods of calculating emissions

    e. Significant assumptions made during collection and analysis

    f. Exclusion of known pollution sources

    g. QA/QC results from internal audits and external audits (if applicable)

3. Inventory data consistency, completeness, and reasonableness

    To report on consistency, completeness, and reasonableness of inventory data, a narrative will be submitted including QA/QC documentation addressing the following items:

    a. Successful implementation of the IPP and notation of any deviations from initial plan

    b. Rigorous application of quality control procedures

    c. Consistency in data collection, analysis, and reporting

    d. Internal and external (if applicable) audit results

    e. References of documentation used to compile the inventory

XIII. INTERNAL AND EXTERNAL QUALITY ASSURANCE AUDITS

A. Internal Quality Assurance Audits

1. Ongoing independent QA oversight will be performed.

2. Planning, data collection and analysis, data handling, and data reporting will be addressed prior to compiling the inventory.

3. Review and necessary updating of all procedures will be done prior to compiling the inventory to assure compliance with federal regulations and guidelines.

4. Inventory records will be check to insure consistent application of procedures for every task performed.

5. The questionnaire design, for point sources, will be updated based on responses from previous inventory requests.

6. Quality is also assured through the use of electronic workbooks. Data calculated or stored in Excel workbooks goes through QA/AC to ensure that the formulae used are accurate and then the cells are locked for protection. This ensures that the subsequent process of data entry did not introduce any errors.

7. Appropriate ranges used to define outliers (data outside the expected range) will be verified.

8. The finalized emission inventory report will be reviewed for completeness no later than one month after the completion date.

9. All QA findings will be summarized for the agency head.

B. External Quality Assurance Audits

1. A draft of the completed inventory will be submitted to EPA for review and comments.

2. The inventory will be revised based on comments and audit results that are federal requirements, reasonable requests, and within the budget constraints of UDAQ and IDEQ.

3. An invitation will be sent to EPA to conduct an independent audit of the UDAQ and IDEQ inventory programs.

4. If resources permit, a draft copy of the inventory will be sent to a qualified contractor for review and comments.

5. The emission inventory will be revised using the same criteria applied to comments provided by EPA.

6. Comments provided by the contractor will be submitted with the inventory.

References

Air Quality Memorandum Report No 24, Conformity Analysis for the Amended 2030 Regional Transportation Plan and the 2009-2014 Transportation Improvement Program, (source of VMT projections), Wasatch Front Regional Council, <http://www.wfrc.org/cms/rtp_amendments/Air_Quality_Memo_24.pdf>, August 2008.

Airs Facility Subsystem Source Classification Codes and Emission Factor Listing For Criteria Air Pollutants, EPA-450/4-90-003, USEPA, Research Triangle Park, NC, March 1990.

Billings, Kip A., "AWKDT Factors 2003.xls," VMT Conversion Factors (for Urban Counties), Wasatch Front Regional Council, August 2006.

------"M6_Mix_28_2001_Grow.xls", MOBILE6 Vehicle Type Mix (Urban Counties) Based on UDOT 2001 VMT Mix, Wasatch Front Regional Council, December 22, 2004.

------"M6_Mix_28_2001_Rural_Grow.xls", MOBILE6 Vehicle Type Mix (Rural Counties) Based on UDOT 2001 VMT Mix, Wasatch Front Regional Council, December 22, 2004.

------"Vehicle Weights 2001.xls", Vehicle Weights by Facility Type, (from PM10 SIP Emissions Inventories), Wasatch Front Regional Council, December 22, 2004.

"Clean Air Fine Particle Implementation Rule; Final Rule (40 CFR Part 51)", *Federal Register*, April 25, 2007,

Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and other Non-road Components of the National Emissions Inventory, Vol. 1, *Methodology*, EPA Work Assignment No 3-01, Contract No 68-D-02-063, <http://www.epa.gov/ttn/chief/net/2002inventory.html>, September 2005.

Draft Motor Vehicle Emission Simulator (MOVES) 2009 Software Design and Reference Manual, EPA420-B-09-007, March 2009.

Draft Motor Vehicle Emission Simulator (MOVES) 2009 User Guide, EPA420-B-09-008, April 2009.

Emissions and Dispersion Modeling System (EDMS) User's Manual, AFF-AEE-07-01, September 2009.

Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, EPA-454/R-05-001, USEPA, Research Triangle Park, NC, August 2005.

Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, EPA-454/R-99-006, USEPA, Research Triangle Park, NC, April 1999.

Emission Inventory Improvement Program, Office of Air Quality Planning and Standards, MD-14, USEPA, Research Triangle Park, NC, EPA-454/R-97-004a.

Emission Inventory Requirement for Carbon Monoxide State Implementation Plans, EPA-450/4-91-011, USEPA, Research Triangle Park, NC. March 1991.

Emission Inventory Requirements for Ozone State Implementation Plans, EPA-450/4/91-010, USEPA, Research Triangle Park, NC, March 1991.

Emission Inventory Requirements for Post – 1987 Ozone State Implementation Plans, EPA-450/4-88-019, USEPA, Research Triangle Park, NC, December 1988.

Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulation, EPA-454/R-05-001, USEPA, Research Triangle Park, NC, August 2005.

Example Emission Inventory Documentation for Post 1987 Ozone State Implementation Plans (SIPs), USEPA-450/4-89-018, October 1988.

Guidance for Improving Weight of Evidence Through Identification of Additional Emission Reductions, Not Modeled, USEPA Office of Air Quality Planning and Standards, USEPA, Research Triangle Park, NC, November 1999.

Guidance for Initiating Ozone/CO SIP Emission Inventories Pursuant To the 1990 Clean Air Act Amendments, February 1991.

Guidance for the Preparation of Quality Assurance Plans for O3/CO SIP Emissions Inventories, EPA-450/4-88-023, USEPA, Research Triangle Park, NC, December 1988.

Guidance on Preparing Enforceable Regulations and Compliance Programs for the 15 percent Rate-of Progress Plans, USEPA, Research Triangle Park, NC, EPA-452/R-93-005, June 1993.

Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate of Progress Plans, USEPA-452/R-92-005, EPA, Research Triangle Park, NC, October 1992.

Guidance on the Post-1996 Rate-of–Progress Plan and the Attainment Demonstration, EPA-452/R-93-015, USEPA, Research Triangle Park, NC, January 1994.

Guidance on the Relationship Between the 15 Percent Rate-or-Progress Plans and Other Provisions of the Clean Air Act, USEPA-452/R-93-007, EPA, Research Triangle Park, NC, May 1993.

Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze, USEPA-454/B-07-002, EPA, Research Triangle Park, NC, April 2007.

Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hour Ozone NAAQS, USEPA, Research Triangle Park, NC, October 2005.

Harnett, William T., *Memorandum, 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) Implementation-Reasonable Further Progress (RFP)*, USEPA, Research Triangle Park, NC, August 15, 2006.

Incorporating Bundled Measures in a State Implementation Plan (SIP), USEPA Office of Air and Radiation, US Environmental Protection Agency, August 2005.

Incorporating Emerging and Voluntary measures in a State Implementation Plan (SIP), USEPA Office of Air Radiation, USEPA, September 2004.

Interim Air Quality Policy on Wildland and Prescribed Fires, April 23, 1998.

McLean, Brian, *Memorandum, Guidance on SIP Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures*, USEPA, Washington, DC, August 5, 2004.

Mountainland Association of Governments, "Conformity Determination Report, Mountainland MPO, 2030 Regional Transportation Plan", <http://www.mountainland.org/Transportation_Plans/2007_Regional_Transportation_Plan/Document/Conformity%20Determination.pdf>, April 2007.

National Mobile Inventory Model (NMIM), Technical Memorandum, Instructions to State and Local Agencies Emission Inventory and Analysis Group, Office of Air Quality Planning and Standards, July 2009.

Page, Stephen D., *Memorandum, Clean Data Policy for the Fine particle National Ambient Air Quality Standards*, USEPA, Washington, D.C., December 14, 2004.

------*Memorandum, Guidance on Incorporating Bundled Measures in a State Implementation Plan*, USEPA, August 16, 2005.

Procedures for Emission Inventory Preparation, Vol. I, *Emission Inventory Fundamentals*, EPA-450/4-81-026a, USEPA, Research Triangle Park, NC.

Procedures for Emission Inventory Preparation, Vol. II, *Point Sources*, EPA-450/4-81-026b, USEPA, Research Triangle Park, NC, September 1982,

Procedures for Emission Inventory Preparation, Vol. III, *Area Sources*, EPA-450/4-81-026c, USEPA, Research Triangle Park, NC, September 1981.

Procedures for Emission Inventory Preparation, Vol. IV, *Mobile Sources,* EPA-450/4-81-026d (Revised), USEPA, Research Triangle Park, NC, 1992.

Procedures for Emission Inventory Preparation, Vol. IV, *Mobile Sources*, EPA-450/4-81-026d, EPA, Research Triangle Park, NC, July 1989.

Procedures for Emission Inventory Preparation, Vol. V, *Bibliography*, EPA-450/4-81-026^{e}, USEPA, Research Triangle Park, NC, September 1981.

Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors Of Ozone, Vol. I, *General Guidance For Stationary Sources*, EPA-450/4-91-016, USEPA, Research Triangle Park, NC, May 1991.

Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. II, *Emission Inventory Requirements for Photo Chemical*, Quality Simulation Models, EPA-450/4-91-014, USEPA, Research Triangle Park, NC, May 1991.

Procedures for the Preparation of Emission Inventories for Precursors of Ozone, Vol. I, 3rd ed., EPA-450/4-88-021, USEPA, Research Triangle Park, NC, December 1988.

"Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards (40 CFR Parts 51 and 52)", *Federal Register*, November 1, 2005.

Quality Review Guidelines for 1990 Base Year Emission Inventories, EPA-450/4-91-022, Draft Report, USEPA, Research Triangle Park, NC, September 1991.

Quality Review Guidelines for Post - 1987 State Implementation Plan Base Year Emission Inventories, USEPA-450/0-00-000, EPA, Research Triangle Park, NC, February 1990.

Seitz, John S., *Memorandum, Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard*, USEPA, Research Triangle Park, NC, May 1995.

Title 40 Code of Federal Regulations, Part 51 Requirements for Preparation, Adoption, and Submittal of Implementation Plans and Part 52 Approval and Promulgation of Implementation Plans, revised July 2, 2007.

Traffic Statistics, Vehicle Miles of Travel, 1994 – 2007, UDOT.

2008 NEI/EIS Implementation Plan, <http://www.epa.gov/ttn/chief/net/neip/index.html> (December 2009).

U.S. Government Printing Office, Code of Federal Regulations, 40 CFR, Protection of Environment, <http://www.gpoaccess.gov/cfr/index.html>.

User's Guide for the Final NONROAD2005 Model, EPA420-R-05-13, USEPA, Research Triangle Park, NC, December 2005.

Utah Smoke Management Plan, 4th ed., July 20, 1999.

Wegman, Lydia N., *Memorandum, 2002 Base Year Emission Inventory SIP Planning: 8-hr Ozone, $PM_{2.5}$ and Regional Haze Programs*, November 18, 2002.

------*Memorandum, Mid-Course Review Guidance for the 1-Hour Ozone Nonattainment Areas that Rely on Weight-of–Evidence for Attainment Demonstration*, Air Quality Strategies & Standards Division, OAQPS, Air Quality Strategies & Standards Division, OAQPS, USEPA, March 28, 2002.

Multi-State Nonattainment Area Considerations

One of Utah's designated nonattainment areas for the 2006 PM2.5 National Ambient Air Quality Standards (NAAQS), the Logan UT-ID nonattainment area, extends northward across the Utah boarder into a portion of the Cache Valley that belongs to Idaho.

As such, any technical analysis of the air basin will naturally include areas in both states. Furthermore, the air quality model developed to address the situation (Community Multi-scale Air Quality Model, or CMAQ) will also be used to evaluate Utah's other two nonattainment areas for PM2.5. These other nonattainment areas extend well to the South of Utah's boarder with Idaho, and as a result the modeling domain is quite large (refer to the Inventory Preparation Plan for a map of the domain.)

As a consequence, the modeling analysis will include emissions estimates for portions of Idaho and Wyoming as well as Utah's contribution.

The emissions from Wyoming are rather peripheral to the modeling domain, and have been estimated by The Utah Division of Air Quality (UDAQ) **using pro-rated totals of Wyoming's 2005 tri-annual inventory for each affected county (based on area.)**

As for Idaho, it too is responsible for producing a nonattainment SIP for its portion of the nonattainment area. As such, the Idaho Department of Environmental Quality (IDEQ) has collaborated with UDAQ in the development of the modeled attainment demonstration. Emission inventories from those regions of Idaho within the modeling domain were provided by IDEQ, **and are documented in this Technical Support Document**. Specific attention is given to that region of Idaho (Franklin County) that is situated in the Cache Valley.

Episodic Inventory Overview

Much of the technical work done to support the modeled attainment demonstration of the State Implementation Plan (SIP) for $PM_{2.5}$ is the collection of accurate emissions inventories.

The episodic inventory is an assessment of actual emissions paired in time with the episodes of elevated $PM_{2.5}$ concentrations used to validate the air quality model.

The inventory includes estimates for the following criteria pollutants: $PM_{2.5}$, SO_x, NO_x, VOC, CO, and NH_3.

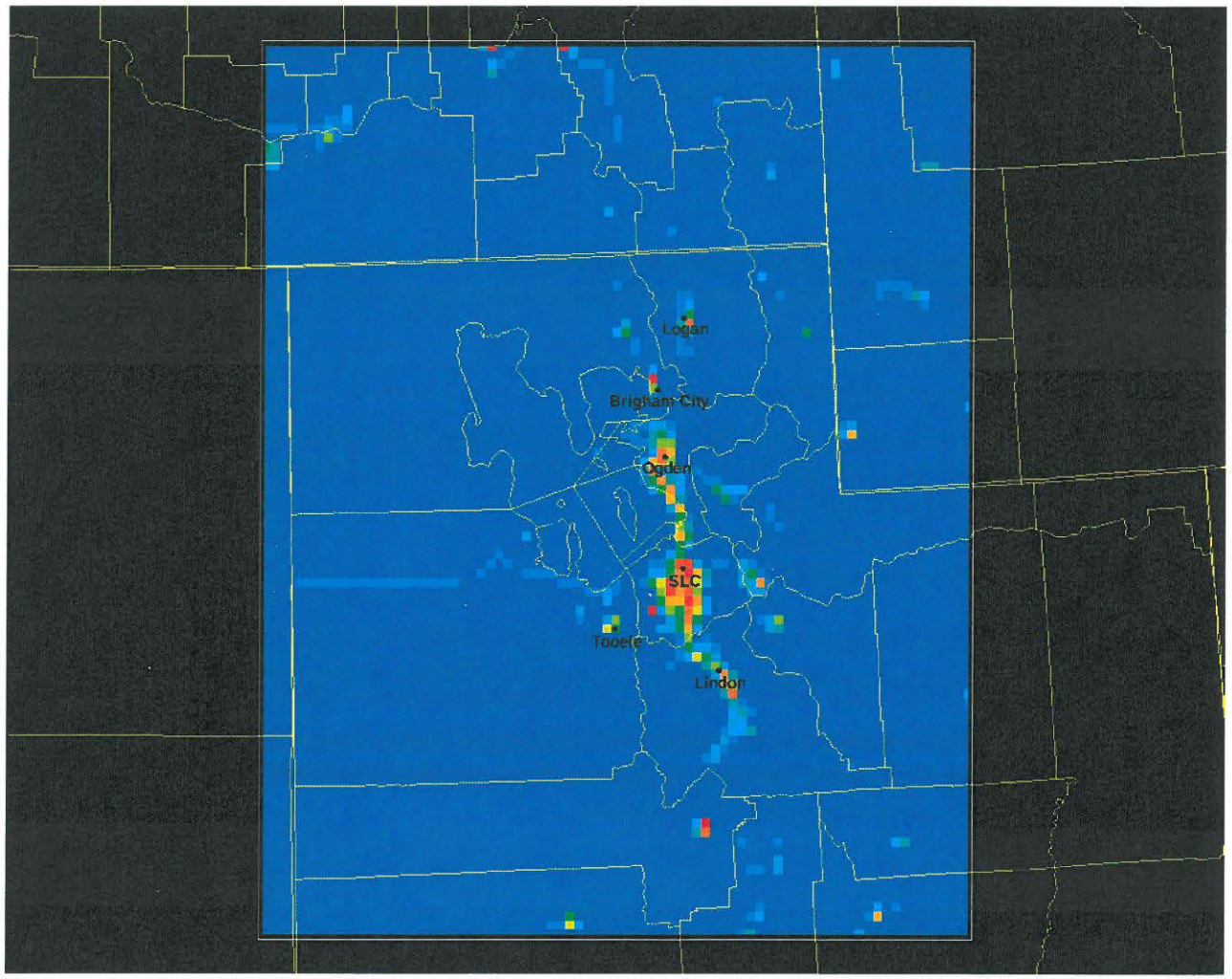
The inventory also includes contribution from a number of sectors. The Utah Division of Air Quality (UDAQ) routinely considers emissions from the following generalized source groupings:

- Large industrial *point sources*;
- *Area sources*, which include smaller, and more numerous, industrial sources as well as activities like space heating that may be well approximated by surrogate indicators such as population;
- *On-road mobile sources;* and
- *Non-road mobile sources.*

As mentioned, these inventories represent a great deal of the technical basis for the $PM_{2.5}$ SIPs. As such, they occupy a large portion of this Technical Support Document (TSD.)

The episodic inventory is presented first, and begins with a comprehensive summary table for each modeled episode. Following that is more in depth information for point sources, area sources, and mobile sources.

Emissions Distribution



The Figure above is a graphical depiction of how the emissions were distributed throughout the modeling domain. The emissions shown in the figure include NOx and CO, both of which are major components of point, area and mobile sources.

Table heading:
Modeling Domain
Temporally and Spatially Adjusted
Tons/Episode Day

This table series shows overall emissions within the modeling domain, by inventory sector (point sources, area/non-point sources, non-road sources, and on-road sources) for each of the 44 days belonging to this episode. Units are in tons per day, and the inventory has been pre-processed by SMOKE. There is a separate table for each pollutant of interest, and the information is also presented beneath each table in terms of percent.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)

Tons/Episode Day

PM2.5	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Average
Date	1/11/2007	1/12/2007	1/13/2007	1/14/2007	1/15/2007	1/16/2007	1/17/2007	1/18/2007	1/19/2007	1/20/2007	Tons/Episode	Tons/Episode Day
Area/NonPoint	34.449	34.449	33.060	30.022	32.893	34.449	34.449	34.449	34.449	33.060	335.727	33.573
Point	12.446	12.430	12.229	12.204	12.601	12.456	12.448	12.446	12.430	12.229	123.920	12.392
NonRoad	3.222	3.222	3.430	3.469	3.262	3.222	3.222	3.222	3.222	3.430	32.925	3.292
OnRoad	35.270	23.680	20.203	16.692	26.379	25.830	25.018	23.680	24.504	21.828	243.085	24.309
Total	**85.387**	**73.782**	**68.922**	**62.388**	**75.135**	**75.957**	**75.137**	**73.798**	**74.605**	**70.546**	**735.657**	**73.566**
Area/NonPoint	40%	47%	48%	48%	44%	45%	46%	47%	46%	47%	46%	46%
Point	15%	17%	18%	20%	17%	16%	17%	17%	17%	17%	17%	17%
NonRoad	4%	4%	5%	6%	4%	4%	4%	4%	4%	5%	4%	4%
OnRoad	41%	32%	29%	27%	35%	34%	33%	32%	33%	31%	33%	33%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

NOX	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Average
Date	1/11/2007	1/12/2007	1/13/2007	1/14/2007	1/15/2007	1/16/2007	1/17/2007	1/18/2007	1/19/2007	1/20/2007	Tons/Episode	Tons/Episode Day
Area/NonPoint	82.723	82.723	80.984	78.263	81.159	82.723	82.723	82.723	82.723	80.984	817.730	81.773
Point	212.242	212.045	209.193	208.931	214.812	212.249	212.248	212.242	212.045	209.193	2,115.202	211.520
NonRoad	27.492	27.492	28.050	28.071	27.513	27.492	27.492	27.492	27.492	28.050	276.636	27.664
OnRoad	253.729	254.948	204.740	159.462	253.873	259.382	261.833	254.948	272.667	203.908	2,379.491	237.949
Total	**576.187**	**577.209**	**522.967**	**474.727**	**577.357**	**581.847**	**584.296**	**577.406**	**594.928**	**522.135**	**5,589.059**	**558.906**
Area/NonPoint	14%	14%	15%	16%	14%	14%	14%	14%	14%	16%	15%	15%
Point	37%	37%	40%	44%	37%	36%	36%	37%	36%	40%	38%	38%
NonRoad	5%	5%	5%	6%	5%	5%	5%	5%	5%	5%	5%	5%
OnRoad	44%	44%	39%	34%	44%	45%	45%	44%	46%	39%	43%	43%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

VOC	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Average
Date	1/11/2007	1/12/2007	1/13/2007	1/14/2007	1/15/2007	1/16/2007	1/17/2007	1/18/2007	1/19/2007	1/20/2007	Tons/Episode	Tons/Episode Day
Area/NonPoint	189.335	189.335	162.905	146.423	179.364	189.335	189.335	189.335	189.335	162.905	1,787.609	178.761
Point	18.149	18.139	16.802	16.566	17.962	18.150	18.149	18.149	18.139	16.802	177.007	17.701
NonRoad	77.626	77.626	84.859	86.640	79.406	77.626	77.626	77.626	77.626	84.859	801.522	80.152
OnRoad	123.009	137.801	118.706	116.381	152.900	147.111	142.535	137.801	137.869	105.942	1,320.055	132.006
Total	**408.119**	**422.902**	**383.272**	**366.010**	**429.632**	**432.223**	**427.646**	**422.911**	**422.970**	**370.508**	**4,086.194**	**408.619**
Area/NonPoint	46%	45%	43%	40%	42%	44%	44%	45%	45%	44%	44%	44%
Point	4%	4%	4%	5%	4%	4%	4%	4%	4%	5%	4%	4%
NonRoad	19%	18%	22%	24%	18%	18%	18%	18%	18%	23%	20%	20%
OnRoad	30%	33%	31%	32%	36%	34%	33%	33%	33%	29%	32%	32%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)

Tons/Episode Day

NH3	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Average
Date	1/11/2007	1/12/2007	1/13/2007	1/14/2007	1/15/2007	1/16/2007	1/17/2007	1/18/2007	1/19/2007	1/20/2007	Tons/Episode	Tons/Episode Day
Area/NonPoint	158.386	158.386	158.384	158.381	158.385	158.386	158.386	158.386	158.386	158.384	1,583.851	158.385
Point	3.340	3.338	3.314	3.313	3.492	3.494	3.340	3.340	3.338	3.314	33.625	3.362
NonRoad	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.045	0.005
OnRoad	3.678	3.678	3.031	2.229	3.634	3.738	3.783	3.678	3.960	3.031	34.438	3.444
Total	**165.409**	**165.407**	**164.734**	**163.928**	**165.514**	**165.623**	**165.514**	**165.409**	**165.689**	**164.734**	**1,651.959**	**165.196**
Area/NonPoint	96%	96%	96%	97%	96%	96%	96%	96%	96%	96%	96%	96%
Point	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
NonRoad	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
OnRoad	2%	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1.000

SO2	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Average
Date	1/11/2007	1/12/2007	1/13/2007	1/14/2007	1/15/2007	1/16/2007	1/17/2007	1/18/2007	1/19/2007	1/20/2007	Tons/Episode	Tons/Episode Day
Area/NonPoint	29.259	29.259	28.142	27.061	28.562	29.259	29.259	29.259	29.259	28.142	287.463	28.746
Point	127.735	127.711	127.668	127.617	127.809	127.735	127.735	127.735	127.711	127.668	1,277.123	127.712
NonRoad	1.725	1.725	1.772	1.776	1.729	1.725	1.725	1.725	1.725	1.772	17.396	1.740
OnRoad	2.351	2.370	1.946	1.481	2.364	2.416	2.438	2.370	2.536	1.931	22.203	2.220
Total	**161.069**	**161.065**	**159.528**	**157.935**	**160.463**	**161.135**	**161.157**	**161.089**	**161.231**	**159.513**	**1,604.185**	**160.418**
Area/NonPoint	18%	18%	18%	17%	18%	18%	18%	18%	18%	18%	18%	18%
Point	79%	79%	80%	81%	80%	79%	79%	79%	79%	80%	80%	80%
NonRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
OnRoad	1%	1%	1%	1%	1%	1%	2%	1%	2%	1%	1%	1%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

CO	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Average
Date	1/11/2007	1/12/2007	1/13/2007	1/14/2007	1/15/2007	1/16/2007	1/17/2007	1/18/2007	1/19/2007	1/20/2007	Tons/Episode	Tons/Episode Day
Area/NonPoint	215.523	215.523	212.105	205.353	212.202	215.523	215.523	215.523	215.523	212.105	2,134.905	213.491
Point	72.549	72.456	71.245	70.865	72.602	72.586	72.553	72.549	72.456	71.245	721.108	72.111
NonRoad	352.474	352.474	362.239	364.588	354.823	352.474	352.474	352.474	352.474	362.239	3,558.733	355.873
OnRoad	1,608.917	1,702.867	1,420.721	1,308.943	1,799.523	1,768.588	1,745.100	1,702.867	1,739.527	1,336.590	16,133.642	1,613.364
Total	**2,249.463**	**2,343.320**	**2,066.311**	**1,949.749**	**2,439.150**	**2,409.172**	**2,385.651**	**2,343.414**	**2,379.980**	**1,982.179**	**22,548.389**	**2,254.839**
Area/NonPoint	10%	9%	10%	11%	9%	9%	9%	9%	9%	11%	9%	9%
Point	3%	3%	3%	4%	3%	3%	3%	3%	3%	4%	3%	3%
NonRoad	16%	15%	18%	19%	15%	15%	15%	15%	15%	18%	16%	16%
OnRoad	72%	73%	69%	67%	74%	73%	73%	73%	73%	67%	72%	72%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table heading:
Modeling Domain
Temporally and Spatially Adjusted
Tons/Episode Day

This table series shows overall emissions within the modeling domain, by inventory sector (point sources, area/non-point sources, non-road sources, and on-road sources) for each of the 44 days belonging to this episode. Units are in tons per day, and the inventory has been pre-processed by SMOKE. There is a separate table for each pollutant of interest, and the information is also presented beneath each table in terms of percent.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2 2/14/2008 - 2/18/2008 (5 days)
Tons/Episode Day

PM2.5	Thursday	Friday	Saturday	Sunday	Monday	Total	Average
Date	2/14/2008	2/15/2008	2/16/2008	2/17/2008	2/18/2008	Tons/Episode	Tons/Episode Day
Area/NonPoint	33.971	33.971	32.588	29.668	32.449	162.648	32.530
Point	12.415	12.399	12.208	12.187	12.473	61.682	12.336
NonRoad	3.809	3.809	3.994	4.033	3.848	19.493	3.899
OnRoad	22.326	23.950	16.638	13.264	20.979	97.158	19.432
	72.521	**74.129**	**65.428**	**59.152**	**69.749**	**340.981**	**68.196**
Area/NonPoint	47%	46%	50%	50%	47%	48%	48%
Point	17%	17%	19%	21%	18%	18%	18%
NonRoad	5%	5%	6%	7%	6%	6%	6%
OnRoad	31%	32%	25%	22%	30%	28%	28%
	100%	100%	100%	100%	100%	100%	100%

NOX	Thursday	Friday	Saturday	Sunday	Monday	Total	Average
Date	2/14/2008	2/15/2008	2/16/2008	2/17/2008	2/18/2008	Tons/Episode	Tons/Episode Day
Area/NonPoint	82.575	82.575	80.908	78.251	81.054	405.363	81.073
Point	198.872	198.676	195.910	195.697	201.118	990.272	198.054
NonRoad	29.747	29.747	30.068	30.089	29.768	149.420	29.884
OnRoad	225.422	246.064	184.814	143.536	226.081	1,025.917	205.183
	536.616	**557.062**	**491.699**	**447.572**	**538.021**	**2,570.971**	**514.194**
Area/NonPoint	15%	15%	16%	17%	15%	16%	16%
Point	37%	36%	40%	44%	37%	39%	39%
NonRoad	6%	5%	6%	7%	6%	6%	6%
OnRoad	42%	44%	38%	32%	42%	40%	40%
	100%	100%	100%	100%	100%	100%	100%

VOC	Thursday	Friday	Saturday	Sunday	Monday	Total	Average
Date	2/14/2008	2/15/2008	2/16/2008	2/17/2008	2/18/2008	Tons/Episode	Tons/Episode Day
Area/NonPoint	188.155	188.155	161.285	144.628	178.048	860.272	172.054
Point	17.428	17.418	16.311	16.134	17.293	84.585	16.917
NonRoad	96.182	96.182	103.388	105.168	97.962	498.882	99.776
OnRoad	104.189	115.590	87.839	78.096	107.415	493.128	98.626
	405.955	**417.346**	**368.823**	**344.025**	**400.718**	**1,936.867**	**387.373**
Area/NonPoint	46%	45%	44%	42%	44%	44%	44%
Point	4%	4%	4%	5%	4%	4%	4%
NonRoad	24%	23%	28%	31%	24%	26%	26%
OnRoad	26%	28%	24%	23%	27%	25%	25%
	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2 2/14/2008 - 2/18/2008 (5 days)
Tons/Episode Day

NH3	Thursday	Friday	Saturday	Sunday	Monday	Total	Average
Date	2/14/2008	2/15/2008	2/16/2008	2/17/2008	2/18/2008	Tons/Episode	Tons/Episode Day
Area/NonPoint	157.812	157.812	157.810	157.808	157.811	789.053	157.811
Point	3.312	3.311	3.287	3.286	3.470	16.667	3.333
NonRoad	0.004	0.004	0.005	0.005	0.004	0.023	0.005
OnRoad	3.428	3.725	2.858	2.108	3.423	15.542	3.108
	164.557	**164.853**	**163.960**	**163.207**	**164.708**	**821.284**	**164.257**
Area/NonPoint	96%	96%	96%	97%	96%	96%	96%
Point	2%	2%	2%	2%	2%	2%	2%
NonRoad	0%	0%	0%	0%	0%	0%	0%
OnRoad	2%	2%	2%	1%	2%	2%	2%
	100%	100%	100%	100%	100%	100%	100%

SO2	Thursday	Friday	Saturday	Sunday	Monday	Total	Average
Date	2/14/2008	2/15/2008	2/16/2008	2/17/2008	2/18/2008	Tons/Episode	Tons/Episode Day
Area/NonPoint	29.253	29.253	28.146	27.073	28.562	142.286	28.457
Point	122.838	122.823	122.781	122.747	122.865	614.054	122.811
NonRoad	1.116	1.116	1.140	1.144	1.120	5.638	1.128
OnRoad	1.758	1.910	1.454	1.112	1.757	7.990	1.598
	154.965	**155.101**	**153.521**	**152.076**	**154.303**	**769.967**	**153.993**
Area/NonPoint	19%	19%	18%	18%	19%	18%	18%
Point	79%	79%	80%	81%	80%	80%	80%
NonRoad	1%	1%	1%	1%	1%	1%	1%
OnRoad	1%	1%	1%	1%	1%	1%	1%
	100%	100%	100%	100%	100%	100%	100%

CO	Thursday	Friday	Saturday	Sunday	Monday	Total	Average
Date	2/14/2008	2/15/2008	2/16/2008	2/17/2008	2/18/2008	Tons/Episode	Tons/Episode Day
Area/NonPoint	197.653	197.653	194.294	187.595	194.366	971.563	194.313
Point	72.406	72.324	71.155	70.874	72.455	359.215	71.843
NonRoad	416.190	416.190	425.822	428.171	418.539	2,104.911	420.982
OnRoad	1,287.086	1,391.976	1,054.775	917.613	1,300.708	5,952.158	1,190.432
	1,973.335	**2,078.143**	**1,746.047**	**1,604.253**	**1,986.069**	**9,387.847**	**1,877.569**
Area/NonPoint	10%	10%	11%	12%	10%	10%	10%
Point	4%	3%	4%	4%	4%	4%	4%
NonRoad	21%	20%	24%	27%	21%	22%	22%
OnRoad	65%	67%	60%	57%	65%	63%	63%
	100%	100%	100%	100%	100%	100%	100%

Table heading:
Modeling Domain
Temporally and Spatially Adjusted
Tons/Episode Day

This table series shows overall emissions within the modeling domain, by inventory sector (point sources, area/non-point sources, non-road sources, and on-road sources) for each of the 44 days belonging to this episode. Units are in tons per day, and the inventory has been pre-processed by SMOKE. There is a separate table for each pollutant of interest, and the information is also presented beneath each table in terms of percent.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

PM2.5	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	12/8/2009	12/9/2009	12/10/2009	12/11/2009	12/12/2009	12/13/2009	12/14/2009	12/15/2009	12/16/2009	12/17/2009	12/18/2009
Point	11.879	11.871	11.864	11.850	11.672	11.646	11.884	11.879	11.871	11.864	11.850
Area/NonPoint	34.520	34.520	34.140	33.834	32.365	30.167	32.985	34.520	34.406	33.812	33.622
NonRoad	2.015	2.015	2.015	2.015	2.310	2.350	2.055	2.015	2.015	2.015	2.015
OnRoad	10.618	11.130	11.366	10.772	6.135	4.606	7.589	7.687	7.379	7.611	8.172
Total	**59.03**	**59.54**	**59.39**	**58.47**	**52.48**	**48.77**	**54.51**	**56.10**	**55.67**	**55.30**	**55.66**
Point	20%	20%	20%	20%	22%	24%	22%	21%	21%	21%	21%
Area/NonPoint	58%	58%	57%	58%	62%	62%	61%	62%	62%	61%	60%
NonRoad	3%	3%	3%	3%	4%	5%	4%	4%	4%	4%	4%
OnRoad	18%	19%	19%	18%	12%	9%	14%	14%	13%	14%	15%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

NOX	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	12/8/2009	12/9/2009	12/10/2009	12/11/2009	12/12/2009	12/13/2009	12/14/2009	12/15/2009	12/16/2009	12/17/2009	12/18/2009
Point	209.098	209.097	209.021	208.842	205.573	205.396	209.218	209.098	209.097	209.021	208.842
Area/NonPoint	81.371	81.371	81.334	81.305	79.542	76.880	79.797	81.371	81.360	81.303	81.285
NonRoad	20.914	20.914	20.914	20.914	22.442	22.462	20.934	20.914	20.914	20.914	20.914
OnRoad	199.065	204.909	203.772	207.285	159.545	123.864	199.196	196.508	200.112	199.461	204.497
Total	**510.448**	**516.291**	**515.041**	**518.345**	**467.101**	**428.602**	**509.146**	**507.891**	**511.483**	**510.698**	**515.537**
Point	41%	40%	41%	40%	44%	48%	41%	41%	41%	41%	41%
Area/NonPoint	16%	16%	16%	16%	17%	18%	16%	16%	16%	16%	16%
NonRoad	4%	4%	4%	4%	5%	5%	4%	4%	4%	4%	4%
OnRoad	39%	40%	40%	40%	34%	29%	39%	39%	39%	39%	40%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

VOC	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	12/8/2009	12/9/2009	12/10/2009	12/11/2009	12/12/2009	12/13/2009	12/14/2009	12/15/2009	12/16/2009	12/17/2009	12/18/2009
Point	15.073	15.071	15.069	15.058	14.245	14.127	14.980	15.073	15.071	15.069	15.058
Area/NonPoint	187.733	187.733	187.039	186.483	158.767	143.376	177.450	187.733	187.524	186.443	186.096
NonRoad	38.223	38.223	38.223	38.223	45.561	47.341	40.003	38.223	38.223	38.223	38.223
OnRoad	115.358	118.318	120.752	115.009	74.082	66.607	89.503	90.272	86.072	88.672	92.929
Total	**356.387**	**359.345**	**361.083**	**354.773**	**292.655**	**271.451**	**321.935**	**331.301**	**326.890**	**328.407**	**332.306**
Point	4%	4%	4%	4%	5%	5%	5%	5%	5%	5%	5%
Area/NonPoint	53%	52%	52%	53%	54%	53%	55%	57%	57%	57%	56%
NonRoad	11%	11%	11%	11%	16%	17%	12%	12%	12%	12%	12%
OnRoad	32%	33%	33%	32%	25%	25%	28%	27%	26%	27%	28%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

PM2.5	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Date	12/19/2009	12/20/2009	12/21/2009	12/22/2009	12/23/2009	12/24/2009	12/25/2009	12/26/2009	12/27/2009	12/28/2009	12/29/2009	12/30/2009	12/31/2009
Point	11.672	11.646	11.884	11.879	11.871	11.658	11.645	11.662	11.646	11.884	11.879	11.871	11.864
Area/NonPoint	31.876	29.019	31.779	33.564	34.520	30.764	29.228	31.594	29.152	31.654	33.084	33.084	33.505
NonRoad	2.310	2.350	2.055	2.015	2.015	2.310	2.350	2.350	2.350	2.055	2.015	2.015	2.015
OnRoad	6.659	5.234	8.413	8.123	8.489	9.173	7.549	8.144	6.340	10.452	9.359	8.690	8.284
Total	**52.52**	**48.25**	**54.13**	**55.58**	**56.90**	**53.90**	**50.77**	**53.75**	**49.49**	**56.04**	**56.34**	**55.66**	**55.67**
Point	22%	24%	22%	21%	21%	22%	23%	22%	24%	21%	21%	21%	21%
Area/NonPoint	61%	60%	59%	60%	61%	57%	58%	59%	59%	56%	59%	59%	60%
NonRoad	4%	5%	4%	4%	4%	4%	5%	4%	5%	4%	4%	4%	4%
OnRoad	13%	11%	16%	15%	15%	17%	15%	15%	13%	19%	17%	16%	15%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

NOX	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Date	12/19/2009	12/20/2009	12/21/2009	12/22/2009	12/23/2009	12/24/2009	12/25/2009	12/26/2009	12/27/2009	12/28/2009	12/29/2009	12/30/2009	12/31/2009
Point	205.573	205.396	209.218	209.098	209.097	205.540	205.389	205.463	205.396	209.218	209.098	209.097	209.021
Area/NonPoint	79.495	76.770	79.682	81.279	81.371	77.613	76.040	78.042	76.782	79.670	81.233	81.233	81.273
NonRoad	22.442	22.462	20.934	20.914	20.914	22.442	22.462	22.462	22.462	20.934	20.914	20.914	20.914
OnRoad	161.171	126.377	201.053	196.586	203.322	198.334	154.703	165.928	127.365	202.644	195.818	203.221	201.960
Total	**468.680**	**431.004**	**510.887**	**507.877**	**514.704**	**503.929**	**458.594**	**471.895**	**432.005**	**512.466**	**507.063**	**514.465**	**513.168**
Point	44%	48%	41%	41%	41%	41%	45%	44%	48%	41%	41%	41%	41%
Area/NonPoint	17%	18%	16%	16%	16%	15%	17%	17%	18%	16%	16%	16%	16%
NonRoad	5%	5%	4%	4%	4%	4%	5%	5%	5%	4%	4%	4%	4%
OnRoad	34%	29%	39%	39%	40%	39%	34%	35%	29%	40%	39%	40%	39%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

VOC	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Date	12/19/2009	12/20/2009	12/21/2009	12/22/2009	12/23/2009	12/24/2009	12/25/2009	12/26/2009	12/27/2009	12/28/2009	12/29/2009	12/30/2009	12/31/2009
Point	14.245	14.127	14.980	15.073	15.071	14.226	14.123	14.144	14.127	14.980	15.073	15.071	15.069
Area/NonPoint	157.877	141.284	175.253	185.991	187.733	151.048	140.765	149.879	141.527	175.026	185.116	185.116	185.883
NonRoad	45.561	47.341	40.003	38.223	38.223	45.561	47.341	47.341	47.341	40.003	38.223	38.223	38.223
OnRoad	78.020	73.685	96.873	93.595	95.773	102.051	99.532	91.086	85.223	114.971	106.016	97.671	94.454
Total	**295.702**	**276.437**	**327.109**	**332.882**	**336.800**	**312.885**	**301.762**	**302.451**	**288.217**	**344.980**	**344.428**	**336.081**	**333.629**
Point	5%	5%	5%	5%	4%	5%	5%	5%	5%	4%	4%	4%	5%
Area/NonPoint	53%	51%	54%	56%	56%	48%	47%	50%	49%	51%	54%	55%	56%
NonRoad	15%	17%	12%	11%	11%	15%	16%	16%	16%	12%	11%	11%	11%
OnRoad	26%	27%	30%	28%	28%	33%	33%	30%	30%	33%	31%	29%	28%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

PM2.5	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	1/1/2010	1/2/2010	1/3/2010	1/4/2010	1/5/2010	1/6/2010	1/7/2010	1/8/2010	1/9/2010	1/10/2010	1/11/2010	1/12/2010	1/13/2010	1/14/2010	1/15/2010
Point	11.639	11.639	11.623	11.991	11.857	11.850	11.848	11.833	11.649	11.623	11.991	11.857	11.850	11.848	11.833
Area/NonPoint	30.764	31.594	29.787	32.027	33.315	33.084	33.563	34.520	31.800	28.731	31.548	33.084	33.458	33.084	33.505
NonRoad	2.310	2.350	2.350	2.055	2.015	2.015	2.015	2.015	2.310	2.350	2.055	2.015	2.015	2.015	2.015
OnRoad	5.234	5.833	4.718	7.950	7.267	7.057	8.691	9.474	6.430	4.886	7.781	7.283	7.255	7.066	7.907
Total	**49.95**	**51.42**	**48.48**	**54.02**	**54.45**	**54.01**	**56.12**	**57.84**	**52.19**	**47.59**	**53.37**	**54.24**	**54.58**	**54.01**	**55.26**
Point	23%	23%	24%	22%	22%	22%	21%	20%	22%	24%	22%	22%	22%	22%	21%
Area/NonPoint	62%	61%	61%	59%	61%	61%	60%	60%	61%	60%	59%	61%	61%	61%	61%
NonRoad	5%	5%	5%	4%	4%	4%	4%	3%	4%	5%	4%	4%	4%	4%	4%
OnRoad	10%	11%	10%	15%	13%	13%	15%	16%	12%	10%	15%	13%	13%	13%	14%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

NOX	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	1/1/2010	1/2/2010	1/3/2010	1/4/2010	1/5/2010	1/6/2010	1/7/2010	1/8/2010	1/9/2010	1/10/2010	1/11/2010	1/12/2010	1/13/2010	1/14/2010	1/15/2010
Point	206.103	206.327	206.263	212.355	209.320	209.319	209.312	209.112	206.437	206.263	212.355	209.320	209.319	209.312	209.112
Area/NonPoint	77.613	78.042	76.843	79.705	81.255	81.233	81.279	81.371	79.488	76.742	79.659	81.233	81.269	81.233	81.273
NonRoad	22.442	22.462	22.462	20.934	20.914	20.914	20.914	20.914	22.442	22.462	20.934	20.914	20.914	20.914	20.914
OnRoad	139.345	152.356	119.302	180.928	176.669	180.311	182.191	185.924	150.966	119.610	178.828	174.968	181.572	179.430	184.695
Total	**445.503**	**459.187**	**424.871**	**493.923**	**488.158**	**491.777**	**493.695**	**497.321**	**459.331**	**425.078**	**491.778**	**486.434**	**493.073**	**490.889**	**495.994**
Point	46%	45%	49%	43%	43%	43%	42%	42%	45%	49%	43%	43%	42%	43%	42%
Area/NonPoint	17%	17%	18%	16%	17%	17%	16%	16%	17%	18%	16%	17%	16%	17%	16%
NonRoad	5%	5%	5%	4%	4%	4%	4%	4%	5%	5%	4%	4%	4%	4%	4%
OnRoad	31%	33%	28%	37%	36%	37%	37%	37%	33%	28%	36%	36%	37%	37%	37%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

VOC	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	1/1/2010	1/2/2010	1/3/2010	1/4/2010	1/5/2010	1/6/2010	1/7/2010	1/8/2010	1/9/2010	1/10/2010	1/11/2010	1/12/2010	1/13/2010	1/14/2010	1/15/2010
Point	14.405	14.400	14.382	15.281	15.360	15.358	15.358	15.347	14.506	14.382	15.281	15.360	15.358	15.358	15.347
Area/NonPoint	151.048	149.879	142.682	175.705	185.536	185.116	185.988	187.733	157.738	140.759	174.833	185.116	185.798	185.116	185.883
NonRoad	45.561	47.341	47.341	40.003	38.223	38.223	38.223	38.223	45.561	47.341	40.003	38.223	38.223	38.223	38.223
OnRoad	73.764	70.534	68.176	94.635	87.227	84.070	99.730	105.755	76.164	70.050	93.971	88.650	87.014	84.613	91.959
Total	**284.778**	**282.153**	**272.582**	**325.624**	**326.347**	**322.767**	**339.299**	**347.058**	**293.969**	**272.532**	**324.087**	**327.349**	**326.393**	**323.310**	**331.413**
Point	5%	5%	5%	5%	5%	5%	5%	4%	5%	5%	5%	5%	5%	5%	5%
Area/NonPoint	53%	53%	52%	54%	57%	57%	55%	54%	54%	52%	54%	57%	57%	57%	56%
NonRoad	16%	17%	17%	12%	12%	12%	11%	11%	15%	17%	12%	12%	12%	12%	12%
OnRoad	26%	25%	25%	29%	27%	26%	29%	30%	26%	26%	29%	27%	27%	26%	28%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

PM2.5	Saturday	Sunday	Monday	Tuesday	Wednesday	Total	Average
Date	1/16/2010	1/17/2010	1/18/2010	1/19/2010	1/20/2010	Tons/Episode	Tons/Episode Day
Point	11.649	11.623	11.991	11.857	11.850	519.093	11.798
Area/NonPoint	31.982	28.856	31.922	34.520	34.520	1427.378	32.440
NonRoad	2.310	2.350	2.055	2.015	2.015	93.687	2.129
OnRoad	6.324	4.858	6.597	6.134	6.691	333.409	7.577
Total	**52.26**	**47.69**	**52.56**	**54.53**	**55.08**	**2,373.57**	**53.94**
Point	22%	24%	23%	22%	22%	22%	22%
Area/NonPoint	61%	61%	61%	63%	63%	60%	60%
NonRoad	4%	5%	4%	4%	4%	4%	4%
OnRoad	12%	10%	13%	11%	12%	14%	14%
	100%	100%	100%	100%	100%	100%	100%

NOX	Saturday	Sunday	Monday	Tuesday	Wednesday	Total	Average
Date	1/16/2010	1/17/2010	1/18/2010	1/19/2010	1/20/2010	Tons/Episode	Tons/Episode Day
Point	206.437	206.263	212.355	209.320	209.319	9,162.825	208.246
Area/NonPoint	79.505	76.754	79.695	81.371	81.371	3,514.334	79.871
NonRoad	22.442	22.462	20.934	20.914	20.914	943.433	21.442
OnRoad	150.697	119.459	174.952	172.190	179.332	7,720.424	175.464
Total	**459.081**	**424.938**	**487.937**	**483.794**	**490.935**	**21,341.016**	**485.023**
Point	45%	49%	44%	43%	43%	43%	43%
Area/NonPoint	17%	18%	16%	17%	17%	16%	16%
NonRoad	5%	5%	4%	4%	4%	4%	4%
OnRoad	33%	28%	36%	36%	37%	36%	36%
	100%	100%	100%	100%	100%	100%	100%

VOC	Saturday	Sunday	Monday	Tuesday	Wednesday	Total	Average
Date	1/16/2010	1/17/2010	1/18/2010	1/19/2010	1/20/2010	Tons/Episode	Tons/Episode Day
Point	14.506	14.382	15.281	15.360	15.358	654.575	14.877
Area/NonPoint	158.070	140.986	175.515	187.733	187.733	7567.844	171.996
NonRoad	45.561	47.341	40.003	38.223	38.223	1818.582	41.331
OnRoad	75.171	69.817	82.306	77.013	80.769	3947.911	89.725
Total	**293.308**	**272.527**	**313.105**	**318.329**	**322.084**	**13988.912**	**317.930**
Point	5%	5%	5%	5%	5%	5%	5%
Area/NonPoint	54%	52%	56%	59%	58%	54%	54%
NonRoad	16%	17%	13%	12%	12%	13%	13%
OnRoad	26%	26%	26%	24%	25%	28%	28%
	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

NH3	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	12/8/2009	12/9/2009	12/10/2009	12/11/2009	12/12/2009	12/13/2009	12/14/2009	12/15/2009	12/16/2009	12/17/2009	12/18/2009
Point	3.539	3.392	3.390	3.389	3.367	3.366	3.537	3.539	3.392	3.390	3.389
Area/NonPoint	155.798	155.798	155.798	155.798	155.795	155.792	155.796	155.798	155.798	155.798	155.798
NonRoad	0.004	0.004	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.004	0.004
OnRoad	3.208	3.294	3.255	3.356	2.673	1.984	3.244	3.208	3.294	3.255	3.356
Total	**162.549**	**162.488**	**162.447**	**162.547**	**161.841**	**161.147**	**162.581**	**162.549**	**162.488**	**162.447**	**162.547**
Point	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Area/NonPoint	96%	96%	96%	96%	96%	97%	96%	96%	96%	96%	96%
NonRoad	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OnRoad	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%	2%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

SO2	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	12/8/2009	12/9/2009	12/10/2009	12/11/2009	12/12/2009	12/13/2009	12/14/2009	12/15/2009	12/16/2009	12/17/2009	12/18/2009
Point	127.272	127.272	127.270	127.254	127.240	127.216	127.276	127.272	127.272	127.270	127.254
Area/NonPoint	29.410	29.410	29.404	29.400	28.274	27.196	28.708	29.410	29.408	29.399	29.396
NonRoad	0.926	0.926	0.926	0.926	0.972	0.976	0.930	0.926	0.926	0.926	0.926
OnRoad	1.230	1.262	1.253	1.280	1.016	0.790	1.230	1.215	1.243	1.234	1.267
Total	**158.838**	**158.870**	**158.852**	**158.860**	**157.501**	**156.179**	**158.143**	**158.823**	**158.849**	**158.829**	**158.844**
Point	80%	80%	80%	80%	81%	81%	80%	80%	80%	80%	80%
Area/NonPoint	19%	19%	19%	19%	18%	17%	18%	19%	19%	19%	19%
NonRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
OnRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

CO	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	12/8/2009	12/9/2009	12/10/2009	12/11/2009	12/12/2009	12/13/2009	12/14/2009	12/15/2009	12/16/2009	12/17/2009	12/18/2009
Point	68.321	68.282	68.218	68.148	67.040	66.829	68.245	68.321	68.282	68.218	68.148
Area/NonPoint	206.913	206.913	203.804	201.313	197.234	196.719	203.584	206.913	205.975	201.133	199.579
NonRoad	201.973	201.973	201.973	201.973	212.321	214.670	204.322	201.973	201.973	201.973	201.973
OnRoad	1,318.268	1,340.407	1,345.820	1,322.001	909.498	808.626	1,134.730	1,128.370	1,101.308	1,121.506	1,169.188
Total	**1,795.475**	**1,817.575**	**1,819.815**	**1,793.435**	**1,386.093**	**1,286.843**	**1,610.880**	**1,605.577**	**1,577.538**	**1,592.830**	**1,638.888**
Point	4%	4%	4%	4%	5%	5%	4%	4%	4%	4%	4%
Area/NonPoint	12%	11%	11%	11%	14%	15%	13%	13%	13%	13%	12%
NonRoad	11%	11%	11%	11%	15%	17%	13%	13%	13%	13%	12%
OnRoad	73%	74%	74%	74%	66%	63%	70%	70%	70%	70%	71%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

NH3	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Date	12/19/2009	12/20/2009	12/21/2009	12/22/2009	12/23/2009	12/24/2009	12/25/2009	12/26/2009	12/27/2009	12/28/2009	12/29/2009	12/30/2009	12/31/2009
Point	3.367	3.366	3.537	3.539	3.392	3.368	3.366	3.366	3.366	3.537	3.539	3.392	3.390
Area/NonPoint	155.795	155.792	155.796	155.798	155.798	155.794	155.792	155.793	155.792	155.796	155.798	155.798	155.798
NonRoad	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004
OnRoad	2.673	1.984	3.244	3.208	3.294	3.185	2.343	2.731	1.984	3.244	3.207	3.294	3.255
Total	**161.841**	**161.147**	**162.581**	**162.549**	**162.488**	**162.352**	**161.506**	**161.896**	**161.147**	**162.581**	**162.548**	**162.488**	**162.447**
Point	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Area/NonPoint	96%	97%	96%	96%	96%	96%	96%	96%	97%	96%	96%	96%	96%
NonRoad	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OnRoad	2%	1%	2%	2%	2%	2%	1%	2%	1%	2%	2%	2%	2%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

SO2	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Date	12/19/2009	12/20/2009	12/21/2009	12/22/2009	12/23/2009	12/24/2009	12/25/2009	12/26/2009	12/27/2009	12/28/2009	12/29/2009	12/30/2009	12/31/2009
Point	127.240	127.216	127.276	127.272	127.272	127.220	127.216	127.238	127.216	127.276	127.272	127.272	127.270
Area/NonPoint	28.266	27.179	28.690	29.396	29.410	27.640	26.938	27.583	27.181	28.688	29.389	29.389	29.395
NonRoad	0.972	0.976	0.930	0.926	0.926	0.972	0.976	0.976	0.976	0.930	0.926	0.926	0.926
OnRoad	1.019	0.795	1.235	1.218	1.250	1.220	0.939	1.045	0.801	1.245	1.217	1.251	1.239
Total	**157.497**	**156.166**	**158.131**	**158.812**	**158.858**	**157.052**	**156.070**	**156.843**	**156.175**	**158.139**	**158.804**	**158.838**	**158.829**
Point	81%	81%	80%	80%	80%	81%	82%	81%	81%	80%	80%	80%	80%
Area/NonPoint	18%	17%	18%	19%	19%	18%	17%	18%	17%	18%	19%	19%	19%
NonRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
OnRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

CO	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Date	12/19/2009	12/20/2009	12/21/2009	12/22/2009	12/23/2009	12/24/2009	12/25/2009	12/26/2009	12/27/2009	12/28/2009	12/29/2009	12/30/2009	12/31/2009
Point	67.040	66.829	68.245	68.321	68.282	66.931	66.822	66.960	66.829	68.245	68.321	68.282	68.218
Area/NonPoint	193.245	187.348	193.745	199.110	206.913	198.134	194.805	200.153	188.434	192.726	195.188	195.188	198.628
NonRoad	212.321	214.670	204.322	201.973	201.973	212.321	214.670	214.670	214.670	204.322	201.973	201.973	201.973
OnRoad	951.914	865.336	1,195.285	1,169.428	1,195.697	1,222.033	1,127.406	1,057.783	946.999	1,321.635	1,255.028	1,207.365	1,177.005
Total	**1,424.520**	**1,334.183**	**1,661.597**	**1,638.832**	**1,672.865**	**1,699.419**	**1,603.704**	**1,539.567**	**1,416.931**	**1,786.928**	**1,720.511**	**1,672.808**	**1,645.824**
Point	5%	5%	4%	4%	4%	4%	4%	4%	5%	4%	4%	4%	4%
Area/NonPoint	14%	14%	12%	12%	12%	12%	12%	13%	13%	11%	11%	12%	12%
NonRoad	15%	16%	12%	12%	12%	12%	13%	14%	15%	11%	12%	12%	12%
OnRoad	67%	65%	72%	71%	71%	72%	70%	69%	67%	74%	73%	72%	72%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

NH3	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	1/1/2010	1/2/2010	1/3/2010	1/4/2010	1/5/2010	1/6/2010	1/7/2010	1/8/2010	1/9/2010	1/10/2010	1/11/2010	1/12/2010	1/13/2010	1/14/2010	1/15/2010
Point	3.369	3.369	3.368	3.539	3.541	3.394	3.394	3.392	3.370	3.368	3.539	3.541	3.394	3.394	3.392
Area/NonPoint	155.794	155.793	155.792	155.796	155.798	155.798	155.798	155.798	155.795	155.792	155.796	155.798	155.798	155.798	155.798
NonRoad	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.004	0.004
OnRoad	2.204	2.614	1.913	3.018	2.985	3.066	3.030	3.124	2.559	1.913	2.968	2.936	3.066	3.030	3.124
Total	**161.371**	**161.781**	**161.079**	**162.357**	**162.328**	**162.262**	**162.226**	**162.318**	**161.729**	**161.079**	**162.307**	**162.279**	**162.262**	**162.226**	**162.318**
Point	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Area/NonPoint	97%	96%	97%	96%	96%	96%	96%	96%	96%	97%	96%	96%	96%	96%	96%
NonRoad	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OnRoad	1%	2%	1%	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%	2%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

SO2	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	1/1/2010	1/2/2010	1/3/2010	1/4/2010	1/5/2010	1/6/2010	1/7/2010	1/8/2010	1/9/2010	1/10/2010	1/11/2010	1/12/2010	1/13/2010	1/14/2010	1/15/2010
Point	127.585	127.759	127.738	127.884	127.816	127.816	127.816	127.800	127.761	127.738	127.884	127.816	127.816	127.816	127.800
Area/NonPoint	27.640	27.583	27.190	28.694	29.392	29.389	29.396	29.410	28.265	27.175	28.687	29.389	29.394	29.389	29.395
NonRoad	0.972	0.976	0.976	0.930	0.926	0.926	0.926	0.926	0.972	0.976	0.930	0.926	0.926	0.926	0.926
OnRoad	0.923	1.049	0.809	1.216	1.197	1.225	1.224	1.257	1.034	0.810	1.201	1.184	1.227	1.215	1.249
Total	**157.121**	**157.368**	**156.713**	**158.724**	**159.331**	**159.356**	**159.362**	**159.393**	**158.032**	**156.699**	**158.702**	**159.314**	**159.363**	**159.345**	**159.370**
Point	81%	81%	82%	81%	80%	80%	80%	80%	81%	82%	81%	80%	80%	80%	80%
Area/NonPoint	18%	18%	17%	18%	18%	18%	18%	18%	18%	17%	18%	18%	18%	18%	18%
NonRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
OnRoad	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

CO	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Date	1/1/2010	1/2/2010	1/3/2010	1/4/2010	1/5/2010	1/6/2010	1/7/2010	1/8/2010	1/9/2010	1/10/2010	1/11/2010	1/12/2010	1/13/2010	1/14/2010	1/15/2010
Point	67.044	67.171	67.039	68.573	68.528	68.489	68.484	68.393	67.251	67.039	68.573	68.528	68.489	68.484	68.393
Area/NonPoint	198.134	200.153	193.611	195.767	197.074	195.188	199.096	206.913	192.624	184.994	191.859	195.188	198.244	195.188	198.628
NonRoad	212.321	214.670	214.670	204.322	201.973	201.973	201.973	201.973	212.321	214.670	204.322	201.973	201.973	201.973	201.973
OnRoad	1,020.587	995.849	910.739	1,309.666	1,236.067	1,214.861	1,355.338	1,405.162	1,047.377	931.819	1,293.870	1,233.606	1,229.641	1,215.300	1,292.483
Total	**1,498.086**	**1,477.843**	**1,386.058**	**1,778.328**	**1,703.642**	**1,680.511**	**1,824.891**	**1,882.441**	**1,519.574**	**1,398.523**	**1,758.623**	**1,699.296**	**1,698.346**	**1,680.945**	**1,761.477**
Point	4%	5%	5%	4%	4%	4%	4%	4%	4%	5%	4%	4%	4%	4%	4%
Area/NonPoint	13%	14%	14%	11%	12%	12%	11%	11%	13%	13%	11%	11%	12%	12%	11%
NonRoad	14%	15%	15%	11%	12%	12%	11%	11%	14%	15%	12%	12%	12%	12%	11%
OnRoad	68%	67%	66%	74%	73%	72%	74%	75%	69%	67%	74%	73%	72%	72%	73%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/08/2009 - 01/20/2010 (44 days)
Tons/Episode Day

NH3	Saturday	Sunday	Monday	Tuesday	Wednesday	Total	Average
Date	1/16/2010	1/17/2010	1/18/2010	1/19/2010	1/20/2010	Tons/Episode	Tons/Episode Day
Point	3.370	3.368	3.539	3.541	3.394	150.786	3.427
Area/NonPoint	155.795	155.792	155.796	155.798	155.798	6,855.031	155.796
NonRoad	0.005	0.005	0.004	0.004	0.004	0.203	0.005
OnRoad	2.559	1.913	2.968	2.936	3.066	126.756	2.881
Total	**161.729**	**161.079**	**162.307**	**162.279**	**162.262**	**7,132.777**	**162.109**
Point	2%	2%	2%	2%	2%	2%	2%
Area/NonPoint	96%	97%	96%	96%	96%	96%	96%
NonRoad	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OnRoad	2%	1%	2%	2%	2%	2%	2%
	100%	100%	100%	100%	100%	100%	100%

SO2	Saturday	Sunday	Monday	Tuesday	Wednesday	Total	Average
Date	1/16/2010	1/17/2010	1/18/2010	1/19/2010	1/20/2010	Tons/Episode	Tons/Episode Day
Point	127.761	127.738	127.884	127.816	127.816	5,609.987	127.500
Area/NonPoint	28.268	27.177	28.692	29.410	29.410	1,261.899	28.680
NonRoad	0.972	0.976	0.930	0.926	0.926	41.495	0.943
OnRoad	1.033	0.810	1.193	1.176	1.223	49.749	1.131
Total	**158.034**	**156.701**	**158.699**	**159.327**	**159.375**	**6,963.131**	**158.253**
Point	81%	82%	81%	80%	80%	81%	81%
Area/NonPoint	18%	17%	18%	18%	18%	18%	18%
NonRoad	1%	1%	1%	1%	1%	1%	1%
OnRoad	1%	1%	1%	1%	1%	1%	1%
	100%	100%	100%	100%	100%	100%	100%

CO	Saturday	Sunday	Monday	Tuesday	Wednesday	Total	Average
Date	1/16/2010	1/17/2010	1/18/2010	1/19/2010	1/20/2010	Tons/Episode	Tons/Episode Day
Point	67.251	67.039	68.573	68.528	68.489	2,987.731	67.903
Area/NonPoint	194.112	186.013	194.914	206.913	206.913	8,705.222	197.846
NonRoad	212.321	214.670	204.322	201.973	201.973	9,077.265	206.301
OnRoad	1,037.399	929.492	1,173.688	1,115.141	1,175.995	50,516.718	1,148.107
Total	**1,511.083**	**1,397.214**	**1,641.497**	**1,592.555**	**1,653.370**	**71,286.936**	**1,620.158**
Point	4%	5%	4%	4%	4%	4%	4%
Area/NonPoint	13%	13%	12%	13%	13%	12%	12%
NonRoad	14%	15%	12%	13%	12%	13%	13%
OnRoad	69%	67%	72%	70%	71%	71%	71%
	100%	100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Summary by Non-Attainment Area – All Categories
Tons/Average Episode Day

This table shows overall emissions for the entire modeling domain, by inventory sector (area/non-point sources, non-road sources, point sources, and on-road sources) for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas sums the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Summary by NA - All Categories

Tons/Average Episode Day

NA-Area	Category	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Area/NonPoint	0.690	1.986	9.976	10.003	0.574	6.276
	Point	0.001	0.015	0.407	0.000	0.000	0.012
	NonRoad	0.122	1.409	1.840	0.000	0.111	10.274
	OnRoad	1.259	8.276	7.107	0.145	0.084	79.015
	Total	**2.072**	**11.686**	**19.331**	**10.148**	**0.769**	**95.577**
Provo, UT	Area/NonPoint	1.879	5.630	15.539	6.435	0.364	18.060
	Point	0.264	1.013	0.683	0.276	0.025	0.522
	NonRoad	0.277	3.478	2.345	0.000	0.281	20.375
	OnRoad	2.349	30.250	18.665	0.454	0.284	229.518
	Total	**4.768**	**40.371**	**37.232**	**7.165**	**0.954**	**268.475**
Salt Lake City, UT	Area/NonPoint	5.998	27.307	61.715	19.334	1.843	71.633
	Point	4.351	25.651	13.935	0.610	10.330	15.749
	NonRoad	1.017	14.109	12.255	0.000	0.920	121.893
	OnRoad	9.200	126.056	76.335	1.997	1.261	947.549
	Total	**20.567**	**193.124**	**164.240**	**21.941**	**14.353**	**1,156.824**
Surrounding Areas	Area/NonPoint	25.129	53.120	95.484	122.844	26.131	169.334
	Point	7.776	184.842	2.676	2.476	117.357	55.828
	NonRoad	1.877	8.668	63.712	0.004	0.428	203.331
	OnRoad	11.377	67.096	25.945	0.617	0.427	305.469
	Total	**46.159**	**313.725**	**187.817**	**125.941**	**144.343**	**733.963**
	Area/NonPoint	33.696	88.043	182.714	158.616	28.912	265.303
	Point	12.392	211.520	17.701	3.362	127.712	72.111
	NonRoad	3.292	27.664	80.152	0.005	1.740	355.873
	OnRoad	24.185	231.679	128.052	3.213	2.055	1,561.552
		73.566	**558.906**	**408.619**	**165.196**	**160.418**	**2,254.839**
	Logan, UT-ID	2.072	11.686	19.331	10.148	0.769	95.577
	Provo, UT	4.768	40.371	37.232	7.165	0.954	268.475
	Salt Lake City, UT	20.567	193.124	164.240	21.941	14.353	1,156.824
	Surrounding Areas	46.159	313.725	187.817	125.941	144.343	733.963
		73.566	**558.906**	**408.619**	**165.196**	**160.418**	**2,254.839**
	Logan, UT-ID	3%	2%	5%	6%	0%	4%
	Provo, UT	6%	7%	9%	4%	1%	12%
	Salt Lake City, UT	28%	35%	40%	13%	9%	51%
	Surrounding Areas	63%	56%	46%	76%	90%	33%
		100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Summary by Non-Attainment Area – All Categories
Tons/Average Episode Day

This table shows overall emissions for the entire modeling domain, by inventory sector (area/non-point sources, non-road sources, point sources, and on-road sources) for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas sums the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Summary by Non-Attainment Area - All Categories

Tons/Average Episode Day

NA-Area	Category	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Area/NonPoint	0.663	2.051	9.706	10.087	0.594	6.221
	Point	0.001	0.012	0.412	0.000	0.000	0.010
	NonRoad	0.134	1.571	2.131	0.000	0.082	11.596
	OnRoad	1.211	7.377	5.677	0.136	0.058	61.495
	Total	**2.010**	**11.011**	**17.926**	**10.223**	**0.734**	**79.323**
Provo, UT	Area/NonPoint	1.810	5.334	14.755	6.684	0.374	14.401
	Point	0.240	0.784	0.410	0.269	0.022	0.410
	NonRoad	0.340	4.253	2.861	0.000	0.178	26.546
	OnRoad	1.816	26.112	13.593	0.411	0.200	177.552
	Total	**4.206**	**36.482**	**31.619**	**7.364**	**0.774**	**218.910**
Salt Lake City, UT	Area/NonPoint	5.835	27.179	57.622	18.766	1.809	62.234
	Point	4.593	27.422	13.389	0.595	9.908	16.683
	NonRoad	1.141	16.390	12.040	0.000	0.579	146.329
	OnRoad	6.900	104.213	55.112	1.734	0.844	667.908
	Total	**18.470**	**175.204**	**138.163**	**21.094**	**13.140**	**893.154**
Surrounding Areas	Area/NonPoint	24.222	46.509	89.971	122.273	25.681	111.456
	Point	7.503	169.836	2.706	2.470	112.880	54.740
	NonRoad	2.282	7.671	82.745	0.004	0.289	236.511
	OnRoad	9.504	67.481	24.244	0.828	0.496	283.477
	Total	**43.511**	**291.497**	**199.666**	**125.575**	**139.346**	**686.183**
	Area/NonPoint	32.530	81.073	172.054	157.811	28.457	194.313
	Point	12.336	198.054	16.917	3.333	122.811	71.843
	NonRoad	3.899	29.884	99.776	0.005	1.128	420.982
	OnRoad	19.432	205.183	98.626	3.108	1.598	1,190.432
		68.196	**514.194**	**387.373**	**164.257**	**153.993**	**1,877.569**
	Logan, UT-ID	2.010	11.011	17.926	10.223	0.734	79.323
	Provo, UT	4.206	36.482	31.619	7.364	0.774	218.910
	Salt Lake City, UT	18.470	175.204	138.163	21.094	13.140	893.154
	Surrounding Areas	43.511	291.497	199.666	125.575	139.346	686.183
		68.196	**514.194**	**387.373**	**164.257**	**153.993**	**1,877.569**
	Logan, UT-ID	3%	2%	5%	6%	0%	4%
	Provo, UT	6%	7%	8%	4%	1%	12%
	Salt Lake City, UT	27%	34%	36%	13%	9%	48%
	Surrounding Areas	64%	57%	52%	76%	90%	37%
		100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Summary by Non-Attainment Area – All Categories
Tons/Average Episode Day

This table shows overall emissions for the entire modeling domain, by inventory sector (area/non-point sources, non-road sources, point sources, and on-road sources) for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas sums the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Summary by Non-Attainment Area - All Categories

Tons/Average Episode Day

NA-Area	Category	PM2_5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Area/NonPoint	0.589	1.897	8.900	9.158	0.581	5.720
	Point	0.001	0.013	0.387	0.000	0.000	0.010
	NonRoad	0.080	0.799	1.200	0.000	0.077	5.470
	OnRoad	0.650	5.962	4.972	0.113	0.033	55.862
	Total	**1.320**	**8.671**	**15.458**	**9.271**	**0.692**	**67.062**
Provo, UT	Area/NonPoint	1.714	5.406	15.767	6.697	0.353	17.900
	Point	0.252	0.788	0.193	0.288	0.021	0.407
	NonRoad	0.033	0.686	0.287	0.000	0.122	1.956
	OnRoad	0.708	22.847	12.191	0.381	0.134	163.281
	Total	**2.708**	**29.727**	**28.438**	**7.365**	**0.630**	**183.543**
Salt Lake City, UT	Area/NonPoint	5.492	27.378	56.179	18.444	1.834	49.499
	Point	3.728	21.937	11.635	0.624	9.568	11.808
	NonRoad	0.456	6.311	6.557	0.000	0.390	36.722
	OnRoad	2.763	89.580	51.151	1.620	0.556	664.100
	Total	**12.439**	**145.207**	**125.521**	**20.688**	**12.348**	**762.129**
Surrounding Areas	Area/NonPoint	24.645	45.189	91.150	121.498	25.912	124.727
	Point	7.816	185.509	2.663	2.515	117.910	55.678
	NonRoad	1.561	13.645	33.288	0.004	0.353	162.154
	OnRoad	6.924	57.076	21.412	0.767	0.408	264.864
	Total	**40.946**	**301.418**	**148.513**	**124.784**	**144.583**	**607.423**
	Logan, UT-ID	1.320	8.671	15.458	9.271	0.692	67.062
	Provo, UT	2.708	29.727	28.438	7.365	0.630	183.543
	Salt Lake City, UT	12.439	145.207	125.521	20.688	12.348	762.129
	Surrounding Areas	40.946	301.418	148.513	124.784	144.583	607.423
		57.412	485.023	317.930	162.109	158.253	1,620.158
	Logan, UT-ID	2%	2%	5%	6%	0%	4%
	Provo, UT	5%	6%	9%	5%	0%	11%
	Salt Lake City, UT	22%	30%	39%	13%	8%	47%
	Surrounding Areas	71%	62%	47%	77%	91%	37%
		100%	100%	100%	100%	100%	100%

Inventory Preparation Plan
Table 4
Area In Modeling Domain

County	Total Sq. Km.	Area in Domain	% in Domain
Bannock (Idaho)	2973	2303	77
Bear Lake (Idaho)	2719	2719	100
Bingham (Idaho)	5485	67	1
Blaine (Idaho)	6871	550	8
Box Elder			100
Cache			100
Carbon	3844	2460.16	64
Caribou (Idaho)	4666	3105	67
Cassia (Idaho)	6669	6208	93
Davis			100
Duchesne	8405	4706.8	56
Emery	11546	2193.74	19
Franklin (Idaho)	1731	1731	100
Jerome (Idaho)	1557	534	34
Juab			100
Lincoln (Idaho)	3120	527	17
Lincoln (Wyoming)			
Minidoka (Idaho)	1982	1199	61
Millard	17708	4604	26
Morgan			100
Oneida (Idaho)	3110	3110	100
Power (Idaho)	3730	3171	85
Rich			100
Salt Lake			100
Sanpete	4147	2654.08	64
Sublette (Wyoming)			
Summit	4867	4331.63	89
Tooele			100
Twin Falls (Idaho)	4995	75	2
Uinta (Wyoming)			
Utah			100
Wasatch			100
Weber			100

Inventory Preparation Plan
Table 5
Population In Domain

County	State	County Total Population	County Population inside Domain
Bannock	Idaho	74,377	36,316
Bear Lake	Idaho	5,714	5,714
Bingham	Idaho	39,710	206
Blaine	Idaho	17,501	26
Box Elder	Utah	48,712	48,712
Cache	Utah	111,841	111,841
Carbon	Utah	19,841	17,431
Caribou	Idaho	6328	6,294
Cassia	Idaho	19,459	19,127
Davis	Utah	301,915	301,915
Duchesne	Utah	16,765	7,106
Emery	Utah	10,610	6,187
Franklin	Idaho	10,424	10,424
Jerome	Idaho	17,491	1,643
Juab	Utah	10,039	10,039
Lincoln	Idaho	3,490	84
Lincoln	Wyoming	14,053	10,399
Minidoka	Idaho	19,982	19,982
Millard	Utah	13,550	6,355
Morgan	Utah	9,645	9,645
Oneida	Idaho	3,499	3,499
Power	Idaho	6,652	6,168
Rich	Utah	2,278	2,278
Salt Lake	Utah	1,030,519	1,030,519
Sanpete	Utah	26,960	21,645
Sublette	Wyoming	5,887	1,472
Summit	Utah	39,951	37,063
Tooele	Utah	58,214	58,214
Twin Falls	Idaho	62,625	294
Uinta	Wyoming	20,304	18,274
Uintah	Utah	30,446	30,446
Utah	Utah	519,632	519,632
Wasatch	Utah	22,845	22,845
Weber	Utah	224,536	224,536

Seasonal Adjustment Codes and Profiles
for Area Source and Non-Road Mobile Source Categories

Description	Month Codes	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
late summer	**16**	0%	0%	0%	0%	4%	15%	20%	20%	20%	15%	6%	0%
all year	**21**	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
construction	**29**	4%	4%	4%	8%	12%	12%	12%	12%	12%	8%	4%	4%
	32	9%	7%	9%	7%	7%	8%	8%	8%	10%	10%	8%	9%
	33	6%	6%	7%	7%	7%	10%	11%	11%	9%	10%	7%	8%
3 season	**34**	0%	0%	0%	8%	17%	17%	17%	17%	17%	8%	0%	0%
spring	**43**	0%	0%	21%	29%	29%	21%	0%	0%	0%	0%	0%	0%
summer emphasis	**44**	0%	0%	0%	0%	0%	21%	29%	29%	21%	0%	0%	0%
ag NH3	**48**	6%	6%	6%	7%	10%	13%	15%	13%	9%	6%	4%	4%
all year, winter emphasis	**469**	12%	12%	8%	8%	8%	5%	5%	5%	8%	8%	8%	12%
winter emphasis, no summer	**485**	16%	16%	10%	10%	5%	0%	0%	0%	5%	10%	12%	16%
no winter	**508**	0%	0%	0%	11%	21%	32%	21%	11%	5%	0%	0%	0%

Description	Day of Week Codes	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
not quite even	**8**	15%	15%	15%	15%	15%	14%	13%
even	**105**	14%	14%	14%	14%	14%	14%	14%
week emphasis	**407**	15%	15%	15%	15%	15%	13%	10%
6 day	**1867**	17%	17%	17%	17%	17%	17%	0%
5 day	**1915**	20%	20%	20%	20%	20%	0%	0%

Description	Hours per day Codes	1	2	3	4	5	6	7	8	9	10	11	12
default day	**10**	2	2	2	2	2	7	7	7	5	5	5	5
off road	**11**	2%	2%	2%	2%	2%	6%	6%	6%	6%	6%	6%	9%
1.02	**12**	2%	2%	2%	2%	2%	5%	6%	6%	6%	5%	5%	9%
1	**26**	2%	2%	2%	2%	2%	2%	3%	4%	5%	5%	6%	6%
24/7	**1864**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
business	**1871**	0%	0%	0%	0%	0%	0%	7%	7%	7%	7%	7%	7%
1	**1874**	2%	2%	2%	2%	2%	2%	2%	7%	7%	7%	7%	7%
1	**1922**	2%	1%	1%	1%	1%	2%	5%	9%	6%	5%	5%	5%
1	**1928**	0%	0%	0%	0%	0%	7%	7%	7%	7%	7%	7%	7%
1	**601**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
1	**600**	5%	5%	5%	5%	5%	5%	5%	5%	5%	3%	3%	3%
1	**99**	2%	2%	2%	2%	3%	5%	7%	7%	7%	5%	3%	3%
home heat	**30**	2%	2%	2%	2%	2%	6%	6%	6%	6%	4%	4%	4%
8 to 5	**40**	0%	0%	0%	0%	0%	0%	8%	8%	8%	8%	9%	8%

Description	Hours per day	13	14	15	16	17	18	19	20	21	22	23	24
default day	**10**	5	5	9	9	9	2	2	2	2	2	2	2
off road	**11**	9%	9%	6%	6%	6%	2%	2%	2%	2%	2%	2%	2%
1.02	**12**	9%	9%	6%	6%	6%	2%	2%	2%	2%	2%	2%	2%
1	**26**	6%	6%	6%	6%	6%	5%	5%	5%	4%	3%	3%	2%
24/7	**1864**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
business	**1871**	7%	7%	7%	7%	7%	7%	7%	7%	0%	0%	0%	0%
1	**1874**	7%	7%	7%	7%	7%	7%	2%	2%	2%	2%	2%	2%
1	**1922**	5%	5%	5%	7%	9%	8%	5%	4%	3%	2%	3%	2%
1	**1928**	7%	7%	7%	7%	7%	7%	7%	7%	0%	0%	0%	0%
1	**601**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
1	**600**	3%	3%	3%	3%	3%	5%	5%	5%	5%	5%	5%	5%
1	**99**	3%	3%	3%	5%	7%	7%	7%	5%	3%	2%	2%	2%
home heat	**30**	4%	4%	4%	4%	4%	6%	8%	8%	8%	4%	2%	2%
8 to 5	**40**	9%	9%	9%	8%	8%	8%	0%	0%	0%	0%	0%	0%

Episodic $PM_{2.5}$ SIP Point Source Inventory

The $PM_{2.5}$ SIP requires a point source inventory for episodes and projections. Episodic inventories are used to verify that the air quality model is working properly by replicating concentrations that were measured during the corresponding episode. The modeling analysis that supports this SIP evaluated four such episodes. The days selected included January 11, 2007 through January 21, 2007; February 14, 2008 through February 19, 2008; January 13, 2009 through January 24, 2009; and December 8, 2009 through January 21, 2010. For further information on how the specific days were determined, refer to the Representative Time Periods portion of this document.

As with all inventories collected for this analysis, the pollutants of concern included PM_{10}, $PM_{2.5}$, SO_2, NO_X, VOC, CO, and NH_3 and the unit of measurement was tons per year (tpy).

Source Selection:

Industrial point sources are one of the fundamental pieces of this inventory. As of the outset of this project the 2008 tri-annual inventory was the latest and most current inventory available for point sources. This included all major sources, Title V sources, and any sources included in the PM_{10} or ozone maintenance plans.

For the SIP base-year inventory, UDAQ and IDEQ used the definition of a major source under Title V of the Clean Air Act (as specified in 40 CFR 51.20) to define the thresholds for reporting actual emissions. These thresholds are the potential to emit annual emissions of 100 tons for all relevant criteria air pollutants except CO, for which it is 1000 tons. The 2008 periodic, three-year inventory was used to make this assessment. Emissions from sources under the above thresholds will be included in the area source base-year inventory.

It was determined that according to the above definition, 51 major sources were contained within the prescribed modeling domain, with an additional seven major sources in Idaho portion of the domain. The table in Section 2.b.iii.A of the TSD lists the 51 major sources in Utah along with their annual emissions for PM_{10}, $PM_{2.5}$, SO_2, NO_X, VOC, CO and NH_3. It should be noted that Proctor & Gamble had not yet completed construction of their facility and therefore had no emissions for 2008.

Representative Time Periods:

As indicated above, four distinct episodes of elevated $PM_{2.5}$ concentrations from 2007, 2008, 2009, and 2009-2010 were used in the modeling analysis. A representative inventory was developed for each period by projecting the 2008 inventory back to the 2007 episode and forward to the 2009 and 2009-2010 episodes using economic data from the Bureau of Economic Analysis (BEA), and the Governor's Office of Planning and

Budget (GOPB). The data from the BEA and the GOPB along with a description of how the projections and episode inventories were developed may be found in Appendix 1.

The 2008 inventory was reported and compiled in terms of tons per year (tpy). Since the $PM_{2.5}$ SIP is designed to protect the 24-hour standard, the model (CMAQ) evaluates emissions on an hourly basis. It uses a pre-processor called SMOKE in order to convert the annual inventory to a 24-hour basis (explained in further detail below.)

Because the model is evaluating the buildup of $PM_{2.5}$ concentrations over the span of multi-day episodes, an inventory worksheet was developed for each episode day. The entry for each of these days will generally be the same, although there are exceptions (see below.) This stands in contrast to the mobile source portion of the inventory wherein differences between weekdays and weekends (among other factors) will result in daily variations.

It was initially determined that three episodes would be included in the modeling analysis. These episodes included January 11, 2007 through January 21, 2007, February 14, 2008 through February 19, 2008, and January 13, 2009 through January 24, 2009. A questionnaire was sent to each of the Utah major point sources to determine if the operation of their facilities was different during these episodes when compared to normal operations during 2008. It was then determined by EPA that an additional episode comprising December 8, 2009 through January 21, 2010 needed to be included in the modeling analysis. An additional questionnaire was then sent to each of the Utah major point sources to determine if the operation of their facilities was different during this particular episode when compared to normal operations during 2008. Table 3 lists the sources that did not report any changes in production during any of the episodes. In the cases where operations were different, changes were made to the actual annual inventory emissions in order to replicate the way the sources operated during the episode days. This was done by determining the average percent change (+/-) in production reported by the source during the given episode and adjusting the annual emissions accordingly. Table 4 lists the sources that reported production changes for any of the episodes along with the average percent change for each. Questionnaires were also used by Utah sources to report any breakdown/excess emissions that occurred during any of the episodes. In cases where breakdown/excess emissions were reported, changes were made to the annual inventory emissions. This was done by adjusting any reported breakdown/excess emissions to annual values and then adding them to the annual emissions accordingly. Table 5 lists the sources that reported breakdown/excess emissions along with the pollutants reported for each episode. Copies of both form questionnaire letters may be found in Appendix 2. Episode production change calculations along with breakdown/excess emissions adjustments may also be found in Appendix 2. Questionnaire and workbook responses from each source are maintained at UDAQ and are available for inspection upon request.

Major sources located in the Idaho portion of the modeling domain were not resurveyed, as none fall directly within the Logan UT-ID $PM_{2.5}$ nonattainment area boundaries. These

facilities were "maxed-out" to their permitted limits to the Source Classification Code level for the projection years.

Data Collection and QA/QC

The 2008 point source inventory data was collected in electronic and hard copy form during the spring of 2009. Data collected electronically was uploaded via an electronic upload program into the UDAQ TEMPO database. Summary data for hard copy inventories were entered by hand into the database by UDAQ inventory staff.

UDAQ has constructed Microsoft Excel inventory workbooks for most of the larger point sources. These workbooks provide a better interface with sources, a more thorough quality assurance/quality control (QA/QC), and allow for seamless upload to our database. Construction of these workbooks required a very careful evaluation of the emissions calculations and their representativeness of each particular facility. After receiving completed workbooks from the sources they were individually inspected and updated to reflect any necessary changes requested by the sources before being uploaded into the database. UDAQ utilized inventory workbooks for 48 of the 51 major point sources contained in the prescribed modeling domain to collect the 2008 annual emissions inventory. The only exceptions were Geneva Rock Products (Point of the Mountain Facility), Hill Air Force Base (Main Base), and Proctor & Gamble. Workbooks have not been completed for Geneva Rock Products (Point of the Mountain Facility) and Hill Air Force Base (Main Base). Proctor & Gamble had not yet begun operations at their site and therefore had not yet submitted an annual emissions inventory. It was estimated that these 48 inventory workbooks encompass approximately 99% of the total calculations for Utah's 2008 major point source SIP emissions inventory thereby greatly surpassing EPA guidance requiring 10% QA/QC as the minimum criteria necessary for a SIP inventory QA/QC check. Electronic versions of the 48 major point source emissions inventory workbooks along with hard copy submittals from Geneva Rock Products (Point of the Mountain Facility), and Hill Air Force Base (Main Base) are maintained at UDAQ and are available for inspection upon request.

Idaho 2008 point source data was gathered between January and April of 2009. It was collected through direct survey using a Web application called the Point Source Survey Tool (POSST) to meet all Air Emissions Reporting Requirements (40 CFR Part 51). The data was quality assured in part by POSST as data entry took place and the remainder manually so that 100% of the data fields were reviewed and corrected as necessary. Idaho DEQ provided the data to UDAQ for joint modeling in Excel tables.

The SMOKE Emissions Model and Processor

The emissions processing model takes the annual, county wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory that, in the end, produces a refined version of the inventory. These include temporal processing, spatial processing, and speciation.

Temporal processing converts emissions from annual to daily and hourly values. Spatial processing locates emissions from the county to specific grid cells within the modeling domain. Speciation breaks PM_{10} and VOC emissions into their component subspecies.

The emissions processing for air quality modeling is done with sets of activity profiles based on various Source Classification Codes (SCCs) and associated cross reference files developed using source provided temporal data. This feature essentially establishes the level of detail required of the point source inventories, wherein each "source component" has with it an associated SCC. These SCCs and the cross reference files are created for area sources and mobile sources, too.

Once developed, these activity profiles serve to establish the temporal allocation of emissions within the model (e.g. 8-hour workdays), and also determine the speciation of $PM_{2.5}$ and VOC emissions.

In the case of spatial processing, the emissions from large industrial sources are placed in the location of the source itself. As with area and mobile sources, the emissions from the smaller point sources are spatially distributed using various surrogates like population density.

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Point Emissions Summary by Non-Attainment Area
Tons/Average Episode Day

This table shows point source emissions for each of the point sources in the modeling domain. Units are in tons per average episode day, and are reported for each pollutant of interest. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment would include all point sources within the county. In actuality, the nonattainment area includes only a portion of Utah County. Point sources listed within the box labeled Surrounding Areas are located in counties belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. All of these sources are located within the modeling domain. All annual point source emissions were temporally adjusted within the SMOKE pre-processor. For Episode 3, the annual totals used were generally compiled as an average of 2009 and 2010. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Point Emissions by NA

Tons/Average Episode Day

NA Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Utah	Cache	0.001	0.015	0.407	0.000	0.000	0.012
		Total	**0.001**	**0.015**	**0.407**	**0.000**	**0.000**	**0.012**
Provo, UT	Utah	Utah	0.264	1.013	0.683	0.276	0.025	0.522
		Total	**0.264**	**1.013**	**0.683**	**0.276**	**0.025**	**0.522**
Salt Lake City, UT	Utah	Box Elder	0.235	1.210	0.480	0.013	0.175	2.679
	Utah	Davis	0.338	3.152	9.389	0.406	2.675	2.114
	Utah	Salt Lake	2.849	16.650	2.814	0.172	7.163	7.562
	Utah	Tooele	0.773	3.218	1.213	0.010	0.287	2.915
	Utah	Weber	0.156	1.421	0.039	0.008	0.029	0.479
		Total	**4.351**	**25.651**	**13.935**	**0.610**	**10.330**	**15.749**
Surrounding Areas	Idaho	Bannock	0.037	2.930	0.024	0.019	0.117	3.300
	Idaho	Bear Lake	0.031	3.430	0.097	0.000	0.000	0.519
	Idaho	Caribou	1.460	7.400	0.014	0.000	5.150	25.132
	Idaho	Cassia	0.000	0.000	0.501	0.000	0.000	0.000
	Idaho	Minidoka	0.556	3.040	0.285	1.490	1.110	6.040
	Idaho	Power	0.585	0.204	0.004	0.294	4.170	0.105
	Utah	Carbon	0.309	10.300	0.055	0.001	15.700	0.459
	Utah	Duchesne	0.006	1.104	0.512	0.000	0.000	0.119
	Utah	Emery	1.150	29.500	0.266	0.003	9.770	2.220
	Utah	Juab	0.233	0.546	0.062	0.268	0.018	0.277
	Utah	Millard	0.725	82.224	0.446	0.276	16.605	12.658
	Utah	Morgan	0.083	3.030	0.123	0.010	0.692	2.610
	Utah	Summit	0.030	0.640	0.014	0.000	0.425	0.049
	Utah	Wasatch	0.001	0.094	0.008	0.000	0.000	0.071
	Wyoming	Lincoln	2.570	40.400	0.264	0.116	63.600	2.270
		Total	**7.776**	**184.842**	**2.676**	**2.476**	**117.357**	**55.828**
		Logan, UT-ID	0.001	0.015	0.407	0.000	0.000	0.012
		Provo, UT	0.264	1.013	0.683	0.276	0.025	0.522
		Salt Lake City, UT	4.351	25.651	13.935	0.610	10.330	15.749
		Surrounding Areas	7.776	184.842	2.676	2.476	117.357	55.828
			12.392	**211.520**	**17.701**	**3.362**	**127.712**	**72.111**
		Logan, UT-ID	0%	0%	2%	0%	0%	0%
		Provo, UT	2%	0%	4%	8%	0%	1%
		Salt Lake City, UT	35%	12%	79%	18%	8%	22%
		Surrounding Areas	63%	87%	15%	74%	92%	77%
			100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Point Emissions Summary by Non-Attainment Area
Tons/Average Episode Day

This table shows point source emissions for each of the point sources in the modeling domain. Units are in tons per average episode day, and are reported for each pollutant of interest. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment would include all point sources within the county. In actuality, the nonattainment area includes only a portion of Utah County. Point sources listed within the box labeled Surrounding Areas are located in counties belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. All of these sources are located within the modeling domain. All annual point source emissions were temporally adjusted within the SMOKE pre-processor. For Episode 3, the annual totals used were generally compiled as an average of 2009 and 2010. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Point Emissions by Non-Attainment Area

Tons/Average Episode Day

NA Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Utah	Cache	0.001	0.012	0.412	0.000	0.000	0.010
		Total	**0.001**	**0.012**	**0.412**	**0.000**	**0.000**	**0.010**
Provo, UT	Utah	Utah	0.240	0.784	0.410	0.269	0.022	0.410
		Total	**0.240**	**0.784**	**0.410**	**0.269**	**0.022**	**0.410**
Salt Lake City, UT	Utah	Box Elder	0.245	1.261	0.526	0.014	0.199	3.104
	Utah	Davis	0.303	2.710	8.580	0.395	2.364	1.798
	Utah	Salt Lake	3.086	18.795	2.987	0.168	7.029	8.295
	Utah	Tooele	0.802	3.262	1.258	0.010	0.286	3.016
	Utah	Weber	0.156	1.394	0.038	0.007	0.029	0.470
		Total	**4.593**	**27.422**	**13.389**	**0.595**	**9.908**	**16.683**
Surrounding Areas	Idaho	Bannock	0.037	2.930	0.024	0.019	0.117	3.300
	Idaho	Bear Lake	0.031	3.430	0.097	0.000	0.000	0.519
	Idaho	Caribou	1.460	7.400	0.014	0.000	5.150	25.132
	Idaho	Cassia	0.000	0.000	0.501	0.000	0.000	0.000
	Idaho	Minidoka	0.556	3.040	0.285	1.490	1.110	6.040
	Idaho	Power	0.585	0.204	0.004	0.294	4.170	0.105
	Utah	Carbon	0.307	9.922	0.053	0.001	15.200	0.445
	Utah	Duchesne	0.007	1.338	0.604	0.000	0.000	0.139
	Utah	Emery	0.943	23.400	0.212	0.002	7.760	1.770
	Utah	Juab	0.222	0.526	0.059	0.255	0.017	0.266
	Utah	Millard	0.678	73.836	0.451	0.283	14.805	12.198
	Utah	Morgan	0.078	2.850	0.116	0.009	0.651	2.450
	Utah	Summit	0.028	0.472	0.013	0.000	0.300	0.042
	Utah	Wasatch	0.001	0.088	0.008	0.000	0.000	0.064
	Wyoming	Lincoln	2.570	40.400	0.264	0.116	63.600	2.270
		Total	**7.503**	**169.836**	**2.706**	**2.470**	**112.880**	**54.740**
		Logan, UT-ID	0.001	0.012	0.412	0.000	0.000	0.010
		Provo, UT	0.240	0.784	0.410	0.269	0.022	0.410
		Salt Lake City, UT	4.593	27.422	13.389	0.595	9.908	16.683
		Surrounding Areas	7.503	169.836	2.706	2.470	112.880	54.740
			12.336	**198.054**	**16.917**	**3.333**	**122.811**	**71.843**
		Logan, UT-ID	0%	0%	2%	0%	0%	0%
		Provo, UT	2%	0%	2%	8%	0%	1%
		Salt Lake City, UT	37%	14%	79%	18%	8%	23%
		Surrounding Areas	61%	86%	16%	74%	92%	76%
			100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Point Emissions Summary by Non-Attainment Area
Tons/Average Episode Day

This table shows point source emissions for each of the point sources in the modeling domain. Units are in tons per average episode day, and are reported for each pollutant of interest. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment would include all point sources within the county. In actuality, the nonattainment area includes only a portion of Utah County. Point sources listed within the box labeled Surrounding Areas are located in counties belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. All of these sources are located within the modeling domain. All annual point source emissions were temporally adjusted within the SMOKE pre-processor. For Episode 3, the annual totals used were generally compiled as an average of 2009 and 2010. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Point Emissions Summary by Non-Attainment Area

Tons/Average Episode Day

NA Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Utah	Cache	0.001	0.013	0.387	0.000	0.000	0.010
		Total	**0.001**	**0.013**	**0.387**	**0.000**	**0.000**	**0.010**
Provo, UT	Utah	Utah	0.252	0.788	0.193	0.288	0.021	0.407
		Total	**0.252**	**0.788**	**0.193**	**0.288**	**0.021**	**0.407**
Salt Lake City, UT	Utah	Box Elder	0.204	1.022	0.412	0.012	0.142	2.157
	Utah	Davis	0.319	2.729	7.887	0.421	2.606	1.837
	Utah	Salt Lake	2.374	13.674	2.158	0.177	6.537	4.906
	Utah	Tooele	0.687	3.165	1.141	0.007	0.257	2.457
	Utah	Weber	0.144	1.346	0.036	0.007	0.028	0.451
		Total	**3.728**	**21.937**	**11.635**	**0.624**	**9.568**	**11.808**
Surrounding Areas	Idaho	Bannock	0.036	2.929	0.024	0.019	0.117	3.300
	Idaho	Bear Lake	0.031	3.435	0.097	0.000	0.000	0.519
	Idaho	Caribou	1.464	7.402	0.014	0.000	5.142	25.130
	Idaho	Cassia	0.000	0.000	0.501	0.000	0.000	0.000
	Idaho	Minidoka	0.556	3.042	0.285	1.491	1.114	6.037
	Idaho	Power	0.585	0.204	0.004	0.294	4.171	0.105
	Utah	Carbon	0.318	10.553	0.057	0.001	16.164	0.473
	Utah	Duchesne	0.007	1.459	0.502	0.000	0.000	0.146
	Utah	Emery	1.142	29.576	0.265	0.003	9.856	2.216
	Utah	Juab	0.264	0.622	0.070	0.303	0.020	0.315
	Utah	Millard	0.733	82.221	0.431	0.278	16.654	12.397
	Utah	Morgan	0.085	3.078	0.125	0.010	0.704	2.652
	Utah	Summit	0.026	0.508	0.013	0.000	0.326	0.044
	Utah	Wasatch	0.001	0.106	0.010	0.000	0.000	0.078
	Wyoming	Lincoln	2.568	40.374	0.264	0.116	63.641	2.265
		Total	**7.816**	**185.509**	**2.663**	**2.515**	**117.910**	**55.678**
		Logan, UT-ID	0.001	0.013	0.387	0.000	0.000	0.010
		Provo, UT	0.252	0.788	0.193	0.288	0.021	0.407
		Salt Lake City, UT	3.728	21.937	11.635	0.624	9.568	11.808
		Surrounding Areas	7.816	185.509	2.663	2.515	117.910	55.678
			11.798	**208.246**	**14.877**	**3.427**	**127.500**	**67.903**
		Logan, UT-ID	0.0%	0.0%	3%	0.0%	0.0%	0.0%
		Provo, UT	2%	0.4%	1%	8%	0%	1%
		Salt Lake City, UT	32%	11%	78%	18%	8%	17%
		Surrounding Areas	66%	89%	18%	73%	92%	82%
			100%	100%	100%	100%	100%	100%

Area Source Episodic Inventories

AREA SOURCE OVERVIEW

This section of the Technical Support Documentation (TSD) gives information describing how the Area Inventory is developed.

Area Sources are small sources that do not qualify as point sources under the relevant emissions cutoffs. Area sources encompass more widespread sources that may be abundant, but that, individually, release small amounts of a given pollutant. These are sources for which emissions are estimated as a group rather than individually. Examples typically include dry cleaners, residential wood heating, auto body painting, and consumer solvent use. Area sources generally are not required to submit individual emissions estimates.

The main distinction between point and area sources is the methodology used to estimate emissions. Point sources are inventoried individually, and area sources are inventoried collectively.

The term "process" is used here to name an operation or activity that produces emissions. Area sources include broad groups of processes such as:

1. Commercial and consumer solvent usage;
2. Stationary fuel combustion;
3. Material storage and distribution;
4. Waste treatment and disposal;
5. Miscellaneous industrial manufacturing operations;
6. Miscellaneous sources (agricultural/forest burning, structure fires, mining construction, for example); and
7. Fuel distribution.

Each of these broad groups of processes contains a number of more specific groups or categories that share similar emission processes and emission estimation methods. The "Inventory Preparation Plan" included under section 1.b of the Table of Contents provides additional information on what is included in the area source inventory.

This section includes individual reports for the categories included in the Area Source Inventory. Summary tables for years 2007, 2008, 2009, and 2010 of the area source modeling **output** data are included under 2.c.ii of the Table of Contents.

Activity data is used to calculate area source categories. This data includes population, employment, VMT, fuel usage, animal, crop, and other estimates. A list of the individual data tables and sources of the data used in the calculation processes is included under 2.c.iii (1).doc. The Episodic Activity Data Workbook which contains the activity data by county is available electronically from UDAQ upon request.

An individual report for each category showing emission factors, activity data, and describing equations is included under 2.c iv (1).doc. An Annual Episodic Excel Workbooks are available upon request for each episode year. These workbooks, in conjunction with the data spreadsheets, are where the calculations occur for each category. They contain summary tables showing the area source categories and individual pollutant emissions by county.

Included in the Annual Episodic Excel Workbooks are emissions for January 2009 and December 2009. This is included because in April of 2009 petroleum companies and gas stations in certain counties were required to begin using Stage 1 in the gasoline process. Because there were potential episodes in the beginning of 2009 and the end of 2009, summary tables for January 2009 without Stage 1 in some counties and December 2009 with Stage 1 in the additional counties were developed.

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area/Nonpoint Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of area / non-point source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all area / non-point source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by NA

Tons/Average Episode Day

NA-Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.148	0.547	3.346	4.670	0.414	1.213
	Utah	Cache	0.542	1.439	6.630	5.334	0.159	5.063
		Total	**0.690**	**1.986**	**9.976**	**10.003**	**0.574**	**6.276**
Provo, UT	Utah	Utah	1.879	5.630	15.539	6.435	0.364	18.060
		Total	**1.879**	**5.630**	**15.539**	**6.435**	**0.364**	**18.060**
Salt Lake City, UT	Utah	Box Elder	0.470	3.246	4.537	7.976	0.275	3.266
	Utah	Davis	0.890	3.874	7.990	1.636	0.148	7.254
	Utah	Salt Lake	3.144	13.633	37.657	4.325	0.823	45.754
	Utah	Tooele	0.486	2.583	3.009	2.834	0.385	4.655
	Utah	Weber	1.007	3.971	8.521	2.562	0.212	10.704
		Total	**5.998**	**27.307**	**61.715**	**19.334**	**1.843**	**71.633**
Surrounding Areas	Idaho	Bannock	0.980	3.398	5.331	2.199	5.536	11.728
	Idaho	Bear Lake	0.088	0.831	1.811	1.766	0.296	0.821
	Idaho	Bingham	0.777	1.988	6.618	7.485	2.151	4.799
	Idaho	Blaine	13.745	13.298	6.821	1.269	3.694	23.716
	Idaho	Caribou	0.112	0.735	1.670	1.644	0.473	0.789
	Idaho	Cassia	0.347	0.741	11.805	19.490	1.234	2.616
	Idaho	Jerome	0.306	0.687	10.447	19.934	0.912	2.089
	Idaho	Lincoln	0.060	0.611	2.849	6.719	0.205	0.538
	Idaho	Minidoka	0.319	0.783	3.066	4.461	0.886	2.070
	Idaho	Oneida	0.053	0.235	1.254	1.327	0.214	0.534
	Idaho	Power	0.132	0.715	1.902	1.828	0.472	1.114
	Idaho	Twin Falls	0.930	2.589	10.963	16.543	5.524	11.255
	Utah	Carbon	0.138	1.796	1.147	1.179	0.198	1.494
	Utah	Duchesne	1.021	0.276	3.396	4.509	0.060	8.703
	Utah	Emery	0.290	0.869	1.418	2.335	0.147	2.315
	Utah	Juab	0.272	1.387	1.744	3.240	0.329	3.323
	Utah	Millard	0.429	2.303	3.152	7.568	0.372	3.395
	Utah	Morgan	0.129	1.139	0.683	0.845	0.091	1.672
	Utah	Rich	0.143	0.056	0.977	2.663	0.039	1.210
	Utah	Sanpete	0.542	0.447	3.403	8.810	0.363	4.131
	Utah	Summit	0.538	2.508	2.556	2.300	0.180	3.333
	Utah	Wasatch	0.300	0.438	1.320	0.962	0.027	4.320
	Wyoming	Lincoln	1.526	4.243	3.477	1.392	1.260	11.425
	Wyoming	Sublette	0.954	0.236	1.716	1.122	0.245	6.138
	Wyoming	Uinta	0.875	4.540	2.003	1.023	1.057	3.995
		Total	**25.006**	**46.849**	**91.531**	**122.613**	**25.966**	**117.521**
		Logan, UT-ID	0.690	1.986	9.976	10.003	0.574	6.276
		Provo, UT	1.879	5.630	15.539	6.435	0.364	18.060
		Salt Lake City, UT	5.998	27.307	61.715	19.334	1.843	71.633
		Surrounding Areas	25.006	46.849	91.531	122.613	25.966	117.521
			33.573	**81.773**	**178.761**	**158.385**	**28.746**	**213.491**
		Logan, UT-ID	2%	2%	6%	6%	2%	3%
		Provo, UT	6%	7%	9%	4%	1%	8%
		Salt Lake City, UT	18%	33%	35%	12%	6%	34%
		Surrounding Areas	74%	57%	51%	77%	90%	55%
			100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area/Nonpoint Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of area / non-point source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all area / non-point source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.148	0.545	3.332	4.670	0.410	1.207
	Utah	Cache	0.515	1.506	6.375	5.418	0.183	5.014
		Total	**0.663**	**2.051**	**9.706**	**10.087**	**0.594**	**6.221**
Provo, UT	Utah	Utah	1.810	5.334	14.755	6.684	0.374	14.401
		Total	**1.810**	**5.334**	**14.755**	**6.684**	**0.374**	**14.401**
Salt Lake City, UT	Utah	Box Elder	0.447	3.277	4.622	8.146	0.281	3.061
	Utah	Davis	0.863	4.003	7.527	1.495	0.152	6.174
	Utah	Salt Lake	3.070	13.247	34.594	4.074	0.741	39.102
	Utah	Tooele	0.461	2.544	2.782	2.479	0.414	3.943
	Utah	Weber	0.995	4.109	8.096	2.572	0.219	9.954
		Total	**5.835**	**27.179**	**57.622**	**18.766**	**1.809**	**62.234**
Surrounding Areas	Idaho	Bannock	0.977	3.381	5.230	2.199	5.468	11.631
	Idaho	Bear Lake	0.088	0.830	1.806	1.766	0.293	0.816
	Idaho	Bingham	0.776	1.982	6.577	7.485	2.130	4.769
	Idaho	Blaine	13.228	12.831	6.612	1.269	3.626	22.954
	Idaho	Caribou	0.112	0.734	1.662	1.644	0.471	0.785
	Idaho	Cassia	0.346	0.737	11.774	19.490	1.221	2.597
	Idaho	Jerome	0.305	0.684	10.409	19.934	0.904	2.077
	Idaho	Lincoln	0.060	0.611	2.846	6.719	0.203	0.536
	Idaho	Minidoka	0.319	0.780	3.047	4.461	0.877	2.058
	Idaho	Oneida	0.053	0.234	1.251	1.327	0.211	0.531
	Idaho	Power	0.132	0.714	1.894	1.828	0.469	1.109
	Idaho	Twin Falls	0.927	2.570	10.854	16.542	5.459	11.162
	Utah	Carbon	0.133	1.800	1.100	1.144	0.163	1.243
	Utah	Duchesne	0.977	0.274	3.032	3.594	0.053	8.017
	Utah	Emery	0.275	0.860	1.410	2.468	0.111	2.248
	Utah	Juab	0.262	1.407	1.627	3.088	0.359	2.556
	Utah	Millard	0.412	2.310	3.037	7.468	0.378	3.020
	Utah	Morgan	0.127	1.152	0.684	0.988	0.091	1.497
	Utah	Rich	0.140	0.059	1.082	3.160	0.045	1.031
	Utah	Sanpete	0.527	0.486	3.267	8.589	0.383	3.906
	Utah	Summit	0.521	2.621	2.475	2.475	0.183	3.252
	Utah	Wasatch	0.291	0.452	1.310	1.098	0.028	3.069
	Wyoming	Lincoln	1.469	4.234	3.383	1.392	1.257	10.960
	Wyoming	Sublette	0.927	0.232	1.669	1.122	0.244	5.927
	Wyoming	Uinta	0.838	4.533	1.932	1.023	1.051	3.704
		Total	**24.222**	**46.509**	**89.971**	**122.273**	**25.681**	**111.456**
		Logan, UT-ID	0.663	2.051	9.706	10.087	0.594	6.221
		Provo, UT	1.810	5.334	14.755	6.684	0.374	14.401
		Salt Lake City, UT	5.835	27.179	57.622	18.766	1.809	62.234
		Surrounding Areas	24.222	46.509	89.971	122.273	25.681	111.456
			32.530	**81.073**	**172.054**	**157.811**	**28.457**	**194.313**
		Logan, UT-ID	2%	3%	6%	6%	2%	3%
		Provo, UT	6%	7%	9%	4%	1%	7%
		Salt Lake City, UT	18%	34%	33%	12%	6%	32%
		Surrounding Areas	74%	57%	52%	77%	90%	57%
			100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area/Nonpoint Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of area / non-point source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all area / non-point source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area/NonPoint Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.148	0.546	3.334	4.670	0.412	1.209
	Utah	Cache	0.441	1.351	5.566	4.488	0.169	4.511
		Total	**0.589**	**1.897**	**8.900**	**9.158**	**0.581**	**5.720**
Provo, UT	Utah	Utah	1.714	5.406	15.767	6.697	0.353	17.900
		Total	**1.714**	**5.406**	**15.767**	**6.697**	**0.353**	**17.900**
Salt Lake City, UT	Utah	Box Elder	0.441	2.976	3.896	7.376	0.260	3.645
	Utah	Davis	0.804	4.527	7.674	1.579	0.175	5.735
	Utah	Salt Lake	2.898	13.068	34.232	4.164	0.752	26.575
	Utah	Tooele	0.488	2.497	2.266	2.638	0.416	4.547
	Utah	Weber	0.860	4.311	8.111	2.687	0.230	8.996
		Total	**5.492**	**27.378**	**56.179**	**18.444**	**1.834**	**49.499**
Surrounding Areas	Idaho	Bannock	0.978	3.386	5.249	2.199	5.490	11.662
	Idaho	Bear Lake	0.088	0.830	1.807	1.766	0.294	0.817
	Idaho	Bingham	0.776	1.984	6.584	7.485	2.137	4.779
	Idaho	Blaine	13.329	12.923	6.652	1.269	3.643	23.109
	Idaho	Caribou	0.112	0.735	1.664	1.644	0.471	0.786
	Idaho	Cassia	0.346	0.739	11.780	19.490	1.226	2.603
	Idaho	Jerome	0.305	0.685	10.417	19.934	0.907	2.081
	Idaho	Lincoln	0.060	0.611	2.846	6.719	0.204	0.536
	Idaho	Minidoka	0.319	0.781	3.050	4.461	0.880	2.062
	Idaho	Oneida	0.053	0.235	1.251	1.327	0.212	0.532
	Idaho	Power	0.132	0.714	1.895	1.828	0.470	1.110
	Idaho	Twin Falls	0.928	2.576	10.874	16.542	5.480	11.192
	Utah	Carbon	0.128	1.318	1.106	1.177	0.185	1.475
	Utah	Duchesne	1.083	0.300	3.185	3.393	0.072	9.166
	Utah	Emery	0.302	0.813	1.483	2.473	0.165	2.492
	Utah	Juab	0.273	1.268	1.670	3.006	0.368	3.578
	Utah	Millard	0.432	1.852	3.139	7.382	0.386	3.947
	Utah	Morgan	0.125	1.007	0.715	0.986	0.082	1.426
	Utah	Rich	0.155	0.071	1.112	3.036	0.047	1.664
	Utah	Sanpete	0.579	0.521	3.354	8.402	0.442	4.422
	Utah	Summit	0.506	2.388	2.559	2.347	0.169	3.544
	Utah	Wasatch	0.308	0.443	1.604	1.096	0.026	10.443
	Wyoming	Lincoln	1.511	4.238	3.457	1.392	1.259	11.272
	Wyoming	Sublette	0.950	0.234	1.709	1.122	0.245	6.098
	Wyoming	Uinta	0.868	4.536	1.987	1.023	1.053	3.929
		Total	**24.645**	**45.189**	**91.150**	**121.498**	**25.912**	**124.727**
		Logan, UT-ID	0.589	1.897	8.900	9.158	0.581	5.720
		Provo, UT	1.714	5.406	15.767	6.697	0.353	17.900
		Salt Lake City, UT	5.492	27.378	56.179	18.444	1.834	49.499
		Surrounding Areas	24.645	45.189	91.150	121.498	25.912	124.727
			32.440	79.871	171.996	155.796	28.680	197.846
		Logan, UT-ID	2%	2%	5%	6%	2%	3%
		Provo, UT	5%	7%	9%	4%	1%	9%
		Salt Lake City, UT	17%	34%	33%	12%	6%	25%
		Surrounding Areas	76%	57%	53%	78%	90%	63%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Logan, UT-ID	Agriculture - Crops & Livestock Dust	0.008	1%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Agriculture - Livestock Waste	0.010	1%	0.000	0%	4.060	41%	9.700	97%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.012	0%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.134	19%	0.000	0%	0.019	0%	0.000	0%	0.000	0%	0.056	1%
	Dust - Construction Dust	0.065	9%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Biomass	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.008	1%	0.045	2%	0.000	0%	0.000	0%	0.258	45%	0.369	6%
	Fuel Comb - Comm/Institutional - Natural Gas	0.032	5%	0.453	23%	0.023	0%	0.002	0%	0.002	0%	0.350	6%
	Fuel Comb - Comm/Institutional - Oil	0.004	1%	0.050	3%	0.001	0%	0.001	0%	0.080	14%	0.008	0%
	Fuel Comb - Comm/Institutional - Other	0.003	0%	0.033	2%	0.002	0%	0.000	0%	0.000	0%	0.027	0%
	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	0.001	0%	0.045	2%	0.001	0%	0.001	0%	0.000	0%	0.014	0%
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.005	1%	0.040	2%	0.000	0%	0.001	0%	0.122	21%	0.004	0%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.000	0%	0.002	0%	0.000	0%	0.000	0%	0.000	0%	0.001	0%
	Fuel Comb - Residential - Natural Gas	0.003	0%	0.613	31%	0.036	0%	0.130	1%	0.004	1%	0.261	4%
	Fuel Comb - Residential - Oil	0.003	0%	0.026	1%	0.001	0%	0.002	0%	0.068	12%	0.007	0%
	Fuel Comb - Residential - Other	0.001	0%	0.043	2%	0.002	0%	0.000	0%	0.001	0%	0.018	0%
	Fuel Comb - Residential - Wood	0.370	54%	0.035	2%	0.630	6%	0.000	0%	0.006	1%	2.897	46%
	Gas Stations	0.000	0%	0.000	0%	0.714	7%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Chemical Manuf	0.000	0%	0.000	0%	0.000	0%	0.007	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.019	3%	0.000	0%	0.052	1%	0.001	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.001	0%	FALSE	0%	0.008	0%	0.086	1%	0.000	0%	0.075	1%
	Mobile - Aircraft	0.000	0%	0.013	1%	0.224	2%	0.000	0%	0.005	1%	2.023	32%
	Mobile - Locomotives	0.018	3%	0.583	29%	0.032	0%	0.000	0%	0.028	5%	0.091	1%
	Mobile - Non-Road Equipment - Diesel	0.000	0%	0.001	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.001	0%	0.001	0%	0.000	0%	0.000	0%	0.056	1%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	1.082	11%	0.007	0%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	0.420	4%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.094	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	1.548	16%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	0.972	10%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.008	1%	0.000	0%	0.041	0%	0.063	1%	0.000	0%	0.019	0%
		0.690	**100%**	**1.985**	**100%**	**9.976**	**100%**	**10.003**	**100%**	**0.574**	**100%**	**6.276**	**100%**
Provo, UT	Agriculture - Livestock Waste	0.013	1%	0.000	0%	1.209	8%	5.151	80%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.090	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.614	33%	0.000	0%	0.090	1%	0.000	0%	0.000	0%	0.255	1%
	Dust - Construction Dust	0.269	14%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.003	0%	0.011	0%	0.000	0%	0.000	0%	0.031	9%	0.005	0%
	Fuel Comb - Comm/Institutional - Natural Gas	0.064	3%	0.841	15%	0.046	0%	0.004	0%	0.005	1%	0.707	4%
	Fuel Comb - Comm/Institutional - Oil	0.004	0%	0.051	1%	0.001	0%	0.001	0%	0.069	19%	0.007	0%
	Fuel Comb - Comm/Institutional - Other	0.005	0%	0.059	1%	0.003	0%	0.000	0%	0.000	0%	0.050	0%
	Fuel Comb - Residential - Natural Gas	0.011	1%	2.357	42%	0.138	1%	0.502	8%	0.015	4%	1.003	6%
	Fuel Comb - Residential - Oil	0.003	0%	0.026	0%	0.001	0%	0.002	0%	0.061	17%	0.007	0%
	Fuel Comb - Residential - Other	0.000	0%	0.065	1%	0.003	0%	0.000	0%	0.002	1%	0.039	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Provo, UT	Fuel Comb - Residential - Wood	0.587	31%	0.056	1%	1.069	7%	0.000	0%	0.009	2%	4.791	27%
	Gas Stations	0.000	0%	0.000	0%	0.320	2%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.212	11%	0.000	0%	0.240	2%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.000	0%	0.004	0%	0.030	0%	0.395	6%	0.000	0%	0.230	1%
	Mobile - Aircraft	0.000	0%	0.024	0%	0.327	2%	0.000	0%	0.011	3%	9.386	52%
	Mobile - Locomotives	0.060	3%	2.124	38%	0.106	1%	0.000	0%	0.160	44%	0.293	2%
	Mobile - Non-Road Equipment - Diesel	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.004	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.001	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.011	0%	0.030	0%	0.000	0%	0.000	0%	1.283	7%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	4.285	28%	0.034	1%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	0.518	3%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.154	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	4.703	30%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	1.886	12%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.036	2%	0.000	0%	0.288	2%	0.345	5%	0.000	0%	0.000	0%
		1.879	**100%**	**5.630**	**100%**	**15.539**	**100%**	**6.435**	**100%**	**0.364**	**100%**	**18.060**	**100%**
Salt Lake City, UT	Agriculture - Livestock Waste	0.031	1%	0.000	0%	3.236	5%	14.626	76%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.326	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	2.008	33%	0.000	0%	0.293	0%	0.000	0%	0.000	0%	0.835	1%
	Dust - Construction Dust	0.845	14%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.004	0%	0.018	0%	0.000	0%	0.000	0%	0.049	3%	0.008	0%
	Fuel Comb - Comm/Institutional - Natural Gas	0.211	4%	2.774	10%	0.153	0%	0.014	0%	0.017	1%	2.330	3%
	Fuel Comb - Comm/Institutional - Oil	0.011	0%	0.163	1%	0.003	0%	0.004	0%	0.223	12%	0.023	0%
	Fuel Comb - Comm/Institutional - Other	0.012	0%	0.157	1%	0.009	0%	0.000	0%	0.001	0%	0.132	0%
	Fuel Comb - Residential - Natural Gas	0.046	1%	10.115	37%	0.592	1%	2.152	11%	0.065	4%	4.304	6%
	Fuel Comb - Residential - Oil	0.008	0%	0.082	0%	0.003	0%	0.006	0%	0.196	11%	0.023	0%
	Fuel Comb - Residential - Other	0.001	0%	0.171	1%	0.008	0%	0.000	0%	0.004	0%	0.080	0%
	Fuel Comb - Residential - Wood	1.859	31%	0.178	1%	3.386	5%	0.000	0%	0.027	1%	15.168	21%
	Gas Stations	0.000	0%	0.000	0%	2.381	4%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.461	8%	0.000	0%	0.786	1%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.001	0%	0.044	0%	0.134	0%	1.293	7%	0.004	0%	0.897	1%
	Mobile - Aircraft	0.084	1%	3.283	12%	4.650	8%	0.000	0%	0.446	24%	45.303	63%
	Mobile - Locomotives	0.298	5%	10.105	37%	0.537	1%	0.000	0%	0.797	43%	1.493	2%
	Mobile - Non-Road Equipment - Diesel	0.014	0%	0.195	1%	0.037	0%	0.000	0%	0.014	1%	0.354	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.005	0%	0.004	0%	0.000	0%	0.000	0%	0.112	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.017	0%	0.014	0%	0.000	0%	0.000	0%	0.569	1%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	14.027	23%	0.112	1%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	2.871	5%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	1.591	3%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	12.698	21%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	12.777	21%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.104	2%	0.000	0%	1.200	2%	1.127	6%	0.000	0%	0.000	0%
		5.998	**100%**	**27.307**	**100%**	**61.715**	**100%**	**19.334**	**100%**	**1.843**	**100%**	**71.633**	**100%**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Surrounding Areas	Agriculture - Crops & Livestock Dust	0.588	2%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Agriculture - Fertilizer Application	0.000	0%	0.000	0%	0.000	0%	0.102	0%	0.000	0%	0.000	0%
	Agriculture - Livestock Waste	0.067	0%	0.000	0%	52.102	57%	119.801	98%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.511	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.253	1%	0.000	0%	0.037	0%	0.000	0%	0.000	0%	0.105	0%
	Dust - Construction Dust	0.549	2%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Biomass	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.501	2%	2.847	6%	0.007	0%	0.003	0%	15.599	60%	21.554	18%
	Fuel Comb - Comm/Institutional - Natural Gas	0.058	0%	1.894	4%	0.040	0%	0.004	0%	0.005	0%	0.664	1%
	Fuel Comb - Comm/Institutional - Oil	0.048	0%	0.472	1%	0.010	0%	0.014	0%	1.038	4%	0.090	0%
	Fuel Comb - Comm/Institutional - Other	0.013	0%	0.182	0%	0.008	0%	0.000	0%	0.001	0%	0.124	0%
	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	0.048	0%	1.886	4%	0.042	0%	0.024	0%	0.005	0%	0.636	1%
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.227	1%	2.163	5%	0.013	0%	0.050	0%	6.013	23%	0.314	0%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.007	0%	0.091	0%	0.000	0%	0.000	0%	0.009	0%	0.051	0%
	Fuel Comb - Residential - Natural Gas	0.006	0%	2.439	5%	0.143	0%	0.492	0%	0.015	0%	1.038	1%
	Fuel Comb - Residential - Oil	0.025	0%	0.238	1%	0.009	0%	0.015	0%	0.711	3%	0.066	0%
	Fuel Comb - Residential - Other	0.049	0%	0.478	1%	0.077	0%	0.003	0%	0.187	1%	1.982	2%
	Fuel Comb - Residential - Wood	6.525	26%	0.611	1%	10.588	12%	0.013	0%	0.104	0%	49.413	42%
	Gas Stations	0.000	0%	0.000	0%	3.399	4%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Chemical Manuf	0.000	0%	0.000	0%	0.085	0%	0.082	0%	0.000	0%	0.000	0%
	Industrial Processes - Mining	0.859	3%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.050	0%	0.000	0%	0.080	0%	1.579	1%	0.000	0%	0.000	0%
	Industrial Processes - Non-ferrous Metals	0.000	0%	0.000	0%	0.000	0%	0.004	0%	0.000	0%	0.000	0%
	Industrial Processes - Oil & Gas Production	0.000	0%	0.000	0%	0.060	0%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Storage and Transfer	0.000	0%	0.000	0%	0.099	0%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.802	3%	0.173	0%	2.149	2%	0.274	0%	0.077	0%	9.362	8%
	Mobile - Aircraft	13.461	54%	11.936	25%	5.040	6%	0.000	0%	0.926	4%	23.479	20%
	Mobile - Locomotives	0.607	2%	21.317	46%	1.102	1%	0.004	0%	1.270	5%	2.839	2%
	Mobile - Non-Road Equipment - Diesel	0.001	0%	0.015	0%	0.008	0%	0.000	0%	0.000	0%	0.330	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.004	0%	0.000	0%	0.000	0%	0.000	0%	0.005	0%
	Mobile - Non-Road Equipment - Other	0.001	0%	0.024	0%	0.118	0%	0.000	0%	0.000	0%	2.590	2%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	5.525	6%	0.011	0%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	5.383	6%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.557	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	0.385	0%	0.001	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	3.329	4%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.261	1%	0.081	0%	0.627	1%	0.135	0%	0.005	0%	2.880	2%
		25.006	**100%**	**46.849**	**100%**	**91.531**	**100%**	**122.613**	**100%**	**25.966**	**100%**	**117.521**	**100%**

	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	0.690	1.985	9.976	10.003	0.574	6.276
Provo, UT	1.879	5.630	15.539	6.435	0.364	18.060
Salt Lake City, UT	5.998	27.307	61.715	19.334	1.843	71.633
Surrounding Areas	25.006	46.849	91.531	122.613	25.966	117.521
	33.573	**81.772**	**178.761**	**158.385**	**28.746**	**213.491**

	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	2%	2%	6%	6%	2%	3%
Provo, UT	6%	7%	9%	4%	1%	8%
Salt Lake City, UT	18%	33%	35%	12%	6%	34%
Surrounding Areas	74%	57%	51%	77%	90%	55%
	100%	100%	100%	100%	100%	100%

2.c.ii.B.II.1 - 3

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area/Nonpoint Sources by Sector by Non-Attainment Area
Tons/Average Episode Day

This table shows area source and non-point source emissions, by generalized groupings of source categories, for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of counties totals approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Logan, UT-ID	Agriculture - Crops & Livestock Dust	0.008	1%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Agriculture - Livestock Waste	0.012	2%	0.000	0%	4.079	42%	9.766	97%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.013	0%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.137	21%	0.000	0%	0.020	0%	0.000	0%	0.000	0%	0.057	1%
	Dust - Construction Dust	0.040	6%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Biomass	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.008	1%	0.044	2%	0.000	0%	0.000	0%	0.253	43%	0.363	6%
	Fuel Comb - Comm/Institutional - Natural Gas	0.031	5%	0.441	22%	0.022	0%	0.002	0%	0.002	0%	0.341	5%
	Fuel Comb - Comm/Institutional - Oil	0.004	1%	0.064	3%	0.001	0%	0.001	0%	0.090	15%	0.009	0%
	Fuel Comb - Comm/Institutional - Other	0.002	0%	0.031	1%	0.002	0%	0.000	0%	0.000	0%	0.025	0%
	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	0.001	0%	0.045	2%	0.001	0%	0.001	0%	0.000	0%	0.014	0%
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.005	1%	0.040	2%	0.000	0%	0.001	0%	0.122	21%	0.004	0%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.000	0%	0.002	0%	0.000	0%	0.000	0%	0.000	0%	0.001	0%
	Fuel Comb - Residential - Natural Gas	0.003	0%	0.676	33%	0.040	0%	0.144	1%	0.004	1%	0.287	5%
	Fuel Comb - Residential - Oil	0.003	0%	0.032	2%	0.001	0%	0.002	0%	0.082	14%	0.009	0%
	Fuel Comb - Residential - Other	0.001	0%	0.042	2%	0.002	0%	0.000	0%	0.001	0%	0.017	0%
	Fuel Comb - Residential - Wood	0.357	54%	0.034	2%	0.607	6%	0.000	0%	0.006	1%	2.793	45%
	Gas Stations	0.000	0%	0.000	0%	0.656	7%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Chemical Manuf	0.000	0%	0.000	0%	0.000	0%	0.007	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.022	3%	0.000	0%	0.054	1%	0.001	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.001	0%	0.001	0%	0.009	0%	0.088	1%	0.000	0%	0.077	1%
	Mobile - Aircraft	0.003	0%	0.013	1%	0.236	2%	0.000	0%	0.005	1%	2.113	34%
	Mobile - Locomotives	0.018	3%	0.583	28%	0.032	0%	0.000	0%	0.028	5%	0.091	1%
	Mobile - Non-Road Equipment - Diesel	0.000	0%	0.001	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	1.093	11%	0.008	0%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	0.407	4%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.088	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	1.321	14%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	0.939	10%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.008	1%	0.000	0%	0.084	1%	0.065	1%	0.000	0%	0.019	0%
	Total	**0.663**	**100%**	**2.051**	**100%**	**9.706**	**100%**	**10.087**	**100%**	**0.594**	**100%**	**6.221**	**100%**
Provo, UT	Agriculture - Livestock Waste	0.015	1%	0.000	0%	1.259	9%	5.332	80%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.099	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.636	35%	0.000	0%	0.093	1%	0.000	0%	0.000	0%	0.265	2%
	Dust - Construction Dust	0.220	12%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.001	0%	0.007	0%	0.000	0%	0.000	0%	0.018	5%	0.003	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Provo, UT	Fuel Comb - Comm/Institutional - Natural Gas	0.027	1%	0.356	7%	0.020	0%	0.002	0%	0.002	1%	0.299	2%
	Fuel Comb - Comm/Institutional - Oil	0.004	0%	0.065	1%	0.001	0%	0.001	0%	0.081	22%	0.009	0%
	Fuel Comb - Comm/Institutional - Other	0.004	0%	0.055	1%	0.003	0%	0.000	0%	0.000	0%	0.046	0%
	Fuel Comb - Residential - Natural Gas	0.012	1%	2.555	48%	0.149	1%	0.544	8%	0.016	4%	1.087	8%
	Fuel Comb - Residential - Oil	0.003	0%	0.032	1%	0.001	0%	0.002	0%	0.077	21%	0.009	0%
	Fuel Comb - Residential - Other	0.000	0%	0.063	1%	0.003	0%	0.000	0%	0.001	0%	0.030	0%
	Fuel Comb - Residential - Wood	0.559	31%	0.054	1%	1.019	7%	0.000	0%	0.008	2%	4.565	32%
	Gas Stations	0.000	0%	0.000	0%	0.315	2%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.228	13%	0.000	0%	0.249	2%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.000	0%	0.004	0%	0.031	0%	0.410	6%	0.000	0%	0.217	2%
	Mobile - Aircraft	0.002	0%	0.019	0%	0.270	2%	0.000	0%	0.009	2%	7.580	53%
	Mobile - Locomotives	0.060	3%	2.124	40%	0.106	1%	0.000	0%	0.160	43%	0.293	2%
	Mobile - Non-Road Equipment - Diesel	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	4.398	30%	0.036	1%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	0.433	3%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.142	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	4.052	27%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	1.843	12%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.037	2%	0.000	0%	0.268	2%	0.358	5%	0.000	0%	0.000	0%
	Total	**1.810**	**100%**	**5.334**	**100%**	**14.755**	**100%**	**6.684**	**100%**	**0.374**	**100%**	**14.401**	**100%**
Salt Lake City, UT	Agriculture - Livestock Waste	0.031	1%	0.000	0%	3.066	5%	13.830	74%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.352	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	2.038	35%	0.000	0%	0.297	1%	0.000	0%	0.000	0%	0.847	1%
	Dust - Construction Dust	0.704	12%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.002	0%	0.010	0%	0.000	0%	0.000	0%	0.029	2%	0.005	0%
	Fuel Comb - Comm/Institutional - Natural Gas	0.159	3%	2.090	8%	0.115	0%	0.010	0%	0.013	1%	1.756	3%
	Fuel Comb - Comm/Institutional - Oil	0.014	0%	0.211	1%	0.004	0%	0.004	0%	0.260	14%	0.028	0%
	Fuel Comb - Comm/Institutional - Other	0.011	0%	0.144	1%	0.008	0%	0.000	0%	0.001	0%	0.121	0%
	Fuel Comb - Residential - Natural Gas	0.050	1%	11.024	41%	0.645	1%	2.346	12%	0.070	4%	4.691	8%
	Fuel Comb - Residential - Oil	0.010	0%	0.104	0%	0.004	0%	0.006	0%	0.249	14%	0.029	0%
	Fuel Comb - Residential - Other	0.001	0%	0.165	1%	0.007	0%	0.000	0%	0.002	0%	0.066	0%
	Fuel Comb - Residential - Wood	1.771	30%	0.170	1%	3.227	6%	0.000	0%	0.026	1%	14.454	23%
	Gas Stations	0.000	0%	0.000	0%	2.244	4%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.543	9%	0.000	0%	0.798	1%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.001	0%	0.039	0%	0.128	0%	1.312	7%	0.004	0%	0.827	1%
	Mobile - Aircraft	0.077	1%	2.815	10%	3.873	7%	0.000	0%	0.352	19%	37.591	60%
	Mobile - Locomotives	0.298	5%	10.105	37%	0.537	1%	0.000	0%	0.797	44%	1.493	2%
	Mobile - Non-Road Equipment - Diesel	0.019	0%	0.290	1%	0.022	0%	0.000	0%	0.007	0%	0.127	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.004	0%	0.004	0%	0.000	0%	0.000	0%	0.169	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.005	0%	0.001	0%	0.000	0%	0.000	0%	0.030	0%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	14.097	24%	0.114	1%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	2.834	5%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	1.434	2%	0.000	0%	0.000	0%	0.000	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Salt Lake City, UT	Solvent - Graphic Arts	0.000	0%	0.000	0%	10.698	19%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	12.133	21%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.105	2%	0.000	0%	1.095	2%	1.143	6%	0.000	0%	0.000	0%
	Total	**5.835**	**100%**	**27.179**	**100%**	**57.622**	**100%**	**18.766**	**100%**	**1.809**	**100%**	**62.234**	**100%**
Surrounding Areas	Agriculture - Crops & Livestock Dust	0.588	2%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Agriculture - Fertilizer Application	0.000	0%	0.000	0%	0.000	0%	0.102	0%	0.000	0%	0.000	0%
	Agriculture - Livestock Waste	0.065	0%	0.000	0%	52.021	58%	119.411	98%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.512	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.259	1%	0.000	0%	0.038	0%	0.000	0%	0.000	0%	0.108	0%
	Dust - Construction Dust	0.541	2%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Biomass	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.482	2%	2.753	6%	0.006	0%	0.003	0%	15.224	59%	21.209	19%
	Fuel Comb - Comm/Institutional - Natural Gas	0.057	0%	1.866	4%	0.040	0%	0.004	0%	0.005	0%	0.654	1%
	Fuel Comb - Comm/Institutional - Oil	0.051	0%	0.547	1%	0.012	0%	0.015	0%	1.088	4%	0.096	0%
	Fuel Comb - Comm/Institutional - Other	0.012	0%	0.171	0%	0.007	0%	0.000	0%	0.001	0%	0.115	0%
	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	0.048	0%	1.886	4%	0.042	0%	0.024	0%	0.005	0%	0.636	1%
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.227	1%	2.163	5%	0.013	0%	0.050	0%	6.013	23%	0.314	0%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.007	0%	0.091	0%	0.000	0%	0.000	0%	0.009	0%	0.051	0%
	Fuel Comb - Residential - Natural Gas	0.007	0%	2.642	6%	0.155	0%	0.535	0%	0.017	0%	1.124	1%
	Fuel Comb - Residential - Oil	0.028	0%	0.274	1%	0.011	0%	0.015	0%	0.797	3%	0.076	0%
	Fuel Comb - Residential - Other	0.047	0%	0.471	1%	0.073	0%	0.002	0%	0.178	1%	1.887	2%
	Fuel Comb - Residential - Wood	6.289	26%	0.589	1%	10.171	11%	0.013	0%	0.101	0%	47.544	43%
	Gas Stations	0.000	0%	0.000	0%	3.191	4%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Chemical Manuf	0.000	0%	0.000	0%	0.085	0%	0.082	0%	0.000	0%	0.000	0%
	Industrial Processes - Mining	0.859	4%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.061	0%	0.000	0%	0.083	0%	1.579	1%	0.000	0%	0.000	0%
	Industrial Processes - Non-ferrous Metals	0.000	0%	0.000	0%	0.000	0%	0.004	0%	0.000	0%	0.000	0%
	Industrial Processes - Oil & Gas Production	0.000	0%	0.000	0%	0.060	0%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Storage and Transfer	0.000	0%	0.000	0%	0.099	0%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.802	3%	0.173	0%	2.149	2%	0.278	0%	0.077	0%	9.363	8%
	Mobile - Aircraft	12.947	53%	11.480	25%	4.872	5%	0.000	0%	0.891	3%	22.791	20%
	Mobile - Locomotives	0.607	3%	21.317	46%	1.102	1%	0.004	0%	1.270	5%	2.839	3%
	Mobile - Non-Road Equipment - Diesel	0.001	0%	0.012	0%	0.001	0%	0.000	0%	0.000	0%	0.005	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.003	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.001	0%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	5.473	6%	0.012	0%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	5.176	6%	0.000	0%	0.000	0%	0.000	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Surrounding Areas	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.533	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	0.336	0%	0.001	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	3.171	4%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.237	1%	0.074	0%	0.542	1%	0.138	0%	0.005	0%	2.640	2%
	Total	**24.222**	**100%**	**46.509**	**100%**	**89.971**	**100%**	**122.273**	**100%**	**25.681**	**100%**	**111.456**	**100%**
	Logan, UT-ID	0.663		2.051		9.706		10.087		0.594		6.221	
	Provo, UT	1.810		5.334		14.755		6.684		0.374		14.401	
	Salt Lake City, UT	5.835		27.179		57.622		18.766		1.809		62.234	
	Surrounding Areas	24.222		46.509		89.971		122.273		25.681		111.456	
		32.530		**81.073**		**172.054**		**157.811**		**28.457**		**194.313**	
	Logan, UT-ID	2%		3%		6%		6%		2%		3%	
	Provo, UT	6%		7%		9%		4%		1%		7%	
	Salt Lake City, UT	18%		34%		33%		12%		6%		32%	
	Surrounding Areas	74%		57%		52%		77%		90%		57%	
		100%		100%		100%		100%		100%		100%	

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area/Nonpoint Sources by Sector by Non-Attainment Area
Tons/Average Episode Day

This table shows area source and non-point source emissions, by generalized groupings of source categories, for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of counties totals approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Logan, UT-ID	Agriculture - Crops & Livestock Dust	0.008	1%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Agriculture - Livestock Waste	0.011	2%	0.000	0%	3.838	43%	8.826	96%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.023	0%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.142	24%	0.000	0%	0.021	0%	0.000	0%	0.000	0%	0.059	1%
	Dust - Construction Dust	0.031	5%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Biomass	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.008	1%	0.045	2%	0.000	0%	0.000	0%	0.256	44%	0.365	6%
	Fuel Comb - Comm/Institutional - Natural Gas	0.032	5%	0.460	24%	0.023	0%	0.002	0%	0.003	0%	0.356	6%
	Fuel Comb - Comm/Institutional - Oil	0.004	1%	0.064	3%	0.001	0%	0.001	0%	0.091	16%	0.009	0%
	Fuel Comb - Comm/Institutional - Other	0.002	0%	0.031	2%	0.002	0%	0.000	0%	0.000	0%	0.025	0%
	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	0.001	0%	0.045	2%	0.001	0%	0.001	0%	0.000	0%	0.014	0%
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.005	1%	0.040	2%	0.000	0%	0.001	0%	0.122	21%	0.004	0%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.000	0%	0.002	0%	0.000	0%	0.000	0%	0.000	0%	0.001	0%
	Fuel Comb - Residential - Natural Gas	0.003	1%	0.699	37%	0.041	0%	0.149	2%	0.004	1%	0.298	5%
	Fuel Comb - Residential - Oil	0.003	1%	0.032	2%	0.001	0%	0.002	0%	0.082	14%	0.009	0%
	Fuel Comb - Residential - Other	0.001	0%	0.042	2%	0.002	0%	0.000	0%	0.001	0%	0.018	0%
	Fuel Comb - Residential - Wood	0.289	49%	0.027	1%	0.483	5%	0.000	0%	0.005	1%	2.236	39%
	Gas Stations	0.000	0%	0.000	0%	0.086	1%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Chemical Manuf	0.000	0%	0.000	0%	0.000	0%	0.007	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.026	4%	0.000	0%	0.056	1%	0.001	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.001	0%	0.001	0%	0.009	0%	0.091	1%	0.000	0%	0.078	1%
	Mobile - Aircraft	0.002	0%	0.013	1%	0.195	2%	0.000	0%	0.005	1%	2.021	35%
	Mobile - Locomotives	0.011	2%	0.388	20%	0.021	0%	0.000	0%	0.013	2%	0.062	1%
	Mobile - Non-Road Equipment - Diesel	0.000	0%	0.001	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.004	0%	0.005	0%	0.000	0%	0.000	0%	0.144	3%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	1.128	13%	0.008	0%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	0.394	4%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.090	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	1.505	17%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	0.921	10%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.008	1%	0.000	0%	0.055	1%	0.067	1%	0.000	0%	0.019	0%
	Total	**0.589**	**100%**	**1.897**	**100%**	**8.900**	**100%**	**9.158**	**100%**	**0.581**	**100%**	**5.720**	**100%**
Provo, UT	Agriculture - Livestock Waste	0.014	1%	0.000	0%	1.235	8%	5.271	79%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.093	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.669	39%	0.000	0%	0.098	1%	0.000	0%	0.000	0%	0.278	2%
	Dust - Construction Dust	0.097	6%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.003	0%	0.014	0%	0.000	0%	0.000	0%	0.039	11%	0.006	0%
	Fuel Comb - Comm/Institutional - Natural Gas	0.073	4%	0.958	18%	0.053	0%	0.005	0%	0.006	2%	0.805	4%
	Fuel Comb - Comm/Institutional - Oil	0.004	0%	0.066	1%	0.001	0%	0.001	0%	0.081	23%	0.009	0%
	Fuel Comb - Comm/Institutional - Other	0.004	0%	0.055	1%	0.003	0%	0.000	0%	0.000	0%	0.046	0%
	Fuel Comb - Residential - Natural Gas	0.012	1%	2.696	50%	0.158	1%	0.574	9%	0.017	5%	1.147	6%
	Fuel Comb - Residential - Oil	0.003	0%	0.032	1%	0.001	0%	0.002	0%	0.077	22%	0.009	0%
	Fuel Comb - Residential - Other	0.001	0%	0.063	1%	0.003	0%	0.000	0%	0.003	1%	0.043	0%
	Fuel Comb - Residential - Wood	0.485	28%	0.047	1%	0.884	6%	0.000	0%	0.007	2%	3.958	22%
	Gas Stations	0.000	0%	0.000	0%	0.306	2%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.271	16%	0.000	0%	0.262	2%	0.000	0%	0.000	0%	0.000	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Provo, UT	Miscellaneous Non-Industrial NEC	0.000	0%	0.004	0%	0.032	0%	0.430	6%	0.000	0%	0.223	1%
	Mobile - Aircraft	0.003	0%	0.032	1%	0.481	3%	0.000	0%	0.015	4%	7.935	44%
	Mobile - Locomotives	0.035	2%	1.417	26%	0.067	0%	0.000	0%	0.107	30%	0.195	1%
	Mobile - Non-Road Equipment - Diesel	0.000	0%	0.000	0%	0.001	0%	0.000	0%	0.000	0%	0.015	0%
	Mobile - Non-Road Equipment - Gasoline	0.000	0%	0.004	0%	0.000	0%	0.000	0%	0.000	0%	0.002	0%
	Mobile - Non-Road Equipment - Other	0.000	0%	0.017	0%	0.091	1%	0.000	0%	0.000	0%	3.228	18%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	4.619	29%	0.037	1%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	0.392	2%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.149	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	4.677	30%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	1.833	12%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.039	2%	0.000	0%	0.328	2%	0.376	6%	0.000	0%	0.000	0%
	Total	**1.714**	**100%**	**5.406**	100%	**15.767**	100%	**6.697**	100%	**0.353**	**100%**	**17.900**	**100%**
Salt Lake City, UT	Agriculture - Livestock Waste	0.030	1%	0.000	0%	2.931	5%	13.386	73%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.369	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	2.103	38%	0.000	0%	0.307	1%	0.000	0%	0.000	0%	0.875	2%
	Dust - Construction Dust	0.598	11%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.005	0%	0.022	0%	0.000	0%	0.000	0%	0.061	3%	0.010	0%
	Fuel Comb - Comm/Institutional - Natural Gas	0.214	4%	2.820	10%	0.155	0%	0.014	0%	0.017	1%	2.369	5%
	Fuel Comb - Comm/Institutional - Oil	0.014	0%	0.212	1%	0.004	0%	0.005	0%	0.262	14%	0.028	0%
	Fuel Comb - Comm/Institutional - Other	0.011	0%	0.146	1%	0.008	0%	0.000	0%	0.001	0%	0.123	0%
	Fuel Comb - Residential - Natural Gas	0.051	1%	11.194	41%	0.655	1%	2.382	13%	0.071	4%	4.763	10%
	Fuel Comb - Residential - Oil	0.010	0%	0.104	0%	0.004	0%	0.006	0%	0.248	14%	0.029	0%
	Fuel Comb - Residential - Other	0.001	0%	0.167	1%	0.008	0%	0.000	0%	0.004	0%	0.087	0%
	Fuel Comb - Residential - Wood	1.486	27%	0.143	1%	2.707	5%	0.000	0%	0.022	1%	12.126	24%
	Gas Stations	0.000	0%	0.000	0%	1.192	2%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.534	10%	0.000	0%	0.823	1%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.001	0%	0.044	0%	0.132	0%	1.354	7%	0.004	0%	0.848	2%
	Mobile - Aircraft	0.086	2%	3.264	12%	2.799	5%	0.000	0%	0.396	22%	24.702	50%
	Mobile - Locomotives	0.236	4%	9.204	34%	0.462	1%	0.000	0%	0.747	41%	1.393	3%
	Mobile - Non-Road Equipment - Diesel	0.001	0%	0.009	0%	0.056	0%	0.000	0%	0.000	0%	0.743	2%
	Mobile - Non-Road Equipment - Gasoline	0.001	0%	0.005	0%	0.001	0%	0.000	0%	0.000	0%	0.004	0%
	Mobile - Non-Road Equipment - Other	0.001	0%	0.045	0%	0.046	0%	0.000	0%	0.000	0%	1.398	3%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	14.542	26%	0.118	1%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	2.606	5%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	1.469	3%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	12.107	22%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	11.642	21%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.108	2%	0.000	0%	1.154	2%	1.180	6%	0.000	0%	0.000	0%
	Total	**5.492**	**100%**	**27.378**	**100%**	**56.179**	**100%**	**18.444**	**100%**	**1.834**	**100%**	**49.499**	**100%**
Surrounding Areas	Agriculture - Crops & Livestock Dust	0.588	2%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Agriculture - Fertilizer Application	0.000	0%	0.000	0%	0.000	0%	0.102	0%	0.000	0%	0.000	0%
	Agriculture - Livestock Waste	0.063	0%	0.000	0%	51.797	57%	118.617	98%	0.000	0%	0.000	0%
	Bulk Gasoline Terminals	0.000	0%	0.000	0%	0.512	1%	0.000	0%	0.000	0%	0.000	0%
	Commercial Cooking	0.266	1%	0.000	0%	0.039	0%	0.000	0%	0.000	0%	0.111	0%
	Dust - Construction Dust	0.479	2%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	Sector	PM2.5	% PM2.5	NOX	% NOX	VOC	% VOC	NH3	% NH3	SO2	% SO2	CO	% CO
Surrounding Areas	Fuel Comb - Comm/Institutional - Biomass	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Fuel Comb - Comm/Institutional - Coal	0.503	2%	2.851	6%	0.007	0%	0.003	0%	15.531	60%	21.349	17%
	Fuel Comb - Comm/Institutional - Natural Gas	0.057	0%	1.881	4%	0.040	0%	0.004	0%	0.005	0%	0.662	1%
	Fuel Comb - Comm/Institutional - Oil	0.052	0%	0.550	1%	0.012	0%	0.016	0%	1.095	4%	0.097	0%
	Fuel Comb - Comm/Institutional - Other	0.012	0%	0.173	0%	0.007	0%	0.000	0%	0.001	0%	0.116	0%
	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	0.048	0%	1.886	4%	0.042	0%	0.024	0%	0.005	0%	0.636	1%
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.227	1%	2.163	5%	0.013	0%	0.050	0%	6.013	23%	0.314	0%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.007	0%	0.091	0%	0.000	0%	0.000	0%	0.009	0%	0.051	0%
	Fuel Comb - Residential - Natural Gas	0.007	0%	2.677	6%	0.157	0%	0.543	0%	0.017	0%	1.139	1%
	Fuel Comb - Residential - Oil	0.028	0%	0.273	1%	0.011	0%	0.015	0%	0.795	3%	0.076	0%
	Fuel Comb - Residential - Other	0.050	0%	0.476	1%	0.079	0%	0.003	0%	0.192	1%	2.040	2%
	Fuel Comb - Residential - Wood	6.714	27%	0.629	1%	10.932	12%	0.013	0%	0.107	0%	50.950	41%
	Gas Stations	0.000	0%	0.000	0%	3.265	4%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Chemical Manuf	0.000	0%	0.000	0%	0.085	0%	0.082	0%	0.000	0%	0.000	0%
	Industrial Processes - Mining	0.859	3%	0.000	0%	0.000	0%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - NEC	0.059	0%	0.000	0%	0.085	0%	1.579	1%	0.000	0%	0.000	0%
	Industrial Processes - Non-ferrous Metals	0.000	0%	0.000	0%	0.000	0%	0.004	0%	0.000	0%	0.000	0%
	Industrial Processes - Oil & Gas Production	0.000	0%	0.000	0%	0.060	0%	0.000	0%	0.000	0%	0.000	0%
	Industrial Processes - Storage and Transfer	0.000	0%	0.000	0%	0.099	0%	0.000	0%	0.000	0%	0.000	0%
	Miscellaneous Non-Industrial NEC	0.802	3%	0.173	0%	2.149	2%	0.282	0%	0.077	0%	9.364	8%
	Mobile - Aircraft	13.047	53%	11.567	26%	4.848	5%	0.000	0%	0.897	3%	21.732	17%
	Mobile - Locomotives	0.534	2%	19.615	43%	1.003	1%	0.004	0%	1.164	4%	2.651	2%
	Mobile - Non-Road Equipment - Diesel	0.001	0%	0.019	0%	0.022	0%	0.000	0%	0.000	0%	0.530	0%
	Mobile - Non-Road Equipment - Gasoline	0.002	0%	0.019	0%	0.002	0%	0.000	0%	0.000	0%	0.012	0%
	Mobile - Non-Road Equipment - Other	0.004	0%	0.072	0%	0.423	0%	0.000	0%	0.000	0%	10.262	8%
	Solvent - Consumer & Commercial Solvent Use	0.000	0%	0.000	0%	5.516	6%	0.012	0%	0.000	0%	0.000	0%
	Solvent - Degreasing	0.000	0%	0.000	0%	5.205	6%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Dry Cleaning	0.000	0%	0.000	0%	0.538	1%	0.000	0%	0.000	0%	0.000	0%
	Solvent - Graphic Arts	0.000	0%	0.000	0%	0.368	0%	0.001	0%	0.000	0%	0.000	0%
	Solvent - Industrial Surface Coating & Solvent Use	0.000	0%	0.000	0%	3.219	4%	0.000	0%	0.000	0%	0.000	0%
	Waste Disposal	0.237	1%	0.074	0%	0.617	1%	0.142	0%	0.005	0%	2.634	2%
	Total	**24.645**	**100%**	**45.189**	**100%**	**91.150**	**100%**	**121.498**	**100%**	**25.912**	**100%**	**124.727**	**100%**
	Logan, UT-ID	0.589		1.897		8.900		9.158		0.581		5.720	
	Provo, UT	1.714		5.406		15.767		6.697		0.353		17.900	
	Salt Lake City, UT	5.492		27.378		56.179		18.444		1.834		49.499	
	Surrounding Areas	24.645		45.189		91.150		121.498		25.912		124.727	
		32.440		**79.871**		**171.996**		**155.796**		**28.680**		**197.846**	
	Logan, UT-ID	2%		2%		5%		6%		2%		3%	
	Provo, UT	5%		7%		9%		4%		1%		9%	
	Salt Lake City, UT	17%		34%		33%		12%		6%		25%	
	Surrounding Areas	76%		57%		53%		78%		90%		63%	
		100%		100%		100%		100%		100%		100%	

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for PM2.5) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Logan, UT-ID	Idaho	Franklin	0.008	0.000	0.000	0.000	0.000	0.014	0.000	0.008
	Utah	Cache	0.000	0.000	0.010	0.000	0.134	0.051	0.000	0.000
		Total	**0.008**	**0.000**	**0.010**	**0.000**	**0.134**	**0.065**	**0.000**	**0.008**
Provo, UT	Utah	Utah	0.000	0.000	0.013	0.000	0.614	0.269	0.000	0.003
		Total	**0.000**	**0.000**	**0.013**	**0.000**	**0.614**	**0.269**	**0.000**	**0.003**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.018	0.000	0.058	0.046	0.000	0.000
	Utah	Davis	0.000	0.000	0.001	0.000	0.363	0.107	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.001	0.000	1.248	0.574	0.000	0.002
	Utah	Tooele	0.000	0.000	0.006	0.000	0.069	0.048	0.000	0.002
	Utah	Weber	0.000	0.000	0.005	0.000	0.270	0.070	0.000	0.000
		Total	**0.000**	**0.000**	**0.031**	**0.000**	**2.008**	**0.845**	**0.000**	**0.004**
Surrounding Areas	Idaho	Bannock	0.015	0.000	0.000	0.000	0.000	0.090	0.000	0.131
	Idaho	Bear Lake	0.006	0.000	0.000	0.000	0.000	0.003	0.000	0.007
	Idaho	Bingham	0.304	0.000	0.000	0.000	0.000	0.020	0.000	0.040
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.063
	Idaho	Caribou	0.015	0.000	0.000	0.000	0.000	0.007	0.000	0.005
	Idaho	Cassia	0.074	0.000	0.000	0.000	0.000	0.049	0.000	0.024

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other
Logan, UT-ID	Idaho	Franklin	0.002	0.001	0.000	0.001	0.005	0.000	0.000	0.000	0.001
	Utah	Cache	0.030	0.003	0.002	0.000	0.000	0.000	0.003	0.002	0.000
		Total	**0.032**	**0.004**	**0.003**	**0.001**	**0.005**	**0.000**	**0.003**	**0.003**	**0.001**
Provo, UT	Utah	Utah	0.064	0.004	0.005	0.000	0.000	0.000	0.011	0.003	0.000
		Total	**0.064**	**0.004**	**0.005**	**0.000**	**0.000**	**0.000**	**0.011**	**0.003**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.009	0.001	0.002	0.000	0.000	0.000	0.001	0.001	0.000
	Utah	Davis	0.051	0.001	0.001	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Salt Lake	0.079	0.003	0.005	0.000	0.000	0.000	0.030	0.002	0.000
	Utah	Tooele	0.010	0.005	0.002	0.000	0.000	0.000	0.001	0.004	0.000
	Utah	Weber	0.062	0.001	0.002	0.000	0.000	0.000	0.006	0.001	0.000
		Total	**0.211**	**0.011**	**0.012**	**0.000**	**0.000**	**0.000**	**0.046**	**0.008**	**0.001**
Surrounding Areas	Idaho	Bannock	0.010	0.004	0.001	0.009	0.033	0.001	0.000	0.003	0.005
	Idaho	Bear Lake	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.004	0.009	0.000	0.007	0.026	0.001	0.000	0.001	0.002
	Idaho	Blaine	0.007	0.003	0.000	0.005	0.020	0.001	0.000	0.001	0.001
	Idaho	Caribou	0.001	0.000	0.000	0.003	0.011	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.003	0.001	0.000	0.003	0.013	0.001	0.000	0.001	0.001

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer
Logan, UT-ID	Idaho	Franklin	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.270	0.000	0.000	0.000	0.019	0.000	0.000	0.000
		Total	**0.370**	**0.000**	**0.000**	**0.000**	**0.019**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.587	0.000	0.000	0.000	0.212	0.000	0.000	0.000
		Total	**0.587**	**0.000**	**0.000**	**0.000**	**0.212**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.207	0.000	0.000	0.000	0.037	0.000	0.000	0.000
	Utah	Davis	0.227	0.000	0.000	0.000	0.051	0.000	0.000	0.000
	Utah	Salt Lake	0.668	0.000	0.000	0.000	0.326	0.000	0.000	0.000
	Utah	Tooele	0.256	0.000	0.000	0.000	0.023	0.000	0.000	0.000
	Utah	Weber	0.500	0.000	0.000	0.000	0.024	0.000	0.000	0.000
		Total	**1.859**	**0.000**	**0.000**	**0.000**	**0.461**	**0.000**	**0.000**	**0.000**
Surrounding Areas	Idaho	Bannock	0.636	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.332	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.178	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.171	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial	Solvent Degreasing
Logan, UT-ID	Idaho	Franklin	0.001	0.000	0.009	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000
		Total	**0.001**	**0.000**	**0.018**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.060**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.086	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.032	0.036	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.001	0.050	0.068	0.013	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.002	0.059	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.049	0.000	0.000	0.000	0.000	0.000
		Total	**0.001**	**0.084**	**0.298**	**0.014**	**0.000**	**0.000**	**0.000**	**0.000**
Surrounding Areas	Idaho	Bannock	0.009	0.000	0.034	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.001	0.000	0.021	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.004	0.000	0.026	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.001	13.451	0.006	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.013	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area PM2.5
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.148
	Utah	Cache	0.000	0.000	0.000	0.008	0.542
		Total	**0.000**	**0.000**	**0.000**	**0.008**	**0.690**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.036	1.879
		Total	**0.000**	**0.000**	**0.000**	**0.036**	**1.879**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.003	0.470
	Utah	Davis	0.000	0.000	0.000	0.011	0.890
	Utah	Salt Lake	0.000	0.000	0.000	0.073	3.144
	Utah	Tooele	0.000	0.000	0.000	0.000	0.486
	Utah	Weber	0.000	0.000	0.000	0.016	1.007
		Total	**0.000**	**0.000**	**0.000**	**0.104**	**5.998**
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.980
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.088
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.777
	Idaho	Blaine	0.000	0.000	0.000	0.000	13.745
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.112
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.347

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Surrounding Areas	Idaho	Jerome	0.039	0.000	0.000	0.000	0.000	0.058	0.000	0.015
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Minidoka	0.073	0.000	0.000	0.000	0.000	0.049	0.000	0.016
	Idaho	Oneida	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.005
	Idaho	Power	0.031	0.000	0.000	0.000	0.000	0.008	0.000	0.007
	Idaho	Twin Falls	0.023	0.000	0.000	0.000	0.000	0.089	0.000	0.124
	Utah	Carbon	0.000	0.000	0.002	0.000	0.024	0.006	0.000	0.006
	Utah	Duchesne	0.000	0.000	0.011	0.000	0.020	0.006	0.000	0.002
	Utah	Emery	0.000	0.000	0.006	0.000	0.013	0.003	0.000	0.007
	Utah	Juab	0.000	0.000	0.003	0.000	0.012	0.003	0.000	0.002
	Utah	Millard	0.000	0.000	0.018	0.000	0.016	0.004	0.000	0.004
	Utah	Morgan	0.000	0.000	0.001	0.000	0.011	0.003	0.000	0.000
	Utah	Rich	0.000	0.000	0.006	0.000	0.003	0.001	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.012	0.000	0.032	0.009	0.000	0.007
	Utah	Summit	0.000	0.000	0.004	0.000	0.047	0.066	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.002	0.000	0.027	0.017	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.018	0.015	0.000	0.008
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.006	0.006	0.000	0.004
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.024	0.030	0.000	0.020
		Total	**0.588**	**0.000**	**0.067**	**0.000**	**0.253**	**0.549**	**0.000**	**0.501**
		Logan, UT-ID	0.008	0.000	0.010	0.000	0.134	0.065	0.000	0.008
		Provo, UT	0.000	0.000	0.013	0.000	0.614	0.269	0.000	0.003
		Salt Lake City, UT	0.000	0.000	0.031	0.000	2.008	0.845	0.000	0.004
		Surrounding Areas	0.588	0.000	0.067	0.000	0.253	0.549	0.000	0.501
			0.596	**0.000**	**0.121**	**0.000**	**3.009**	**1.728**	**0.000**	**0.515**
		Logan, UT-ID	1%	0%	8%	0%	4%	4%	3%	2%
		Provo, UT	0%	0%	11%	0%	20%	16%	0%	0%
		Salt Lake City, UT	0%	0%	26%	0%	67%	49%	0%	1%
		Surrounding Areas	99%	0%	55%	0%	8%	32%	97%	97%
			100%	0%	100%	0%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other
Surrounding Areas	Idaho	Jerome	0.003	0.001	0.000	0.004	0.014	0.001	0.000	0.001	0.001
	Idaho	Lincoln	0.001	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.002	0.001	0.000	0.003	0.011	0.000	0.000	0.001	0.001
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Idaho	Power	0.001	0.000	0.000	0.002	0.008	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.013	0.005	0.001	0.011	0.040	0.002	0.000	0.003	0.005
	Utah	Carbon	0.002	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001
	Utah	Duchesne	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Juab	0.000	0.005	0.001	0.000	0.000	0.000	0.000	0.004	0.000
	Utah	Millard	0.001	0.004	0.001	0.000	0.000	0.000	0.000	0.003	0.001
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Sanpete	0.003	0.007	0.001	0.000	0.000	0.000	0.001	0.005	0.001
	Utah	Summit	0.003	0.000	0.001	0.000	0.000	0.000	0.003	0.000	0.000
	Utah	Wasatch	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
	Wyoming	Lincoln	0.000	0.001	0.000	0.000	0.026	0.000	0.000	0.000	0.020
	Wyoming	Sublette	0.000	0.001	0.000	0.000	0.004	0.000	0.000	0.001	0.001
	Wyoming	Uinta	0.000	0.003	0.000	0.000	0.015	0.000	0.000	0.000	0.006
		Total	**0.058**	**0.048**	**0.013**	**0.048**	**0.227**	**0.007**	**0.006**	**0.025**	**0.049**
		Logan, UT-ID	0.032	0.004	0.003	0.001	0.005	0.000	0.003	0.003	0.001
		Provo, UT	0.064	0.004	0.005	0.000	0.000	0.000	0.011	0.003	0.000
		Salt Lake City, UT	0.211	0.011	0.012	0.000	0.000	0.000	0.046	0.008	0.001
		Surrounding Areas	0.058	0.048	0.013	0.048	0.227	0.007	0.006	0.025	0.049
			0.364	**0.066**	**0.032**	**0.049**	**0.231**	**0.007**	**0.066**	**0.039**	**0.051**
		Logan, UT-ID	9%	6%	8%	2%	2%	2%	4%	7%	2%
		Provo, UT	18%	5%	14%	0%	0%	0%	16%	7%	1%
		Salt Lake City, UT	58%	17%	37%	0%	0%	0%	70%	21%	2%
		Surrounding Areas	16%	72%	41%	98%	98%	98%	9%	66%	96%
			100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer
Surrounding Areas	Idaho	Jerome	0.166	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.152	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.055	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.599	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.053	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Duchesne	0.972	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Emery	0.237	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.187	0.000	0.000	0.000	0.017	0.000	0.000	0.000
	Utah	Millard	0.312	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.075	0.000	0.000	0.000	0.004	0.000	0.000	0.000
	Utah	Rich	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.458	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.326	0.000	0.000	0.000	0.020	0.000	0.000	0.000
	Utah	Wasatch	0.240	0.000	0.000	0.000	0.007	0.000	0.000	0.000
	Wyoming	Lincoln	0.515	0.000	0.000	0.286	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.279	0.000	0.000	0.286	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.282	0.000	0.000	0.286	0.000	0.000	0.000	0.000
		Total	**6.525**	**0.000**	**0.000**	**0.859**	**0.050**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.370	0.000	0.000	0.000	0.019	0.000	0.000	0.000
		Provo, UT	0.587	0.000	0.000	0.000	0.212	0.000	0.000	0.000
		Salt Lake City, UT	1.859	0.000	0.000	0.000	0.461	0.000	0.000	0.000
		Surrounding Areas	6.525	0.000	0.000	0.859	0.050	0.000	0.000	0.000
			9.341	**0.000**	**0.000**	**0.859**	**0.743**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	4%	0%	0%	0%	3%	0%	0%	0%
		Provo, UT	6%	0%	0%	0%	29%	0%	0%	0%
		Salt Lake City, UT	20%	0%	0%	0%	62%	0%	0%	0%
		Surrounding Areas	70%	0%	0%	100%	7%	0%	0%	0%
			100%	0%	0%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial	Solvent Degreasing
Surrounding Areas	Idaho	Jerome	0.002	0.000	0.003	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.001	0.000	0.014	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.002	0.000	0.008	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.001	0.005	0.013	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.009	0.004	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.039	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.037	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.062	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.033	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.057	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.401	0.000	0.097	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.041	0.000	0.110	0.000	0.000	0.000	0.000	0.000
		Total	**0.802**	**13.461**	**0.607**	**0.001**	**0.000**	**0.001**	**0.000**	**0.000**
		Logan, UT-ID	0.001	0.000	0.018	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.001	0.084	0.298	0.014	0.000	0.000	0.000	0.000
		Surrounding Areas	0.802	13.461	0.607	0.001	0.000	0.001	0.000	0.000
			0.804	**13.545**	**0.982**	**0.015**	**0.000**	**0.001**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	2%	0%	1%	1%	0%	0%
		Provo, UT	0%	0%	6%	0%	11%	19%	0%	0%
		Salt Lake City, UT	0%	1%	30%	93%	30%	15%	0%	0%
		Surrounding Areas	100%	99%	62%	6%	59%	65%	0%	0%
			100%	100%	100%	100%	100%	100%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area PM2.5
Surrounding Areas	Idaho	Jerome	0.000	0.000	0.000	0.000	0.306
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.060
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.319
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.053
	Idaho	Power	0.000	0.000	0.000	0.000	0.132
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.930
	Utah	Carbon	0.000	0.000	0.000	0.001	0.138
	Utah	Duchesne	0.000	0.000	0.000	0.004	1.021
	Utah	Emery	0.000	0.000	0.000	0.002	0.290
	Utah	Juab	0.000	0.000	0.000	0.001	0.272
	Utah	Millard	0.000	0.000	0.000	0.003	0.429
	Utah	Morgan	0.000	0.000	0.000	0.001	0.129
	Utah	Rich	0.000	0.000	0.000	0.000	0.143
	Utah	Sanpete	0.000	0.000	0.000	0.006	0.542
	Utah	Summit	0.000	0.000	0.000	0.009	0.538
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.300
	Wyoming	Lincoln	0.000	0.000	0.000	0.138	1.526
	Wyoming	Sublette	0.000	0.000	0.000	0.037	0.954
	Wyoming	Uinta	0.000	0.000	0.000	0.058	0.875
		Total	**0.000**	**0.000**	**0.000**	**0.261**	**25.006**
		Logan, UT-ID	0.000	0.000	0.000	0.008	0.690
		Provo, UT	0.000	0.000	0.000	0.036	1.879
		Salt Lake City, UT	0.000	0.000	0.000	0.104	5.998
		Surrounding Areas	0.000	0.000	0.000	0.261	25.006
			0.000	**0.000**	**0.000**	**0.408**	**33.573**
		Logan, UT-ID	0%	0%	0%	2%	2%
		Provo, UT	0%	0%	0%	9%	6%
		Salt Lake City, UT	0%	0%	0%	25%	18%
		Surrounding Areas	0%	0%	0%	64%	74%
			0%	0%	0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for NO_x) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.044	0.056	0.005	0.001	0.045	0.040
	Utah	Cache	0.001	0.396	0.046	0.032	0.000	0.000
		Total	**0.045**	**0.453**	**0.050**	**0.033**	**0.045**	**0.040**
Provo, UT	Utah	Utah	0.011	0.841	0.051	0.059	0.000	0.000
		Total	**0.011**	**0.841**	**0.051**	**0.059**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.001	0.120	0.014	0.029	0.000	0.000
	Utah	Davis	0.000	0.675	0.007	0.012	0.000	0.000
	Utah	Salt Lake	0.007	1.035	0.050	0.063	0.000	0.000
	Utah	Tooele	0.008	0.130	0.074	0.021	0.000	0.000
	Utah	Weber	0.002	0.814	0.018	0.031	0.000	0.000
		Total	**0.018**	**2.774**	**0.163**	**0.157**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.002	0.038	0.003	0.008	0.009	0.000	0.000	0.000
	Utah	Cache	0.000	0.575	0.023	0.035	0.026	0.000	0.000	0.000
		Total	**0.002**	**0.613**	**0.026**	**0.043**	**0.035**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	2.357	0.026	0.065	0.056	0.000	0.000	0.000
		Total	**0.000**	**2.357**	**0.026**	**0.065**	**0.056**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.257	0.007	0.031	0.020	0.000	0.000	0.000
	Utah	Davis	0.000	1.643	0.004	0.013	0.022	0.000	0.000	0.000
	Utah	Salt Lake	0.000	6.586	0.025	0.069	0.064	0.000	0.000	0.000
	Utah	Tooele	0.000	0.260	0.037	0.023	0.025	0.000	0.000	0.000
	Utah	Weber	0.000	1.370	0.009	0.034	0.048	0.000	0.000	0.000
		Total	**0.000**	**10.115**	**0.082**	**0.171**	**0.178**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.001	0.000	0.292
	Utah	Cache	0.000	0.000	0.000	0.000	0.001	0.013	0.291
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.013**	**0.583**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.004	0.024	2.124
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.024**	**2.124**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.003	2.756
	Utah	Davis	0.000	0.000	0.000	0.000	0.005	0.256	1.234
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.037	2.973	2.525
	Utah	Tooele	0.000	0.000	0.000	0.000	0.001	0.034	1.966
	Utah	Weber	0.000	0.000	0.000	0.000	0.002	0.017	1.624
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.044**	**3.283**	**10.105**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning
Logan, UT-ID	Idaho	Franklin	0.001	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.001	0.000	0.000	0.000
		Total	**0.001**	**0.000**	**0.001**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.001	0.011	0.000	0.000	0.000
		Total	**0.000**	**0.001**	**0.011**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.009	0.000	0.000	0.000
	Utah	Davis	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.191	0.004	0.004	0.000	0.000	0.000
	Utah	Tooele	0.000	0.001	0.003	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.001	0.000	0.000	0.000
		Total	**0.195**	**0.005**	**0.017**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Vaste Dispos	Total Area NOX
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.547
	Utah	Cache	0.000	0.000	0.000	1.439
		Total	**0.000**	**0.000**	**0.000**	1.986
						0.000
Provo, UT	Utah	Utah	0.000	0.000	0.000	5.630
		Total	**0.000**	**0.000**	**0.000**	**5.630**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	3.246
	Utah	Davis	0.000	0.000	0.000	3.874
	Utah	Salt Lake	0.000	0.000	0.000	13.633
	Utah	Tooele	0.000	0.000	0.000	2.583
	Utah	Weber	0.000	0.000	0.000	3.971
		Total	**0.000**	**0.000**	**0.000**	**27.307**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	4%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	0%	0%	96%
			0%	0%	0%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.768	0.379	0.036	0.009	0.316	0.284
	Idaho	Bear Lake	0.039	0.025	0.003	0.001	0.015	0.014
	Idaho	Bingham	0.233	0.154	0.015	0.004	0.253	0.228
	Idaho	Blaine	0.366	0.275	0.027	0.007	0.196	0.176
	Idaho	Caribou	0.029	0.036	0.004	0.001	0.102	0.092
	Idaho	Cassia	0.143	0.120	0.012	0.003	0.125	0.112
	Idaho	Jerome	0.086	0.102	0.009	0.002	0.131	0.118
	Idaho	Lincoln	0.019	0.019	0.002	0.000	0.028	0.025
	Idaho	Minidoka	0.094	0.077	0.008	0.002	0.105	0.094
	Idaho	Oneida	0.029	0.015	0.001	0.000	0.012	0.011
	Idaho	Power	0.039	0.027	0.002	0.001	0.081	0.073
	Idaho	Twin Falls	0.726	0.489	0.047	0.012	0.391	0.352
	Utah	Carbon	0.029	0.027	0.001	0.010	0.000	0.000
	Utah	Duchesne	0.009	0.005	0.008	0.043	0.000	0.000
	Utah	Emery	0.029	0.001	0.001	0.013	0.000	0.000
	Utah	Juab	0.010	0.000	0.076	0.008	0.000	0.000
	Utah	Millard	0.020	0.013	0.056	0.015	0.000	0.000
	Utah	Morgan	0.000	0.002	0.000	0.003	0.000	0.000
	Utah	Rich	0.001	0.000	0.013	0.006	0.000	0.000
	Utah	Sanpete	0.030	0.034	0.104	0.015	0.000	0.000
	Utah	Summit	0.001	0.044	0.006	0.013	0.000	0.000
	Utah	Wasatch	0.001	0.016	0.002	0.010	0.000	0.000
	Wyoming	Lincoln	0.038	0.009	0.011	0.001	0.075	0.335
	Wyoming	Sublette	0.018	0.004	0.005	0.001	0.013	0.057
	Wyoming	Uinta	0.091	0.021	0.025	0.003	0.043	0.193
		Total	**2.847**	**1.894**	**0.472**	**0.182**	**1.886**	**2.163**
		Logan, UT-ID	0.045	0.453	0.050	0.033	0.045	0.040
		Provo, UT	0.011	0.841	0.051	0.059	0.000	0.000
		Salt Lake City, UT	0.018	2.774	0.163	0.157	0.000	0.000
		Surrounding Areas	2.847	1.894	0.472	0.182	1.886	2.163
			2.922	**5.962**	**0.735**	**0.431**	**1.931**	**2.203**
		Logan, UT-ID	2%	8%	7%	8%	2%	2%
		Provo, UT	0%	14%	7%	14%	0%	0%
		Salt Lake City, UT	1%	47%	22%	36%	0%	0%
		Surrounding Areas	97%	32%	64%	42%	98%	98%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.016	0.279	0.024	0.062	0.059	0.000	0.000	0.000
	Idaho	Bear Lake	0.001	0.020	0.002	0.004	0.004	0.000	0.000	0.000
	Idaho	Bingham	0.013	0.129	0.011	0.029	0.031	0.000	0.000	0.000
	Idaho	Blaine	0.010	0.088	0.008	0.020	0.016	0.000	0.000	0.000
	Idaho	Caribou	0.005	0.024	0.002	0.005	0.005	0.000	0.000	0.000
	Idaho	Cassia	0.006	0.069	0.006	0.016	0.016	0.000	0.000	0.000
	Idaho	Jerome	0.007	0.069	0.006	0.015	0.015	0.000	0.000	0.000
	Idaho	Lincoln	0.001	0.016	0.001	0.004	0.003	0.000	0.000	0.000
	Idaho	Minidoka	0.005	0.064	0.006	0.014	0.014	0.000	0.000	0.000
	Idaho	Oneida	0.001	0.014	0.001	0.003	0.003	0.000	0.000	0.000
	Idaho	Power	0.004	0.023	0.002	0.005	0.005	0.000	0.000	0.000
	Idaho	Twin Falls	0.020	0.272	0.024	0.061	0.056	0.000	0.000	0.000
	Utah	Carbon	0.000	0.145	0.000	0.012	0.005	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.063	0.004	0.047	0.093	0.000	0.000	0.000
	Utah	Emery	0.000	0.047	0.000	0.015	0.023	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.039	0.010	0.018	0.000	0.000	0.000
	Utah	Millard	0.000	0.056	0.028	0.018	0.030	0.000	0.000	0.000
	Utah	Morgan	0.000	0.058	0.000	0.003	0.007	0.000	0.000	0.000
	Utah	Rich	0.000	0.008	0.007	0.007	0.012	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.147	0.052	0.018	0.044	0.000	0.000	0.000
	Utah	Summit	0.000	0.557	0.003	0.014	0.031	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.165	0.001	0.011	0.023	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.025	0.004	0.055	0.046	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.012	0.006	0.012	0.025	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.089	0.001	0.018	0.025	0.000	0.000	0.000
		Total	**0.091**	**2.439**	**0.238**	**0.478**	**0.611**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.002	0.613	0.026	0.043	0.035	0.000	0.000	0.000
		Provo, UT	0.000	2.357	0.026	0.065	0.056	0.000	0.000	0.000
		Salt Lake City, UT	0.000	10.115	0.082	0.171	0.178	0.000	0.000	0.000
		Surrounding Areas	0.091	2.439	0.238	0.478	0.611	0.000	0.000	0.000
			0.093	**15.524**	**0.372**	**0.758**	**0.881**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	6%	4%	0%	0%	0%
		Provo, UT	0%	15%	7%	9%	6%	0%	0%	0%
		Salt Lake City, UT	0%	65%	22%	23%	20%	0%	0%	0%
		Surrounding Areas	97%	16%	64%	63%	69%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.004	0.000	1.159
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.701
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.002	0.000	0.886
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	11.915	0.195
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.428
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.000	0.109
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.000	0.125
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.493
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.000	0.298
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.143
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.002	0.448
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.004	0.002	0.134
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.003	1.562
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.001	0.737
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.004	1.215
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.001	2.063
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.002	1.061
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	1.834
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.005	0.191
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.072	0.000	3.531
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.073	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.011	0.000	4.002
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.173**	**11.936**	**21.317**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.001	0.013	0.583
		Provo, UT	0.000	0.000	0.000	0.000	0.004	0.024	2.124
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.044	3.283	10.105
		Surrounding Areas	0.000	0.000	0.000	0.000	0.173	11.936	21.317
			0.000	**0.000**	**0.000**	**0.000**	**0.222**	**15.256**	**34.130**
		Logan, UT-ID	0%	0%	0%	0%	1%	0%	2%
		Provo, UT	0%	0%	0%	0%	2%	0%	6%
		Salt Lake City, UT	0%	0%	0%	0%	20%	22%	30%
		Surrounding Areas	0%	0%	0%	0%	78%	78%	62%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning
Surrounding Areas	Idaho	Bannock	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.003	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.001	0.001	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.007	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Rich	0.000	0.001	0.001	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.011	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.015**	**0.004**	**0.024**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.001	0.000	0.001	0.000	0.000	0.000
		Provo, UT	0.000	0.001	0.011	0.000	0.000	0.000
		Salt Lake City, UT	0.195	0.005	0.017	0.000	0.000	0.000
		Surrounding Areas	0.015	0.004	0.024	0.000	0.000	0.000
			0.210	**0.009**	**0.053**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	2%	0%	0%	0%
		Provo, UT	0%	9%	20%	0%	0%	0%
		Salt Lake City, UT	93%	51%	32%	0%	0%	0%
		Surrounding Areas	7%	40%	45%	0%	0%	0%
			100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Vaste Dispos	Total Area NOX
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	3.398
	Idaho	Bear Lake	0.000	0.000	0.000	0.831
	Idaho	Bingham	0.000	0.000	0.000	1.988
	Idaho	Blaine	0.000	0.000	0.000	13.298
	Idaho	Caribou	0.000	0.000	0.000	0.735
	Idaho	Cassia	0.000	0.000	0.000	0.741
	Idaho	Jerome	0.000	0.000	0.000	0.687
	Idaho	Lincoln	0.000	0.000	0.000	0.611
	Idaho	Minidoka	0.000	0.000	0.000	0.783
	Idaho	Oneida	0.000	0.000	0.000	0.235
	Idaho	Power	0.000	0.000	0.000	0.715
	Idaho	Twin Falls	0.000	0.000	0.000	2.589
	Utah	Carbon	0.000	0.000	0.000	1.796
	Utah	Duchesne	0.000	0.000	0.002	0.276
	Utah	Emery	0.000	0.000	0.001	0.869
	Utah	Juab	0.000	0.000	0.000	1.387
	Utah	Millard	0.000	0.000	0.001	2.303
	Utah	Morgan	0.000	0.000	0.001	1.139
	Utah	Rich	0.000	0.000	0.000	0.056
	Utah	Sanpete	0.000	0.000	0.003	0.447
	Utah	Summit	0.000	0.000	0.004	2.508
	Utah	Wasatch	0.000	0.000	0.000	0.438
	Wyoming	Lincoln	0.000	0.000	0.042	4.243
	Wyoming	Sublette	0.000	0.000	0.011	0.236
	Wyoming	Uinta	0.000	0.000	0.017	4.540
		Total	**0.000**	**0.000**	**0.081**	**46.849**
		Logan, UT-ID	0.000	0.000	0.000	1.986
		Provo, UT	0.000	0.000	0.000	5.630
		Salt Lake City, UT	0.000	0.000	0.000	27.307
		Surrounding Areas	0.000	0.000	0.081	46.849
			0.000	**0.000**	**0.081**	**81.773**
		Logan, UT-ID	0%	0%	0%	2%
		Provo, UT	0%	0%	0%	7%
		Salt Lake City, UT	0%	0%	0%	33%
		Surrounding Areas	0%	0%	100%	57%
			0%	0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area/Nonpoint Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of area / non-point source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all area / non-point source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	2.763	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	1.296	0.012	0.019	0.000	0.000
		Total	**0.000**	**0.000**	**4.060**	**0.012**	**0.019**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	1.209	0.090	0.090	0.000	0.000
		Total	**0.000**	**0.000**	**1.209**	**0.090**	**0.090**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	1.812	0.011	0.008	0.000	0.000
	Utah	Davis	0.000	0.000	0.188	0.057	0.053	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.236	0.207	0.182	0.000	0.000
	Utah	Tooele	0.000	0.000	0.528	0.011	0.010	0.000	0.000
	Utah	Weber	0.000	0.000	0.473	0.039	0.039	0.000	0.000
		Total	**0.000**	**0.000**	**3.236**	**0.326**	**0.293**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.000	0.001	0.000	0.000	0.001	0.000
	Utah	Cache	0.000	0.022	0.001	0.002	0.000	0.000
		Total	**0.000**	**0.023**	**0.001**	**0.002**	**0.001**	**0.000**
Provo, UT	Utah	Utah	0.000	0.046	0.001	0.003	0.000	0.000
		Total	**0.000**	**0.046**	**0.001**	**0.003**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.007	0.000	0.002	0.000	0.000
	Utah	Davis	0.000	0.037	0.000	0.001	0.000	0.000
	Utah	Salt Lake	0.000	0.057	0.001	0.003	0.000	0.000
	Utah	Tooele	0.000	0.007	0.001	0.001	0.000	0.000
	Utah	Weber	0.000	0.045	0.000	0.002	0.000	0.000
		Total	**0.000**	**0.153**	**0.003**	**0.009**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.002	0.000	0.000	0.138	0.000	0.000	0.000
	Utah	Cache	0.000	0.034	0.001	0.001	0.492	0.714	0.000	0.000
		Total	**0.000**	**0.036**	**0.001**	**0.002**	**0.630**	**0.714**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.138	0.001	0.003	1.069	0.320	0.000	0.000
		Total	**0.000**	**0.138**	**0.001**	**0.003**	**1.069**	**0.320**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.015	0.000	0.001	0.377	0.664	0.000	0.000
	Utah	Davis	0.000	0.096	0.000	0.001	0.414	0.198	0.000	0.000
	Utah	Salt Lake	0.000	0.385	0.001	0.003	1.217	0.703	0.000	0.000
	Utah	Tooele	0.000	0.015	0.001	0.001	0.466	0.673	0.000	0.000
	Utah	Weber	0.000	0.080	0.000	0.001	0.910	0.143	0.000	0.000
		Total	**0.000**	**0.592**	**0.003**	**0.008**	**3.386**	**2.381**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.016
	Utah	Cache	0.052	0.000	0.000	0.000	0.008	0.224	0.016
		Total	**0.052**	**0.000**	**0.000**	**0.000**	**0.008**	**0.224**	**0.032**
Provo, UT	Utah	Utah	0.240	0.000	0.000	0.000	0.030	0.327	0.106
		Total	**0.240**	**0.000**	**0.000**	**0.000**	**0.030**	**0.327**	**0.106**
Salt Lake City, UT	Utah	Box Elder	0.023	0.000	0.000	0.000	0.003	0.029	0.153
	Utah	Davis	0.142	0.000	0.000	0.000	0.018	0.193	0.065
	Utah	Salt Lake	0.489	0.000	0.000	0.000	0.092	3.707	0.127
	Utah	Tooele	0.027	0.000	0.000	0.000	0.007	0.446	0.103
	Utah	Weber	0.106	0.000	0.000	0.000	0.015	0.275	0.089
		Total	**0.786**	**0.000**	**0.000**	**0.000**	**0.134**	**4.650**	**0.537**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.143	0.137	0.047
	Utah	Cache	0.000	0.000	0.001	0.938	0.282	0.046
		Total	**0.000**	**0.000**	**0.001**	**1.082**	**0.420**	**0.094**
Provo, UT	Utah	Utah	0.000	0.000	0.030	4.285	0.518	0.154
		Total	**0.000**	**0.000**	**0.030**	**4.285**	**0.518**	**0.154**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.005	0.422	0.075	0.007
	Utah	Davis	0.021	0.000	0.000	2.526	0.326	0.194
	Utah	Salt Lake	0.015	0.004	0.001	8.692	1.883	1.043
	Utah	Tooele	0.000	0.000	0.004	0.501	0.059	0.011
	Utah	Weber	0.001	0.000	0.003	1.887	0.528	0.335
		Total	**0.037**	**0.004**	**0.014**	**14.027**	**2.871**	**1.591**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposa	Total Area NOX
Logan, UT-ID	Idaho	Franklin	0.002	0.084	0.008	3.346
	Utah	Cache	1.546	0.888	0.033	6.630
		Total	**1.548**	**0.972**	**0.041**	**9.976**
Provo, UT	Utah	Utah	4.703	1.886	0.288	15.539
		Total	**4.703**	**1.886**	**0.288**	**15.539**
Salt Lake City, UT	Utah	Box Elder	0.148	0.746	0.028	4.537
	Utah	Davis	1.348	1.982	0.131	7.990
	Utah	Salt Lake	9.423	8.427	0.758	37.657
	Utah	Tooele	0.000	0.109	0.025	3.009
	Utah	Weber	1.779	1.514	0.258	8.521
		Total	**12.698**	**12.777**	**1.200**	**61.715**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	1.395	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	1.549	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	4.841	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.972	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	1.355	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	10.654	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	9.132	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	2.652	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	2.195	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	1.083	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	1.547	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	6.865	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.256	0.004	0.004	0.000	0.000
	Utah	Duchesne	0.000	0.000	1.078	0.003	0.003	0.000	0.000
	Utah	Emery	0.000	0.000	0.505	0.005	0.002	0.000	0.000
	Utah	Juab	0.000	0.000	0.685	0.005	0.002	0.000	0.000
	Utah	Millard	0.000	0.000	1.879	0.006	0.002	0.000	0.000
	Utah	Morgan	0.000	0.000	0.202	0.002	0.002	0.000	0.000
	Utah	Rich	0.000	0.000	0.663	0.001	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	1.938	0.003	0.005	0.000	0.000
	Utah	Summit	0.000	0.000	0.453	0.010	0.007	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.200	0.004	0.004	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.059	0.003	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.059	0.001	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.352	0.003	0.000	0.000
		Total	**0.000**	**0.000**	**52.102**	**0.511**	**0.037**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	4.060	0.012	0.019	0.000	0.000
		Provo, UT	0.000	0.000	1.209	0.090	0.090	0.000	0.000
		Salt Lake City, UT	0.000	0.000	3.236	0.326	0.293	0.000	0.000
		Surrounding Areas	0.000	0.000	52.102	0.511	0.037	0.000	0.000
			0.000	**0.000**	**60.606**	**0.940**	**0.439**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	7%	1%	4%	0%	0%
		Provo, UT	0%	0%	2%	10%	20%	0%	0%
		Salt Lake City, UT	0%	0%	5%	35%	67%	0%	0%
		Surrounding Areas	0%	0%	86%	54%	8%	0%	100%
			0%	0%	100%	100%	100%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.002	0.007	0.001	0.000	0.006	0.001
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.003	0.000	0.000	0.005	0.001
	Idaho	Blaine	0.001	0.005	0.001	0.000	0.004	0.001
	Idaho	Caribou	0.000	0.001	0.000	0.000	0.002	0.000
	Idaho	Cassia	0.000	0.002	0.000	0.000	0.002	0.000
	Idaho	Jerome	0.000	0.002	0.000	0.000	0.003	0.001
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Minidoka	0.000	0.001	0.000	0.000	0.002	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.002	0.000
	Idaho	Twin Falls	0.002	0.009	0.001	0.000	0.008	0.001
	Utah	Carbon	0.000	0.001	0.000	0.001	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.002	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Juab	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Millard	0.000	0.001	0.001	0.001	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.002	0.002	0.001	0.000	0.000
	Utah	Summit	0.000	0.002	0.000	0.001	0.000	0.000
	Utah	Wasatch	0.000	0.001	0.000	0.001	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.004	0.003
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.001	0.001
	Wyoming	Uinta	0.000	0.001	0.000	0.000	0.002	0.002
		Total	**0.007**	**0.040**	**0.010**	**0.008**	**0.042**	**0.013**
		Logan, UT-ID	0.000	0.023	0.001	0.002	0.001	0.000
		Provo, UT	0.000	0.046	0.001	0.003	0.000	0.000
		Salt Lake City, UT	0.000	0.153	0.003	0.009	0.000	0.000
		Surrounding Areas	0.007	0.040	0.010	0.008	0.042	0.013
			0.007	**0.262**	**0.016**	**0.021**	**0.043**	**0.013**
		Logan, UT-ID	1%	9%	7%	8%	2%	1%
		Provo, UT	1%	18%	6%	15%	0%	0%
		Salt Lake City, UT	1%	58%	20%	40%	0%	0%
		Surrounding Areas	97%	15%	67%	36%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.000	0.016	0.001	0.001	0.876	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.001	0.000	0.000	0.065	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.008	0.000	0.001	0.460	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.005	0.000	0.000	0.242	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.001	0.000	0.000	0.076	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.004	0.000	0.000	0.237	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.004	0.000	0.000	0.229	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.001	0.000	0.000	0.051	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.004	0.000	0.000	0.210	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.001	0.000	0.000	0.046	0.000	0.000	0.000
	Idaho	Power	0.000	0.001	0.000	0.000	0.075	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.016	0.001	0.001	0.825	0.000	0.000	0.000
	Utah	Carbon	0.000	0.009	0.000	0.002	0.096	0.218	0.000	0.000
	Utah	Duchesne	0.000	0.004	0.000	0.002	1.772	0.189	0.000	0.000
	Utah	Emery	0.000	0.003	0.000	0.002	0.433	0.277	0.000	0.000
	Utah	Juab	0.000	0.000	0.002	0.001	0.340	0.307	0.000	0.000
	Utah	Millard	0.000	0.003	0.001	0.002	0.569	0.348	0.000	0.000
	Utah	Morgan	0.000	0.003	0.000	0.000	0.136	0.112	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.237	0.036	0.000	0.000
	Utah	Sanpete	0.000	0.009	0.002	0.003	0.836	0.187	0.000	0.000
	Utah	Summit	0.000	0.033	0.000	0.001	0.594	0.553	0.000	0.000
	Utah	Wasatch	0.000	0.010	0.000	0.000	0.437	0.230	0.000	0.000
	Wyoming	Lincoln	0.000	0.001	0.000	0.042	0.844	0.333	0.078	0.000
	Wyoming	Sublette	0.000	0.001	0.000	0.003	0.457	0.196	0.000	0.000
	Wyoming	Uinta	0.000	0.005	0.000	0.012	0.446	0.414	0.007	0.000
		Total	**0.000**	**0.143**	**0.009**	**0.077**	**10.588**	**3.399**	**0.085**	**0.000**
		Logan, UT-ID	0.000	0.036	0.001	0.002	0.630	0.714	0.000	0.000
		Provo, UT	0.000	0.138	0.001	0.003	1.069	0.320	0.000	0.000
		Salt Lake City, UT	0.000	0.592	0.003	0.008	3.386	2.381	0.000	0.000
		Surrounding Areas	0.000	0.143	0.009	0.077	10.588	3.399	0.085	0.000
			0.000	**0.908**	**0.015**	**0.089**	**15.674**	**6.814**	**0.085**	**0.000**
		Logan, UT-ID	0%	4%	7%	2%	4%	10%	0%	0%
		Provo, UT	0%	15%	7%	4%	7%	5%	0%	0%
		Salt Lake City, UT	0%	65%	22%	9%	22%	35%	0%	0%
		Surrounding Areas	0%	16%	64%	86%	68%	50%	100%	0%
			0%	100%	100%	100%	100%	100%	100%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.002	0.000	0.065
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.039
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.002	0.001	0.050
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.001	4.785	0.011
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.024
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.000	0.006
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.000	0.006
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.028
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.000	0.016
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.008
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.011	0.025
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.003	0.011	0.007
	Utah	Carbon	0.009	0.000	0.000	0.000	0.001	0.034	0.067
	Utah	Duchesne	0.008	0.000	0.000	0.000	0.001	0.007	0.000
	Utah	Emery	0.005	0.000	0.000	0.000	0.001	0.003	0.035
	Utah	Juab	0.005	0.000	0.000	0.000	0.002	0.099	0.066
	Utah	Millard	0.006	0.000	0.000	0.000	0.001	0.003	0.109
	Utah	Morgan	0.004	0.000	0.000	0.000	0.001	0.012	0.059
	Utah	Rich	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.013	0.000	0.000	0.000	0.001	0.002	0.000
	Utah	Summit	0.018	0.000	0.000	0.000	0.002	0.000	0.102
	Utah	Wasatch	0.011	0.000	0.000	0.000	0.002	0.071	0.008
	Wyoming	Lincoln	0.000	0.000	0.033	0.013	1.111	0.000	0.175
	Wyoming	Sublette	0.000	0.000	0.014	0.013	0.887	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.013	0.073	0.129	0.000	0.198
		Total	**0.080**	**0.000**	**0.060**	**0.099**	**2.149**	**5.040**	**1.102**
		Logan, UT-ID	0.052	0.000	0.000	0.000	0.008	0.224	0.032
		Provo, UT	0.240	0.000	0.000	0.000	0.030	0.327	0.106
		Salt Lake City, UT	0.786	0.000	0.000	0.000	0.134	4.650	0.537
		Surrounding Areas	0.080	0.000	0.060	0.099	2.149	5.040	1.102
			1.159	**0.000**	**0.060**	**0.099**	**2.322**	**10.240**	**1.778**
		Logan, UT-ID	5%	0%	0%	0%	0%	2%	2%
		Provo, UT	21%	0%	0%	0%	1%	3%	6%
		Salt Lake City, UT	68%	0%	0%	0%	6%	45%	30%
		Surrounding Areas	7%	0%	100%	100%	93%	49%	62%
			100%	0%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.906	1.342	0.049
	Idaho	Bear Lake	0.000	0.000	0.000	0.067	0.052	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.471	0.424	0.044
	Idaho	Blaine	0.000	0.000	0.000	0.250	0.262	0.047
	Idaho	Caribou	0.000	0.000	0.000	0.078	0.082	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.245	0.431	0.047
	Idaho	Jerome	0.000	0.000	0.000	0.235	0.627	0.047
	Idaho	Lincoln	0.000	0.000	0.000	0.052	0.044	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.214	0.304	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.047	0.053	0.000
	Idaho	Power	0.000	0.000	0.000	0.078	0.133	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.853	1.428	0.246
	Utah	Carbon	0.002	0.000	0.006	0.174	0.033	0.011
	Utah	Duchesne	0.004	0.000	0.000	0.152	0.031	0.007
	Utah	Emery	0.000	0.000	0.000	0.103	0.012	0.004
	Utah	Juab	0.000	0.000	0.051	0.096	0.014	0.000
	Utah	Millard	0.000	0.000	0.018	0.136	0.000	0.000
	Utah	Morgan	0.000	0.000	0.004	0.080	0.004	0.000
	Utah	Rich	0.000	0.000	0.008	0.022	0.001	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.233	0.021	0.007
	Utah	Summit	0.000	0.000	0.001	0.334	0.043	0.047
	Utah	Wasatch	0.001	0.000	0.029	0.193	0.018	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.310	0.007	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.043	0.002	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.152	0.012	0.000
		Total	**0.008**	**0.000**	**0.118**	**5.525**	**5.383**	**0.557**
		Logan, UT-ID	0.000	0.000	0.001	1.082	0.420	0.094
		Provo, UT	0.000	0.000	0.030	4.285	0.518	0.154
		Salt Lake City, UT	0.037	0.004	0.014	14.027	2.871	1.591
		Surrounding Areas	0.008	0.000	0.118	5.525	5.383	0.557
			0.045	**0.005**	**0.163**	**24.918**	**9.191**	**2.396**
		Logan, UT-ID	0%	1%	1%	4%	5%	4%
		Provo, UT	1%	1%	18%	17%	6%	6%
		Salt Lake City, UT	81%	88%	9%	56%	31%	66%
		Surrounding Areas	18%	11%	72%	22%	59%	23%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposa	Total Area NOX
Surrounding Areas	Idaho	Bannock	0.036	0.565	0.060	5.331
	Idaho	Bear Lake	0.000	0.032	0.005	1.811
	Idaho	Bingham	0.004	0.270	0.031	6.618
	Idaho	Blaine	0.010	0.202	0.021	6.821
	Idaho	Caribou	0.000	0.046	0.003	1.670
	Idaho	Cassia	0.000	0.159	0.015	11.805
	Idaho	Jerome	0.012	0.133	0.014	10.447
	Idaho	Lincoln	0.000	0.017	0.002	2.849
	Idaho	Minidoka	0.000	0.098	0.020	3.066
	Idaho	Oneida	0.000	0.013	0.002	1.254
	Idaho	Power	0.000	0.023	0.005	1.902
	Idaho	Twin Falls	0.023	0.590	0.071	10.963
	Utah	Carbon	0.137	0.065	0.018	1.147
	Utah	Duchesne	0.023	0.073	0.036	3.396
	Utah	Emery	0.000	0.022	0.005	1.418
	Utah	Juab	0.000	0.062	0.004	1.744
	Utah	Millard	0.000	0.031	0.035	3.152
	Utah	Morgan	0.024	0.019	0.017	0.683
	Utah	Rich	0.000	0.005	0.001	0.977
	Utah	Sanpete	0.050	0.061	0.027	3.403
	Utah	Summit	0.024	0.290	0.043	2.556
	Utah	Wasatch	0.024	0.075	0.005	1.320
	Wyoming	Lincoln	0.011	0.347	0.103	3.477
	Wyoming	Sublette	0.000	0.011	0.029	1.716
	Wyoming	Uinta	0.006	0.120	0.053	2.003
		Total	**0.385**	**3.329**	**0.627**	**91.531**
		Logan, UT-ID	1.548	0.972	0.041	9.976
		Provo, UT	4.703	1.886	0.288	15.539
		Salt Lake City, UT	12.698	12.777	1.200	61.715
		Surrounding Areas	0.385	3.329	0.627	91.531
			19.334	**18.964**	**2.155**	**178.761**
		Logan, UT-ID	8%	5%	2%	6%
		Provo, UT	24%	10%	13%	9%
		Salt Lake City, UT	66%	67%	56%	35%
		Surrounding Areas	2%	18%	29%	51%
			100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for NH_3) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	4.650	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	5.050	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**9.700**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	5.151	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**5.151**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	7.849	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.824	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	1.327	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	2.688	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	1.938	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**14.626**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.001	0.001
	Utah	Cache	0.000	0.002	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.002**	**0.001**	**0.000**	**0.001**	**0.001**
Provo, UT	Utah	Utah	0.000	0.004	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.004**	**0.001**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.003	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.005	0.001	0.000	0.000	0.000
	Utah	Tooele	0.000	0.001	0.002	0.000	0.000	0.000
	Utah	Weber	0.000	0.004	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.014**	**0.004**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.008	0.000	0.000	0.000	0.000	0.007	0.000
	Utah	Cache	0.000	0.122	0.002	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.130**	**0.002**	**0.000**	**0.000**	**0.000**	**0.007**	**0.000**
Provo, UT	Utah	Utah	0.000	0.502	0.002	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.502**	**0.002**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.055	0.001	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.350	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	1.401	0.002	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.055	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.291	0.001	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**2.152**	**0.006**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.086	0.000	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.000**	**0.086**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.395	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.395**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.037	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.233	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.803	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.045	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.174	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**1.293**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.007	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.007**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.034	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.034**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.020	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.070	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.004	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.015	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.112**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Logan, UT-ID	Idaho	Franklin	0.000	0.000	4.670
	Utah	Cache	0.000	0.063	5.334
		Total	**0.000**	**0.063**	**10.003**
Provo, UT	Utah	Utah	0.000	0.345	6.435
		Total	**0.000**	**0.345**	**6.435**
Salt Lake City, UT	Utah	Box Elder	0.000	0.030	7.976
	Utah	Davis	0.000	0.205	1.636
	Utah	Salt Lake	0.000	0.716	4.325
	Utah	Tooele	0.000	0.037	2.834
	Utah	Weber	0.000	0.139	2.562
		Total	**0.000**	**1.127**	**19.334**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	1.901	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	1.760	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	7.053	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	1.235	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	1.579	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	19.282	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	19.801	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	6.695	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	4.276	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	1.320	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	1.654	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	16.121	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	1.118	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	4.470	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	2.309	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	3.220	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	7.532	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.818	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	2.657	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	8.731	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	2.117	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.891	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.002	1.298	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.060	0.999	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.040	0.964	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.102**	**119.801**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	9.700	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	5.151	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	14.626	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.102	119.801	0.000	0.000	0.000	0.000
			0.000	**0.102**	**149.278**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	6%	0%	0%	0%	0%
		Provo, UT	0%	0%	3%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	10%	0%	0%	0%	0%
		Surrounding Areas	0%	100%	80%	0%	0%	0%	100%
			0%	100%	100%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.001	0.001	0.001	0.000	0.004	0.005
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.001	0.000	0.003	0.004
	Idaho	Blaine	0.000	0.000	0.001	0.000	0.002	0.003
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.001	0.001
	Idaho	Twin Falls	0.001	0.001	0.002	0.000	0.004	0.006
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.002	0.013
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.002
	Wyoming	Uinta	0.000	0.000	0.001	0.000	0.001	0.008
		Total	**0.003**	**0.004**	**0.014**	**0.000**	**0.024**	**0.050**
		Logan, UT-ID	0.000	0.002	0.001	0.000	0.001	0.001
		Provo, UT	0.000	0.004	0.001	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.014	0.004	0.000	0.000	0.000
		Surrounding Areas	0.003	0.004	0.014	0.000	0.024	0.050
			0.003	**0.024**	**0.020**	**0.001**	**0.025**	**0.051**
		Logan, UT-ID	1%	9%	6%	8%	2%	1%
		Provo, UT	1%	17%	6%	15%	0%	0%
		Salt Lake City, UT	2%	57%	18%	41%	0%	0%
		Surrounding Areas	96%	16%	70%	35%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.000	0.059	0.001	0.000	0.003	0.000	0.036	0.000
	Idaho	Bear Lake	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.027	0.001	0.000	0.002	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.019	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.005	0.000	0.000	0.000	0.000	0.037	0.000
	Idaho	Cassia	0.000	0.015	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.015	0.000	0.000	0.001	0.000	0.002	0.000
	Idaho	Lincoln	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.014	0.000	0.000	0.001	0.000	0.001	0.000
	Idaho	Oneida	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.005	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Twin Falls	0.000	0.058	0.001	0.000	0.003	0.000	0.004	0.000
	Utah	Carbon	0.000	0.031	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.012	0.002	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.031	0.004	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.119	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.492**	**0.015**	**0.003**	**0.013**	**0.000**	**0.082**	**0.000**
		Logan, UT-ID	0.000	0.130	0.002	0.000	0.000	0.000	0.007	0.000
		Provo, UT	0.000	0.502	0.002	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	2.152	0.006	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.492	0.015	0.003	0.013	0.000	0.082	0.000
			0.000	**3.276**	**0.025**	**0.003**	**0.014**	**0.000**	**0.089**	**0.000**
		Logan, UT-ID	0%	4%	8%	2%	3%	0%	8%	0%
		Provo, UT	0%	15%	8%	5%	0%	0%	0%	0%
		Salt Lake City, UT	0%	66%	24%	8%	0%	0%	0%	0%
		Surrounding Areas	0%	15%	60%	86%	97%	0%	92%	0%
			0%	100%	100%	100%	100%	0%	100%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.182	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.390	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.003	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.019	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.187	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.110	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.019	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.164	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.004	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.165	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.337	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.016	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.013	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.011	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.007	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.002	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.021	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.030	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.017	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.075	0.000	0.001
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.060	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.007	0.000	0.001
		Total	**1.579**	**0.004**	**0.000**	**0.000**	**0.274**	**0.000**	**0.004**
		Logan, UT-ID	0.001	0.000	0.000	0.000	0.086	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.395	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	1.293	0.000	0.000
		Surrounding Areas	1.579	0.004	0.000	0.000	0.274	0.000	0.004
			1.580	**0.004**	**0.000**	**0.000**	**2.048**	**0.000**	**0.005**
		Logan, UT-ID	0%	0%	0%	0%	4%	0%	3%
		Provo, UT	0%	0%	0%	0%	19%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	63%	0%	0%
		Surrounding Areas	100%	100%	0%	0%	13%	100%	97%
			100%	100%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Carbon	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.011**	**0.000**	**0.000**	**0.001**
		Logan, UT-ID	0.000	0.000	0.000	0.007	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.034	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.112	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.011	0.000	0.000	0.001
			0.000	**0.000**	**0.000**	**0.166**	**0.000**	**0.000**	**0.001**
		Logan, UT-ID	5%	0%	0%	5%	0%	0%	4%
		Provo, UT	0%	0%	0%	21%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	68%	0%	0%	0%
		Surrounding Areas	95%	0%	0%	7%	0%	0%	96%
			100%	0%	0%	100%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Surrounding Areas	Idaho	Bannock	0.000	0.003	2.199
	Idaho	Bear Lake	0.000	0.000	1.766
	Idaho	Bingham	0.000	0.002	7.485
	Idaho	Blaine	0.000	0.001	1.269
	Idaho	Caribou	0.000	0.000	1.644
	Idaho	Cassia	0.000	0.001	19.490
	Idaho	Jerome	0.000	0.001	19.934
	Idaho	Lincoln	0.000	0.000	6.719
	Idaho	Minidoka	0.000	0.001	4.461
	Idaho	Oneida	0.000	0.000	1.327
	Idaho	Power	0.000	0.000	1.828
	Idaho	Twin Falls	0.000	0.003	16.543
	Utah	Carbon	0.000	0.013	1.179
	Utah	Duchesne	0.000	0.011	4.509
	Utah	Emery	0.000	0.007	2.335
	Utah	Juab	0.000	0.007	3.240
	Utah	Millard	0.000	0.009	7.568
	Utah	Morgan	0.000	0.006	0.845
	Utah	Rich	0.000	0.001	2.663
	Utah	Sanpete	0.000	0.018	8.810
	Utah	Summit	0.000	0.031	2.300
	Utah	Wasatch	0.000	0.018	0.962
	Wyoming	Lincoln	0.000	0.000	1.392
	Wyoming	Sublette	0.000	0.000	1.122
	Wyoming	Uinta	0.000	0.000	1.023
		Total	**0.000**	**0.135**	**122.613**
		Logan, UT-ID	0.000	0.063	10.003
		Provo, UT	0.000	0.345	6.435
		Salt Lake City, UT	0.000	1.127	19.334
		Surrounding Areas	0.000	0.135	122.613
			0.000	**1.670**	**158.385**
		Logan, UT-ID	0%	4%	6%
		Provo, UT	0%	21%	4%
		Salt Lake City, UT	0%	67%	12%
		Surrounding Areas	0%	8%	77%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for SO_2) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.255	0.000	0.017	0.000	0.000	0.122
	Utah	Cache	0.003	0.002	0.062	0.000	0.000	0.000
		Total	**0.258**	**0.002**	**0.080**	**0.000**	**0.000**	**0.122**
Provo, UT	Utah	Utah	0.031	0.005	0.069	0.000	0.000	0.000
		Total	**0.031**	**0.005**	**0.069**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.002	0.001	0.019	0.000	0.000	0.000
	Utah	Davis	0.000	0.004	0.010	0.000	0.000	0.000
	Utah	Salt Lake	0.020	0.006	0.068	0.000	0.000	0.000
	Utah	Tooele	0.021	0.001	0.101	0.000	0.000	0.000
	Utah	Weber	0.006	0.005	0.025	0.000	0.000	0.000
		Total	**0.049**	**0.017**	**0.223**	**0.001**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.013	0.001	0.002	0.000	0.000	0.000
	Utah	Cache	0.000	0.004	0.055	0.000	0.004	0.000	0.000	0.000
		Total	**0.000**	**0.004**	**0.068**	**0.001**	**0.006**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.015	0.061	0.002	0.009	0.000	0.000	0.000
		Total	**0.000**	**0.015**	**0.061**	**0.002**	**0.009**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.002	0.017	0.000	0.003	0.000	0.000	0.000
	Utah	Davis	0.000	0.010	0.009	0.000	0.003	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.042	0.060	0.001	0.010	0.000	0.000	0.000
	Utah	Tooele	0.000	0.002	0.089	0.001	0.004	0.000	0.000	0.000
	Utah	Weber	0.000	0.009	0.022	0.000	0.007	0.000	0.000	0.000
		Total	**0.000**	**0.065**	**0.196**	**0.004**	**0.027**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.005	0.024
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.005**	**0.028**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.011	0.160
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.011**	**0.160**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.001	0.230
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.014	0.097
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.004	0.415	0.181
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.008	0.158
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.007	0.130
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.446**	**0.797**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Mobile On-Road Diesel Heavy Duty Vehicles	Mobile On-Road Diesel Light Duty Vehicles	Mobile On-Road Gasoline Heavy Duty Vehicles
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.014	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.014**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile On-Road Gasoline Light Duty Vehicles	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	0%	0%	100%
			0%	0%	0%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	4.416	0.001	0.128	0.000	0.001	0.859
	Idaho	Bear Lake	0.227	0.000	0.010	0.000	0.000	0.041
	Idaho	Bingham	1.342	0.000	0.054	0.000	0.001	0.688
	Idaho	Blaine	2.107	0.001	0.095	0.000	0.000	0.533
	Idaho	Caribou	0.165	0.000	0.013	0.000	0.000	0.278
	Idaho	Cassia	0.821	0.000	0.044	0.000	0.000	0.339
	Idaho	Jerome	0.493	0.000	0.032	0.000	0.000	0.356
	Idaho	Lincoln	0.111	0.000	0.006	0.000	0.000	0.075
	Idaho	Minidoka	0.544	0.000	0.027	0.000	0.000	0.284
	Idaho	Oneida	0.168	0.000	0.005	0.000	0.000	0.032
	Idaho	Power	0.227	0.000	0.009	0.000	0.000	0.220
	Idaho	Twin Falls	4.180	0.001	0.165	0.000	0.001	1.063
	Utah	Carbon	0.081	0.000	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.024	0.000	0.010	0.000	0.000	0.000
	Utah	Emery	0.081	0.000	0.001	0.000	0.000	0.000
	Utah	Juab	0.027	0.000	0.105	0.000	0.000	0.000
	Utah	Millard	0.055	0.000	0.076	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.003	0.000	0.018	0.000	0.000	0.000
	Utah	Sanpete	0.083	0.000	0.142	0.000	0.000	0.000
	Utah	Summit	0.002	0.000	0.008	0.000	0.000	0.000
	Utah	Wasatch	0.002	0.000	0.003	0.000	0.000	0.000
	Wyoming	Lincoln	0.114	0.000	0.023	0.000	0.000	0.713
	Wyoming	Sublette	0.053	0.000	0.011	0.000	0.000	0.122
	Wyoming	Uinta	0.273	0.000	0.054	0.000	0.000	0.410
		Total	**15.599**	**0.005**	**1.038**	**0.001**	**0.005**	**6.013**
		Logan, UT-ID	0.258	0.002	0.080	0.000	0.000	0.122
		Provo, UT	0.031	0.005	0.069	0.000	0.000	0.000
		Salt Lake City, UT	0.049	0.017	0.223	0.001	0.000	0.000
		Surrounding Areas	15.599	0.005	1.038	0.001	0.005	6.013
			15.938	**0.029**	**1.411**	**0.002**	**0.005**	**6.136**
		Logan, UT-ID	2%	9%	6%	8%	2%	2%
		Provo, UT	0%	17%	5%	15%	0%	0%
		Salt Lake City, UT	0%	58%	16%	40%	0%	0%
		Surrounding Areas	98%	16%	74%	37%	98%	98%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.002	0.002	0.096	0.004	0.012	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.007	0.000	0.001	0.000	0.000	0.000
	Idaho	Bingham	0.001	0.001	0.044	0.002	0.006	0.000	0.000	0.000
	Idaho	Blaine	0.001	0.001	0.030	0.001	0.003	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.008	0.000	0.001	0.000	0.000	0.000
	Idaho	Cassia	0.001	0.000	0.024	0.001	0.003	0.000	0.000	0.000
	Idaho	Jerome	0.001	0.000	0.024	0.001	0.003	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.000
	Idaho	Minidoka	0.001	0.000	0.022	0.001	0.003	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.008	0.000	0.001	0.000	0.000	0.000
	Idaho	Twin Falls	0.002	0.002	0.093	0.004	0.011	0.000	0.000	0.000
	Utah	Carbon	0.000	0.001	0.001	0.005	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.009	0.002	0.014	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.001	0.005	0.003	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.092	0.002	0.003	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.067	0.003	0.005	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.016	0.000	0.002	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.001	0.124	0.005	0.007	0.000	0.000	0.000
	Utah	Summit	0.000	0.004	0.007	0.000	0.005	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.001	0.003	0.000	0.004	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.010	0.111	0.007	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.013	0.007	0.004	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.001	0.003	0.032	0.004	0.000	0.000	0.000
		Total	**0.009**	**0.015**	**0.711**	**0.187**	**0.104**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.004	0.068	0.001	0.006	0.000	0.000	0.000
		Provo, UT	0.000	0.015	0.061	0.002	0.009	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.065	0.196	0.004	0.027	0.000	0.000	0.000
		Surrounding Areas	0.009	0.015	0.711	0.187	0.104	0.000	0.000	0.000
			0.009	**0.099**	**1.035**	**0.193**	**0.146**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	0%	4%	0%	0%	0%
		Provo, UT	0%	15%	6%	1%	6%	0%	0%	0%
		Salt Lake City, UT	0%	65%	19%	2%	19%	0%	0%	0%
		Surrounding Areas	97%	16%	69%	97%	71%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.017
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.013
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.919	0.003
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.007
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.001	0.107
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.054
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.002	0.100
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.165
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.001	0.089
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.153
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.002	0.013
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.037	0.000	0.243
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.034	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.005	0.000	0.275
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.077**	**0.926**	**1.270**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.005	0.028
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.011	0.160
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.004	0.446	0.797
		Surrounding Areas	0.000	0.000	0.000	0.000	0.077	0.926	1.270
			0.000	**0.000**	**0.000**	**0.000**	**0.081**	**1.388**	**2.255**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	1%
		Provo, UT	0%	0%	0%	0%	0%	1%	7%
		Salt Lake City, UT	0%	0%	0%	0%	5%	32%	35%
		Surrounding Areas	0%	0%	0%	0%	94%	67%	56%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Mobile On-Road Diesel Heavy Duty Vehicles	Mobile On-Road Diesel Light Duty Vehicles	Mobile On-Road Gasoline Heavy Duty Vehicles
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.026	0.000	0.002
	Wyoming	Sublette	0.000	0.000	0.000	0.014	0.000	0.001
	Wyoming	Uinta	0.000	0.000	0.000	0.046	0.000	0.002
		Total	**0.000**	**0.000**	**0.000**	**0.087**	**0.000**	**0.006**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.014	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.087	0.000	0.006
			0.014	**0.000**	**0.000**	**0.087**	**0.000**	**0.006**
		Logan, UT-ID	0%	1%	2%	0%	0%	0%
		Provo, UT	0%	15%	28%	0%	0%	0%
		Salt Lake City, UT	98%	17%	17%	0%	0%	0%
		Surrounding Areas	2%	67%	54%	100%	100%	100%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile On-Road Gasoline Light Duty Vehicles	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.027	0.000	0.000	0.000	0.000	0.000	0.002
	Wyoming	Sublette	0.015	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.031	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.073**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.005**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.073	0.000	0.000	0.000	0.000	0.000	0.005
			0.073	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.005**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	100%	0%	0%	0%	0%	0%	100%
			100%	0%	0%	0%	0%	0%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for CO) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.056	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.056**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.255	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.255**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.024	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.151	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.519	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.029	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.112	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.835**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.369	0.017	0.001	0.000	0.014	0.004
	Utah	Cache	0.000	0.333	0.007	0.027	0.000	0.000
		Total	**0.369**	**0.350**	**0.008**	**0.027**	**0.014**	**0.004**
Provo, UT	Utah	Utah	0.005	0.707	0.007	0.050	0.000	0.000
		Total	**0.005**	**0.707**	**0.007**	**0.050**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.101	0.002	0.024	0.000	0.000
	Utah	Davis	0.000	0.567	0.001	0.010	0.000	0.000
	Utah	Salt Lake	0.003	0.869	0.007	0.053	0.000	0.000
	Utah	Tooele	0.004	0.109	0.011	0.018	0.000	0.000
	Utah	Weber	0.001	0.684	0.003	0.026	0.000	0.000
		Total	**0.008**	**2.330**	**0.023**	**0.132**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.001	0.016	0.001	0.006	0.692	0.000	0.000	0.000
	Utah	Cache	0.000	0.245	0.006	0.012	2.205	0.000	0.000	0.000
		Total	**0.001**	**0.261**	**0.007**	**0.018**	**2.897**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	1.003	0.007	0.039	4.791	0.000	0.000	0.000
		Total	**0.000**	**1.003**	**0.007**	**0.039**	**4.791**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.109	0.002	0.010	1.691	0.000	0.000	0.000
	Utah	Davis	0.000	0.699	0.001	0.004	1.857	0.000	0.000	0.000
	Utah	Salt Lake	0.000	2.803	0.007	0.033	5.454	0.000	0.000	0.000
	Utah	Tooele	0.000	0.111	0.010	0.020	2.089	0.000	0.000	0.000
	Utah	Weber	0.000	0.583	0.003	0.014	4.078	0.000	0.000	0.000
		Total	**0.000**	**4.304**	**0.023**	**0.080**	**15.168**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.025	0.001	0.046
	Utah	Cache	0.000	0.000	0.000	0.000	0.050	2.022	0.045
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.075**	**2.023**	**0.091**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.230	9.386	0.293
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.230**	**9.386**	**0.293**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.020	0.731	0.438
	Utah	Davis	0.000	0.000	0.000	0.000	0.115	3.439	0.181
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.624	34.810	0.335
	Utah	Tooele	0.000	0.000	0.000	0.000	0.032	1.658	0.293
	Utah	Weber	0.000	0.000	0.000	0.000	0.106	4.664	0.247
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.897**	**45.303**	**1.493**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.056	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.056**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.004	0.000	1.283	0.000	0.000	0.000	0.000
		Total	**0.004**	**0.000**	**1.283**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.114	0.000	0.000	0.000	0.000
	Utah	Davis	0.225	0.000	0.005	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.100	0.112	0.025	0.000	0.000	0.000	0.000
	Utah	Tooele	0.015	0.001	0.257	0.000	0.000	0.000	0.000
	Utah	Weber	0.015	0.000	0.169	0.000	0.000	0.000	0.000
		Total	**0.354**	**0.112**	**0.569**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area CO
Logan, UT-ID	Idaho	Franklin	0.000	0.019	1.213
	Utah	Cache	0.000	0.000	5.063
		Total	**0.000**	**0.019**	**6.276**
Provo, UT	Utah	Utah	0.000	0.000	18.060
		Total	**0.000**	**0.000**	**18.060**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	3.266
	Utah	Davis	0.000	0.000	7.254
	Utah	Salt Lake	0.000	0.000	45.754
	Utah	Tooele	0.000	0.000	4.655
	Utah	Weber	0.000	0.000	10.704
		Total	**0.000**	**0.000**	**71.633**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.010	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.007	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.013	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.020	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.011	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.002	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.010	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.105**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.056	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.255	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.835	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.105	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**1.251**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	4%	0%	3%
		Provo, UT	0%	0%	0%	0%	20%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	67%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	8%	0%	97%
			0%	0%	0%	0%	100%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	6.394	0.114	0.009	0.001	0.095	0.030
	Idaho	Bear Lake	0.328	0.008	0.001	0.000	0.005	0.001
	Idaho	Bingham	1.942	0.046	0.004	0.000	0.076	0.024
	Idaho	Blaine	3.049	0.082	0.007	0.001	0.059	0.019
	Idaho	Caribou	0.239	0.011	0.001	0.000	0.031	0.010
	Idaho	Cassia	1.189	0.036	0.003	0.000	0.037	0.012
	Idaho	Jerome	0.714	0.031	0.002	0.000	0.039	0.013
	Idaho	Lincoln	0.160	0.006	0.000	0.000	0.008	0.003
	Idaho	Minidoka	0.787	0.023	0.002	0.000	0.031	0.010
	Idaho	Oneida	0.244	0.004	0.000	0.000	0.004	0.001
	Idaho	Power	0.329	0.008	0.001	0.000	0.024	0.008
	Idaho	Twin Falls	6.053	0.147	0.012	0.002	0.117	0.037
	Utah	Carbon	0.013	0.023	0.000	0.008	0.000	0.000
	Utah	Duchesne	0.004	0.004	0.001	0.036	0.000	0.000
	Utah	Emery	0.013	0.000	0.000	0.011	0.000	0.000
	Utah	Juab	0.004	0.000	0.011	0.007	0.000	0.000
	Utah	Millard	0.009	0.011	0.008	0.013	0.000	0.000
	Utah	Morgan	0.000	0.002	0.000	0.003	0.000	0.000
	Utah	Rich	0.000	0.000	0.002	0.005	0.000	0.000
	Utah	Sanpete	0.014	0.028	0.015	0.012	0.000	0.000
	Utah	Summit	0.000	0.037	0.001	0.011	0.000	0.000
	Utah	Wasatch	0.000	0.014	0.000	0.009	0.000	0.000
	Wyoming	Lincoln	0.017	0.007	0.003	0.001	0.063	0.084
	Wyoming	Sublette	0.008	0.003	0.001	0.001	0.011	0.014
	Wyoming	Uinta	0.041	0.017	0.006	0.003	0.036	0.048
		Total	**21.554**	**0.664**	**0.090**	**0.124**	**0.636**	**0.314**
		Logan, UT-ID	0.369	0.350	0.008	0.027	0.014	0.004
		Provo, UT	0.005	0.707	0.007	0.050	0.000	0.000
		Salt Lake City, UT	0.008	2.330	0.023	0.132	0.000	0.000
		Surrounding Areas	21.554	0.664	0.090	0.124	0.636	0.314
			21.936	**4.050**	**0.128**	**0.332**	**0.650**	**0.318**
		Logan, UT-ID	2%	9%	6%	8%	2%	1%
		Provo, UT	0%	17%	6%	15%	0%	0%
		Salt Lake City, UT	0%	58%	18%	40%	0%	0%
		Surrounding Areas	98%	16%	70%	37%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.009	0.119	0.007	0.044	4.413	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.009	0.000	0.003	0.330	0.000	0.000	0.000
	Idaho	Bingham	0.007	0.055	0.003	0.020	2.305	0.000	0.000	0.000
	Idaho	Blaine	0.006	0.037	0.002	0.014	1.232	0.000	0.000	0.000
	Idaho	Caribou	0.003	0.010	0.001	0.004	0.385	0.000	0.000	0.000
	Idaho	Cassia	0.004	0.030	0.002	0.011	1.190	0.000	0.000	0.000
	Idaho	Jerome	0.004	0.029	0.002	0.011	1.150	0.000	0.000	0.000
	Idaho	Lincoln	0.001	0.007	0.000	0.003	0.254	0.000	0.000	0.000
	Idaho	Minidoka	0.003	0.027	0.002	0.010	1.058	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.006	0.000	0.002	0.233	0.000	0.000	0.000
	Idaho	Power	0.002	0.010	0.001	0.004	0.379	0.000	0.000	0.000
	Idaho	Twin Falls	0.011	0.116	0.007	0.043	4.156	0.000	0.000	0.000
	Utah	Carbon	0.000	0.062	0.000	0.056	0.431	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.027	0.001	0.029	7.933	0.000	0.000	0.000
	Utah	Emery	0.000	0.020	0.000	0.057	1.938	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.011	0.020	1.525	0.000	0.000	0.000
	Utah	Millard	0.000	0.024	0.008	0.040	2.547	0.000	0.000	0.000
	Utah	Morgan	0.000	0.025	0.000	0.001	0.608	0.000	0.000	0.000
	Utah	Rich	0.000	0.003	0.002	0.004	1.059	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.063	0.015	0.058	3.741	0.000	0.000	0.000
	Utah	Summit	0.000	0.237	0.001	0.005	2.659	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.070	0.000	0.005	1.956	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.011	0.001	1.138	3.813	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.005	0.002	0.077	2.065	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.038	0.000	0.325	2.052	0.000	0.000	0.000
		Total	**0.051**	**1.038**	**0.066**	**1.982**	**49.413**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.001	0.261	0.007	0.018	2.897	0.000	0.000	0.000
		Provo, UT	0.000	1.003	0.007	0.039	4.791	0.000	0.000	0.000
		Salt Lake City, UT	0.000	4.304	0.023	0.080	15.168	0.000	0.000	0.000
		Surrounding Areas	0.051	1.038	0.066	1.982	49.413	0.000	0.000	0.000
			0.052	**6.606**	**0.103**	**2.119**	**72.268**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	1%	4%	0%	0%	0%
		Provo, UT	0%	15%	7%	2%	7%	0%	0%	0%
		Salt Lake City, UT	0%	65%	22%	4%	21%	0%	0%	0%
		Surrounding Areas	97%	16%	64%	94%	68%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.185	0.000	0.183
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.014	0.000	0.110
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.092	0.019	0.140
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.015	19.129	0.031
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.015	0.000	0.068
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.048	0.009	0.011
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.050	0.000	0.012
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.011	0.000	0.078
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.046	0.000	0.041
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.009	0.001	0.023
	Idaho	Power	0.000	0.000	0.000	0.000	0.014	0.252	0.071
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.183	0.242	0.013
	Utah	Carbon	0.000	0.000	0.000	0.000	0.011	0.516	0.182
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.008	0.398	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.004	0.137	0.097
	Utah	Juab	0.000	0.000	0.000	0.000	0.011	0.850	0.188
	Utah	Millard	0.000	0.000	0.000	0.000	0.005	0.149	0.308
	Utah	Morgan	0.000	0.000	0.000	0.000	0.010	0.771	0.169
	Utah	Rich	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.008	0.113	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.010	0.000	0.291
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.015	0.894	0.021
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	4.572	0.000	0.378
	Wyoming	Sublette	0.000	0.000	0.000	0.000	3.598	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.425	0.000	0.428
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**9.362**	**23.479**	**2.839**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.075	2.023	0.091
		Provo, UT	0.000	0.000	0.000	0.000	0.230	9.386	0.293
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.897	45.303	1.493
		Surrounding Areas	0.000	0.000	0.000	0.000	9.362	23.479	2.839
			0.000	**0.000**	**0.000**	**0.000**	**10.564**	**80.191**	**4.717**
		Logan, UT-ID	0%	0%	0%	0%	1%	3%	2%
		Provo, UT	0%	0%	0%	0%	2%	12%	6%
		Salt Lake City, UT	0%	0%	0%	0%	8%	56%	32%
		Surrounding Areas	0%	0%	0%	0%	89%	29%	60%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.001	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.022	0.000	0.160	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.226	0.000	0.006	0.000	0.000	0.000	0.000
	Utah	Emery	0.010	0.000	0.008	0.000	0.000	0.000	0.000
	Utah	Juab	0.005	0.000	0.686	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.248	0.000	0.000	0.000	0.000
	Utah	Morgan	0.009	0.000	0.058	0.000	0.000	0.000	0.000
	Utah	Rich	0.009	0.000	0.121	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.008	0.000	0.006	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.007	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.036	0.000	1.288	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.330**	**0.005**	**2.590**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.056	0.000	0.000	0.000	0.000
		Provo, UT	0.004	0.000	1.283	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.354	0.112	0.569	0.000	0.000	0.000	0.000
		Surrounding Areas	0.330	0.005	2.590	0.000	0.000	0.000	0.000
			0.689	**0.118**	**4.498**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	1%	0%	0%	0%	0%
		Provo, UT	1%	0%	29%	0%	0%	0%	0%
		Salt Lake City, UT	51%	96%	13%	0%	0%	0%	0%
		Surrounding Areas	48%	4%	58%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/22/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area CO
Surrounding Areas	Idaho	Bannock	0.000	0.124	11.728
	Idaho	Bear Lake	0.000	0.009	0.821
	Idaho	Bingham	0.000	0.064	4.799
	Idaho	Blaine	0.000	0.034	23.716
	Idaho	Caribou	0.000	0.011	0.789
	Idaho	Cassia	0.000	0.034	2.616
	Idaho	Jerome	0.000	0.032	2.089
	Idaho	Lincoln	0.000	0.007	0.538
	Idaho	Minidoka	0.000	0.029	2.070
	Idaho	Oneida	0.000	0.006	0.534
	Idaho	Power	0.000	0.011	1.114
	Idaho	Twin Falls	0.000	0.116	11.255
	Utah	Carbon	0.000	0.000	1.494
	Utah	Duchesne	0.000	0.022	8.703
	Utah	Emery	0.000	0.014	2.315
	Utah	Juab	0.000	0.000	3.323
	Utah	Millard	0.000	0.018	3.395
	Utah	Morgan	0.000	0.013	1.672
	Utah	Rich	0.000	0.003	1.210
	Utah	Sanpete	0.000	0.036	4.131
	Utah	Summit	0.000	0.052	3.333
	Utah	Wasatch	0.000	0.000	4.320
	Wyoming	Lincoln	0.000	1.330	11.425
	Wyoming	Sublette	0.000	0.351	6.138
	Wyoming	Uinta	0.000	0.565	3.995
		Total	**0.000**	**2.880**	**117.521**
		Logan, UT-ID	0.000	0.019	6.276
		Provo, UT	0.000	0.000	18.060
		Salt Lake City, UT	0.000	0.000	71.633
		Surrounding Areas	0.000	2.880	117.521
			0.000	**2.900**	**213.491**
		Logan, UT-ID	0%	1%	3%
		Provo, UT	0%	0%	8%
		Salt Lake City, UT	0%	0%	34%
		Surrounding Areas	0%	99%	55%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for PM2.5) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.008	0.000	0.000	0.000	0.000	0.014	0.000
	Utah	Cache	0.000	0.000	0.012	0.000	0.137	0.026	0.000
		Total	**0.008**	**0.000**	**0.012**	**0.000**	**0.137**	**0.040**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.015	0.000	0.636	0.220	0.000
		Total	**0.000**	**0.000**	**0.015**	**0.000**	**0.636**	**0.220**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.020	0.000	0.060	0.022	0.000
	Utah	Davis	0.000	0.000	0.001	0.000	0.370	0.084	0.000
	Utah	Salt Lake	0.000	0.000	0.001	0.000	1.262	0.491	0.000
	Utah	Tooele	0.000	0.000	0.005	0.000	0.071	0.033	0.000
	Utah	Weber	0.000	0.000	0.004	0.000	0.275	0.074	0.000
		Total	**0.000**	**0.000**	**0.031**	**0.000**	**2.038**	**0.704**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.007	0.002	0.001	0.000	0.001	0.005
	Utah	Cache	0.000	0.029	0.004	0.002	0.000	0.000
		Total	**0.008**	**0.031**	**0.004**	**0.002**	**0.001**	**0.005**
Provo, UT	Utah	Utah	0.001	0.027	0.004	0.004	0.000	0.000
		Total	**0.001**	**0.027**	**0.004**	**0.004**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.010	0.001	0.002	0.000	0.000
	Utah	Davis	0.000	0.051	0.001	0.001	0.000	0.000
	Utah	Salt Lake	0.001	0.033	0.004	0.004	0.000	0.000
	Utah	Tooele	0.001	0.003	0.006	0.001	0.000	0.000
	Utah	Weber	0.000	0.061	0.002	0.002	0.000	0.000
		Total	**0.002**	**0.159**	**0.014**	**0.011**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.001	0.100	0.000	0.000	0.000
	Utah	Cache	0.000	0.003	0.003	0.000	0.257	0.000	0.000	0.000
		Total	**0.000**	**0.003**	**0.003**	**0.001**	**0.357**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.012	0.003	0.000	0.559	0.000	0.000	0.000
		Total	**0.000**	**0.012**	**0.003**	**0.000**	**0.559**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.001	0.001	0.000	0.197	0.000	0.000	0.000
	Utah	Davis	0.000	0.008	0.000	0.000	0.217	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.033	0.003	0.000	0.637	0.000	0.000	0.000
	Utah	Tooele	0.000	0.001	0.005	0.000	0.244	0.000	0.000	0.000
	Utah	Weber	0.000	0.007	0.001	0.000	0.476	0.000	0.000	0.000
		Total	**0.000**	**0.050**	**0.010**	**0.001**	**1.771**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.001	0.000	0.009
	Utah	Cache	0.022	0.000	0.000	0.000	0.000	0.003	0.009
		Total	**0.022**	**0.000**	**0.000**	**0.000**	**0.001**	**0.003**	**0.018**
Provo, UT	Utah	Utah	0.228	0.000	0.000	0.000	0.000	0.002	0.060
		Total	**0.228**	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**	**0.060**
Salt Lake City, UT	Utah	Box Elder	0.042	0.000	0.000	0.000	0.000	0.000	0.086
	Utah	Davis	0.050	0.000	0.000	0.000	0.000	0.032	0.036
	Utah	Salt Lake	0.401	0.000	0.000	0.000	0.000	0.036	0.068
	Utah	Tooele	0.025	0.000	0.000	0.000	0.000	0.006	0.059
	Utah	Weber	0.024	0.000	0.000	0.000	0.000	0.002	0.049
		Total	**0.543**	**0.000**	**0.000**	**0.000**	**0.001**	**0.077**	**0.298**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.019	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.019**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area PM2.5
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.148
	Utah	Cache	0.000	0.008	0.515
		Total	**0.000**	**0.008**	**0.663**
Provo, UT	Utah	Utah	0.000	0.037	1.810
		Total	**0.000**	**0.037**	**1.810**
Salt Lake City, UT	Utah	Box Elder	0.000	0.004	0.447
	Utah	Davis	0.000	0.011	0.863
	Utah	Salt Lake	0.000	0.074	3.070
	Utah	Tooele	0.000	0.000	0.461
	Utah	Weber	0.000	0.016	0.995
		Total	**0.000**	**0.105**	**5.835**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.015	0.000	0.000	0.000	0.000	0.089	0.000
	Idaho	Bear Lake	0.006	0.000	0.000	0.000	0.000	0.003	0.000
	Idaho	Bingham	0.304	0.000	0.000	0.000	0.000	0.020	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.008	0.000
	Idaho	Caribou	0.015	0.000	0.000	0.000	0.000	0.007	0.000
	Idaho	Cassia	0.074	0.000	0.000	0.000	0.000	0.048	0.000
	Idaho	Jerome	0.039	0.000	0.000	0.000	0.000	0.058	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.073	0.000	0.000	0.000	0.000	0.049	0.000
	Idaho	Oneida	0.008	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.031	0.000	0.000	0.000	0.000	0.008	0.000
	Idaho	Twin Falls	0.023	0.000	0.000	0.000	0.000	0.088	0.000
	Utah	Carbon	0.000	0.000	0.002	0.000	0.024	0.006	0.000
	Utah	Duchesne	0.000	0.000	0.010	0.000	0.021	0.008	0.000
	Utah	Emery	0.000	0.000	0.006	0.000	0.013	0.002	0.000
	Utah	Juab	0.000	0.000	0.003	0.000	0.012	0.001	0.000
	Utah	Millard	0.000	0.000	0.016	0.000	0.017	0.004	0.000
	Utah	Morgan	0.000	0.000	0.002	0.000	0.012	0.003	0.000
	Utah	Rich	0.000	0.000	0.009	0.000	0.003	0.002	0.000
	Utah	Sanpete	0.000	0.000	0.010	0.000	0.033	0.008	0.000
	Utah	Summit	0.000	0.000	0.005	0.000	0.049	0.060	0.000
	Utah	Wasatch	0.000	0.000	0.002	0.000	0.028	0.016	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.018	0.015	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.006	0.006	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.024	0.030	0.000
		Total	**0.588**	**0.000**	**0.065**	**0.000**	**0.259**	**0.541**	**0.000**
		Logan, UT-ID	0.008	0.000	0.012	0.000	0.137	0.040	0.000
		Provo, UT	0.000	0.000	0.015	0.000	0.636	0.220	0.000
		Salt Lake City, UT	0.000	0.000	0.031	0.000	2.038	0.704	0.000
		Surrounding Areas	0.588	0.000	0.065	0.000	0.259	0.541	0.000
			0.596	**0.000**	**0.122**	**0.000**	**3.070**	**1.505**	**0.000**
		Logan, UT-ID	1%	0%	9%	0%	4%	3%	3%
		Provo, UT	0%	0%	12%	0%	21%	15%	0%
		Salt Lake City, UT	0%	0%	25%	0%	66%	47%	0%
		Surrounding Areas	99%	0%	53%	0%	8%	36%	97%
			100%	0%	100%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.129	0.010	0.004	0.001	0.009	0.033
	Idaho	Bear Lake	0.007	0.001	0.000	0.000	0.000	0.002
	Idaho	Bingham	0.039	0.004	0.008	0.000	0.007	0.026
	Idaho	Blaine	0.062	0.007	0.003	0.000	0.005	0.020
	Idaho	Caribou	0.005	0.001	0.000	0.000	0.003	0.011
	Idaho	Cassia	0.024	0.003	0.001	0.000	0.003	0.013
	Idaho	Jerome	0.014	0.003	0.001	0.000	0.004	0.014
	Idaho	Lincoln	0.003	0.000	0.000	0.000	0.001	0.003
	Idaho	Minidoka	0.016	0.002	0.001	0.000	0.003	0.011
	Idaho	Oneida	0.005	0.000	0.000	0.000	0.000	0.001
	Idaho	Power	0.007	0.001	0.000	0.000	0.002	0.008
	Idaho	Twin Falls	0.122	0.013	0.005	0.001	0.011	0.040
	Utah	Carbon	0.004	0.002	0.000	0.001	0.000	0.000
	Utah	Duchesne	0.001	0.000	0.001	0.003	0.000	0.000
	Utah	Emery	0.004	0.000	0.000	0.001	0.000	0.000
	Utah	Juab	0.001	0.000	0.007	0.001	0.000	0.000
	Utah	Millard	0.003	0.001	0.005	0.001	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Sanpete	0.004	0.003	0.009	0.001	0.000	0.000
	Utah	Summit	0.000	0.004	0.001	0.001	0.000	0.000
	Utah	Wasatch	0.000	0.001	0.000	0.001	0.000	0.000
	Wyoming	Lincoln	0.008	0.000	0.001	0.000	0.000	0.026
	Wyoming	Sublette	0.004	0.000	0.001	0.000	0.000	0.004
	Wyoming	Uinta	0.020	0.000	0.003	0.000	0.000	0.015
		Total	**0.482**	**0.057**	**0.051**	**0.012**	**0.048**	**0.227**
		Logan, UT-ID	0.008	0.031	0.004	0.002	0.001	0.005
		Provo, UT	0.001	0.027	0.004	0.004	0.000	0.000
		Salt Lake City, UT	0.002	0.159	0.014	0.011	0.000	0.000
		Surrounding Areas	0.482	0.057	0.051	0.012	0.048	0.227
			0.493	**0.273**	**0.074**	**0.030**	**0.049**	**0.231**
		Logan, UT-ID	2%	11%	6%	8%	2%	2%
		Provo, UT	0%	10%	6%	14%	0%	0%
		Salt Lake City, UT	0%	58%	19%	37%	0%	0%
		Surrounding Areas	98%	21%	69%	41%	98%	98%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.001	0.000	0.003	0.005	0.636	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.048	0.000	0.000	0.000
	Idaho	Bingham	0.001	0.000	0.001	0.002	0.332	0.000	0.000	0.000
	Idaho	Blaine	0.001	0.000	0.001	0.001	0.178	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.056	0.000	0.000	0.000
	Idaho	Cassia	0.001	0.000	0.001	0.001	0.171	0.000	0.000	0.000
	Idaho	Jerome	0.001	0.000	0.001	0.001	0.166	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.037	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.001	0.001	0.152	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.033	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.055	0.000	0.000	0.000
	Idaho	Twin Falls	0.002	0.000	0.003	0.005	0.599	0.000	0.000	0.000
	Utah	Carbon	0.000	0.001	0.000	0.000	0.050	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.926	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.226	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.005	0.000	0.178	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.003	0.000	0.297	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.071	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.001	0.000	0.124	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.001	0.006	0.000	0.437	0.000	0.000	0.000
	Utah	Summit	0.000	0.003	0.000	0.000	0.310	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.001	0.000	0.000	0.228	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.020	0.472	0.000	0.000	0.286
	Wyoming	Sublette	0.000	0.000	0.001	0.001	0.255	0.000	0.000	0.286
	Wyoming	Uinta	0.000	0.000	0.000	0.006	0.252	0.000	0.000	0.286
		Total	**0.007**	**0.007**	**0.028**	**0.047**	**6.289**	**0.000**	**0.000**	**0.859**
		Logan, UT-ID	0.000	0.003	0.003	0.001	0.357	0.000	0.000	0.000
		Provo, UT	0.000	0.012	0.003	0.000	0.559	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.050	0.010	0.001	1.771	0.000	0.000	0.000
		Surrounding Areas	0.007	0.007	0.028	0.047	6.289	0.000	0.000	0.859
			0.007	**0.072**	**0.045**	**0.049**	**8.976**	**0.000**	**0.000**	**0.859**
		Logan, UT-ID	2%	4%	7%	2%	4%	0%	0%	0%
		Provo, UT	0%	16%	7%	1%	6%	0%	0%	0%
		Salt Lake City, UT	0%	70%	22%	2%	20%	0%	0%	0%
		Surrounding Areas	98%	10%	64%	96%	70%	0%	0%	100%
			100%	100%	100%	100%	100%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.009	0.000	0.034
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.001	0.000	0.021
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.004	0.000	0.026
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.001	12.935	0.006
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.001	0.000	0.013
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.002	0.000	0.002
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.002	0.000	0.003
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.001	0.000	0.014
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.002	0.000	0.008
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Idaho	Power	0.000	0.000	0.000	0.000	0.001	0.005	0.013
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.009	0.004	0.003
	Utah	Carbon	0.002	0.000	0.000	0.000	0.000	0.000	0.039
	Utah	Duchesne	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.020
	Utah	Juab	0.015	0.000	0.000	0.000	0.000	0.001	0.037
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.062
	Utah	Morgan	0.004	0.000	0.000	0.000	0.000	0.000	0.033
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.022	0.000	0.000	0.000	0.000	0.000	0.057
	Utah	Wasatch	0.008	0.000	0.000	0.000	0.000	0.001	0.005
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.401	0.000	0.097
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.329	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.041	0.000	0.110
		Total	**0.061**	**0.000**	**0.000**	**0.000**	**0.802**	**12.947**	**0.607**
		Logan, UT-ID	0.022	0.000	0.000	0.000	0.001	0.003	0.018
		Provo, UT	0.228	0.000	0.000	0.000	0.000	0.002	0.060
		Salt Lake City, UT	0.543	0.000	0.000	0.000	0.001	0.077	0.298
		Surrounding Areas	0.061	0.000	0.000	0.000	0.802	12.947	0.607
			0.854	**0.000**	**0.000**	**0.000**	**0.804**	**13.028**	**0.982**
		Logan, UT-ID	3%	0%	0%	0%	0%	0%	2%
		Provo, UT	27%	0%	0%	0%	0%	0%	6%
		Salt Lake City, UT	64%	0%	0%	0%	0%	1%	30%
		Surrounding Areas	7%	0%	0%	0%	100%	99%	62%
			100%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.019	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.001	0.000	0.000	0.000	0.000	0.000	0.000
			0.020	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	95%	96%	98%	0%	0%	0%	0%
		Surrounding Areas	4%	4%	2%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - PM2.5

Tons/Average Area Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area PM2.5
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.977
	Idaho	Bear Lake	0.000	0.000	0.088
	Idaho	Bingham	0.000	0.000	0.776
	Idaho	Blaine	0.000	0.000	13.228
	Idaho	Caribou	0.000	0.000	0.112
	Idaho	Cassia	0.000	0.000	0.346
	Idaho	Jerome	0.000	0.000	0.305
	Idaho	Lincoln	0.000	0.000	0.060
	Idaho	Minidoka	0.000	0.000	0.319
	Idaho	Oneida	0.000	0.000	0.053
	Idaho	Power	0.000	0.000	0.132
	Idaho	Twin Falls	0.000	0.000	0.927
	Utah	Carbon	0.000	0.001	0.133
	Utah	Duchesne	0.000	0.004	0.977
	Utah	Emery	0.000	0.002	0.275
	Utah	Juab	0.000	0.001	0.262
	Utah	Millard	0.000	0.003	0.412
	Utah	Morgan	0.000	0.002	0.127
	Utah	Rich	0.000	0.001	0.140
	Utah	Sanpete	0.000	0.006	0.527
	Utah	Summit	0.000	0.009	0.521
	Utah	Wasatch	0.000	0.000	0.291
	Wyoming	Lincoln	0.000	0.123	1.469
	Wyoming	Sublette	0.000	0.033	0.927
	Wyoming	Uinta	0.000	0.052	0.838
		Total	**0.000**	**0.237**	**24.222**
		Logan, UT-ID	0.000	0.008	0.663
		Provo, UT	0.000	0.037	1.810
		Salt Lake City, UT	0.000	0.105	5.835
		Surrounding Areas	0.000	0.237	24.222
			0.000	**0.388**	**32.530**
		Logan, UT-ID	0%	2%	2%
		Provo, UT	0%	10%	6%
		Salt Lake City, UT	0%	27%	18%
		Surrounding Areas	0%	61%	74%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for PM2.5) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.044	0.056	0.005	0.001	0.045	0.040
	Utah	Cache	0.001	0.386	0.059	0.029	0.000	0.000
		Total	**0.044**	**0.441**	**0.064**	**0.031**	**0.045**	**0.040**
Provo, UT	Utah	Utah	0.007	0.356	0.065	0.055	0.000	0.000
		Total	**0.007**	**0.356**	**0.065**	**0.055**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.129	0.018	0.026	0.000	0.000
	Utah	Davis	0.000	0.670	0.009	0.011	0.000	0.000
	Utah	Salt Lake	0.004	0.440	0.065	0.058	0.000	0.000
	Utah	Tooele	0.005	0.045	0.096	0.019	0.000	0.000
	Utah	Weber	0.001	0.806	0.024	0.029	0.000	0.000
		Total	**0.010**	**2.090**	**0.211**	**0.144**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.002	0.038	0.003	0.008	0.009	0.000	0.000	0.000
	Utah	Cache	0.000	0.638	0.029	0.034	0.025	0.000	0.000	0.000
		Total	**0.002**	**0.676**	**0.032**	**0.042**	**0.034**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	2.555	0.032	0.063	0.054	0.000	0.000	0.000
		Total	**0.000**	**2.555**	**0.032**	**0.063**	**0.054**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.287	0.009	0.030	0.019	0.000	0.000	0.000
	Utah	Davis	0.000	1.781	0.005	0.013	0.021	0.000	0.000	0.000
	Utah	Salt Lake	0.000	7.156	0.032	0.067	0.061	0.000	0.000	0.000
	Utah	Tooele	0.000	0.283	0.047	0.022	0.023	0.000	0.000	0.000
	Utah	Weber	0.000	1.517	0.012	0.033	0.046	0.000	0.000	0.000
		Total	**0.000**	**11.024**	**0.104**	**0.165**	**0.170**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.001	0.000	0.292
	Utah	Cache	0.000	0.000	0.000	0.000	0.001	0.013	0.291
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.013**	**0.583**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.004	0.019	2.124
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.019**	**2.124**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.003	2.756
	Utah	Davis	0.000	0.000	0.000	0.000	0.005	0.254	1.234
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.032	2.508	2.525
	Utah	Tooele	0.000	0.000	0.000	0.000	0.001	0.036	1.966
	Utah	Weber	0.000	0.000	0.000	0.000	0.002	0.016	1.624
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.039**	**2.815**	**10.105**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.290	0.004	0.005	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.290**	**0.004**	**0.005**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NOX
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.545
	Utah	Cache	0.000	0.000	1.506
		Total	**0.000**	**0.000**	**2.051**
Provo, UT	Utah	Utah	0.000	0.000	5.334
		Total	**0.000**	**0.000**	**5.334**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	3.277
	Utah	Davis	0.000	0.000	4.003
	Utah	Salt Lake	0.000	0.000	13.247
	Utah	Tooele	0.000	0.000	2.544
	Utah	Weber	0.000	0.000	4.109
		Total	**0.000**	**0.000**	**27.179**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	4%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	0%	0%	96%
			0%	0%	0%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.756	0.373	0.035	0.009	0.316	0.284
	Idaho	Bear Lake	0.039	0.025	0.003	0.001	0.015	0.014
	Idaho	Bingham	0.230	0.152	0.015	0.004	0.253	0.228
	Idaho	Blaine	0.360	0.271	0.026	0.007	0.196	0.176
	Idaho	Caribou	0.028	0.035	0.004	0.001	0.102	0.092
	Idaho	Cassia	0.141	0.118	0.012	0.003	0.125	0.112
	Idaho	Jerome	0.084	0.100	0.009	0.002	0.131	0.118
	Idaho	Lincoln	0.019	0.018	0.002	0.000	0.028	0.025
	Idaho	Minidoka	0.093	0.076	0.007	0.002	0.105	0.094
	Idaho	Oneida	0.029	0.015	0.001	0.000	0.012	0.011
	Idaho	Power	0.039	0.027	0.002	0.001	0.081	0.073
	Idaho	Twin Falls	0.715	0.482	0.046	0.012	0.391	0.352
	Utah	Carbon	0.017	0.025	0.001	0.009	0.000	0.000
	Utah	Duchesne	0.005	0.005	0.010	0.039	0.000	0.000
	Utah	Emery	0.017	0.001	0.001	0.012	0.000	0.000
	Utah	Juab	0.006	0.000	0.099	0.008	0.000	0.000
	Utah	Millard	0.012	0.011	0.072	0.014	0.000	0.000
	Utah	Morgan	0.000	0.006	0.000	0.003	0.000	0.000
	Utah	Rich	0.001	0.000	0.017	0.006	0.000	0.000
	Utah	Sanpete	0.018	0.037	0.134	0.014	0.000	0.000
	Utah	Summit	0.000	0.049	0.008	0.012	0.000	0.000
	Utah	Wasatch	0.000	0.007	0.003	0.010	0.000	0.000
	Wyoming	Lincoln	0.037	0.009	0.010	0.001	0.075	0.335
	Wyoming	Sublette	0.017	0.004	0.005	0.001	0.013	0.057
	Wyoming	Uinta	0.089	0.020	0.025	0.003	0.043	0.193
		Total	**2.753**	**1.866**	**0.547**	**0.171**	**1.886**	**2.163**
		Logan, UT-ID	0.044	0.441	0.064	0.031	0.045	0.040
		Provo, UT	0.007	0.356	0.065	0.055	0.000	0.000
		Salt Lake City, UT	0.010	2.090	0.211	0.144	0.000	0.000
		Surrounding Areas	2.753	1.866	0.547	0.171	1.886	2.163
			2.814	**4.753**	**0.888**	**0.400**	**1.931**	**2.203**
		Logan, UT-ID	2%	9%	7%	8%	2%	2%
		Provo, UT	0%	7%	7%	14%	0%	0%
		Salt Lake City, UT	0%	44%	24%	36%	0%	0%
		Surrounding Areas	98%	39%	62%	43%	98%	98%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.016	0.279	0.024	0.062	0.059	0.000	0.000	0.000
	Idaho	Bear Lake	0.001	0.020	0.002	0.004	0.004	0.000	0.000	0.000
	Idaho	Bingham	0.013	0.129	0.011	0.029	0.031	0.000	0.000	0.000
	Idaho	Blaine	0.010	0.088	0.008	0.020	0.016	0.000	0.000	0.000
	Idaho	Caribou	0.005	0.024	0.002	0.005	0.005	0.000	0.000	0.000
	Idaho	Cassia	0.006	0.069	0.006	0.016	0.016	0.000	0.000	0.000
	Idaho	Jerome	0.007	0.069	0.006	0.015	0.015	0.000	0.000	0.000
	Idaho	Lincoln	0.001	0.016	0.001	0.004	0.003	0.000	0.000	0.000
	Idaho	Minidoka	0.005	0.064	0.006	0.014	0.014	0.000	0.000	0.000
	Idaho	Oneida	0.001	0.014	0.001	0.003	0.003	0.000	0.000	0.000
	Idaho	Power	0.004	0.023	0.002	0.005	0.005	0.000	0.000	0.000
	Idaho	Twin Falls	0.020	0.272	0.024	0.061	0.056	0.000	0.000	0.000
	Utah	Carbon	0.000	0.167	0.000	0.011	0.005	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.073	0.005	0.045	0.089	0.000	0.000	0.000
	Utah	Emery	0.000	0.054	0.000	0.014	0.022	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.049	0.009	0.017	0.000	0.000	0.000
	Utah	Millard	0.000	0.055	0.036	0.017	0.029	0.000	0.000	0.000
	Utah	Morgan	0.000	0.069	0.000	0.003	0.007	0.000	0.000	0.000
	Utah	Rich	0.000	0.009	0.008	0.007	0.012	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.156	0.066	0.017	0.042	0.000	0.000	0.000
	Utah	Summit	0.000	0.666	0.004	0.014	0.030	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.200	0.001	0.011	0.022	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.025	0.004	0.055	0.042	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.012	0.006	0.012	0.023	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.089	0.001	0.018	0.023	0.000	0.000	0.000
		Total	**0.091**	**2.642**	**0.274**	**0.471**	**0.589**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.002	0.676	0.032	0.042	0.034	0.000	0.000	0.000
		Provo, UT	0.000	2.555	0.032	0.063	0.054	0.000	0.000	0.000
		Salt Lake City, UT	0.000	11.024	0.104	0.165	0.170	0.000	0.000	0.000
		Surrounding Areas	0.091	2.642	0.274	0.471	0.589	0.000	0.000	0.000
			0.093	**16.896**	**0.443**	**0.741**	**0.847**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	6%	4%	0%	0%	0%
		Provo, UT	0%	15%	7%	8%	6%	0%	0%	0%
		Salt Lake City, UT	0%	65%	24%	22%	20%	0%	0%	0%
		Surrounding Areas	97%	16%	62%	64%	70%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.004	0.000	1.159
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.701
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.002	0.000	0.886
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	11.458	0.195
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.428
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.000	0.109
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.000	0.125
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.493
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.000	0.298
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.143
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.002	0.448
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.004	0.002	0.134
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.003	1.562
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.001	0.737
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.004	1.215
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.001	2.063
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.002	1.061
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	1.834
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.006	0.191
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.072	0.000	3.531
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.073	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.011	0.000	4.002
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.173**	**11.480**	**21.317**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.001	0.013	0.583
		Provo, UT	0.000	0.000	0.000	0.000	0.004	0.019	2.124
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.039	2.815	10.105
		Surrounding Areas	0.000	0.000	0.000	0.000	0.173	11.480	21.317
			0.000	**0.000**	**0.000**	**0.000**	**0.218**	**14.328**	**34.130**
		Logan, UT-ID	0%	0%	0%	0%	1%	0%	2%
		Provo, UT	0%	0%	0%	0%	2%	0%	6%
		Salt Lake City, UT	0%	0%	0%	0%	18%	20%	30%
		Surrounding Areas	0%	0%	0%	0%	80%	80%	62%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.003	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.012**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.001	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.290	0.004	0.005	0.000	0.000	0.000	0.000
		Surrounding Areas	0.012	0.000	0.000	0.000	0.000	0.000	0.000
			0.303	**0.005**	**0.005**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	96%	96%	97%	0%	0%	0%	0%
		Surrounding Areas	4%	3%	3%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NOX

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NOX
Surrounding Areas	Idaho	Bannock	0.000	0.000	3.381
	Idaho	Bear Lake	0.000	0.000	0.830
	Idaho	Bingham	0.000	0.000	1.982
	Idaho	Blaine	0.000	0.000	12.831
	Idaho	Caribou	0.000	0.000	0.734
	Idaho	Cassia	0.000	0.000	0.737
	Idaho	Jerome	0.000	0.000	0.684
	Idaho	Lincoln	0.000	0.000	0.611
	Idaho	Minidoka	0.000	0.000	0.780
	Idaho	Oneida	0.000	0.000	0.234
	Idaho	Power	0.000	0.000	0.714
	Idaho	Twin Falls	0.000	0.000	2.570
	Utah	Carbon	0.000	0.000	1.800
	Utah	Duchesne	0.000	0.002	0.274
	Utah	Emery	0.000	0.001	0.860
	Utah	Juab	0.000	0.000	1.407
	Utah	Millard	0.000	0.001	2.310
	Utah	Morgan	0.000	0.001	1.152
	Utah	Rich	0.000	0.000	0.059
	Utah	Sanpete	0.000	0.003	0.486
	Utah	Summit	0.000	0.004	2.621
	Utah	Wasatch	0.000	0.000	0.452
	Wyoming	Lincoln	0.000	0.038	4.234
	Wyoming	Sublette	0.000	0.010	0.232
	Wyoming	Uinta	0.000	0.015	4.533
		Total	**0.000**	**0.074**	**46.509**
		Logan, UT-ID	0.000	0.000	2.051
		Provo, UT	0.000	0.000	5.334
		Salt Lake City, UT	0.000	0.000	27.179
		Surrounding Areas	0.000	0.074	46.509
			0.000	**0.074**	**81.073**
		Logan, UT-ID	0%	0%	3%
		Provo, UT	0%	0%	7%
		Salt Lake City, UT	0%	0%	34%
		Surrounding Areas	0%	100%	57%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for VOC) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	2.763	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	1.315	0.013	0.020	0.000	0.000
		Total	**0.000**	**0.000**	**4.079**	**0.013**	**0.020**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	1.259	0.099	0.093	0.000	0.000
		Total	**0.000**	**0.000**	**1.259**	**0.099**	**0.093**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	1.862	0.012	0.009	0.000	0.000
	Utah	Davis	0.000	0.000	0.144	0.062	0.054	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.139	0.225	0.184	0.000	0.000
	Utah	Tooele	0.000	0.000	0.451	0.011	0.010	0.000	0.000
	Utah	Weber	0.000	0.000	0.470	0.043	0.040	0.000	0.000
		Total	**0.000**	**0.000**	**3.066**	**0.352**	**0.297**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.000	0.001	0.000	0.000	0.001	0.000
	Utah	Cache	0.000	0.021	0.001	0.002	0.000	0.000
		Total	**0.000**	**0.022**	**0.001**	**0.002**	**0.001**	**0.000**
Provo, UT	Utah	Utah	0.000	0.020	0.001	0.003	0.000	0.000
		Total	**0.000**	**0.020**	**0.001**	**0.003**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.007	0.000	0.001	0.000	0.000
	Utah	Davis	0.000	0.037	0.000	0.001	0.000	0.000
	Utah	Salt Lake	0.000	0.024	0.001	0.003	0.000	0.000
	Utah	Tooele	0.000	0.002	0.002	0.001	0.000	0.000
	Utah	Weber	0.000	0.044	0.000	0.002	0.000	0.000
		Total	**0.000**	**0.115**	**0.004**	**0.008**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.002	0.000	0.000	0.138	0.000	0.000	0.000
	Utah	Cache	0.000	0.037	0.001	0.001	0.469	0.656	0.000	0.000
		Total	**0.000**	**0.040**	**0.001**	**0.002**	**0.607**	**0.656**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.149	0.001	0.003	1.019	0.315	0.000	0.000
		Total	**0.000**	**0.149**	**0.001**	**0.003**	**1.019**	**0.315**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.017	0.000	0.001	0.360	0.620	0.000	0.000
	Utah	Davis	0.000	0.104	0.000	0.001	0.395	0.192	0.000	0.000
	Utah	Salt Lake	0.000	0.419	0.001	0.003	1.160	0.694	0.000	0.000
	Utah	Tooele	0.000	0.017	0.002	0.001	0.444	0.596	0.000	0.000
	Utah	Weber	0.000	0.089	0.000	0.001	0.867	0.141	0.000	0.000
		Total	**0.000**	**0.645**	**0.004**	**0.007**	**3.227**	**2.244**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.016
	Utah	Cache	0.054	0.000	0.000	0.000	0.008	0.236	0.016
		Total	**0.054**	**0.000**	**0.000**	**0.000**	**0.009**	**0.236**	**0.032**
Provo, UT	Utah	Utah	0.249	0.000	0.000	0.000	0.031	0.270	0.106
		Total	**0.249**	**0.000**	**0.000**	**0.000**	**0.031**	**0.270**	**0.106**
Salt Lake City, UT	Utah	Box Elder	0.023	0.000	0.000	0.000	0.003	0.028	0.153
	Utah	Davis	0.145	0.000	0.000	0.000	0.018	0.181	0.065
	Utah	Salt Lake	0.494	0.000	0.000	0.000	0.086	3.043	0.127
	Utah	Tooele	0.028	0.000	0.000	0.000	0.007	0.370	0.103
	Utah	Weber	0.108	0.000	0.000	0.000	0.015	0.251	0.089
		Total	**0.798**	**0.000**	**0.000**	**0.000**	**0.128**	**3.873**	**0.537**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.140	0.132	0.046	0.002
	Utah	Cache	0.000	0.000	0.000	0.953	0.275	0.042	1.319
		Total	**0.000**	**0.000**	**0.000**	**1.093**	**0.407**	**0.088**	**1.321**
Provo, UT	Utah	Utah	0.000	0.000	0.000	4.398	0.433	0.142	4.052
		Total	**0.000**	**0.000**	**0.000**	**4.398**	**0.433**	**0.142**	**4.052**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.426	0.182	0.006	0.126
	Utah	Davis	0.000	0.000	0.000	2.552	0.283	0.176	1.143
	Utah	Salt Lake	0.022	0.004	0.001	8.709	1.796	0.938	7.925
	Utah	Tooele	0.000	0.000	0.000	0.509	0.060	0.010	0.000
	Utah	Weber	0.000	0.000	0.000	1.901	0.513	0.303	1.504
		Total	**0.022**	**0.004**	**0.001**	**14.097**	**2.834**	**1.434**	**10.698**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NOX
Logan, UT-ID	Idaho	Franklin	0.080	0.008	3.332
	Utah	Cache	0.859	0.076	6.375
		Total	**0.939**	**0.084**	**9.706**
Provo, UT	Utah	Utah	1.843	0.268	14.755
		Total	**1.843**	**0.268**	**14.755**
Salt Lake City, UT	Utah	Box Elder	0.755	0.029	4.622
	Utah	Davis	1.830	0.146	7.527
	Utah	Salt Lake	7.989	0.606	34.594
	Utah	Tooele	0.105	0.053	2.782
	Utah	Weber	1.455	0.261	8.096
		Total	**12.133**	**1.095**	**57.622**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	1.395	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	1.549	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	4.841	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.972	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	1.355	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	10.654	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	9.132	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	2.652	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	2.195	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	1.083	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	1.547	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	6.865	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.252	0.004	0.004	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.850	0.003	0.003	0.000	0.000
	Utah	Emery	0.000	0.000	0.542	0.004	0.002	0.000	0.000
	Utah	Juab	0.000	0.000	0.651	0.005	0.002	0.000	0.000
	Utah	Millard	0.000	0.000	1.858	0.006	0.002	0.000	0.000
	Utah	Morgan	0.000	0.000	0.238	0.002	0.002	0.000	0.000
	Utah	Rich	0.000	0.000	0.789	0.001	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	1.884	0.003	0.005	0.000	0.000
	Utah	Summit	0.000	0.000	0.490	0.010	0.007	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.225	0.004	0.004	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.059	0.003	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.059	0.001	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.352	0.003	0.000	0.000
		Total	**0.000**	**0.000**	**52.021**	**0.512**	**0.038**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	4.079	0.013	0.020	0.000	0.000
		Provo, UT	0.000	0.000	1.259	0.099	0.093	0.000	0.000
		Salt Lake City, UT	0.000	0.000	3.066	0.352	0.297	0.000	0.000
		Surrounding Areas	0.000	0.000	52.021	0.512	0.038	0.000	0.000
			0.000	**0.000**	**60.425**	**0.976**	**0.448**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	7%	1%	4%	0%	0%
		Provo, UT	0%	0%	2%	10%	21%	0%	0%
		Salt Lake City, UT	0%	0%	5%	36%	66%	0%	0%
		Surrounding Areas	0%	0%	86%	52%	8%	0%	100%
			0%	0%	100%	100%	100%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.002	0.007	0.001	0.000	0.006	0.001
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.003	0.000	0.000	0.005	0.001
	Idaho	Blaine	0.001	0.005	0.001	0.000	0.004	0.001
	Idaho	Caribou	0.000	0.001	0.000	0.000	0.002	0.000
	Idaho	Cassia	0.000	0.002	0.000	0.000	0.002	0.000
	Idaho	Jerome	0.000	0.002	0.000	0.000	0.003	0.001
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Minidoka	0.000	0.001	0.000	0.000	0.002	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.002	0.000
	Idaho	Twin Falls	0.002	0.009	0.001	0.000	0.008	0.001
	Utah	Carbon	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.002	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Juab	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Millard	0.000	0.001	0.001	0.001	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.002	0.003	0.001	0.000	0.000
	Utah	Summit	0.000	0.003	0.000	0.001	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.001	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.004	0.003
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.001	0.001
	Wyoming	Uinta	0.000	0.001	0.000	0.000	0.002	0.002
		Total	**0.006**	**0.040**	**0.012**	**0.007**	**0.042**	**0.013**
		Logan, UT-ID	0.000	0.022	0.001	0.002	0.001	0.000
		Provo, UT	0.000	0.020	0.001	0.003	0.000	0.000
		Salt Lake City, UT	0.000	0.115	0.004	0.008	0.000	0.000
		Surrounding Areas	0.006	0.040	0.012	0.007	0.042	0.013
			0.007	**0.197**	**0.019**	**0.020**	**0.043**	**0.013**
		Logan, UT-ID	1%	11%	7%	8%	2%	1%
		Provo, UT	0%	10%	7%	15%	0%	0%
		Salt Lake City, UT	1%	59%	22%	40%	0%	0%
		Surrounding Areas	97%	20%	64%	36%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.000	0.016	0.001	0.001	0.876	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.001	0.000	0.000	0.065	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.008	0.000	0.001	0.460	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.005	0.000	0.000	0.242	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.001	0.000	0.000	0.076	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.004	0.000	0.000	0.237	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.004	0.000	0.000	0.229	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.001	0.000	0.000	0.051	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.004	0.000	0.000	0.210	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.001	0.000	0.000	0.046	0.000	0.000	0.000
	Idaho	Power	0.000	0.001	0.000	0.000	0.075	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.016	0.001	0.001	0.825	0.000	0.000	0.000
	Utah	Carbon	0.000	0.010	0.000	0.002	0.092	0.216	0.000	0.000
	Utah	Duchesne	0.000	0.004	0.000	0.002	1.689	0.182	0.000	0.000
	Utah	Emery	0.000	0.003	0.000	0.002	0.413	0.248	0.000	0.000
	Utah	Juab	0.000	0.000	0.002	0.001	0.324	0.281	0.000	0.000
	Utah	Millard	0.000	0.003	0.001	0.001	0.542	0.317	0.000	0.000
	Utah	Morgan	0.000	0.004	0.000	0.000	0.130	0.104	0.000	0.000
	Utah	Rich	0.000	0.001	0.000	0.000	0.225	0.033	0.000	0.000
	Utah	Sanpete	0.000	0.009	0.003	0.002	0.796	0.169	0.000	0.000
	Utah	Summit	0.000	0.039	0.000	0.001	0.566	0.501	0.000	0.000
	Utah	Wasatch	0.000	0.012	0.000	0.000	0.416	0.221	0.000	0.000
	Wyoming	Lincoln	0.000	0.001	0.000	0.042	0.772	0.324	0.078	0.000
	Wyoming	Sublette	0.000	0.001	0.000	0.003	0.418	0.191	0.000	0.000
	Wyoming	Uinta	0.000	0.005	0.000	0.012	0.395	0.404	0.007	0.000
		Total	**0.000**	**0.155**	**0.011**	**0.073**	**10.171**	**3.191**	**0.085**	**0.000**
		Logan, UT-ID	0.000	0.040	0.001	0.002	0.607	0.656	0.000	0.000
		Provo, UT	0.000	0.149	0.001	0.003	1.019	0.315	0.000	0.000
		Salt Lake City, UT	0.000	0.645	0.004	0.007	3.227	2.244	0.000	0.000
		Surrounding Areas	0.000	0.155	0.011	0.073	10.171	3.191	0.085	0.000
			0.000	**0.989**	**0.017**	**0.085**	**15.024**	**6.406**	**0.085**	**0.000**
		Logan, UT-ID	0%	4%	7%	2%	4%	10%	0%	0%
		Provo, UT	0%	15%	7%	3%	7%	5%	0%	0%
		Salt Lake City, UT	0%	65%	24%	8%	21%	35%	0%	0%
		Surrounding Areas	0%	16%	62%	86%	68%	50%	100%	0%
			0%	100%	100%	100%	100%	100%	100%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.002	0.000	0.065
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.039
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.002	0.001	0.050
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.001	4.603	0.011
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.024
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.000	0.006
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.000	0.006
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.028
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.000	0.016
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.008
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.011	0.025
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.003	0.011	0.007
	Utah	Carbon	0.010	0.000	0.000	0.000	0.001	0.033	0.067
	Utah	Duchesne	0.008	0.000	0.000	0.000	0.001	0.006	0.000
	Utah	Emery	0.005	0.000	0.000	0.000	0.001	0.011	0.035
	Utah	Juab	0.005	0.000	0.000	0.000	0.002	0.099	0.066
	Utah	Millard	0.006	0.000	0.000	0.000	0.001	0.004	0.109
	Utah	Morgan	0.005	0.000	0.000	0.000	0.001	0.010	0.059
	Utah	Rich	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.013	0.000	0.000	0.000	0.001	0.002	0.000
	Utah	Summit	0.019	0.000	0.000	0.000	0.002	0.000	0.102
	Utah	Wasatch	0.011	0.000	0.000	0.000	0.002	0.081	0.008
	Wyoming	Lincoln	0.000	0.000	0.033	0.013	1.111	0.000	0.175
	Wyoming	Sublette	0.000	0.000	0.014	0.013	0.887	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.013	0.073	0.129	0.000	0.198
		Total	**0.083**	**0.000**	**0.060**	**0.099**	**2.149**	**4.872**	**1.102**
		Logan, UT-ID	0.054	0.000	0.000	0.000	0.009	0.236	0.032
		Provo, UT	0.249	0.000	0.000	0.000	0.031	0.270	0.106
		Salt Lake City, UT	0.798	0.000	0.000	0.000	0.128	3.873	0.537
		Surrounding Areas	0.083	0.000	0.060	0.099	2.149	4.872	1.102
			1.183	**0.000**	**0.060**	**0.099**	**2.316**	**9.251**	**1.778**
		Logan, UT-ID	5%	0%	0%	0%	0%	3%	2%
		Provo, UT	21%	0%	0%	0%	1%	3%	6%
		Salt Lake City, UT	67%	0%	0%	0%	6%	42%	30%
		Surrounding Areas	7%	0%	100%	100%	93%	53%	62%
			100%	0%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.888	1.292	0.047	0.035
	Idaho	Bear Lake	0.000	0.000	0.000	0.065	0.050	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.462	0.408	0.043	0.004
	Idaho	Blaine	0.000	0.000	0.000	0.245	0.253	0.046	0.010
	Idaho	Caribou	0.000	0.000	0.000	0.077	0.079	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.240	0.415	0.046	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.230	0.603	0.046	0.012
	Idaho	Lincoln	0.000	0.000	0.000	0.051	0.043	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.210	0.293	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.046	0.051	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.076	0.128	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.837	1.375	0.237	0.023
	Utah	Carbon	0.000	0.000	0.000	0.173	0.032	0.010	0.114
	Utah	Duchesne	0.000	0.000	0.000	0.154	0.026	0.006	0.020
	Utah	Emery	0.000	0.000	0.000	0.102	0.012	0.004	0.000
	Utah	Juab	0.000	0.000	0.000	0.097	0.013	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.134	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.083	0.004	0.000	0.020
	Utah	Rich	0.000	0.000	0.000	0.023	0.001	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.234	0.019	0.006	0.043
	Utah	Summit	0.000	0.000	0.000	0.343	0.039	0.043	0.020
	Utah	Wasatch	0.000	0.000	0.000	0.198	0.017	0.000	0.020
	Wyoming	Lincoln	0.000	0.000	0.000	0.310	0.007	0.000	0.009
	Wyoming	Sublette	0.000	0.000	0.000	0.043	0.002	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.152	0.011	0.000	0.005
		Total	**0.001**	**0.000**	**0.000**	**5.473**	**5.176**	**0.533**	**0.336**
		Logan, UT-ID	0.000	0.000	0.000	1.093	0.407	0.088	1.321
		Provo, UT	0.000	0.000	0.000	4.398	0.433	0.142	4.052
		Salt Lake City, UT	0.022	0.004	0.001	14.097	2.834	1.434	10.698
		Surrounding Areas	0.001	0.000	0.000	5.473	5.176	0.533	0.336
			0.023	**0.005**	**0.001**	**25.061**	**8.850**	**2.197**	**16.407**
		Logan, UT-ID	0%	0%	0%	4%	5%	4%	8%
		Provo, UT	0%	0%	0%	18%	5%	6%	25%
		Salt Lake City, UT	96%	96%	97%	56%	32%	65%	65%
		Surrounding Areas	4%	3%	2%	22%	58%	24%	2%
			100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NOX
Surrounding Areas	Idaho	Bannock	0.535	0.060	5.230
	Idaho	Bear Lake	0.030	0.005	1.806
	Idaho	Bingham	0.256	0.031	6.577
	Idaho	Blaine	0.192	0.021	6.612
	Idaho	Caribou	0.042	0.003	1.662
	Idaho	Cassia	0.150	0.015	11.774
	Idaho	Jerome	0.125	0.014	10.409
	Idaho	Lincoln	0.017	0.002	2.846
	Idaho	Minidoka	0.093	0.020	3.047
	Idaho	Oneida	0.013	0.002	1.251
	Idaho	Power	0.021	0.005	1.894
	Idaho	Twin Falls	0.562	0.071	10.854
	Utah	Carbon	0.062	0.018	1.100
	Utah	Duchesne	0.065	0.008	3.032
	Utah	Emery	0.021	0.005	1.410
	Utah	Juab	0.059	0.019	1.627
	Utah	Millard	0.029	0.021	3.037
	Utah	Morgan	0.019	0.003	0.684
	Utah	Rich	0.005	0.001	1.082
	Utah	Sanpete	0.058	0.013	3.267
	Utah	Summit	0.273	0.016	2.475
	Utah	Wasatch	0.071	0.019	1.310
	Wyoming	Lincoln	0.346	0.093	3.383
	Wyoming	Sublette	0.010	0.026	1.669
	Wyoming	Uinta	0.116	0.049	1.932
		Total	**3.171**	**0.542**	**89.971**
		Logan, UT-ID	0.939	0.084	9.706
		Provo, UT	1.843	0.268	14.755
		Salt Lake City, UT	12.133	1.095	57.622
		Surrounding Areas	3.171	0.542	89.971
			18.086	**1.988**	**172.054**
		Logan, UT-ID	5%	4%	6%
		Provo, UT	10%	13%	9%
		Salt Lake City, UT	67%	55%	33%
		Surrounding Areas	18%	27%	52%
			100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for NH_3) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	4.650	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	5.117	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**9.766**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	5.332	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**5.332**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	8.010	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.645	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.938	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	2.326	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	1.911	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**13.830**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.001	0.001
	Utah	Cache	0.000	0.002	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.002**	**0.001**	**0.000**	**0.001**	**0.001**
Provo, UT	Utah	Utah	0.000	0.002	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.002**	**0.001**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.003	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.002	0.001	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Weber	0.000	0.004	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.010**	**0.004**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.008	0.000	0.000	0.000	0.000	0.007	0.000
	Utah	Cache	0.000	0.136	0.002	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.144**	**0.002**	**0.000**	**0.000**	**0.000**	**0.007**	**0.000**
Provo, UT	Utah	Utah	0.000	0.544	0.002	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.544**	**0.002**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.061	0.001	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.379	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	1.523	0.002	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.060	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.323	0.001	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**2.346**	**0.006**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.088	0.000	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.000**	**0.088**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.410	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.410**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.038	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.238	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.812	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.046	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.177	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**1.312**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.008	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.008**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.036	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.036**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.021	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.071	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.004	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.015	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.114**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Logan, UT-ID	Idaho	Franklin	0.000	0.000	4.670
	Utah	Cache	0.000	0.065	5.418
		Total	**0.000**	**0.065**	**10.087**
Provo, UT	Utah	Utah	0.000	0.358	6.684
		Total	**0.000**	**0.358**	**6.684**
Salt Lake City, UT	Utah	Box Elder	0.000	0.031	8.146
	Utah	Davis	0.000	0.209	1.495
	Utah	Salt Lake	0.000	0.724	4.074
	Utah	Tooele	0.000	0.038	2.479
	Utah	Weber	0.000	0.141	2.572
		Total	**0.000**	**1.143**	**18.766**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	1.901	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	1.760	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	7.053	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	1.235	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	1.579	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	19.282	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	19.801	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	6.695	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	4.276	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	1.320	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	1.654	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	16.121	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	1.078	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	3.552	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	2.440	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	3.068	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	7.431	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.959	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	3.154	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	8.507	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	2.267	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	1.017	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.002	1.298	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.060	0.999	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.040	0.964	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.102**	**119.411**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	9.766	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	5.332	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	13.830	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.102	119.411	0.000	0.000	0.000	0.000
			0.000	**0.102**	**148.339**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	7%	0%	0%	0%	0%
		Provo, UT	0%	0%	4%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	9%	0%	0%	0%	0%
		Surrounding Areas	0%	100%	80%	0%	0%	0%	100%
			0%	100%	100%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.001	0.001	0.001	0.000	0.004	0.005
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.001	0.000	0.003	0.004
	Idaho	Blaine	0.000	0.000	0.001	0.000	0.002	0.003
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.002
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.001	0.001
	Idaho	Twin Falls	0.001	0.001	0.002	0.000	0.004	0.006
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.003	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.002	0.013
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.002
	Wyoming	Uinta	0.000	0.000	0.001	0.000	0.001	0.008
		Total	**0.003**	**0.004**	**0.015**	**0.000**	**0.024**	**0.050**
		Logan, UT-ID	0.000	0.002	0.001	0.000	0.001	0.001
		Provo, UT	0.000	0.002	0.001	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.010	0.004	0.000	0.000	0.000
		Surrounding Areas	0.003	0.004	0.015	0.000	0.024	0.050
			0.003	**0.018**	**0.023**	**0.000**	**0.025**	**0.051**
		Logan, UT-ID	1%	11%	6%	8%	2%	1%
		Provo, UT	1%	10%	6%	15%	0%	0%
		Salt Lake City, UT	1%	57%	20%	41%	0%	0%
		Surrounding Areas	97%	22%	68%	35%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.000	0.059	0.001	0.000	0.003	0.000	0.036	0.000
	Idaho	Bear Lake	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.027	0.001	0.000	0.002	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.019	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.005	0.000	0.000	0.000	0.000	0.037	0.000
	Idaho	Cassia	0.000	0.015	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.015	0.000	0.000	0.001	0.000	0.002	0.000
	Idaho	Lincoln	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.014	0.000	0.000	0.001	0.000	0.001	0.000
	Idaho	Oneida	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.005	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Twin Falls	0.000	0.058	0.001	0.000	0.003	0.000	0.004	0.000
	Utah	Carbon	0.000	0.036	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.012	0.002	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.033	0.004	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.142	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.043	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.535**	**0.015**	**0.002**	**0.013**	**0.000**	**0.082**	**0.000**
		Logan, UT-ID	0.000	0.144	0.002	0.000	0.000	0.000	0.007	0.000
		Provo, UT	0.000	0.544	0.002	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	2.346	0.006	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.535	0.015	0.002	0.013	0.000	0.082	0.000
			0.000	**3.568**	**0.025**	**0.002**	**0.014**	**0.000**	**0.089**	**0.000**
		Logan, UT-ID	0%	4%	8%	2%	3%	0%	8%	0%
		Provo, UT	0%	15%	8%	4%	0%	0%	0%	0%
		Salt Lake City, UT	0%	66%	25%	6%	0%	0%	0%	0%
		Surrounding Areas	0%	15%	60%	88%	97%	0%	92%	0%
			0%	100%	100%	100%	100%	0%	100%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.182	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.390	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.003	0.002	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.019	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.187	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.110	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.019	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.164	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.004	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.165	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.337	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.016	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.013	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.011	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.002	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.021	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.031	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.018	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.075	0.000	0.001
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.060	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.007	0.000	0.001
		Total	**1.579**	**0.004**	**0.000**	**0.000**	**0.278**	**0.000**	**0.004**
		Logan, UT-ID	0.001	0.000	0.000	0.000	0.088	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.410	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	1.312	0.000	0.000
		Surrounding Areas	1.579	0.004	0.000	0.000	0.278	0.000	0.004
			1.580	**0.004**	**0.000**	**0.000**	**2.087**	**0.000**	**0.005**
		Logan, UT-ID	0%	0%	0%	0%	4%	0%	3%
		Provo, UT	0%	0%	0%	0%	20%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	63%	0%	0%
		Surrounding Areas	100%	100%	0%	0%	13%	100%	97%
			100%	100%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Carbon	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.012**	**0.000**	**0.000**	**0.001**
		Logan, UT-ID	0.000	0.000	0.000	0.008	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.036	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.114	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.012	0.000	0.000	0.001
			0.000	**0.000**	**0.000**	**0.169**	**0.000**	**0.000**	**0.001**
		Logan, UT-ID	5%	0%	0%	5%	0%	0%	4%
		Provo, UT	0%	0%	0%	21%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	67%	0%	0%	0%
		Surrounding Areas	95%	0%	0%	7%	0%	0%	96%
			100%	0%	0%	100%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Surrounding Areas	Idaho	Bannock	0.000	0.003	2.199
	Idaho	Bear Lake	0.000	0.000	1.766
	Idaho	Bingham	0.000	0.002	7.485
	Idaho	Blaine	0.000	0.001	1.269
	Idaho	Caribou	0.000	0.000	1.644
	Idaho	Cassia	0.000	0.001	19.490
	Idaho	Jerome	0.000	0.001	19.934
	Idaho	Lincoln	0.000	0.000	6.719
	Idaho	Minidoka	0.000	0.001	4.461
	Idaho	Oneida	0.000	0.000	1.327
	Idaho	Power	0.000	0.000	1.828
	Idaho	Twin Falls	0.000	0.003	16.542
	Utah	Carbon	0.000	0.013	1.144
	Utah	Duchesne	0.000	0.012	3.594
	Utah	Emery	0.000	0.007	2.468
	Utah	Juab	0.000	0.007	3.088
	Utah	Millard	0.000	0.009	7.468
	Utah	Morgan	0.000	0.007	0.988
	Utah	Rich	0.000	0.002	3.160
	Utah	Sanpete	0.000	0.019	8.589
	Utah	Summit	0.000	0.032	2.475
	Utah	Wasatch	0.000	0.018	1.098
	Wyoming	Lincoln	0.000	0.000	1.392
	Wyoming	Sublette	0.000	0.000	1.122
	Wyoming	Uinta	0.000	0.000	1.023
		Total	**0.000**	**0.138**	**122.273**
		Logan, UT-ID	0.000	0.065	10.087
		Provo, UT	0.000	0.358	6.684
		Salt Lake City, UT	0.000	1.143	18.766
		Surrounding Areas	0.000	0.138	122.273
			0.000	**1.704**	**157.811**
		Logan, UT-ID	0%	4%	6%
		Provo, UT	0%	21%	4%
		Salt Lake City, UT	0%	67%	12%
		Surrounding Areas	0%	8%	77%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for SO_2) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.251	0.000	0.017	0.000	0.000	0.122
	Utah	Cache	0.002	0.002	0.073	0.000	0.000	0.000
		Total	**0.253**	**0.002**	**0.090**	**0.000**	**0.000**	**0.122**
Provo, UT	Utah	Utah	0.018	0.002	0.081	0.000	0.000	0.000
		Total	**0.018**	**0.002**	**0.081**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.001	0.001	0.022	0.000	0.000	0.000
	Utah	Davis	0.000	0.004	0.012	0.000	0.000	0.000
	Utah	Salt Lake	0.012	0.003	0.080	0.000	0.000	0.000
	Utah	Tooele	0.013	0.000	0.118	0.000	0.000	0.000
	Utah	Weber	0.003	0.005	0.029	0.000	0.000	0.000
		Total	**0.029**	**0.013**	**0.260**	**0.001**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.013	0.001	0.002	0.000	0.000	0.000
	Utah	Cache	0.000	0.004	0.069	0.000	0.004	0.000	0.000	0.000
		Total	**0.000**	**0.004**	**0.082**	**0.001**	**0.006**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.016	0.077	0.001	0.008	0.000	0.000	0.000
		Total	**0.000**	**0.016**	**0.077**	**0.001**	**0.008**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.002	0.021	0.000	0.003	0.000	0.000	0.000
	Utah	Davis	0.000	0.011	0.011	0.000	0.003	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.046	0.076	0.001	0.009	0.000	0.000	0.000
	Utah	Tooele	0.000	0.002	0.113	0.001	0.004	0.000	0.000	0.000
	Utah	Weber	0.000	0.010	0.028	0.000	0.007	0.000	0.000	0.000
		Total	**0.000**	**0.070**	**0.249**	**0.002**	**0.026**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.005	0.024
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.005**	**0.028**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.009	0.160
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.009**	**0.160**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.001	0.230
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.014	0.097
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.003	0.323	0.181
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.007	0.158
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.007	0.130
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.352**	**0.797**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.007	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.007**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.410
	Utah	Cache	0.000	0.000	0.183
		Total	**0.000**	**0.000**	**0.594**
Provo, UT	Utah	Utah	0.000	0.000	0.374
		Total	**0.000**	**0.000**	**0.374**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.281
	Utah	Davis	0.000	0.000	0.152
	Utah	Salt Lake	0.000	0.000	0.741
	Utah	Tooele	0.000	0.000	0.414
	Utah	Weber	0.000	0.000	0.219
		Total	**0.000**	**0.000**	**1.809**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	0%	0%	100%
			0%	0%	0%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	4.350	0.001	0.126	0.000	0.001	0.859
	Idaho	Bear Lake	0.223	0.000	0.010	0.000	0.000	0.041
	Idaho	Bingham	1.322	0.000	0.053	0.000	0.001	0.688
	Idaho	Blaine	2.075	0.001	0.094	0.000	0.000	0.533
	Idaho	Caribou	0.163	0.000	0.013	0.000	0.000	0.278
	Idaho	Cassia	0.809	0.000	0.043	0.000	0.000	0.339
	Idaho	Jerome	0.486	0.000	0.031	0.000	0.000	0.356
	Idaho	Lincoln	0.109	0.000	0.006	0.000	0.000	0.075
	Idaho	Minidoka	0.536	0.000	0.026	0.000	0.000	0.284
	Idaho	Oneida	0.166	0.000	0.005	0.000	0.000	0.032
	Idaho	Power	0.224	0.000	0.009	0.000	0.000	0.220
	Idaho	Twin Falls	4.118	0.001	0.163	0.000	0.001	1.063
	Utah	Carbon	0.047	0.000	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.014	0.000	0.012	0.000	0.000	0.000
	Utah	Emery	0.048	0.000	0.001	0.000	0.000	0.000
	Utah	Juab	0.016	0.000	0.122	0.000	0.000	0.000
	Utah	Millard	0.032	0.000	0.089	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.002	0.000	0.021	0.000	0.000	0.000
	Utah	Sanpete	0.049	0.000	0.166	0.000	0.000	0.000
	Utah	Summit	0.001	0.000	0.010	0.000	0.000	0.000
	Utah	Wasatch	0.001	0.000	0.004	0.000	0.000	0.000
	Wyoming	Lincoln	0.112	0.000	0.022	0.000	0.000	0.713
	Wyoming	Sublette	0.053	0.000	0.010	0.000	0.000	0.122
	Wyoming	Uinta	0.269	0.000	0.053	0.000	0.000	0.410
		Total	**15.224**	**0.005**	**1.088**	**0.001**	**0.005**	**6.013**
		Logan, UT-ID	0.253	0.002	0.090	0.000	0.000	0.122
		Provo, UT	0.018	0.002	0.081	0.000	0.000	0.000
		Salt Lake City, UT	0.029	0.013	0.260	0.001	0.000	0.000
		Surrounding Areas	15.224	0.005	1.088	0.001	0.005	6.013
			15.524	**0.022**	**1.519**	**0.002**	**0.005**	**6.136**
		Logan, UT-ID	2%	11%	6%	8%	2%	2%
		Provo, UT	0%	10%	5%	15%	0%	0%
		Salt Lake City, UT	0%	58%	17%	40%	0%	0%
		Surrounding Areas	98%	21%	72%	37%	98%	98%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.002	0.002	0.096	0.004	0.012	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.007	0.000	0.001	0.000	0.000	0.000
	Idaho	Bingham	0.001	0.001	0.044	0.002	0.006	0.000	0.000	0.000
	Idaho	Blaine	0.001	0.001	0.030	0.001	0.003	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.008	0.000	0.001	0.000	0.000	0.000
	Idaho	Cassia	0.001	0.000	0.024	0.001	0.003	0.000	0.000	0.000
	Idaho	Jerome	0.001	0.000	0.024	0.001	0.003	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.000
	Idaho	Minidoka	0.001	0.000	0.022	0.001	0.003	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.008	0.000	0.001	0.000	0.000	0.000
	Idaho	Twin Falls	0.002	0.002	0.093	0.004	0.011	0.000	0.000	0.000
	Utah	Carbon	0.000	0.001	0.001	0.003	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.011	0.001	0.014	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.001	0.003	0.003	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.116	0.001	0.003	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.085	0.002	0.004	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.020	0.000	0.002	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.001	0.158	0.003	0.006	0.000	0.000	0.000
	Utah	Summit	0.000	0.004	0.009	0.000	0.005	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.001	0.003	0.000	0.003	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.010	0.111	0.006	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.013	0.007	0.003	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.001	0.003	0.032	0.003	0.000	0.000	0.000
		Total	**0.009**	**0.017**	**0.797**	**0.178**	**0.101**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.004	0.082	0.001	0.006	0.000	0.000	0.000
		Provo, UT	0.000	0.016	0.077	0.001	0.008	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.070	0.249	0.002	0.026	0.000	0.000	0.000
		Surrounding Areas	0.009	0.017	0.797	0.178	0.101	0.000	0.000	0.000
			0.009	**0.108**	**1.205**	**0.183**	**0.140**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	0%	4%	0%	0%	0%
		Provo, UT	0%	15%	6%	1%	6%	0%	0%	0%
		Salt Lake City, UT	0%	65%	21%	1%	18%	0%	0%	0%
		Surrounding Areas	97%	16%	66%	97%	72%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.017
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.013
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.884	0.003
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.007
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.001	0.107
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.054
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.002	0.100
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.165
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.001	0.089
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.153
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.002	0.013
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.037	0.000	0.243
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.034	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.005	0.000	0.275
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.077**	**0.891**	**1.270**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.005	0.028
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.009	0.160
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.004	0.352	0.797
		Surrounding Areas	0.000	0.000	0.000	0.000	0.077	0.891	1.270
			0.000	**0.000**	**0.000**	**0.000**	**0.080**	**1.257**	**2.255**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	1%
		Provo, UT	0%	0%	0%	0%	0%	1%	7%
		Salt Lake City, UT	0%	0%	0%	0%	4%	28%	35%
		Surrounding Areas	0%	0%	0%	0%	95%	71%	56%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.007	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.007	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	4%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	96%	71%	100%	0%	0%	0%	0%
		Surrounding Areas	4%	25%	0%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Surrounding Areas	Idaho	Bannock	0.000	0.000	5.468
	Idaho	Bear Lake	0.000	0.000	0.293
	Idaho	Bingham	0.000	0.000	2.130
	Idaho	Blaine	0.000	0.000	3.626
	Idaho	Caribou	0.000	0.000	0.471
	Idaho	Cassia	0.000	0.000	1.221
	Idaho	Jerome	0.000	0.000	0.904
	Idaho	Lincoln	0.000	0.000	0.203
	Idaho	Minidoka	0.000	0.000	0.877
	Idaho	Oneida	0.000	0.000	0.211
	Idaho	Power	0.000	0.000	0.469
	Idaho	Twin Falls	0.000	0.000	5.459
	Utah	Carbon	0.000	0.000	0.163
	Utah	Duchesne	0.000	0.000	0.053
	Utah	Emery	0.000	0.000	0.111
	Utah	Juab	0.000	0.000	0.359
	Utah	Millard	0.000	0.000	0.378
	Utah	Morgan	0.000	0.000	0.091
	Utah	Rich	0.000	0.000	0.045
	Utah	Sanpete	0.000	0.000	0.383
	Utah	Summit	0.000	0.001	0.183
	Utah	Wasatch	0.000	0.000	0.028
	Wyoming	Lincoln	0.000	0.002	1.257
	Wyoming	Sublette	0.000	0.000	0.244
	Wyoming	Uinta	0.000	0.000	1.051
		Total	**0.000**	**0.005**	**25.681**
		Logan, UT-ID	0.000	0.000	0.594
		Provo, UT	0.000	0.000	0.374
		Salt Lake City, UT	0.000	0.000	1.809
		Surrounding Areas	0.000	0.005	25.681
			0.000	**0.005**	**28.457**
		Logan, UT-ID	0%	0%	2%
		Provo, UT	0%	0%	1%
		Salt Lake City, UT	0%	0%	6%
		Surrounding Areas	0%	100%	90%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for CO) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.057	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.057**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.265	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.265**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.025	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.154	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.525	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.030	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.114	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.847**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.363	0.017	0.001	0.000	0.014	0.004
	Utah	Cache	0.000	0.324	0.008	0.025	0.000	0.000
		Total	**0.363**	**0.341**	**0.009**	**0.025**	**0.014**	**0.004**
Provo, UT	Utah	Utah	0.003	0.299	0.009	0.046	0.000	0.000
		Total	**0.003**	**0.299**	**0.009**	**0.046**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.108	0.002	0.022	0.000	0.000
	Utah	Davis	0.000	0.563	0.001	0.010	0.000	0.000
	Utah	Salt Lake	0.002	0.370	0.009	0.049	0.000	0.000
	Utah	Tooele	0.002	0.038	0.013	0.016	0.000	0.000
	Utah	Weber	0.001	0.677	0.003	0.024	0.000	0.000
		Total	**0.005**	**1.756**	**0.028**	**0.121**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.001	0.016	0.001	0.006	0.692	0.000	0.000	0.000
	Utah	Cache	0.000	0.271	0.008	0.011	2.101	0.000	0.000	0.000
		Total	**0.001**	**0.287**	**0.009**	**0.017**	**2.793**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	1.087	0.009	0.030	4.565	0.000	0.000	0.000
		Total	**0.000**	**1.087**	**0.009**	**0.030**	**4.565**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.122	0.002	0.009	1.611	0.000	0.000	0.000
	Utah	Davis	0.000	0.758	0.001	0.004	1.769	0.000	0.000	0.000
	Utah	Salt Lake	0.000	3.045	0.009	0.027	5.197	0.000	0.000	0.000
	Utah	Tooele	0.000	0.121	0.013	0.015	1.990	0.000	0.000	0.000
	Utah	Weber	0.000	0.646	0.003	0.012	3.886	0.000	0.000	0.000
		Total	**0.000**	**4.691**	**0.029**	**0.066**	**14.454**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.025	0.001	0.046
	Utah	Cache	0.000	0.000	0.000	0.000	0.051	2.112	0.045
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.077**	**2.113**	**0.091**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.217	7.580	0.293
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.217**	**7.580**	**0.293**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.020	0.700	0.438
	Utah	Davis	0.000	0.000	0.000	0.000	0.108	2.625	0.181
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.566	28.644	0.335
	Utah	Tooele	0.000	0.000	0.000	0.000	0.030	1.383	0.293
	Utah	Weber	0.000	0.000	0.000	0.000	0.103	4.238	0.247
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.827**	**37.591**	**1.493**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.127	0.169	0.030	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.127**	**0.169**	**0.030**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area CO
Logan, UT-ID	Idaho	Franklin	0.000	0.019	1.207
	Utah	Cache	0.000	0.000	5.014
		Total	**0.000**	**0.019**	**6.221**
Provo, UT	Utah	Utah	0.000	0.000	14.401
		Total	**0.000**	**0.000**	**14.401**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	3.061
	Utah	Davis	0.000	0.000	6.174
	Utah	Salt Lake	0.000	0.000	39.102
	Utah	Tooele	0.000	0.000	3.943
	Utah	Weber	0.000	0.000	9.954
		Total	**0.000**	**0.000**	**62.234**

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.010	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.009	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.007	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.014	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.020	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.012	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.002	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.010	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.108**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.057	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.265	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.847	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.108	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**1.277**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	4%	0%	3%
		Provo, UT	0%	0%	0%	0%	21%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	66%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	8%	0%	97%
			0%	0%	0%	0%	100%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	6.298	0.112	0.009	0.001	0.095	0.030
	Idaho	Bear Lake	0.324	0.008	0.001	0.000	0.005	0.001
	Idaho	Bingham	1.913	0.046	0.004	0.000	0.076	0.024
	Idaho	Blaine	3.003	0.081	0.007	0.001	0.059	0.019
	Idaho	Caribou	0.236	0.011	0.001	0.000	0.031	0.010
	Idaho	Cassia	1.171	0.036	0.003	0.000	0.037	0.012
	Idaho	Jerome	0.703	0.030	0.002	0.000	0.039	0.013
	Idaho	Lincoln	0.158	0.006	0.000	0.000	0.008	0.003
	Idaho	Minidoka	0.775	0.023	0.002	0.000	0.031	0.010
	Idaho	Oneida	0.240	0.004	0.000	0.000	0.004	0.001
	Idaho	Power	0.324	0.008	0.001	0.000	0.024	0.008
	Idaho	Twin Falls	5.963	0.144	0.011	0.002	0.117	0.037
	Utah	Carbon	0.008	0.021	0.000	0.007	0.000	0.000
	Utah	Duchesne	0.002	0.004	0.001	0.033	0.000	0.000
	Utah	Emery	0.008	0.000	0.000	0.010	0.000	0.000
	Utah	Juab	0.003	0.000	0.013	0.006	0.000	0.000
	Utah	Millard	0.005	0.009	0.010	0.012	0.000	0.000
	Utah	Morgan	0.000	0.005	0.000	0.002	0.000	0.000
	Utah	Rich	0.000	0.000	0.002	0.005	0.000	0.000
	Utah	Sanpete	0.008	0.031	0.018	0.011	0.000	0.000
	Utah	Summit	0.000	0.041	0.001	0.010	0.000	0.000
	Utah	Wasatch	0.000	0.006	0.000	0.008	0.000	0.000
	Wyoming	Lincoln	0.017	0.007	0.003	0.001	0.063	0.084
	Wyoming	Sublette	0.008	0.003	0.001	0.001	0.011	0.014
	Wyoming	Uinta	0.041	0.017	0.006	0.003	0.036	0.048
		Total	**21.209**	**0.654**	**0.096**	**0.115**	**0.636**	**0.314**
		Logan, UT-ID	0.363	0.341	0.009	0.025	0.014	0.004
		Provo, UT	0.003	0.299	0.009	0.046	0.000	0.000
		Salt Lake City, UT	0.005	1.756	0.028	0.121	0.000	0.000
		Surrounding Areas	21.209	0.654	0.096	0.115	0.636	0.314
			21.580	**3.049**	**0.142**	**0.307**	**0.650**	**0.318**
		Logan, UT-ID	2%	11%	6%	8%	2%	1%
		Provo, UT	0%	10%	6%	15%	0%	0%
		Salt Lake City, UT	0%	58%	20%	39%	0%	0%
		Surrounding Areas	98%	21%	68%	37%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.009	0.119	0.007	0.044	4.413	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.009	0.000	0.003	0.330	0.000	0.000	0.000
	Idaho	Bingham	0.007	0.055	0.003	0.020	2.305	0.000	0.000	0.000
	Idaho	Blaine	0.006	0.037	0.002	0.014	1.232	0.000	0.000	0.000
	Idaho	Caribou	0.003	0.010	0.001	0.004	0.385	0.000	0.000	0.000
	Idaho	Cassia	0.004	0.030	0.002	0.011	1.190	0.000	0.000	0.000
	Idaho	Jerome	0.004	0.029	0.002	0.011	1.150	0.000	0.000	0.000
	Idaho	Lincoln	0.001	0.007	0.000	0.003	0.254	0.000	0.000	0.000
	Idaho	Minidoka	0.003	0.027	0.002	0.010	1.058	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.006	0.000	0.002	0.233	0.000	0.000	0.000
	Idaho	Power	0.002	0.010	0.001	0.004	0.379	0.000	0.000	0.000
	Idaho	Twin Falls	0.011	0.116	0.007	0.043	4.156	0.000	0.000	0.000
	Utah	Carbon	0.000	0.071	0.000	0.034	0.411	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.031	0.001	0.022	7.559	0.000	0.000	0.000
	Utah	Emery	0.000	0.023	0.000	0.035	1.847	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.014	0.013	1.453	0.000	0.000	0.000
	Utah	Millard	0.000	0.023	0.010	0.026	2.427	0.000	0.000	0.000
	Utah	Morgan	0.000	0.029	0.000	0.001	0.580	0.000	0.000	0.000
	Utah	Rich	0.000	0.004	0.002	0.003	1.009	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.067	0.018	0.037	3.565	0.000	0.000	0.000
	Utah	Summit	0.000	0.284	0.001	0.004	2.534	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.085	0.000	0.004	1.864	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.011	0.001	1.138	3.494	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.005	0.002	0.077	1.892	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.038	0.000	0.325	1.824	0.000	0.000	0.000
		Total	**0.051**	**1.124**	**0.076**	**1.887**	**47.544**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.001	0.287	0.009	0.017	2.793	0.000	0.000	0.000
		Provo, UT	0.000	1.087	0.009	0.030	4.565	0.000	0.000	0.000
		Salt Lake City, UT	0.000	4.691	0.029	0.066	14.454	0.000	0.000	0.000
		Surrounding Areas	0.051	1.124	0.076	1.887	47.544	0.000	0.000	0.000
			0.052	**7.190**	**0.123**	**2.000**	**69.357**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	1%	4%	0%	0%	0%
		Provo, UT	0%	15%	7%	1%	7%	0%	0%	0%
		Salt Lake City, UT	0%	65%	24%	3%	21%	0%	0%	0%
		Surrounding Areas	97%	16%	62%	94%	69%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.185	0.000	0.183
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.014	0.000	0.110
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.092	0.019	0.140
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.015	18.414	0.031
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.015	0.000	0.068
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.048	0.009	0.011
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.050	0.000	0.012
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.011	0.000	0.078
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.046	0.000	0.041
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.009	0.001	0.023
	Idaho	Power	0.000	0.000	0.000	0.000	0.014	0.252	0.071
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.183	0.242	0.013
	Utah	Carbon	0.000	0.000	0.000	0.000	0.010	0.489	0.182
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.008	0.323	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.005	0.204	0.097
	Utah	Juab	0.000	0.000	0.000	0.000	0.011	0.850	0.188
	Utah	Millard	0.000	0.000	0.000	0.000	0.005	0.160	0.308
	Utah	Morgan	0.000	0.000	0.000	0.000	0.009	0.683	0.169
	Utah	Rich	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.008	0.093	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.011	0.000	0.291
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.017	1.052	0.021
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	4.572	0.000	0.378
	Wyoming	Sublette	0.000	0.000	0.000	0.000	3.598	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.425	0.000	0.428
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**9.363**	**22.791**	**2.839**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.077	2.113	0.091
		Provo, UT	0.000	0.000	0.000	0.000	0.217	7.580	0.293
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.827	37.591	1.493
		Surrounding Areas	0.000	0.000	0.000	0.000	9.363	22.791	2.839
			0.000	**0.000**	**0.000**	**0.000**	**10.483**	**70.074**	**4.717**
		Logan, UT-ID	0%	0%	0%	0%	1%	3%	2%
		Provo, UT	0%	0%	0%	0%	2%	11%	6%
		Salt Lake City, UT	0%	0%	0%	0%	8%	54%	32%
		Surrounding Areas	0%	0%	0%	0%	89%	33%	60%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.001	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.005**	**0.003**	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.127	0.169	0.030	0.000	0.000	0.000	0.000
		Surrounding Areas	0.005	0.003	0.001	0.000	0.000	0.000	0.000
			0.132	**0.172**	**0.031**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	96%	98%	97%	0%	0%	0%	0%
		Surrounding Areas	4%	2%	3%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area CO
Surrounding Areas	Idaho	Bannock	0.000	0.124	11.631
	Idaho	Bear Lake	0.000	0.009	0.816
	Idaho	Bingham	0.000	0.064	4.769
	Idaho	Blaine	0.000	0.034	22.954
	Idaho	Caribou	0.000	0.011	0.785
	Idaho	Cassia	0.000	0.034	2.597
	Idaho	Jerome	0.000	0.032	2.077
	Idaho	Lincoln	0.000	0.007	0.536
	Idaho	Minidoka	0.000	0.029	2.058
	Idaho	Oneida	0.000	0.006	0.531
	Idaho	Power	0.000	0.011	1.109
	Idaho	Twin Falls	0.000	0.116	11.162
	Utah	Carbon	0.000	0.000	1.243
	Utah	Duchesne	0.000	0.023	8.017
	Utah	Emery	0.000	0.014	2.248
	Utah	Juab	0.000	0.000	2.556
	Utah	Millard	0.000	0.018	3.020
	Utah	Morgan	0.000	0.013	1.497
	Utah	Rich	0.000	0.003	1.031
	Utah	Sanpete	0.000	0.037	3.906
	Utah	Summit	0.000	0.054	3.252
	Utah	Wasatch	0.000	0.000	3.069
	Wyoming	Lincoln	0.000	1.184	10.960
	Wyoming	Sublette	0.000	0.313	5.927
	Wyoming	Uinta	0.000	0.503	3.704
		Total	**0.000**	**2.640**	**111.456**
		Logan, UT-ID	0.000	0.019	6.221
		Provo, UT	0.000	0.000	14.401
		Salt Lake City, UT	0.000	0.000	62.234
		Surrounding Areas	0.000	2.640	111.456
			0.000	**2.659**	**194.313**
		Logan, UT-ID	0%	1%	3%
		Provo, UT	0%	0%	7%
		Salt Lake City, UT	0%	0%	32%
		Surrounding Areas	0%	99%	57%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for PM2.5) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.001
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**	**0.001**	**0.000**	**0.000**	**0.001**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.011	0.002	0.000	0.000	0.002
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.011**	**0.002**	**0.000**	**0.000**	**0.002**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.006	0.001	0.000	0.000	0.001
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.021	0.007	0.000	0.000	0.002
	Utah	Tooele	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.005	0.001	0.000	0.000	0.002
		Total	**0.000**	**0.000**	**0.001**	**0.000**	**0.035**	**0.009**	**0.000**	**0.000**	**0.005**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.007**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.014**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.015
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	**0.043**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.001
		Total	**0.000**	**0.000**	**0.000**	**0.006**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Davis	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001
	Utah	Salt Lake	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.001	0.001
	Utah	Tooele	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Weber	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
		Total	**0.000**	**0.000**	**0.000**	**0.012**	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**	**0.005**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.003	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.002	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
	Idaho	Jerome	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.002	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.001	0.000	0.000	0.000	0.000	0.002	0.000	0.003	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
		Total	**0.013**	**0.000**	**0.001**	**0.000**	**0.004**	**0.010**	**0.000**	**0.012**	**0.001**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.001
		Provo, UT	0.000	0.000	0.000	0.000	0.011	0.002	0.000	0.000	0.002
		Salt Lake City, UT	0.000	0.000	0.001	0.000	0.035	0.009	0.000	0.000	0.005
		Surrounding Areas	0.013	0.000	0.001	0.000	0.004	0.010	0.000	0.012	0.001
			0.014	**0.000**	**0.003**	**0.000**	**0.052**	**0.021**	**0.000**	**0.012**	**0.009**
		Logan, UT-ID	1%	0%	9%	0%	4%	2%	3%	1%	9%
		Provo, UT	0%	0%	12%	0%	21%	8%	0%	1%	19%
		Salt Lake City, UT	0%	0%	26%	0%	66%	42%	0%	1%	57%
		Surrounding Areas	99%	0%	53%	0%	8%	48%	97%	97%	15%
			100%	0%	100%	0%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.005
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.003
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.005
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Wyoming	Lincoln	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.005
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
		Total	**0.001**	**0.000**	**0.001**	**0.005**	**0.000**	**0.000**	**0.001**	**0.001**	**0.102**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.043
		Surrounding Areas	0.001	0.000	0.001	0.005	0.000	0.000	0.001	0.001	0.102
			0.001	**0.001**	**0.001**	**0.005**	**0.000**	**0.002**	**0.001**	**0.001**	**0.165**
		Logan, UT-ID	5%	8%	2%	2%	2%	4%	7%	1%	4%
		Provo, UT	4%	14%	0%	0%	0%	17%	6%	1%	8%
		Salt Lake City, UT	14%	37%	0%	0%	0%	69%	19%	1%	26%
		Surrounding Areas	76%	41%	98%	98%	98%	10%	69%	96%	62%
			100%	100%	100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.323	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.009	0.000	0.002
	Wyoming	Sublette	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.007	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.001	0.000	0.002
		Total	**0.000**	**0.000**	**0.020**	**0.001**	**0.000**	**0.000**	**0.000**	**0.018**	**0.324**	**0.012**
		Logan, UT-ID	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.001
		Salt Lake City, UT	0.000	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.002	0.005
		Surrounding Areas	0.000	0.000	0.020	0.001	0.000	0.000	0.000	0.018	0.324	0.012
			0.000	**0.000**	**0.020**	**0.020**	**0.000**	**0.000**	**0.000**	**0.018**	**0.326**	**0.018**
		Logan, UT-ID	0%	0%	0%	3%	0%	0%	0%	0%	0%	1%
		Provo, UT	0%	0%	0%	30%	0%	0%	0%	0%	0%	4%
		Salt Lake City, UT	0%	0%	0%	60%	0%	0%	0%	0%	1%	29%
		Surrounding Areas	0%	0%	100%	7%	0%	0%	0%	100%	99%	65%
			0%	0%	100%	100%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - PM2.5

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.006**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
			0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.010**
		Logan, UT-ID	3%	0%	2%	0%	0%	0%	0%	0%	2%
		Provo, UT	1%	11%	10%	0%	0%	0%	0%	0%	9%
		Salt Lake City, UT	41%	24%	13%	0%	0%	0%	0%	0%	26%
		Surrounding Areas	56%	64%	75%	0%	0%	0%	0%	0%	63%
			100%	100%	100%	0%	0%	0%	0%	0%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for NO_x) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Logan, UT-ID	Idaho	Franklin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Cache	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Provo, UT	Utah	Utah	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Salt Lake City, UT	Utah	Box Elder	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Davis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Salt Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Tooele	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Weber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas
Logan, UT-ID	Idaho	Franklin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Cache	0.01	0.00	0.00	0.00	0.00	0.00	0.02
		Total	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**
Provo, UT	Utah	Utah	0.02	0.00	0.00	0.00	0.00	0.00	0.06
		Total	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.06**
Salt Lake City, UT	Utah	Box Elder	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Utah	Davis	0.02	0.00	0.00	0.00	0.00	0.00	0.04
	Utah	Salt Lake	0.02	0.00	0.00	0.00	0.00	0.00	0.16
	Utah	Tooele	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	Utah	Weber	0.02	0.00	0.00	0.00	0.00	0.00	0.04
		Total	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals
Logan, UT-ID	Idaho	Franklin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Cache	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Provo, UT	Utah	Utah	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Salt Lake City, UT	Utah	Box Elder	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Davis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Salt Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Tooele	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Weber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline
Logan, UT-ID	Idaho	Franklin	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Utah	Cache	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**
Provo, UT	Utah	Utah	0.00	0.00	0.00	0.00	0.03	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.03**	**0.00**	**0.00**
Salt Lake City, UT	Utah	Box Elder	0.00	0.00	0.00	0.00	0.05	0.00	0.00
	Utah	Davis	0.00	0.00	0.00	0.01	0.04	0.00	0.00
	Utah	Salt Lake	0.00	0.00	0.00	0.07	0.04	0.00	0.00
	Utah	Tooele	0.00	0.00	0.00	0.00	0.04	0.00	0.00
	Utah	Weber	0.00	0.00	0.00	0.00	0.04	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.07**	**0.21**	**0.00**	**0.00**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Logan, UT-ID	Idaho	Franklin	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Cache	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Provo, UT	Utah	Utah	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Salt Lake City, UT	Utah	Box Elder	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Davis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Salt Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Tooele	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Weber	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Surrounding Areas	Idaho	Bannock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Idaho	Bear Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Bingham	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Idaho	Blaine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Idaho	Caribou	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Cassia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Jerome	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Minidoka	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Oneida	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Twin Falls	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Utah	Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Duchesne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Emery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Juab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Millard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Morgan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Rich	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Sanpete	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Summit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Wasatch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Sublette	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Uinta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**
		Logan, UT-ID	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Provo, UT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Salt Lake City, UT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Surrounding Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
			0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	4%	2%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%	1%
		Surrounding Areas	0%	0%	0%	0%	0%	0%	96%	97%
			0%	0%	0%	0%	0%	0%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas
Surrounding Areas	Idaho	Bannock	0.01	0.00	0.00	0.01	0.01	0.00	0.01
	Idaho	Bear Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Bingham	0.00	0.00	0.00	0.01	0.01	0.00	0.00
	Idaho	Blaine	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Caribou	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Cassia	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Jerome	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Minidoka	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Oneida	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Power	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Twin Falls	0.01	0.00	0.00	0.01	0.01	0.00	0.01
	Utah	Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Duchesne	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Emery	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Juab	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Millard	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Morgan	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Rich	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Sanpete	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Summit	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Utah	Wasatch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Lincoln	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Wyoming	Sublette	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Uinta	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.04**	**0.01**	**0.00**	**0.04**	**0.05**	**0.00**	**0.06**
		Logan, UT-ID	0.01	0.00	0.00	0.00	0.00	0.00	0.02
		Provo, UT	0.02	0.00	0.00	0.00	0.00	0.00	0.06
		Salt Lake City, UT	0.07	0.00	0.00	0.00	0.00	0.00	0.25
		Surrounding Areas	0.04	0.01	0.00	0.04	0.05	0.00	0.06
			0.14	**0.02**	**0.01**	**0.04**	**0.05**	**0.00**	**0.39**
		Logan, UT-ID	8%	7%	8%	2%	2%	3%	4%
		Provo, UT	16%	7%	14%	0%	0%	0%	16%
		Salt Lake City, UT	46%	22%	36%	0%	0%	0%	65%
		Surrounding Areas	31%	65%	43%	98%	98%	97%	16%
			100%	100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals
Surrounding Areas	Idaho	Bannock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Bear Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Bingham	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Blaine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Caribou	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Cassia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Jerome	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Minidoka	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Oneida	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Twin Falls	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Duchesne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Emery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Juab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Millard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Morgan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Rich	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Sanpete	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Summit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Wasatch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Sublette	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Uinta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Logan, UT-ID	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Provo, UT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Salt Lake City, UT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Surrounding Areas	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
			0.01	**0.02**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Logan, UT-ID	6%	6%	4%	0%	0%	0%	0%	0%
		Provo, UT	6%	9%	8%	0%	0%	0%	0%	0%
		Salt Lake City, UT	19%	23%	26%	0%	0%	0%	0%	0%
		Surrounding Areas	69%	62%	61%	0%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline
Surrounding Areas	Idaho	Bannock	0.00	0.00	0.00	0.00	0.03	0.00	0.00
	Idaho	Bear Lake	0.00	0.00	0.00	0.00	0.02	0.00	0.00
	Idaho	Bingham	0.00	0.00	0.00	0.00	0.02	0.00	0.00
	Idaho	Blaine	0.00	0.00	0.00	0.29	0.00	0.00	0.00
	Idaho	Caribou	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Idaho	Cassia	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Jerome	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Lincoln	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Idaho	Minidoka	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Oneida	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Power	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Idaho	Twin Falls	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Carbon	0.00	0.00	0.00	0.00	0.02	0.00	0.00
	Utah	Duchesne	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Emery	0.00	0.00	0.00	0.00	0.02	0.00	0.00
	Utah	Juab	0.00	0.00	0.00	0.00	0.02	0.00	0.00
	Utah	Millard	0.00	0.00	0.00	0.00	0.04	0.00	0.00
	Utah	Morgan	0.00	0.00	0.00	0.00	0.02	0.00	0.00
	Utah	Rich	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Sanpete	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Summit	0.00	0.00	0.00	0.00	0.04	0.00	0.00
	Utah	Wasatch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Lincoln	0.00	0.00	0.00	0.00	0.08	0.00	0.00
	Wyoming	Sublette	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Uinta	0.00	0.00	0.00	0.00	0.09	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.29**	**0.44**	**0.00**	**0.00**
		Logan, UT-ID	0.00	0.00	0.00	0.00	0.01	0.00	0.00
		Provo, UT	0.00	0.00	0.00	0.00	0.03	0.00	0.00
		Salt Lake City, UT	0.00	0.00	0.00	0.07	0.21	0.00	0.00
		Surrounding Areas	0.00	0.00	0.00	0.29	0.44	0.00	0.00
			0.00	**0.00**	**0.00**	**0.36**	**0.69**	**0.00**	**0.00**
		Logan, UT-ID	0%	0%	1%	0%	1%	3%	1%
		Provo, UT	0%	0%	1%	0%	5%	1%	15%
		Salt Lake City, UT	0%	0%	16%	20%	30%	31%	17%
		Surrounding Areas	0%	0%	82%	79%	64%	66%	67%
			0%	0%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Surrounding Areas	Idaho	Bannock	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Bear Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Bingham	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Blaine	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Caribou	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Cassia	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Jerome	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Minidoka	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Oneida	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Power	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Idaho	Twin Falls	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Duchesne	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Emery	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Juab	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Millard	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Morgan	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Rich	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Sanpete	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Summit	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Utah	Wasatch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Lincoln	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Sublette	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wyoming	Uinta	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Logan, UT-ID	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Provo, UT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Salt Lake City, UT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Surrounding Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Logan, UT-ID	3%	0%	0%	0%	0%	0%	0%
		Provo, UT	12%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	33%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	52%	0%	0%	0%	0%	0%	100%
			100%	0%	0%	0%	0%	0%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for VOC) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.049	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.019	0.001	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.068**	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.026	0.002	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.026**	**0.002**	**0.001**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.035	0.001	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.002	0.005	0.003	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.010	0.001	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.010	0.001	0.001	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.058**	**0.008**	**0.004**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.000**
Provo, UT	Utah	Utah	0.001	0.000	0.000	0.000	0.000	0.000	0.004	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.000
	Utah	Salt Lake	0.001	0.000	0.000	0.000	0.000	0.000	0.009	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.000
		Total	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.015**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC
Logan, UT-ID	Idaho	Franklin	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.012	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.013**	**0.001**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.025	0.005	0.000	0.000	0.006	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.025**	**0.005**	**0.000**	**0.000**	**0.006**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.009	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.010	0.003	0.000	0.000	0.003	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.029	0.012	0.000	0.000	0.012	0.000	0.000	0.000	0.001
	Utah	Tooele	0.000	0.011	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.022	0.002	0.000	0.000	0.003	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.080**	**0.020**	**0.000**	**0.000**	**0.019**	**0.000**	**0.000**	**0.000**	**0.002**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.001	0.000	0.000	0.000
	Utah	Cache	0.004	0.000	0.000	0.000	0.000	0.007	0.006	0.001	0.052	0.011	0.001
		Total	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**	**0.008**	**0.009**	**0.002**	**0.052**	**0.011**	**0.001**
Provo, UT	Utah	Utah	0.011	0.002	0.000	0.000	0.002	0.032	0.010	0.004	0.161	0.013	0.004
		Total	**0.011**	**0.002**	**0.000**	**0.000**	**0.002**	**0.032**	**0.010**	**0.004**	**0.161**	**0.013**	**0.004**
Salt Lake City, UT	Utah	Box Elder	0.001	0.003	0.000	0.000	0.000	0.003	0.004	0.000	0.005	0.008	0.001
	Utah	Davis	0.005	0.002	0.001	0.000	0.000	0.019	0.006	0.005	0.045	0.012	0.001
	Utah	Salt Lake	0.048	0.002	0.000	0.000	0.000	0.063	0.041	0.027	0.309	0.065	0.008
	Utah	Tooele	0.004	0.002	0.000	0.000	0.000	0.004	0.001	0.000	0.000	0.002	0.002
	Utah	Weber	0.006	0.002	0.000	0.000	0.000	0.014	0.012	0.009	0.058	0.009	0.003
		Total	**0.064**	**0.010**	**0.001**	**0.000**	**0.001**	**0.102**	**0.065**	**0.042**	**0.417**	**0.095**	**0.014**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.031	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.108	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.031	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.234	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.197	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.056	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.147	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.029	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**1.090**	**0.009**	**0.001**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.068	0.001	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.026	0.002	0.001	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.058	0.008	0.004	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	1.090	0.009	0.001	0.000	0.000	0.000
			0.000	**0.000**	**1.243**	**0.020**	**0.006**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	5%	3%	4%	0%	0%	1%
		Provo, UT	0%	0%	2%	10%	21%	0%	0%	1%
		Salt Lake City, UT	0%	0%	5%	41%	66%	0%	0%	1%
		Surrounding Areas	0%	0%	88%	46%	8%	0%	100%	96%
			0%	0%	100%	100%	100%	0%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.001**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	**0.004**	**0.000**
		Logan, UT-ID	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000
		Provo, UT	0.001	0.000	0.000	0.000	0.000	0.000	0.004	0.000
		Salt Lake City, UT	0.004	0.000	0.000	0.000	0.000	0.000	0.015	0.000
		Surrounding Areas	0.001	0.000	0.000	0.001	0.000	0.000	0.004	0.000
			0.006	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	**0.023**	**0.000**
		Logan, UT-ID	9%	7%	8%	2%	1%	0%	4%	7%
		Provo, UT	19%	6%	15%	0%	0%	0%	16%	6%
		Salt Lake City, UT	57%	20%	40%	0%	0%	0%	65%	19%
		Surrounding Areas	15%	67%	36%	98%	99%	0%	15%	69%
			100%	100%	100%	100%	100%	0%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC
Surrounding Areas	Idaho	Bannock	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.002	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.042	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.010	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.008	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.013	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.020	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.014	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.001	0.010	0.005	0.002	0.000	0.000	0.000	0.001	0.000	0.025
	Wyoming	Sublette	0.000	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.019
	Wyoming	Uinta	0.000	0.007	0.006	0.000	0.000	0.000	0.000	0.000	0.002	0.002
		Total	**0.002**	**0.185**	**0.061**	**0.002**	**0.000**	**0.002**	**0.000**	**0.001**	**0.002**	**0.047**
		Logan, UT-ID	0.000	0.013	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.025	0.005	0.000	0.000	0.006	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.080	0.020	0.000	0.000	0.019	0.000	0.000	0.000	0.002
		Surrounding Areas	0.002	0.185	0.061	0.002	0.000	0.002	0.000	0.001	0.002	0.047
			0.002	**0.304**	**0.087**	**0.002**	**0.000**	**0.028**	**0.000**	**0.001**	**0.002**	**0.049**
		Logan, UT-ID	2%	4%	1%	0%	0%	5%	0%	0%	0%	0%
		Provo, UT	3%	8%	6%	0%	0%	21%	0%	0%	0%	1%
		Salt Lake City, UT	8%	26%	23%	0%	0%	67%	0%	0%	0%	3%
		Surrounding Areas	88%	61%	70%	100%	0%	7%	0%	100%	100%	96%
			100%	100%	100%	100%	0%	100%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010
Area Emissions by Sector - VOC

Tons/Average Episode Day

NA-Area	State	County	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Surrounding Areas	Idaho	Bannock	0.000	0.001	0.000	0.000	0.000	0.006	0.029	0.001	0.001	0.002	0.001
	Idaho	Bear Lake	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.001	0.000	0.000	0.000	0.003	0.009	0.001	0.000	0.001	0.000
	Idaho	Blaine	0.115	0.000	0.000	0.000	0.000	0.002	0.006	0.001	0.000	0.002	0.000
	Idaho	Caribou	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.002	0.010	0.001	0.000	0.001	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.001	0.014	0.001	0.000	0.001	0.000
	Idaho	Lincoln	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.001	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.005	0.032	0.006	0.000	0.002	0.001
	Utah	Carbon	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.004	0.001	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000
	Utah	Emery	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.001	0.001	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.001	0.000
	Utah	Millard	0.000	0.002	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.001
	Utah	Morgan	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.002	0.001	0.000
	Utah	Summit	0.000	0.002	0.000	0.000	0.000	0.002	0.001	0.001	0.001	0.005	0.001
	Utah	Wasatch	0.003	0.000	0.000	0.000	0.005	0.001	0.000	0.000	0.001	0.001	0.000
	Wyoming	Lincoln	0.000	0.004	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.007	0.002
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Wyoming	Uinta	0.000	0.004	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001
		Total	**0.119**	**0.023**	**0.000**	**0.000**	**0.010**	**0.039**	**0.119**	**0.014**	**0.012**	**0.028**	**0.010**
		Logan, UT-ID	0.004	0.000	0.000	0.000	0.000	0.008	0.009	0.002	0.052	0.011	0.001
		Provo, UT	0.011	0.002	0.000	0.000	0.002	0.032	0.010	0.004	0.161	0.013	0.004
		Salt Lake City, UT	0.064	0.010	0.001	0.000	0.001	0.102	0.065	0.042	0.417	0.095	0.014
		Surrounding Areas	0.119	0.023	0.000	0.000	0.010	0.039	0.119	0.014	0.012	0.028	0.010
			0.198	**0.035**	**0.002**	**0.000**	**0.013**	**0.180**	**0.202**	**0.062**	**0.642**	**0.148**	**0.029**
		Logan, UT-ID	2%	1%	0%	1%	1%	4%	5%	4%	8%	8%	2%
		Provo, UT	6%	4%	1%	9%	16%	18%	5%	7%	25%	9%	13%
		Salt Lake City, UT	32%	30%	71%	26%	8%	56%	32%	67%	65%	64%	50%
		Surrounding Areas	60%	64%	28%	63%	75%	21%	59%	22%	2%	19%	35%
			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for NH_3) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.051	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.076	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.127**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.103	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.103**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.139	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.038	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.038	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.231**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.003**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.013**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.054**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.002**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.001
		Total	**0.000**	**0.010**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**
Salt Lake City, UT	Utah	Box Elder	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.002
	Utah	Tooele	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.031**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.003**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.002
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.009
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.009**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.001
	Utah	Davis	0.000	0.000	0.000	0.000	0.005
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.017
	Utah	Tooele	0.000	0.000	0.000	0.000	0.001
	Utah	Weber	0.000	0.000	0.000	0.000	0.003
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.027**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass	Fuel Comb Comm/Institutional Coal
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.031	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.108	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.031	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.234	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.242	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.093	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.206	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.066	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.042	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.029	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.114	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.062	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.086	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.038	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.001	0.016	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.001**	**1.629**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.103	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.231	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.001	1.629	0.000	0.000	0.000	0.000	0.000
			0.000	**0.001**	**2.089**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	6%	0%	0%	0%	0%	1%
		Provo, UT	0%	0%	5%	0%	0%	0%	0%	1%
		Salt Lake City, UT	0%	0%	11%	0%	0%	0%	0%	2%
		Surrounding Areas	0%	100%	78%	0%	0%	0%	100%	96%
			0%	100%	100%	0%	0%	0%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.000**	**0.012**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.054	0.000
		Surrounding Areas	0.000	0.000	0.000	0.001	0.001	0.000	0.012	0.000
			0.001	**0.000**	**0.000**	**0.001**	**0.001**	**0.000**	**0.083**	**0.000**
		Logan, UT-ID	8%	5%	8%	2%	1%	0%	4%	7%
		Provo, UT	19%	4%	15%	0%	0%	0%	16%	6%
		Salt Lake City, UT	56%	14%	41%	0%	0%	0%	65%	20%
		Surrounding Areas	16%	76%	35%	98%	99%	0%	15%	67%
			100%	100%	100%	100%	100%	0%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.001	0.000	0.004	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.002**	**0.000**	**0.036**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.002	0.000	0.036	0.000	0.000
			0.000	**0.000**	**0.000**	**0.002**	**0.000**	**0.036**	**0.000**	**0.000**
		Logan, UT-ID	1%	3%	0%	8%	0%	0%	0%	0%
		Provo, UT	5%	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	8%	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	85%	97%	0%	92%	0%	100%	100%	0%
			100%	100%	0%	100%	0%	100%	100%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.006**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.001
		Salt Lake City, UT	0.000	0.031	0.000	0.000	0.000	0.000	0.000	0.003
		Surrounding Areas	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000
			0.000	**0.049**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**
		Logan, UT-ID	0%	4%	0%	3%	5%	0%	0%	5%
		Provo, UT	0%	20%	0%	0%	0%	0%	0%	21%
		Salt Lake City, UT	0%	63%	0%	0%	0%	0%	0%	67%
		Surrounding Areas	0%	13%	100%	97%	95%	0%	0%	7%
			0%	100%	100%	100%	100%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emission by Sector - NH3

Tons/Average Episode Day

NA-Area	State	County	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.001
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.003**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.002
		Provo, UT	0.000	0.000	0.000	0.000	0.009
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.027
		Surrounding Areas	0.000	0.000	0.000	0.000	0.003
			0.000	**0.000**	**0.000**	**0.000**	**0.040**
		Logan, UT-ID	0%	0%	4%	0%	4%
		Provo, UT	0%	0%	0%	0%	21%
		Salt Lake City, UT	0%	0%	0%	0%	67%
		Surrounding Areas	0%	0%	96%	0%	8%
			0%	0%	100%	0%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for SO_2) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.255	0.000	0.017	0.000	0.000	0.122
	Utah	Cache	0.003	0.002	0.062	0.000	0.000	0.000
		Total	**0.258**	**0.002**	**0.080**	**0.000**	**0.000**	**0.122**
Provo, UT	Utah	Utah	0.031	0.005	0.069	0.000	0.000	0.000
		Total	**0.031**	**0.005**	**0.069**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.002	0.001	0.019	0.000	0.000	0.000
	Utah	Davis	0.000	0.004	0.010	0.000	0.000	0.000
	Utah	Salt Lake	0.020	0.006	0.068	0.000	0.000	0.000
	Utah	Tooele	0.021	0.001	0.101	0.000	0.000	0.000
	Utah	Weber	0.006	0.005	0.025	0.000	0.000	0.000
		Total	**0.049**	**0.017**	**0.223**	**0.001**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.013	0.001	0.002	0.000	0.000	0.000
	Utah	Cache	0.000	0.004	0.055	0.000	0.004	0.000	0.000	0.000
		Total	**0.000**	**0.004**	**0.068**	**0.001**	**0.006**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.015	0.061	0.002	0.009	0.000	0.000	0.000
		Total	**0.000**	**0.015**	**0.061**	**0.002**	**0.009**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.002	0.017	0.000	0.003	0.000	0.000	0.000
	Utah	Davis	0.000	0.010	0.009	0.000	0.003	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.042	0.060	0.001	0.010	0.000	0.000	0.000
	Utah	Tooele	0.000	0.002	0.089	0.001	0.004	0.000	0.000	0.000
	Utah	Weber	0.000	0.009	0.022	0.000	0.007	0.000	0.000	0.000
		Total	**0.000**	**0.065**	**0.196**	**0.004**	**0.027**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.005	0.024
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.005**	**0.028**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.011	0.160
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.011**	**0.160**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.001	0.230
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.014	0.097
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.004	0.415	0.181
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.008	0.158
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.007	0.130
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.446**	**0.797**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.014	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.014**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.414
	Utah	Cache	0.000	0.000	0.159
		Total	**0.000**	**0.000**	**0.574**
Provo, UT	Utah	Utah	0.000	0.000	0.364
		Total	**0.000**	**0.000**	**0.364**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.275
	Utah	Davis	0.000	0.000	0.148
	Utah	Salt Lake	0.000	0.000	0.823
	Utah	Tooele	0.000	0.000	0.385
	Utah	Weber	0.000	0.000	0.212
		Total	**0.000**	**0.000**	**1.843**

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	0%
		Provo, UT	0%	0%	0%	0%	0%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	0%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	0%	0%	100%
			0%	0%	0%	0%	0%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	4.416	0.001	0.128	0.000	0.001	0.859
	Idaho	Bear Lake	0.227	0.000	0.010	0.000	0.000	0.041
	Idaho	Bingham	1.342	0.000	0.054	0.000	0.001	0.688
	Idaho	Blaine	2.107	0.001	0.095	0.000	0.000	0.533
	Idaho	Caribou	0.165	0.000	0.013	0.000	0.000	0.278
	Idaho	Cassia	0.821	0.000	0.044	0.000	0.000	0.339
	Idaho	Jerome	0.493	0.000	0.032	0.000	0.000	0.356
	Idaho	Lincoln	0.111	0.000	0.006	0.000	0.000	0.075
	Idaho	Minidoka	0.544	0.000	0.027	0.000	0.000	0.284
	Idaho	Oneida	0.168	0.000	0.005	0.000	0.000	0.032
	Idaho	Power	0.227	0.000	0.009	0.000	0.000	0.220
	Idaho	Twin Falls	4.180	0.001	0.165	0.000	0.001	1.063
	Utah	Carbon	0.081	0.000	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.024	0.000	0.010	0.000	0.000	0.000
	Utah	Emery	0.081	0.000	0.001	0.000	0.000	0.000
	Utah	Juab	0.027	0.000	0.105	0.000	0.000	0.000
	Utah	Millard	0.055	0.000	0.076	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.003	0.000	0.018	0.000	0.000	0.000
	Utah	Sanpete	0.083	0.000	0.142	0.000	0.000	0.000
	Utah	Summit	0.002	0.000	0.008	0.000	0.000	0.000
	Utah	Wasatch	0.002	0.000	0.003	0.000	0.000	0.000
	Wyoming	Lincoln	0.114	0.000	0.023	0.000	0.000	0.713
	Wyoming	Sublette	0.053	0.000	0.011	0.000	0.000	0.122
	Wyoming	Uinta	0.273	0.000	0.054	0.000	0.000	0.410
		Total	**15.599**	**0.005**	**1.038**	**0.001**	**0.005**	**6.013**
		Logan, UT-ID	0.258	0.002	0.080	0.000	0.000	0.122
		Provo, UT	0.031	0.005	0.069	0.000	0.000	0.000
		Salt Lake City, UT	0.049	0.017	0.223	0.001	0.000	0.000
		Surrounding Areas	15.599	0.005	1.038	0.001	0.005	6.013
			15.938	**0.029**	**1.411**	**0.002**	**0.005**	**6.136**
		Logan, UT-ID	2%	9%	6%	8%	2%	2%
		Provo, UT	0%	17%	5%	15%	0%	0%
		Salt Lake City, UT	0%	58%	16%	40%	0%	0%
		Surrounding Areas	98%	16%	74%	37%	98%	98%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.002	0.002	0.096	0.004	0.012	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.007	0.000	0.001	0.000	0.000	0.000
	Idaho	Bingham	0.001	0.001	0.044	0.002	0.006	0.000	0.000	0.000
	Idaho	Blaine	0.001	0.001	0.030	0.001	0.003	0.000	0.000	0.000
	Idaho	Caribou	0.001	0.000	0.008	0.000	0.001	0.000	0.000	0.000
	Idaho	Cassia	0.001	0.000	0.024	0.001	0.003	0.000	0.000	0.000
	Idaho	Jerome	0.001	0.000	0.024	0.001	0.003	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.000
	Idaho	Minidoka	0.001	0.000	0.022	0.001	0.003	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.008	0.000	0.001	0.000	0.000	0.000
	Idaho	Twin Falls	0.002	0.002	0.093	0.004	0.011	0.000	0.000	0.000
	Utah	Carbon	0.000	0.001	0.001	0.005	0.001	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.009	0.002	0.014	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.001	0.005	0.003	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.092	0.002	0.003	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.067	0.003	0.005	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.016	0.000	0.002	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.001	0.124	0.005	0.007	0.000	0.000	0.000
	Utah	Summit	0.000	0.004	0.007	0.000	0.005	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.001	0.003	0.000	0.004	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.010	0.111	0.007	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.013	0.007	0.004	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.001	0.003	0.032	0.004	0.000	0.000	0.000
		Total	**0.009**	**0.015**	**0.711**	**0.187**	**0.104**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.004	0.068	0.001	0.006	0.000	0.000	0.000
		Provo, UT	0.000	0.015	0.061	0.002	0.009	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.065	0.196	0.004	0.027	0.000	0.000	0.000
		Surrounding Areas	0.009	0.015	0.711	0.187	0.104	0.000	0.000	0.000
			0.009	**0.099**	**1.035**	**0.193**	**0.146**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	7%	0%	4%	0%	0%	0%
		Provo, UT	0%	15%	6%	1%	6%	0%	0%	0%
		Salt Lake City, UT	0%	65%	19%	2%	19%	0%	0%	0%
		Surrounding Areas	97%	16%	69%	97%	71%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.017
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.013
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.919	0.003
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.007
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.004
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.001	0.107
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.054
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.002	0.100
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.165
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.001	0.089
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.153
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.002	0.013
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.037	0.000	0.243
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.034	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.005	0.000	0.275
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.077**	**0.926**	**1.270**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.005	0.028
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.011	0.160
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.004	0.446	0.797
		Surrounding Areas	0.000	0.000	0.000	0.000	0.077	0.926	1.270
			0.000	**0.000**	**0.000**	**0.000**	**0.081**	**1.388**	**2.255**
		Logan, UT-ID	0%	0%	0%	0%	0%	0%	1%
		Provo, UT	0%	0%	0%	0%	0%	1%	7%
		Salt Lake City, UT	0%	0%	0%	0%	5%	32%	35%
		Surrounding Areas	0%	0%	0%	0%	94%	67%	56%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.014	0.000	0.000	0.000	0.000	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			0.014	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	1%	2%	0%	0%	0%	0%
		Provo, UT	0%	15%	28%	0%	0%	0%	0%
		Salt Lake City, UT	98%	17%	17%	0%	0%	0%	0%
		Surrounding Areas	2%	67%	54%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
Area Emissions by Sector - SO2

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal	Total Area NH3
Surrounding Areas	Idaho	Bannock	0.000	0.000	5.536
	Idaho	Bear Lake	0.000	0.000	0.296
	Idaho	Bingham	0.000	0.000	2.151
	Idaho	Blaine	0.000	0.000	3.694
	Idaho	Caribou	0.000	0.000	0.473
	Idaho	Cassia	0.000	0.000	1.234
	Idaho	Jerome	0.000	0.000	0.912
	Idaho	Lincoln	0.000	0.000	0.205
	Idaho	Minidoka	0.000	0.000	0.886
	Idaho	Oneida	0.000	0.000	0.214
	Idaho	Power	0.000	0.000	0.472
	Idaho	Twin Falls	0.000	0.000	5.524
	Utah	Carbon	0.000	0.000	0.198
	Utah	Duchesne	0.000	0.000	0.060
	Utah	Emery	0.000	0.000	0.147
	Utah	Juab	0.000	0.000	0.329
	Utah	Millard	0.000	0.000	0.372
	Utah	Morgan	0.000	0.000	0.091
	Utah	Rich	0.000	0.000	0.039
	Utah	Sanpete	0.000	0.000	0.363
	Utah	Summit	0.000	0.001	0.180
	Utah	Wasatch	0.000	0.000	0.027
	Wyoming	Lincoln	0.000	0.002	1.260
	Wyoming	Sublette	0.000	0.000	0.245
	Wyoming	Uinta	0.000	0.000	1.057
		Total	**0.000**	**0.005**	**25.966**
		Logan, UT-ID	0.000	0.000	0.574
		Provo, UT	0.000	0.000	0.364
		Salt Lake City, UT	0.000	0.000	1.843
		Surrounding Areas	0.000	0.005	25.966
			0.000	**0.005**	**28.746**
		Logan, UT-ID	0%	0%	2%
		Provo, UT	0%	0%	1%
		Salt Lake City, UT	0%	0%	6%
		Surrounding Areas	0%	100%	90%
			0%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
Area Emissions by Sector
Tons/Average Episode Day

This table (for CO) shows area / non-point source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the $PM_{2.5}$ nonattainment areas within the modeling domain, one table for each Criteria Pollutant. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three $PM_{2.5}$ nonattainment Areas. Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population. Emissions were also temporally adjusted within the SMOKE pre-processor. All annual area / non-point source emissions were temporally adjusted within the SMOKE pre-processor. The annual totals for Episode 3 were compiled as an average of 2009 and 2010.
Domain-wide totals for each of the source categories are reported below in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.000	0.000	0.001	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.004	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Davis	0.000	0.000	0.000	0.000	0.003	0.000	0.000
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.009	0.000	0.000
	Utah	Tooele	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Weber	0.000	0.000	0.000	0.000	0.002	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.014**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Logan, UT-ID	Idaho	Franklin	0.009	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.008	0.000	0.001	0.000	0.000
		Total	**0.009**	**0.008**	**0.000**	**0.001**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.019	0.000	0.001	0.000	0.000
		Total	**0.000**	**0.019**	**0.000**	**0.001**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.004	0.000	0.001	0.000	0.000
	Utah	Davis	0.000	0.014	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.017	0.000	0.001	0.000	0.000
	Utah	Tooele	0.000	0.004	0.000	0.000	0.000	0.000
	Utah	Weber	0.000	0.017	0.000	0.001	0.000	0.000
		Total	**0.000**	**0.056**	**0.000**	**0.003**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000
	Utah	Cache	0.000	0.006	0.000	0.000	0.051	0.000	0.000	0.000
		Total	**0.000**	**0.007**	**0.000**	**0.000**	**0.057**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.026	0.000	0.001	0.110	0.000	0.000	0.000
		Total	**0.000**	**0.026**	**0.000**	**0.001**	**0.110**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.003	0.000	0.000	0.039	0.000	0.000	0.000
	Utah	Davis	0.000	0.018	0.000	0.000	0.043	0.000	0.000	0.000
	Utah	Salt Lake	0.000	0.069	0.000	0.000	0.125	0.000	0.000	0.000
	Utah	Tooele	0.000	0.003	0.000	0.000	0.048	0.000	0.000	0.000
	Utah	Weber	0.000	0.016	0.000	0.000	0.094	0.000	0.000	0.000
		Total	**0.000**	**0.108**	**0.000**	**0.001**	**0.349**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.001	0.000	0.001
	Utah	Cache	0.000	0.000	0.000	0.000	0.001	0.046	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.046**	**0.001**
Provo, UT	Utah	Utah	0.000	0.000	0.000	0.000	0.003	0.180	0.004
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.003**	**0.180**	**0.004**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.000	0.000	0.000	0.015	0.009
	Utah	Davis	0.000	0.000	0.000	0.000	0.002	0.045	0.005
	Utah	Salt Lake	0.000	0.000	0.000	0.000	0.007	0.399	0.006
	Utah	Tooele	0.000	0.000	0.000	0.000	0.000	0.019	0.006
	Utah	Weber	0.000	0.000	0.000	0.000	0.001	0.084	0.006
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.010**	**0.561**	**0.032**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Logan, UT-ID	Idaho	Franklin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Cache	0.000	0.000	0.003	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.003**	**0.000**	**0.000**	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000	0.073	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.073**	**0.000**	**0.000**	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000	0.010	0.000	0.000	0.000	0.000
	Utah	Davis	0.013	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Salt Lake	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Tooele	0.001	0.000	0.016	0.000	0.000	0.000	0.000
	Utah	Weber	0.001	0.000	0.005	0.000	0.000	0.000	0.000
		Total	**0.017**	**0.000**	**0.032**	**0.000**	**0.000**	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Logan, UT-ID	Idaho	Franklin	0.000	0.000
	Utah	Cache	0.000	0.000
		Total	**0.000**	**0.000**
Provo, UT	Utah	Utah	0.000	0.000
		Total	**0.000**	**0.000**
Salt Lake City, UT	Utah	Box Elder	0.000	0.000
	Utah	Davis	0.000	0.000
	Utah	Salt Lake	0.000	0.000
	Utah	Tooele	0.000	0.000
	Utah	Weber	0.000	0.000
		Total	**0.000**	**0.000**

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Agriculture Crops & Livestock Dust	Agriculture Fertilizer Application	Agriculture Livestock Waste	Bulk Gasoline Terminals	Commercial Cooking	Dust Construction Dust	Fuel Comb Comm/Institutional Biomass
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.002**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.001	0.000	0.000
		Provo, UT	0.000	0.000	0.000	0.000	0.004	0.000	0.000
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.014	0.000	0.000
		Surrounding Areas	0.000	0.000	0.000	0.000	0.002	0.000	0.000
			0.000	**0.000**	**0.000**	**0.000**	**0.021**	**0.000**	**0.000**
		Logan, UT-ID	0%	0%	0%	0%	4%	0%	3%
		Provo, UT	0%	0%	0%	0%	21%	0%	0%
		Salt Lake City, UT	0%	0%	0%	0%	66%	0%	0%
		Surrounding Areas	0%	0%	0%	0%	8%	0%	97%
			0%	0%	0%	0%	100%	0%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Comm/Institutional Coal	Fuel Comb Comm/Institutional Natural Gas	Fuel Comb Comm/Institutional Oil	Fuel Comb Comm/Institutional Other	Fuel Comb Industrial Boilers, ICEs Natural Gas	Fuel Comb Industrial Boilers, ICEs Oil
Surrounding Areas	Idaho	Bannock	0.149	0.003	0.000	0.000	0.002	0.001
	Idaho	Bear Lake	0.008	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.045	0.001	0.000	0.000	0.002	0.001
	Idaho	Blaine	0.071	0.002	0.000	0.000	0.001	0.000
	Idaho	Caribou	0.006	0.000	0.000	0.000	0.001	0.000
	Idaho	Cassia	0.028	0.001	0.000	0.000	0.001	0.000
	Idaho	Jerome	0.017	0.001	0.000	0.000	0.001	0.000
	Idaho	Lincoln	0.004	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.018	0.001	0.000	0.000	0.001	0.000
	Idaho	Oneida	0.006	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.008	0.000	0.000	0.000	0.001	0.000
	Idaho	Twin Falls	0.141	0.003	0.000	0.000	0.003	0.001
	Utah	Carbon	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.000	0.000	0.001	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.001	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.001	0.002
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.001	0.000	0.000	0.000	0.001	0.001
		Total	**0.503**	**0.016**	**0.002**	**0.003**	**0.014**	**0.007**
		Logan, UT-ID	0.009	0.008	0.000	0.001	0.000	0.000
		Provo, UT	0.000	0.019	0.000	0.001	0.000	0.000
		Salt Lake City, UT	0.000	0.056	0.000	0.003	0.000	0.000
		Surrounding Areas	0.503	0.016	0.002	0.003	0.014	0.007
			0.512	**0.099**	**0.002**	**0.007**	**0.015**	**0.007**
		Logan, UT-ID	2%	8%	5%	8%	2%	1%
		Provo, UT	0%	19%	4%	15%	0%	0%
		Salt Lake City, UT	0%	57%	14%	40%	0%	0%
		Surrounding Areas	98%	16%	76%	37%	98%	99%
			100%	100%	100%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Fuel Comb Industrial Boilers, ICEs Other	Fuel Comb Residential Natural Gas	Fuel Comb Residential Oil	Fuel Comb Residential Other	Fuel Comb Residential Wood	Gas Stations	Industrial Processes Chemical Manuf	Industrial Processes Mining
Surrounding Areas	Idaho	Bannock	0.000	0.003	0.000	0.001	0.039	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.001	0.000	0.000	0.021	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.001	0.000	0.000	0.011	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.001	0.000	0.000	0.011	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.001	0.000	0.000	0.010	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.001	0.000	0.000	0.009	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.003	0.000	0.001	0.037	0.000	0.000	0.000
	Utah	Carbon	0.000	0.002	0.000	0.002	0.010	0.000	0.000	0.000
	Utah	Duchesne	0.000	0.001	0.000	0.000	0.183	0.000	0.000	0.000
	Utah	Emery	0.000	0.001	0.000	0.002	0.045	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.000	0.000	0.035	0.000	0.000	0.000
	Utah	Millard	0.000	0.001	0.000	0.001	0.059	0.000	0.000	0.000
	Utah	Morgan	0.000	0.001	0.000	0.000	0.014	0.000	0.000	0.000
	Utah	Rich	0.000	0.000	0.000	0.000	0.024	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.002	0.000	0.002	0.086	0.000	0.000	0.000
	Utah	Summit	0.000	0.007	0.000	0.000	0.061	0.000	0.000	0.000
	Utah	Wasatch	0.000	0.002	0.000	0.000	0.045	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.026	0.041	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.002	0.022	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.001	0.000	0.007	0.030	0.000	0.000	0.000
		Total	**0.001**	**0.026**	**0.001**	**0.044**	**0.807**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.007	0.000	0.000	0.057	0.000	0.000	0.000
		Provo, UT	0.000	0.026	0.000	0.001	0.110	0.000	0.000	0.000
		Salt Lake City, UT	0.000	0.108	0.000	0.001	0.349	0.000	0.000	0.000
		Surrounding Areas	0.001	0.026	0.001	0.044	0.807	0.000	0.000	0.000
			0.001	**0.167**	**0.002**	**0.047**	**1.322**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	3%	4%	6%	1%	4%	0%	0%	0%
		Provo, UT	0%	16%	6%	1%	8%	0%	0%	0%
		Salt Lake City, UT	0%	65%	19%	3%	26%	0%	0%	0%
		Surrounding Areas	97%	16%	69%	95%	61%	0%	0%	0%
			100%	100%	100%	100%	100%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Industrial Processes NEC	Industrial Processes Non-ferrous Metals	Industrial Processes Oil & Gas Production	Industrial Processes Storage and Transfer	Miscellaneous Non-Industrial NEC	Mobile Aircraft	Mobile Locomotives
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.004	0.000	0.004
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.002	0.000	0.003
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.448	0.001
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.001	0.000	0.001
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.006	0.002
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.004	0.005	0.000
	Utah	Carbon	0.000	0.000	0.000	0.000	0.000	0.006	0.003
	Utah	Duchesne	0.000	0.000	0.000	0.000	0.000	0.007	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.004	0.002
	Utah	Juab	0.000	0.000	0.000	0.000	0.000	0.008	0.004
	Utah	Millard	0.000	0.000	0.000	0.000	0.000	0.003	0.006
	Utah	Morgan	0.000	0.000	0.000	0.000	0.000	0.009	0.003
	Utah	Rich	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.000	0.000	0.000	0.000	0.000	0.002	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Utah	Wasatch	0.000	0.000	0.000	0.000	0.000	0.021	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.104	0.000	0.009
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.082	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.010	0.000	0.010
		Total	**0.000**	**0.000**	**0.000**	**0.000**	**0.211**	**0.519**	**0.060**
		Logan, UT-ID	0.000	0.000	0.000	0.000	0.001	0.046	0.001
		Provo, UT	0.000	0.000	0.000	0.000	0.003	0.180	0.004
		Salt Lake City, UT	0.000	0.000	0.000	0.000	0.010	0.561	0.032
		Surrounding Areas	0.000	0.000	0.000	0.000	0.211	0.519	0.060
			0.000	**0.000**	**0.000**	**0.000**	**0.225**	**1.307**	**0.098**
		Logan, UT-ID	0%	0%	0%	0%	0%	4%	1%
		Provo, UT	0%	0%	0%	0%	1%	14%	5%
		Salt Lake City, UT	0%	0%	0%	0%	4%	43%	32%
		Surrounding Areas	0%	0%	0%	0%	94%	40%	62%
			0%	0%	0%	0%	100%	100%	100%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Mobile Non-Road Equipment Diesel	Mobile Non-Road Equipment Gasoline	Mobile Non-Road Equipment Other	Solvent Consumer & Commercial Solvent Use	Solvent Degreasing	Solvent Dry Cleaning	Solvent Graphic Arts
Surrounding Areas	Idaho	Bannock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bear Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Bingham	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Blaine	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Caribou	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Cassia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Jerome	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Minidoka	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Power	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Twin Falls	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Carbon	0.001	0.000	0.009	0.000	0.000	0.000	0.000
	Utah	Duchesne	0.006	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Emery	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Juab	0.000	0.000	0.031	0.000	0.000	0.000	0.000
	Utah	Millard	0.000	0.000	0.016	0.000	0.000	0.000	0.000
	Utah	Morgan	0.001	0.000	0.003	0.000	0.000	0.000	0.000
	Utah	Rich	0.001	0.000	0.011	0.000	0.000	0.000	0.000
	Utah	Sanpete	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Summit	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Utah	Wasatch	0.002	0.000	0.164	0.000	0.000	0.000	0.000
	Wyoming	Lincoln	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Sublette	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Wyoming	Uinta	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Total	**0.012**	**0.000**	**0.233**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0.000	0.000	0.003	0.000	0.000	0.000	0.000
		Provo, UT	0.000	0.000	0.073	0.000	0.000	0.000	0.000
		Salt Lake City, UT	0.017	0.000	0.032	0.000	0.000	0.000	0.000
		Surrounding Areas	0.012	0.000	0.233	0.000	0.000	0.000	0.000
			0.029	**0.000**	**0.342**	**0.000**	**0.000**	**0.000**	**0.000**
		Logan, UT-ID	0%	2%	1%	0%	0%	0%	0%
		Provo, UT	1%	10%	21%	0%	0%	0%	0%
		Salt Lake City, UT	58%	21%	9%	0%	0%	0%	0%
		Surrounding Areas	41%	68%	68%	0%	0%	0%	0%
			100%	100%	100%	0%	0%	0%	0%

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
Area Emissions by Sector - CO

Tons/Average Episode Day

NA-Area	State	County	Solvent Industrial Surface Coating & Solvent Use	Waste Disposal
Surrounding Areas	Idaho	Bannock	0.000	0.003
	Idaho	Bear Lake	0.000	0.000
	Idaho	Bingham	0.000	0.001
	Idaho	Blaine	0.000	0.001
	Idaho	Caribou	0.000	0.000
	Idaho	Cassia	0.000	0.001
	Idaho	Jerome	0.000	0.001
	Idaho	Lincoln	0.000	0.000
	Idaho	Minidoka	0.000	0.001
	Idaho	Oneida	0.000	0.000
	Idaho	Power	0.000	0.000
	Idaho	Twin Falls	0.000	0.003
	Utah	Carbon	0.000	0.000
	Utah	Duchesne	0.000	0.001
	Utah	Emery	0.000	0.000
	Utah	Juab	0.000	0.000
	Utah	Millard	0.000	0.000
	Utah	Morgan	0.000	0.000
	Utah	Rich	0.000	0.000
	Utah	Sanpete	0.000	0.001
	Utah	Summit	0.000	0.001
	Utah	Wasatch	0.000	0.000
	Wyoming	Lincoln	0.000	0.033
	Wyoming	Sublette	0.000	0.009
	Wyoming	Uinta	0.000	0.014
		Total	**0.000**	**0.070**
		Logan, UT-ID	0.000	0.000
		Provo, UT	0.000	0.000
		Salt Lake City, UT	0.000	0.000
		Surrounding Areas	0.000	0.070
			0.000	**0.071**
		Logan, UT-ID	0%	1%
		Provo, UT	0%	0%
		Salt Lake City, UT	0%	0%
		Surrounding Areas	0%	99%
			0%	100%

Inventory Preparation Plan
Table 4
Area In Modeling Domain

County	Total Sq. Km.	Area in Domain	% in Domain
Bannock (Idaho)	2973	2303	77
Bear Lake (Idaho)	2719	2719	100
Bingham (Idaho)	5485	67	1
Blaine (Idaho)	6871	550	8
Box Elder			100
Cache			100
Carbon	3844	2460.16	64
Caribou (Idaho)	4666	3105	67
Cassia (Idaho)	6669	6208	93
Davis			100
Duchesne	8405	4706.8	56
Emery	11546	2193.74	19
Franklin (Idaho)	1731	1731	100
Jerome (Idaho)	1557	534	34
Juab			100
Lincoln (Idaho)	3120	527	17
Lincoln (Wyoming)			
Minidoka (Idaho)	1982	1199	61
Millard	17708	4604	26
Morgan			100
Oneida (Idaho)	3110	3110	100
Power (Idaho)	3730	3171	85
Rich			100
Salt Lake			100
Sanpete	4147	2654.08	64
Sublette (Wyoming)			
Summit	4867	4331.63	89
Tooele			100
Twin Falls (Idaho)	4995	75	2
Uinta (Wyoming)			
Utah			100
Wasatch			100
Weber			100

Inventory Preparation Plan
Table 5
Population In Domain

County	State	County Total Population	County Population inside Domain
Bannock	Idaho	74,377	36,316
Bear Lake	Idaho	5,714	5,714
Bingham	Idaho	39,710	206
Blaine	Idaho	17,501	26
Box Elder	Utah	48,712	48,712
Cache	Utah	111,841	111,841
Carbon	Utah	19,841	17,431
Caribou	Idaho	6328	6,294
Cassia	Idaho	19,459	19,127
Davis	Utah	301,915	301,915
Duchesne	Utah	16,765	7,106
Emery	Utah	10,610	6,187
Franklin	Idaho	10,424	10,424
Jerome	Idaho	17,491	1,643
Juab	Utah	10,039	10,039
Lincoln	Idaho	3,490	84
Lincoln	Wyoming	14,053	10,399
Minidoka	Idaho	19,982	19,982
Millard	Utah	13,550	6,355
Morgan	Utah	9,645	9,645
Oneida	Idaho	3,499	3,499
Power	Idaho	6,652	6,168
Rich	Utah	2,278	2,278
Salt Lake	Utah	1,030,519	1,030,519
Sanpete	Utah	26,960	21,645
Sublette	Wyoming	5,887	1,472
Summit	Utah	39,951	37,063
Tooele	Utah	58,214	58,214
Twin Falls	Idaho	62,625	294
Uinta	Wyoming	20,304	18,274
Uintah	Utah	30,446	30,446
Utah	Utah	519,632	519,632
Wasatch	Utah	22,845	22,845
Weber	Utah	224,536	224,536

Seasonal Adjustment Codes and Profiles
for Area Source and Non-Road Mobile Source Categories

Description	Month Codes	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
late summer	**16**	0%	0%	0%	0%	4%	15%	20%	20%	20%	15%	6%	0%
all year	**21**	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
construction	**29**	4%	4%	4%	8%	12%	12%	12%	12%	12%	8%	4%	4%
	32	9%	7%	9%	7%	7%	8%	8%	8%	10%	10%	8%	9%
	33	6%	6%	7%	7%	7%	10%	11%	11%	9%	10%	7%	8%
3 season	**34**	0%	0%	0%	8%	17%	17%	17%	17%	17%	8%	0%	0%
spring	**43**	0%	0%	21%	29%	29%	21%	0%	0%	0%	0%	0%	0%
summer emphasis	**44**	0%	0%	0%	0%	0%	21%	29%	29%	21%	0%	0%	0%
ag NH3	**48**	6%	6%	6%	7%	10%	13%	15%	13%	9%	6%	4%	4%
all year, winter emphasis	**469**	12%	12%	8%	8%	8%	5%	5%	5%	8%	8%	8%	12%
winter emphasis, no summer	**485**	16%	16%	10%	10%	5%	0%	0%	0%	5%	10%	12%	16%
no winter	**508**	0%	0%	0%	11%	21%	32%	21%	11%	5%	0%	0%	0%

Description	Day of Week Codes	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
not quite even	**8**	15%	15%	15%	15%	15%	14%	13%
even	**105**	14%	14%	14%	14%	14%	14%	14%
week emphasis	**407**	15%	15%	15%	15%	15%	13%	10%
6 day	**1867**	17%	17%	17%	17%	17%	17%	0%
5 day	**1915**	20%	20%	20%	20%	20%	0%	0%

Description	Hours per day Codes	1	2	3	4	5	6	7	8	9	10	11	12
default day	**10**	2	2	2	2	2	7	7	7	5	5	5	5
off road	**11**	2%	2%	2%	2%	2%	6%	6%	6%	6%	6%	6%	9%
1.02	**12**	2%	2%	2%	2%	2%	5%	6%	6%	6%	5%	5%	9%
1	**26**	2%	2%	2%	2%	2%	2%	3%	4%	5%	5%	6%	6%
24/7	**1864**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
business	**1871**	0%	0%	0%	0%	0%	0%	7%	7%	7%	7%	7%	7%
1	**1874**	2%	2%	2%	2%	2%	2%	2%	7%	7%	7%	7%	7%
1	**1922**	2%	1%	1%	1%	1%	2%	5%	9%	6%	5%	5%	5%
1	**1928**	0%	0%	0%	0%	0%	7%	7%	7%	7%	7%	7%	7%
1	**601**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
1	**600**	5%	5%	5%	5%	5%	5%	5%	5%	5%	3%	3%	3%
1	**99**	2%	2%	2%	2%	3%	5%	7%	7%	7%	5%	3%	3%
home heat	**30**	2%	2%	2%	2%	2%	6%	6%	6%	6%	4%	4%	4%
8 to 5	**40**	0%	0%	0%	0%	0%	0%	8%	8%	8%	8%	9%	8%

Description	Hours per day	13	14	15	16	17	18	19	20	21	22	23	24
default day	**10**	5	5	9	9	9	2	2	2	2	2	2	2
off road	**11**	9%	9%	6%	6%	6%	2%	2%	2%	2%	2%	2%	2%
1.02	**12**	9%	9%	6%	6%	6%	2%	2%	2%	2%	2%	2%	2%
1	**26**	6%	6%	6%	6%	6%	5%	5%	5%	4%	3%	3%	2%
24/7	**1864**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
business	**1871**	7%	7%	7%	7%	7%	7%	7%	7%	0%	0%	0%	0%
1	**1874**	7%	7%	7%	7%	7%	7%	2%	2%	2%	2%	2%	2%
1	**1922**	5%	5%	5%	7%	9%	8%	5%	4%	3%	2%	3%	2%
1	**1928**	7%	7%	7%	7%	7%	7%	7%	7%	0%	0%	0%	0%
1	**601**	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
1	**600**	3%	3%	3%	3%	3%	5%	5%	5%	5%	5%	5%	5%
1	**99**	3%	3%	3%	5%	7%	7%	7%	5%	3%	2%	2%	2%
home heat	**30**	4%	4%	4%	4%	4%	6%	8%	8%	8%	4%	2%	2%
8 to 5	**40**	9%	9%	9%	8%	8%	8%	0%	0%	0%	0%	0%	0%

INPUT DATA

ACTIVITY DATA FOR ESTIMATION METHODS

Emissions from area sources are nearly always estimated using some type of calculation procedure. Direct measurement of area source emissions is hardly ever practical because of technical and cost considerations.

There are four basic approaches for developing an area source emission estimate:

- Extrapolation from a sample set of the sources (surveys, permit files, or other databases);
- Material balance method
- Mathematical models; and
- Emission factors applied to activity levels.

The calculation procedures determine what data is used to estimate the area source emissions. The activity data is in the "Episode Activity Data Workbook" available upon request from UDAQ. This data are used in the calculations to estimate emissions for area sources. Section 2.c iii (1).doc lists the data tables and reference documents used in the area source calculations.

Included in the Annual Emission Episode Workbooks are emissions for January 2009 and December 2009. This is included because in April of 2009 petroleum companies and gas stations in certain counties were required to begin using Stage 1 in the gasoline process. Because there were potential episodes in the beginning of 2009 and the end of 2009, summary tables for January 2009 without Stage 1 in some counties and December 2009 with Stage 1 in the additional counties were developed.

Since one of the episodes that was analyzed for this SIP extended over two calendar years, an average of the emissions from December 2009 and 2010 was input into the model to account for the changes in the annual numbers. This was done to prevent the entire change in annual emissions to be attributed to December 31, 2009, and January 1, 2010. The Episodic Annual Summary Workbook includes the average emissions of these two sets of data.

ACTIVITY DATA

AND

SOURCES

Data tables contain activity data that are used in calculating emissions for area source categories. The individual tables are available from Utah Division of Air Quality (UDAQ) upon request.

Within the data tables, blue shading indicates the activity data was calculated by the UDAQ. Yellow shading shows projections made by contacts outside UDAQ. Actual activity data is not shaded. Purple shading identifies specific SIP tables, and green shading indicates that the county is in the PM_{25} SIP domain.

The following activity data tables are used in calculations:

Table 1 – Utah Human Population
Table 2 – Utah Human Population Growth Rates
Table 3 – United States Human Population
Table 4 – Agricultural Employment
Table 5 – Agricultural Employment Growth Rates
Table 6 – Manufacturing Employment
Table 7 – Manufacturing Employment Growth Rates
Table 8 – Construction Employment
Table 9 – Construction Employment Growth Rates
Table 10 – Transportation Employment
Table 11 – Transportation Employment Growth Rates
Table 12 – Mining Employment
Table 13 – Mining Employment Growth Rates
Table 14 – Degreasing Employment
Table 15 – Autobody Refinishing Employment
Table 16 – Metal Furniture Employment
Table 17 – Wood Furniture Manufacturing Employment
Table 18 – Metal Containers Manufacturing Employment
Table 19 – Machinery and Equipment Manufacturing Employment
Table 20 – Appliances Manufacturing Employment
Table 21 – Other Transportation Equipment Manufacturing Employment
Table 22 - Sheet, Strip, and coal Manufacturing Employment
Table 23 – Factory Finished Wood Products Manufacturing Employment
Table 24 – Electrical Manufacturing Employment
Table 25 – Other Product Coatings Employment
Table 26 – Marine Coatings Employment
Table 27 – Paper, Film, and Foil Employment
Table 28 – Railroad Coatings Employment
Table 29 – Aircraft Coatings Employment
Table 30 – Graphic Art Employment
Table 31 - Land Area by County
Table 32 - Statewide Average Ambient Air Temperatures
Table 33 – Temperature Max
Table 34 – Temperature Min
Table 35 – Taxable Gasoline & Gasohol Usage

Table 36 – Government Gasoline & Gasohol Usage
Table 37 – US Jet Fuel and Aviation Gasoline Fuel Consumption
Table 38 – US Jet Fuel and Aviation Gasoline Fuel Consumption Growth Rates
Table 39 – Utah Taxable Aviation Fuel Usage
Table 40 – Utah Government Aviation Fuel Usage
Table 41 – Utah Aviation Gasoline
Table 42 – Utah Jet Fuel Usage
Table 43 – Forecast Domestic and Internationally Available Seat Miles Percentage of Change from 2008
Table 44 – Aircraft – All Airports Landing and Take offs
Table 45 – Aircraft by County Landing and Take offs
Table 46 – Aircraft by County Operations at Airports with Aviation Gasoline Refueling
Table 47 – Aircraft by County Operations at Airports with Jet Fuel Refueling
Table 48 – Refueling of On Road Vehicles
Table 49 – Sum of USA Gasoline for Vehicles (Gallons)
Table 50 – Sum of USA Gasoline for Vehicles (BTU)
Table 51 – Sum of USA Gasoline for Vehicles Percentage of Change
Table 52 – Houses Heating with Coal
Table 53 – Residential & Commercial Coal Usage
Table 54 – US Coal Consumption by Sector Forecast
Table 55 – US Coal Consumption Percent of Change
Table 56 – Commercial Point Sources Coal Burned
Table 57 – US Petroleum Consumption
Table 58 – Calculation of Asphalt, Aviation Gasoline, and Lubricants Included in Other Petroleum Products
Table 59 – US Petroleum Consumption Percentage of Change by Sector Forecast
Table 60 - Petroleum Products Consumption Statewide
Table 61 - Percentage of Total Petroleum Products by Fuel
Table 62 – Total Petroleum Products by Fuel Excluding Products Not Used by Residential Sector
Table 63 – Percentage of Total Petroleum Products by Fuel Excluding Products Not Used by Residential Sector
Table 64 – Percentage of Growth of Energy Consumption by Sector
Table 65 - Consumption of Petroleum Products in Utah by End Use
Table 66 – Percent of Consumption of Petroleum Products in Utah by End Use
Table 67 – Residential Distillate Fuel Oil
Table 68 – Commercial Distillate Fuel Oil
Table 69 – Commercial Distillate Fuel Oil Used by Point Sources
Table 70 - Residential Percentage of Kerosene, LPG, and Residual Oil
Table 71 – Commercial Percentage of Kerosene, LPG, and Residual Oil
Table 72 – Commercial Kerosene Used by Point Sources
Table 73 - Houses Heating with Fuel Oil, Kerosene, Etc.
Table 74 – Kerosene Petroleum Products Barrels
Table 75 – Houses Heating – Bottled, Tank, LPG
Table 76 – LPG Petroleum Products

Table 77 – LPG Burned by Point Sources
Table 78 – Residual Fuel Usage
Table 79 – Residual Residential Fuel Usage
Table 80 – Residual Commercial Fuel Usage
Table 81 – Residual Commercial Fuel Burned by Point Sources
Table 82 – Natural Gas Usage by Residential Sources
Table 83 – Natural Gas Usage by Commercial Sources
Table 84 – Point Source Natural Gas Usage
Table 85 – USA Housing Units Using Fireplaces with Inserts for Heating
Table 86 – USA Housing Units Using Fireplaces without Inserts for Heating
Table 87 – USA Housing Units Using Fireplaces with Inserts for Aesthetics
Table 88 – USA Housing Units Using Fireplaces without Inserts for Aesthetics
Table 89 – USA Housing Units Using Wood Fuel
Table 90 – Cords of Wood Used for Heating in Utah
Table 91 – Projections of Consumption of Biomass for US
Table 92 - Houses Heating with Wood
Table 93 – Prescribed and Wild Fires excluding Agricultural Fires
Table 94 – Wild Fires
Table 95 – Prescribed Fires
Table 96 – Summer Week Day Refueling
Table 97 – Wheat Harvested
Table 98 – Wheat Planted
Table 99 – Barley Harvested
Table 100 – Barley Planted
Table 101 – Corn Harvested
Table 102 – Corn Planted
Table 103 – Oats Harvested
Table 104 – Oats Planted
Table 105 – Hay Harvested
Table 106 – Dry Beans Planted
Table 107 – Dry Beans Harvested
Table 108 – Potatoes Planted
Table 109 – Potatoes Harvested
Table 110 – Onions Planted
Table 111 – Onions Harvested
Table 112 – Commercial Apples
Table 113 – Tart Cherries
Table 114 – Sweet Cherries
Table 115 – Pears
Table 116 – Peaches
Table 117 – Cattle and Cows for Milk and Meat Head Count
Table 118 – Cattle and Cows for Meat
Table 119 – Cows for Milk
Table 120 – Chickens for Eggs & Meat Head Count
Table 121 – Sheep and Lambs Head Count
Table 122 – Turkey Head Count

Table 123 – Pig/Hogs Head Count
Table 124 – Wild Animals
Table 125 – Paved Roads
Table 126 – Paved Roads Percentage of Change
Table 127 - Class B and C Road Allocations
Table 128 – New Residential Houses and Apartments
Table 129 – Single Family Home Construction in Utah
Table 130 – Two-Family Home Construction in Utah
Table 131 – Apartment Construction in Utah
Table 132 – Non-Residential Construction Value
Table 133 – Point Source Architectural Coatings VOC Emissions
Table 134 – Point Source Automobile Surface Coatings VOC Emissions
Table 135 – Point Source Paper, Film, and Foil Coatings VOC Emissions
Table 136 – Point Source Industrial Surface Coatings VOC Emissions
Table 137 – Point Source Metal Furniture and Fixers Surface Coatings VOC Emissions
Table 138 – Point Source Metal Containers Surface Coatings VOC Emissions
Table 139 – Point Source New Automobiles Surface Coatings VOC Emissions
Table 140 – Point Source Machinery and Equipment Surface Coatings VOC Emissions
Table 141 – Point Source4 Appliances Surface Coatings VOC Emissions
Table 142 – Point Source Other Transportation Equipment Surface Coatings VOC Emissions
Table 143 – Point Source Sheet, Strip, and Coil Surface Coatings VOC Emissions
Table 144 – Point Source Factory Finished Wood Surface Coatings VOC Emissions
Table 145 – Point Source Aircraft Surface Coatings
Table 146 – Point Source Railroad Surface Coatings
Table 147 – Point Source Electrical Insulation Surface Coatings VOC Emissions
Table 148 – Point Source Other Product Surface Coatings VOC Emissions
Table 149 – Point Source High Performance Maintenance Surface Coatings VOC Emissions
Table 150 – Point Source Other Special Purpose Surface Coatings VOC Emissions
Table 151 – Point Source Solvent Cleaning and Degreasing VOC Emissions
Table 152 – Point Source Auto Solvent Cleaning and Degreasing VOC Emissions
Table 153 – Point Source Electronic Solvent Cleaning and Degreasing VOC Emissions
Table 154 – Point Source Other Solvent Cleaning and Degreasing VOC Emissions
Table 155 – Point Source Bakeries
Table 156 – Point Source Graphic Arts Voc Emissions
Table 157 – Ammonia from Point Sources
Table 158 – Leaking Underground Storage Tanks
Table 159 – Sewer Point Sources
Table 160 – Acres of Agricultural Burning

Table 161 – Dry Cleaning Facilities
Table 162 – Dry Cleaning Employment
Table 163 - Point Source Dry Cleaning VOC Emissions
Table 164 – CO Aircraft Emissions
Table 165 – VOC Aircraft Emissions
Table 166 – NOx Aircraft Emissions
Table 167 – SOx Aircraft Emissions
Table 168 – PM10 Aircraft Emissions
Table 169 – PM25 Aircraft Emissions
Table 170 – Vehicle Miles Traveled Daily
Table 171 – Vehicle Miles Traveled (Change Percentage)
Table 172 – Vehicle Miles Traveled Annual
Table 173 – Cutback Asphalt Usage
Table 174 – Emulsified Asphalt Usage
Table 175 – Sand and Gravel Sources CO
Table 176 - Sand and Gravel CO
Table 177 – Sand and Gravel Sources NOx
Table 178 – Sand and Gravel NOx
Table 179 – Sand and Gravel Sources PM10
Table 180 – Sand and Gravel PM10
Table 181 – Sand and Gravel Sources PM25
Table 182 – Sand and Gravel PM25
Table 183 – Sand and Gravel Sources SOx
Table 184 – Sand and Gravel SOx
Table 185 – Sand and Gravel Sources VOC
Table 186 – Sand and Gravel VOC
Table 187 - US Architectural Coatings
Table 188 – US Architectural Coatings Exterior Solvent Type
Table 189 – US Architectural Coatings Interior Solvent Type
Table 190 – US Architectural Coatings Lacquers
Table 191 – US Architectural Coatings N.S.K.
Table 192 – US Architectural Coatings Solvent
Table 193 – US Architectural Coatings Exterior Water Type
Table 194 – US Architectural Coatings Interior Water Type
Table 195 – US Architectural Coatings Water Type Total
Table 196 - Landfill Point Sources – VOC
Table 197 - Landfill Point Sources – PM10
Table 198 - Landfill Point Sources – PM25

Table heading: Modeling Domain
Temporally and Spatially Adjusted
NonRoad Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of non-road mobile source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all non-road mobile source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* All ***annual*** non-road mobile source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
NonRoad Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.024	0.137	0.508	0.000	0.004	1.150
	Utah	Cache	0.098	1.273	1.332	0.000	0.107	9.124
		Total	**0.122**	**1.409**	**1.840**	**0.000**	**0.111**	**10.274**
Provo, UT	Utah	Utah	0.277	3.478	2.345	0.000	0.281	20.375
		Total	**0.277**	**3.478**	**2.345**	**0.000**	**0.281**	**20.375**
Salt Lake City, UT	Utah	Box Elder	0.046	0.905	0.558	0.000	0.053	4.790
	Utah	Davis	0.194	2.507	1.489	0.000	0.165	16.985
	Utah	Salt Lake	0.577	8.129	6.857	0.000	0.524	80.454
	Utah	Tooele	0.078	0.812	2.101	0.000	0.068	7.473
	Utah	Weber	0.123	1.757	1.250	0.000	0.111	12.191
		Total	**1.017**	**14.109**	**12.255**	**0.000**	**0.920**	**121.893**
Surrounding Areas	Idaho	Bannock	0.045	0.442	0.807	0.001	0.011	3.839
	Idaho	Bear Lake	0.048	0.184	1.694	0.000	0.007	2.682
	Idaho	Bingham	0.014	0.224	0.140	0.000	0.005	2.457
	Idaho	Blaine	0.005	0.578	0.457	0.000	0.014	2.782
	Idaho	Caribou	0.026	0.263	0.365	0.000	0.006	1.080
	Idaho	Cassia	0.051	0.507	0.379	0.001	0.012	1.723
	Idaho	Jerome	0.003	0.097	0.069	0.000	0.002	1.128
	Idaho	Lincoln	0.000	0.028	0.009	0.000	0.001	0.073
	Idaho	Minidoka	0.030	0.367	0.141	0.000	0.008	1.100
	Idaho	Oneida	0.016	0.179	0.045	0.000	0.004	0.296
	Idaho	Power	0.049	0.296	1.032	0.000	0.009	2.247
	Idaho	Twin Falls	0.004	0.540	0.318	0.000	0.012	4.570
	Utah	Carbon	0.055	0.435	0.869	0.000	0.022	8.897
	Utah	Duchesne	0.095	0.193	3.836	0.000	0.011	12.627
	Utah	Emery	0.040	0.423	0.242	0.000	0.024	2.907
	Utah	Juab	0.151	0.344	6.098	0.000	0.021	20.386
	Utah	Millard	0.035	0.193	0.904	0.000	0.011	3.505
	Utah	Morgan	0.175	0.346	7.008	0.000	0.023	18.971
	Utah	Rich	0.620	0.473	26.728	0.000	0.027	69.955
	Utah	Sanpete	0.077	0.520	2.465	0.000	0.015	9.007
	Utah	Summit	0.091	0.860	1.971	0.000	0.073	8.081
	Utah	Wasatch	0.108	0.524	3.533	0.000	0.034	10.276
	Wyoming	Lincoln	0.044	0.304	1.136	0.000	0.036	3.927
	Wyoming	Sublette	0.060	0.109	2.561	0.001	0.014	6.777
	Wyoming	Uinta	0.032	0.236	0.904	0.000	0.025	4.040
		Total	**1.877**	**8.668**	**63.712**	**0.004**	**0.428**	**203.331**
		Logan, UT-ID	0.122	1.409	1.840	0.000	0.111	10.274
		Provo, UT	0.277	3.478	2.345	0.000	0.281	20.375
		Salt Lake City, UT	1.017	14.109	12.255	0.000	0.920	121.893
		Surrounding Areas	1.877	8.668	63.712	0.004	0.428	203.331
			3.292	**27.664**	**80.152**	**0.005**	**1.740**	**355.873**
		Logan, UT-ID	4%	5%	2%	5%	6%	3%
		Provo, UT	8%	13%	3%	0%	16%	6%
		Salt Lake City, UT	31%	51%	15%	0%	53%	34%
		Surrounding Areas	57%	31%	79%	95%	25%	57%
			100%	100%	100%	100%	100%	100%

N:\SIP\PM2.5 SIPs\Inventories\SMOKE Output Data Sorting\SMOKE Output-Recd081511_PM25-EpisodeOnly2007.xls - 2007 NonRoad by NA

Table heading: Modeling Domain
Temporally and Spatially Adjusted
NonRoad Mobile Emissions by Non-Attainment Area - Sector
Tons/Average Episode Day

This table (for PM2.5) shows non-road mobile source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* Emissions were also temporally adjusted within the SMOKE pre-processor. The annual totals used for Episode 3 were compiled as an average of 2009 and 2010.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	Mobile - Aircraft	0.001	0.000	0.002	0.000	0.000	0.058
	Idaho	Franklin	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.002
	Idaho	Franklin	Mobile - Non-Road Equipment - Diesel	0.010	0.116	0.012	0.000	0.003	0.061
	Idaho	Franklin	Mobile - Non-Road Equipment - Gasoline	0.015	0.008	0.603	0.000	0.002	1.089
	Idaho	Franklin	Mobile - Non-Road Equipment - Other	0.000	0.012	0.003	0.000	0.000	0.063
	Utah	Cache	Mobile - Non-Road Equipment - Diesel	0.071	1.056	0.126	0.000	0.077	0.521
	Utah	Cache	Mobile - Non-Road Equipment - Gasoline	0.034	0.061	1.302	0.000	0.000	8.013
	Utah	Cache	Mobile - Non-Road Equipment - Other	0.003	0.317	0.083	0.000	0.001	1.789
			Total	**0.134**	**1.571**	**2.131**	**0.000**	**0.082**	**11.596**
Provo, UT	Utah	Utah	Mobile - Non-Road Equipment - Diesel	0.262	3.540	0.396	0.000	0.176	1.891
	Utah	Utah	Mobile - Non-Road Equipment - Gasoline	0.073	0.151	2.320	0.000	0.001	21.528
	Utah	Utah	Mobile - Non-Road Equipment - Other	0.005	0.562	0.145	0.000	0.001	3.128
			Total	**0.340**	**4.253**	**2.861**	**0.000**	**0.178**	**26.546**
Salt Lake City, UT	Utah	Box Elder	Mobile - Non-Road Equipment - Diesel	0.025	0.541	0.060	0.000	0.033	0.259
	Utah	Box Elder	Mobile - Non-Road Equipment - Gasoline	0.006	0.021	0.195	0.000	0.000	1.923
	Utah	Box Elder	Mobile - Non-Road Equipment - Other	0.003	0.292	0.077	0.000	0.001	1.662
	Utah	Davis	Mobile - Non-Road Equipment - Diesel	0.177	2.409	0.256	0.000	0.080	1.216
	Utah	Davis	Mobile - Non-Road Equipment - Gasoline	0.042	0.102	1.304	0.000	0.000	14.429
	Utah	Davis	Mobile - Non-Road Equipment - Other	0.003	0.347	0.089	0.000	0.001	1.922
	Utah	Salt Lake	Mobile - Non-Road Equipment - Diesel	0.482	7.257	0.866	0.000	0.342	3.932
	Utah	Salt Lake	Mobile - Non-Road Equipment - Gasoline	0.213	0.655	7.087	0.000	0.003	93.468
	Utah	Salt Lake	Mobile - Non-Road Equipment - Other	0.017	1.946	0.495	0.000	0.003	10.668
	Utah	Tooele	Mobile - Non-Road Equipment - Diesel	0.026	0.736	0.076	0.000	0.056	0.312
	Utah	Tooele	Mobile - Non-Road Equipment - Gasoline	0.004	0.008	0.127	0.000	0.000	1.054
	Utah	Tooele	Mobile - Non-Road Equipment - Other	0.000	0.044	0.011	0.000	0.000	0.247
	Utah	Weber	Mobile - Non-Road Equipment - Diesel	0.103	1.539	0.191	0.000	0.059	0.877
	Utah	Weber	Mobile - Non-Road Equipment - Gasoline	0.034	0.088	1.100	0.000	0.000	12.089
	Utah	Weber	Mobile - Non-Road Equipment - Other	0.004	0.405	0.105	0.000	0.001	2.271
			Total	**1.141**	**16.390**	**12.040**	**0.000**	**0.579**	**146.329**
Surrounding Areas	Idaho	Bannock	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.019
	Idaho	Bannock	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.006
	Idaho	Bannock	Mobile - Non-Road Equipment - Diesel	0.026	0.312	0.032	0.000	0.008	0.163
	Idaho	Bannock	Mobile - Non-Road Equipment - Gasoline	0.022	0.036	0.922	0.000	0.003	3.538
	Idaho	Bannock	Mobile - Non-Road Equipment - Other	0.001	0.093	0.024	0.000	0.000	0.513
	Idaho	Bear Lake	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.020
	Idaho	Bear Lake	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.004
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Diesel	0.011	0.140	0.013	0.000	0.003	0.066
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Gasoline	0.045	0.043	2.063	0.000	0.005	2.902
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Other	0.000	0.004	0.001	0.000	0.000	0.019
	Idaho	Bingham	Mobile - Aircraft	0.014	0.006	0.034	0.000	0.001	1.062
	Idaho	Bingham	Mobile - Non-Road Equipment - Diesel	0.000	0.158	0.016	0.000	0.004	0.082
	Idaho	Bingham	Mobile - Non-Road Equipment - Gasoline	0.000	0.013	0.074	0.000	0.001	1.041
	Idaho	Bingham	Mobile - Non-Road Equipment - Other	0.000	0.047	0.012	0.000	0.000	0.260

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Idaho	Blaine	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.381
	Idaho	Blaine	Mobile - Non-Road Equipment - Diesel	0.000	0.542	0.057	0.000	0.013	0.287
	Idaho	Blaine	Mobile - Non-Road Equipment - Gasoline	0.000	0.015	0.331	0.000	0.001	1.864
	Idaho	Blaine	Mobile - Non-Road Equipment - Other	0.000	0.019	0.005	0.000	0.000	0.100
	Idaho	Caribou	Mobile - Aircraft	0.001	0.000	0.003	0.000	0.000	0.086
	Idaho	Caribou	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.003
	Idaho	Caribou	Mobile - Non-Road Equipment - Diesel	0.019	0.227	0.023	0.000	0.005	0.117
	Idaho	Caribou	Mobile - Non-Road Equipment - Gasoline	0.006	0.017	0.411	0.000	0.001	0.874
	Idaho	Caribou	Mobile - Non-Road Equipment - Other	0.000	0.018	0.005	0.000	0.000	0.100
	Idaho	Cassia	Mobile - Aircraft	0.003	0.001	0.008	0.000	0.000	0.237
	Idaho	Cassia	Mobile - Locomotives	0.001	0.005	0.001	0.000	0.000	0.005
	Idaho	Cassia	Mobile - Non-Road Equipment - Diesel	0.040	0.462	0.047	0.000	0.010	0.243
	Idaho	Cassia	Mobile - Non-Road Equipment - Gasoline	0.009	0.014	0.390	0.000	0.001	1.237
	Idaho	Cassia	Mobile - Non-Road Equipment - Other	0.000	0.026	0.006	0.000	0.000	0.141
	Idaho	Jerome	Mobile - Aircraft	0.003	0.001	0.007	0.000	0.000	0.234
	Idaho	Jerome	Mobile - Non-Road Equipment - Diesel	0.000	0.058	0.006	0.000	0.001	0.030
	Idaho	Jerome	Mobile - Non-Road Equipment - Gasoline	0.000	0.008	0.046	0.000	0.000	0.698
	Idaho	Jerome	Mobile - Non-Road Equipment - Other	0.000	0.029	0.007	0.000	0.000	0.161
	Idaho	Lincoln	Mobile - Aircraft	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Lincoln	Mobile - Non-Road Equipment - Diesel	0.000	0.028	0.004	0.000	0.001	0.017
	Idaho	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.000	0.001	0.005	0.000	0.000	0.047
	Idaho	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.001	0.000	0.000	0.000	0.005
	Idaho	Minidoka	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.003
	Idaho	Minidoka	Mobile - Non-Road Equipment - Diesel	0.028	0.317	0.033	0.000	0.007	0.168
	Idaho	Minidoka	Mobile - Non-Road Equipment - Gasoline	0.002	0.008	0.120	0.000	0.001	0.802
	Idaho	Minidoka	Mobile - Non-Road Equipment - Other	0.000	0.040	0.010	0.000	0.000	0.218
	Idaho	Oneida	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.036
	Idaho	Oneida	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.002
	Idaho	Oneida	Mobile - Non-Road Equipment - Diesel	0.015	0.174	0.018	0.000	0.004	0.092
	Idaho	Oneida	Mobile - Non-Road Equipment - Gasoline	0.001	0.002	0.031	0.000	0.000	0.177
	Idaho	Oneida	Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.010
	Idaho	Power	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.377
	Idaho	Power	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.004
	Idaho	Power	Mobile - Non-Road Equipment - Diesel	0.022	0.257	0.026	0.000	0.006	0.132
	Idaho	Power	Mobile - Non-Road Equipment - Gasoline	0.027	0.024	1.217	0.000	0.003	1.871
	Idaho	Power	Mobile - Non-Road Equipment - Other	0.000	0.014	0.003	0.000	0.000	0.076
	Idaho	Twin Falls	Mobile - Aircraft	0.004	0.002	0.010	0.000	0.000	0.310
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Diesel	0.000	0.408	0.042	0.000	0.010	0.213
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Gasoline	0.000	0.041	0.234	0.000	0.002	3.546
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Other	0.000	0.089	0.022	0.000	0.000	0.474
	Utah	Carbon	Mobile - Non-Road Equipment - Diesel	0.039	0.353	0.065	0.000	0.008	0.272
	Utah	Carbon	Mobile - Non-Road Equipment - Gasoline	0.004	0.015	0.127	0.000	0.000	2.090
	Utah	Carbon	Mobile - Non-Road Equipment - Other	0.000	0.023	0.006	0.000	0.000	0.121
	Utah	Duchesne	Mobile - Non-Road Equipment - Diesel	0.006	0.095	0.010	0.000	0.002	0.062
	Utah	Duchesne	Mobile - Non-Road Equipment - Gasoline	0.133	0.070	5.737	0.000	0.002	16.240
	Utah	Duchesne	Mobile - Non-Road Equipment - Other	0.000	0.009	0.002	0.000	0.000	0.051

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Utah	Emery	Mobile - Non-Road Equipment - Diesel	0.032	0.278	0.051	0.000	0.005	0.237
	Utah	Emery	Mobile - Non-Road Equipment - Gasoline	0.001	0.003	0.029	0.000	0.000	0.426
	Utah	Emery	Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.012
	Utah	Juab	Mobile - Non-Road Equipment - Diesel	0.006	0.135	0.014	0.000	0.006	0.055
	Utah	Juab	Mobile - Non-Road Equipment - Gasoline	0.001	0.006	0.045	0.000	0.000	0.854
	Utah	Juab	Mobile - Non-Road Equipment - Other	0.000	0.009	0.002	0.000	0.000	0.056
	Utah	Millard	Mobile - Non-Road Equipment - Diesel	0.005	0.059	0.007	0.000	0.001	0.034
	Utah	Millard	Mobile - Non-Road Equipment - Gasoline	0.001	0.006	0.040	0.000	0.000	0.766
	Utah	Millard	Mobile - Non-Road Equipment - Other	0.000	0.014	0.004	0.000	0.000	0.079
	Utah	Morgan	Mobile - Non-Road Equipment - Diesel	0.004	0.073	0.007	0.000	0.002	0.033
	Utah	Morgan	Mobile - Non-Road Equipment - Gasoline	0.264	0.127	11.400	0.000	0.004	30.331
	Utah	Morgan	Mobile - Non-Road Equipment - Other	0.000	0.007	0.002	0.000	0.000	0.039
	Utah	Rich	Mobile - Non-Road Equipment - Diesel	0.003	0.038	0.004	0.000	0.001	0.020
	Utah	Rich	Mobile - Non-Road Equipment - Gasoline	0.997	0.459	43.149	0.000	0.014	112.373
	Utah	Rich	Mobile - Non-Road Equipment - Other	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Sanpete	Mobile - Non-Road Equipment - Diesel	0.007	0.147	0.014	0.000	0.008	0.066
	Utah	Sanpete	Mobile - Non-Road Equipment - Gasoline	0.087	0.043	3.719	0.000	0.001	10.136
	Utah	Sanpete	Mobile - Non-Road Equipment - Other	0.000	0.026	0.007	0.000	0.000	0.149
	Utah	Summit	Mobile - Non-Road Equipment - Diesel	0.043	0.810	0.084	0.000	0.048	0.361
	Utah	Summit	Mobile - Non-Road Equipment - Gasoline	0.070	0.048	2.898	0.000	0.001	9.537
	Utah	Summit	Mobile - Non-Road Equipment - Other	0.000	0.029	0.007	0.000	0.000	0.157
	Utah	Wasatch	Mobile - Non-Road Equipment - Diesel	0.024	0.346	0.040	0.000	0.015	0.181
	Utah	Wasatch	Mobile - Non-Road Equipment - Gasoline	0.118	0.059	5.057	0.000	0.002	13.723
	Utah	Wasatch	Mobile - Non-Road Equipment - Other	0.000	0.010	0.003	0.000	0.000	0.055
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Diesel	0.021	0.254	0.026	0.000	0.034	0.120
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.019	0.017	0.926	0.000	0.001	3.159
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.035	0.006	0.000	0.000	0.208
	Wyoming	Sublette	Mobile - Non-Road Equipment - Diesel	0.007	0.079	0.008	0.000	0.011	0.039
	Wyoming	Sublette	Mobile - Non-Road Equipment - Gasoline	0.044	0.019	2.129	0.000	0.003	5.643
	Wyoming	Sublette	Mobile - Non-Road Equipment - Other	0.000	0.008	0.001	0.000	0.000	0.045
	Wyoming	Uinta	Mobile - Non-Road Equipment - Diesel	0.014	0.181	0.018	0.000	0.024	0.079
	Wyoming	Uinta	Mobile - Non-Road Equipment - Gasoline	0.015	0.022	0.747	0.000	0.001	3.411
	Wyoming	Uinta	Mobile - Non-Road Equipment - Other	0.000	0.034	0.004	0.000	0.000	0.216
			Total	**2.282**	**7.671**	**82.745**	**0.004**	**0.289**	**236.511**
			Logan, UT-ID	0.134	1.571	2.131	0.000	0.082	11.596
			Provo, UT	0.340	4.253	2.861	0.000	0.178	26.546
			Salt Lake City, UT	1.141	16.390	12.040	0.000	0.579	146.329
			Surrounding Areas	2.282	7.671	82.745	0.004	0.289	236.511
				3.899	**29.884**	**99.776**	**0.005**	**1.128**	**420.982**
			Logan, UT-ID	3%	5%	2%	5%	7%	3%
			Provo, UT	9%	14%	3%	0%	16%	6%
			Salt Lake City, UT	29%	55%	12%	0%	51%	35%
			Surrounding Areas	59%	26%	83%	95%	26%	56%
				100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
NonRoad Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of non-road mobile source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all non-road mobile source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* All ***annual*** non-road mobile source emissions were temporally adjusted within the SMOKE pre-processor. ***The annual totals used for this episode were compiled as an average of 2009 and 2010.*** Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/22/2010 (44 days)
NonRoad Mobile Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.025	0.137	0.565	0.000	0.004	1.212
	Utah	Cache	0.055	0.662	0.635	0.000	0.073	4.258
		Total	**0.080**	**0.799**	**1.200**	**0.000**	**0.077**	**5.470**
Provo, UT	Utah	Utah	0.033	0.686	0.287	0.000	0.122	1.956
		Total	**0.033**	**0.686**	**0.287**	**0.000**	**0.122**	**1.956**
Salt Lake City, UT	Utah	Box Elder	0.087	1.166	0.795	0.000	0.044	5.896
	Utah	Davis	0.087	1.204	0.612	0.000	0.042	8.862
	Utah	Salt Lake	0.071	2.245	0.457	0.000	0.210	3.137
	Utah	Tooele	0.161	0.932	4.347	0.000	0.055	16.402
	Utah	Weber	0.050	0.765	0.346	0.000	0.040	2.425
		Total	**0.456**	**6.311**	**6.557**	**0.000**	**0.390**	**36.722**
Surrounding Areas	Idaho	Bannock	0.047	0.443	0.894	0.001	0.011	4.042
	Idaho	Bear Lake	0.052	0.186	1.889	0.000	0.008	2.848
	Idaho	Bingham	0.014	0.224	0.140	0.000	0.005	2.457
	Idaho	Blaine	0.005	0.579	0.458	0.000	0.014	2.782
	Idaho	Caribou	0.027	0.264	0.404	0.000	0.006	1.131
	Idaho	Cassia	0.052	0.508	0.416	0.001	0.012	1.794
	Idaho	Jerome	0.003	0.097	0.069	0.000	0.002	1.128
	Idaho	Lincoln	0.000	0.029	0.010	0.000	0.001	0.074
	Idaho	Minidoka	0.030	0.367	0.152	0.000	0.008	1.146
	Idaho	Oneida	0.016	0.179	0.048	0.000	0.004	0.307
	Idaho	Power	0.052	0.298	1.147	0.000	0.009	2.355
	Idaho	Twin Falls	0.004	0.540	0.318	0.000	0.012	4.570
	Utah	Carbon	0.077	0.708	2.343	0.000	0.009	26.563
	Utah	Duchesne	0.039	0.374	0.784	0.000	0.006	7.524
	Utah	Emery	0.065	0.999	0.527	0.000	0.016	7.721
	Utah	Juab	0.379	0.936	13.706	0.000	0.019	48.274
	Utah	Millard	0.108	0.633	1.962	0.000	0.011	7.587
	Utah	Morgan	0.085	1.181	0.273	0.000	0.022	1.855
	Utah	Rich	0.133	0.981	1.404	0.000	0.013	6.089
	Utah	Sanpete	0.105	1.796	0.673	0.000	0.019	10.018
	Utah	Summit	0.060	0.933	0.276	0.000	0.052	3.477
	Utah	Wasatch	0.070	0.739	0.793	0.000	0.018	3.668
	Wyoming	Lincoln	0.044	0.305	1.136	0.000	0.036	3.928
	Wyoming	Sublette	0.060	0.109	2.561	0.001	0.014	6.777
	Wyoming	Uinta	0.032	0.237	0.904	0.000	0.025	4.041
		Total	**1.561**	**13.645**	**33.288**	**0.004**	**0.353**	**162.154**
		Logan, UT-ID	0.080	0.799	1.200	0.000	0.077	5.470
		Provo, UT	0.033	0.686	0.287	0.000	0.122	1.956
		Salt Lake City, UT	0.456	6.311	6.557	0.000	0.390	36.722
		Surrounding Areas	1.561	13.645	33.288	0.004	0.353	162.154
			2.129	21.442	41.331	0.005	0.943	206.301
		Logan, UT-ID	4%	4%	3%	5%	8%	3%
		Provo, UT	2%	3%	1%	0%	13%	1%
		Salt Lake City, UT	21%	29%	16%	0%	41%	18%
		Surrounding Areas	73%	64%	81%	95%	37%	79%
			100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
NonRoad Mobile Emissions by Non-Attainment Area - Sector
Tons/Average Episode Day

This table (for PM2.5) shows non-road mobile source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* Emissions were also temporally adjusted within the SMOKE pre-processor. The annual totals used for Episode 3 were compiled as an average of 2009 and 2010.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	Mobile - Aircraft	0.001	0.000	0.002	0.000	0.000	0.058
	Idaho	Franklin	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.002
	Idaho	Franklin	Mobile - Non-Road Equipment - Diesel	0.010	0.116	0.012	0.000	0.003	0.061
	Idaho	Franklin	Mobile - Non-Road Equipment - Gasoline	0.013	0.007	0.491	0.000	0.001	0.965
	Idaho	Franklin	Mobile - Non-Road Equipment - Other	0.000	0.012	0.003	0.000	0.000	0.063
	Utah	Cache	Mobile - Non-Road Equipment - Diesel	0.061	0.865	0.138	0.000	0.101	0.532
	Utah	Cache	Mobile - Non-Road Equipment - Gasoline	0.027	0.126	0.887	0.000	0.006	6.336
	Utah	Cache	Mobile - Non-Road Equipment - Other	0.010	0.282	0.307	0.000	0.001	2.256
			Total	**0.122**	**1.409**	**1.840**	**0.000**	**0.111**	**10.274**
Provo, UT	Utah	Utah	Mobile - Non-Road Equipment - Diesel	0.213	2.806	0.415	0.000	0.276	1.875
	Utah	Utah	Mobile - Non-Road Equipment - Gasoline	0.057	0.169	1.789	0.000	0.003	15.810
	Utah	Utah	Mobile - Non-Road Equipment - Other	0.006	0.502	0.141	0.000	0.002	2.689
			Total	**0.277**	**3.478**	**2.345**	**0.000**	**0.281**	**20.375**
Salt Lake City, UT	Utah	Box Elder	Mobile - Non-Road Equipment - Diesel	0.022	0.472	0.055	0.000	0.043	0.325
	Utah	Box Elder	Mobile - Non-Road Equipment - Gasoline	0.007	0.062	0.222	0.000	0.001	2.598
	Utah	Box Elder	Mobile - Non-Road Equipment - Other	0.017	0.371	0.280	0.000	0.009	1.867
	Utah	Davis	Mobile - Non-Road Equipment - Diesel	0.147	1.948	0.257	0.000	0.155	1.043
	Utah	Davis	Mobile - Non-Road Equipment - Gasoline	0.042	0.188	1.067	0.000	0.007	10.874
	Utah	Davis	Mobile - Non-Road Equipment - Other	0.005	0.370	0.165	0.000	0.003	5.068
	Utah	Salt Lake	Mobile - Non-Road Equipment - Diesel	0.388	5.685	0.701	0.000	0.505	3.166
	Utah	Salt Lake	Mobile - Non-Road Equipment - Gasoline	0.166	0.616	5.678	0.000	0.006	68.121
	Utah	Salt Lake	Mobile - Non-Road Equipment - Other	0.023	1.829	0.478	0.000	0.013	9.166
	Utah	Tooele	Mobile - Non-Road Equipment - Diesel	0.027	0.678	0.305	0.000	0.065	0.906
	Utah	Tooele	Mobile - Non-Road Equipment - Gasoline	0.007	0.075	0.197	0.000	0.001	1.910
	Utah	Tooele	Mobile - Non-Road Equipment - Other	0.044	0.059	1.599	0.000	0.001	4.657
	Utah	Weber	Mobile - Non-Road Equipment - Diesel	0.084	1.241	0.171	0.000	0.103	0.916
	Utah	Weber	Mobile - Non-Road Equipment - Gasoline	0.031	0.107	0.969	0.000	0.002	9.138
	Utah	Weber	Mobile - Non-Road Equipment - Other	0.008	0.409	0.110	0.000	0.005	2.136
			Total	**1.017**	**14.109**	**12.255**	**0.000**	**0.920**	**121.893**
Surrounding Areas	Idaho	Bannock	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.019
	Idaho	Bannock	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.006
	Idaho	Bannock	Mobile - Non-Road Equipment - Diesel	0.026	0.312	0.032	0.000	0.008	0.163
	Idaho	Bannock	Mobile - Non-Road Equipment - Gasoline	0.018	0.033	0.750	0.000	0.003	3.137
	Idaho	Bannock	Mobile - Non-Road Equipment - Other	0.001	0.093	0.024	0.000	0.000	0.513
	Idaho	Bear Lake	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.020
	Idaho	Bear Lake	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.004
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Diesel	0.011	0.140	0.013	0.000	0.003	0.066
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Gasoline	0.037	0.039	1.679	0.000	0.004	2.573
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Other	0.000	0.004	0.001	0.000	0.000	0.019
	Idaho	Bingham	Mobile - Aircraft	0.014	0.006	0.034	0.000	0.001	1.062
	Idaho	Bingham	Mobile - Non-Road Equipment - Diesel	0.000	0.158	0.016	0.000	0.004	0.082
	Idaho	Bingham	Mobile - Non-Road Equipment - Gasoline	0.000	0.013	0.078	0.000	0.001	1.052
	Idaho	Bingham	Mobile - Non-Road Equipment - Other	0.000	0.047	0.012	0.000	0.000	0.260
	Idaho	Blaine	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.381

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Idaho	Blaine	Mobile - Non-Road Equipment - Diesel	0.000	0.541	0.057	0.000	0.013	0.286
	Idaho	Blaine	Mobile - Non-Road Equipment - Gasoline	0.000	0.016	0.384	0.000	0.001	2.015
	Idaho	Blaine	Mobile - Non-Road Equipment - Other	0.000	0.019	0.005	0.000	0.000	0.100
	Idaho	Caribou	Mobile - Aircraft	0.001	0.000	0.003	0.000	0.000	0.086
	Idaho	Caribou	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.002
	Idaho	Caribou	Mobile - Non-Road Equipment - Diesel	0.019	0.227	0.023	0.000	0.005	0.117
	Idaho	Caribou	Mobile - Non-Road Equipment - Gasoline	0.005	0.016	0.334	0.000	0.001	0.775
	Idaho	Caribou	Mobile - Non-Road Equipment - Other	0.000	0.018	0.005	0.000	0.000	0.100
	Idaho	Cassia	Mobile - Aircraft	0.003	0.001	0.008	0.000	0.000	0.237
	Idaho	Cassia	Mobile - Locomotives	0.001	0.004	0.001	0.000	0.000	0.004
	Idaho	Cassia	Mobile - Non-Road Equipment - Diesel	0.040	0.462	0.047	0.000	0.010	0.243
	Idaho	Cassia	Mobile - Non-Road Equipment - Gasoline	0.007	0.013	0.317	0.000	0.001	1.097
	Idaho	Cassia	Mobile - Non-Road Equipment - Other	0.000	0.026	0.006	0.000	0.000	0.141
	Idaho	Jerome	Mobile - Aircraft	0.003	0.001	0.007	0.000	0.000	0.234
	Idaho	Jerome	Mobile - Non-Road Equipment - Diesel	0.000	0.058	0.006	0.000	0.001	0.030
	Idaho	Jerome	Mobile - Non-Road Equipment - Gasoline	0.000	0.008	0.048	0.000	0.000	0.704
	Idaho	Jerome	Mobile - Non-Road Equipment - Other	0.000	0.029	0.007	0.000	0.000	0.161
	Idaho	Lincoln	Mobile - Aircraft	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Lincoln	Mobile - Non-Road Equipment - Diesel	0.000	0.027	0.003	0.000	0.001	0.016
	Idaho	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.000	0.001	0.006	0.000	0.000	0.049
	Idaho	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.001	0.000	0.000	0.000	0.005
	Idaho	Minidoka	Mobile - Locomotives	0.000	0.003	0.000	0.000	0.000	0.003
	Idaho	Minidoka	Mobile - Non-Road Equipment - Diesel	0.028	0.317	0.033	0.000	0.007	0.168
	Idaho	Minidoka	Mobile - Non-Road Equipment - Gasoline	0.002	0.007	0.098	0.000	0.001	0.711
	Idaho	Minidoka	Mobile - Non-Road Equipment - Other	0.000	0.040	0.010	0.000	0.000	0.218
	Idaho	Oneida	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.036
	Idaho	Oneida	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.001
	Idaho	Oneida	Mobile - Non-Road Equipment - Diesel	0.015	0.174	0.018	0.000	0.004	0.092
	Idaho	Oneida	Mobile - Non-Road Equipment - Gasoline	0.000	0.002	0.025	0.000	0.000	0.157
	Idaho	Oneida	Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.010
	Idaho	Power	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.377
	Idaho	Power	Mobile - Locomotives	0.000	0.002	0.001	0.000	0.000	0.004
	Idaho	Power	Mobile - Non-Road Equipment - Diesel	0.022	0.257	0.026	0.000	0.006	0.132
	Idaho	Power	Mobile - Non-Road Equipment - Gasoline	0.022	0.022	0.991	0.000	0.003	1.659
	Idaho	Power	Mobile - Non-Road Equipment - Other	0.000	0.014	0.003	0.000	0.000	0.076
	Idaho	Twin Falls	Mobile - Aircraft	0.004	0.002	0.010	0.000	0.000	0.310
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Diesel	0.000	0.408	0.042	0.000	0.010	0.213
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Gasoline	0.000	0.041	0.244	0.000	0.002	3.573
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Other	0.000	0.089	0.022	0.000	0.000	0.474
	Utah	Carbon	Mobile - Non-Road Equipment - Diesel	0.041	0.299	0.406	0.000	0.019	1.213
	Utah	Carbon	Mobile - Non-Road Equipment - Gasoline	0.005	0.048	0.118	0.000	0.002	1.934
	Utah	Carbon	Mobile - Non-Road Equipment - Other	0.009	0.087	0.345	0.000	0.001	5.749
	Utah	Duchesne	Mobile - Non-Road Equipment - Diesel	0.009	0.082	0.109	0.000	0.006	0.224
	Utah	Duchesne	Mobile - Non-Road Equipment - Gasoline	0.081	0.057	3.541	0.000	0.003	10.806
	Utah	Duchesne	Mobile - Non-Road Equipment - Other	0.005	0.055	0.185	0.000	0.002	1.597
	Utah	Emery	Mobile - Non-Road Equipment - Diesel	0.027	0.238	0.087	0.000	0.013	0.465
	Utah	Emery	Mobile - Non-Road Equipment - Gasoline	0.005	0.066	0.040	0.000	0.004	0.656

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007 (10 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Utah	Emery	Mobile - Non-Road Equipment - Other	0.007	0.119	0.115	0.000	0.007	1.786
	Utah	Juab	Mobile - Non-Road Equipment - Diesel	0.011	0.151	0.135	0.000	0.011	0.635
	Utah	Juab	Mobile - Non-Road Equipment - Gasoline	0.007	0.076	0.078	0.000	0.005	0.758
	Utah	Juab	Mobile - Non-Road Equipment - Other	0.134	0.118	5.885	0.000	0.004	18.993
	Utah	Millard	Mobile - Non-Road Equipment - Diesel	0.005	0.063	0.019	0.000	0.004	0.358
	Utah	Millard	Mobile - Non-Road Equipment - Gasoline	0.023	0.056	0.794	0.000	0.003	2.635
	Utah	Millard	Mobile - Non-Road Equipment - Other	0.007	0.074	0.091	0.000	0.004	0.512
	Utah	Morgan	Mobile - Non-Road Equipment - Diesel	0.005	0.073	0.016	0.000	0.005	0.197
	Utah	Morgan	Mobile - Non-Road Equipment - Gasoline	0.161	0.133	6.949	0.000	0.009	18.529
	Utah	Morgan	Mobile - Non-Road Equipment - Other	0.009	0.140	0.043	0.000	0.009	0.245
	Utah	Rich	Mobile - Non-Road Equipment - Diesel	0.004	0.043	0.014	0.000	0.003	0.222
	Utah	Rich	Mobile - Non-Road Equipment - Gasoline	0.593	0.337	26.158	0.000	0.019	68.180
	Utah	Rich	Mobile - Non-Road Equipment - Other	0.024	0.093	0.557	0.000	0.006	1.553
	Utah	Sanpete	Mobile - Non-Road Equipment - Diesel	0.007	0.084	0.028	0.000	0.006	0.121
	Utah	Sanpete	Mobile - Non-Road Equipment - Gasoline	0.055	0.047	2.282	0.000	0.003	6.398
	Utah	Sanpete	Mobile - Non-Road Equipment - Other	0.015	0.389	0.155	0.000	0.006	2.488
	Utah	Summit	Mobile - Non-Road Equipment - Diesel	0.039	0.708	0.092	0.000	0.066	0.900
	Utah	Summit	Mobile - Non-Road Equipment - Gasoline	0.048	0.104	1.827	0.000	0.006	6.570
	Utah	Summit	Mobile - Non-Road Equipment - Other	0.005	0.049	0.051	0.000	0.001	0.611
	Utah	Wasatch	Mobile - Non-Road Equipment - Diesel	0.020	0.370	0.070	0.000	0.025	0.924
	Utah	Wasatch	Mobile - Non-Road Equipment - Gasoline	0.081	0.127	3.334	0.000	0.008	9.106
	Utah	Wasatch	Mobile - Non-Road Equipment - Other	0.007	0.027	0.129	0.000	0.001	0.247
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Diesel	0.021	0.252	0.026	0.000	0.034	0.119
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.023	0.018	1.104	0.000	0.001	3.601
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.035	0.006	0.000	0.000	0.208
	Wyoming	Sublette	Mobile - Non-Road Equipment - Diesel	0.007	0.079	0.008	0.000	0.011	0.039
	Wyoming	Sublette	Mobile - Non-Road Equipment - Gasoline	0.053	0.022	2.552	0.001	0.003	6.693
	Wyoming	Sublette	Mobile - Non-Road Equipment - Other	0.000	0.008	0.001	0.000	0.000	0.045
	Wyoming	Uinta	Mobile - Non-Road Equipment - Diesel	0.014	0.179	0.017	0.000	0.024	0.077
	Wyoming	Uinta	Mobile - Non-Road Equipment - Gasoline	0.018	0.023	0.882	0.000	0.001	3.747
	Wyoming	Uinta	Mobile - Non-Road Equipment - Other	0.000	0.034	0.004	0.000	0.000	0.216
			Total	**1.877**	**8.668**	**63.712**	**0.004**	**0.428**	**203.331**
			Logan, UT-ID	0.122	1.409	1.840	0.000	0.111	10.274
			Provo, UT	0.277	3.478	2.345	0.000	0.281	20.375
			Salt Lake City, UT	1.017	14.109	12.255	0.000	0.920	121.893
			Surrounding Areas	1.877	8.668	63.712	0.004	0.428	203.331
				3.292	**27.664**	**80.152**	**0.005**	**1.740**	**355.873**
			Logan, UT-ID	4%	5%	2%	5%	6%	3%
			Provo, UT	8%	13%	3%	0%	16%	6%
			Salt Lake City, UT	31%	51%	15%	0%	53%	34%
			Surrounding Areas	57%	31%	79%	95%	25%	57%
				100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
NonRoad Mobile Emissions by Non-Attainment Area - Sector
Tons/Average Episode Day

This table (for PM2.5) shows non-road mobile source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* Emissions were also temporally adjusted within the SMOKE pre-processor. The annual totals used for Episode 3 were compiled as an average of 2009 and 2010.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	Mobile - Aircraft	0.001	0.000	0.002	0.000	0.000	0.058
	Idaho	Franklin	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.002
	Idaho	Franklin	Mobile - Non-Road Equipment - Diesel	0.010	0.116	0.012	0.000	0.003	0.061
	Idaho	Franklin	Mobile - Non-Road Equipment - Gasoline	0.015	0.008	0.603	0.000	0.002	1.089
	Idaho	Franklin	Mobile - Non-Road Equipment - Other	0.000	0.012	0.003	0.000	0.000	0.063
	Utah	Cache	Mobile - Non-Road Equipment - Diesel	0.071	1.056	0.126	0.000	0.077	0.521
	Utah	Cache	Mobile - Non-Road Equipment - Gasoline	0.034	0.061	1.302	0.000	0.000	8.013
	Utah	Cache	Mobile - Non-Road Equipment - Other	0.003	0.317	0.083	0.000	0.001	1.789
			Total	**0.134**	**1.571**	**2.131**	**0.000**	**0.082**	**11.596**
Provo, UT	Utah	Utah	Mobile - Non-Road Equipment - Diesel	0.262	3.540	0.396	0.000	0.176	1.891
	Utah	Utah	Mobile - Non-Road Equipment - Gasoline	0.073	0.151	2.320	0.000	0.001	21.528
	Utah	Utah	Mobile - Non-Road Equipment - Other	0.005	0.562	0.145	0.000	0.001	3.128
			Total	**0.340**	**4.253**	**2.861**	**0.000**	**0.178**	**26.546**
Salt Lake City, UT	Utah	Box Elder	Mobile - Non-Road Equipment - Diesel	0.025	0.541	0.060	0.000	0.033	0.259
	Utah	Box Elder	Mobile - Non-Road Equipment - Gasoline	0.006	0.021	0.195	0.000	0.000	1.923
	Utah	Box Elder	Mobile - Non-Road Equipment - Other	0.003	0.292	0.077	0.000	0.001	1.662
	Utah	Davis	Mobile - Non-Road Equipment - Diesel	0.177	2.409	0.256	0.000	0.080	1.216
	Utah	Davis	Mobile - Non-Road Equipment - Gasoline	0.042	0.102	1.304	0.000	0.000	14.429
	Utah	Davis	Mobile - Non-Road Equipment - Other	0.003	0.347	0.089	0.000	0.001	1.922
	Utah	Salt Lake	Mobile - Non-Road Equipment - Diesel	0.482	7.257	0.866	0.000	0.342	3.932
	Utah	Salt Lake	Mobile - Non-Road Equipment - Gasoline	0.213	0.655	7.087	0.000	0.003	93.468
	Utah	Salt Lake	Mobile - Non-Road Equipment - Other	0.017	1.946	0.495	0.000	0.003	10.668
	Utah	Tooele	Mobile - Non-Road Equipment - Diesel	0.026	0.736	0.076	0.000	0.056	0.312
	Utah	Tooele	Mobile - Non-Road Equipment - Gasoline	0.004	0.008	0.127	0.000	0.000	1.054
	Utah	Tooele	Mobile - Non-Road Equipment - Other	0.000	0.044	0.011	0.000	0.000	0.247
	Utah	Weber	Mobile - Non-Road Equipment - Diesel	0.103	1.539	0.191	0.000	0.059	0.877
	Utah	Weber	Mobile - Non-Road Equipment - Gasoline	0.034	0.088	1.100	0.000	0.000	12.089
	Utah	Weber	Mobile - Non-Road Equipment - Other	0.004	0.405	0.105	0.000	0.001	2.271
			Total	**1.141**	**16.390**	**12.040**	**0.000**	**0.579**	**146.329**
Surrounding Areas	Idaho	Bannock	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.019
	Idaho	Bannock	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.006
	Idaho	Bannock	Mobile - Non-Road Equipment - Diesel	0.026	0.312	0.032	0.000	0.008	0.163
	Idaho	Bannock	Mobile - Non-Road Equipment - Gasoline	0.022	0.036	0.922	0.000	0.003	3.538
	Idaho	Bannock	Mobile - Non-Road Equipment - Other	0.001	0.093	0.024	0.000	0.000	0.513
	Idaho	Bear Lake	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.020
	Idaho	Bear Lake	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.004
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Diesel	0.011	0.140	0.013	0.000	0.003	0.066
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Gasoline	0.045	0.043	2.063	0.000	0.005	2.902
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Other	0.000	0.004	0.001	0.000	0.000	0.019
	Idaho	Bingham	Mobile - Aircraft	0.014	0.006	0.034	0.000	0.001	1.062
	Idaho	Bingham	Mobile - Non-Road Equipment - Diesel	0.000	0.158	0.016	0.000	0.004	0.082
	Idaho	Bingham	Mobile - Non-Road Equipment - Gasoline	0.000	0.013	0.074	0.000	0.001	1.041
	Idaho	Bingham	Mobile - Non-Road Equipment - Other	0.000	0.047	0.012	0.000	0.000	0.260

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Idaho	Blaine	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.381
	Idaho	Blaine	Mobile - Non-Road Equipment - Diesel	0.000	0.542	0.057	0.000	0.013	0.287
	Idaho	Blaine	Mobile - Non-Road Equipment - Gasoline	0.000	0.015	0.331	0.000	0.001	1.864
	Idaho	Blaine	Mobile - Non-Road Equipment - Other	0.000	0.019	0.005	0.000	0.000	0.100
	Idaho	Caribou	Mobile - Aircraft	0.001	0.000	0.003	0.000	0.000	0.086
	Idaho	Caribou	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.003
	Idaho	Caribou	Mobile - Non-Road Equipment - Diesel	0.019	0.227	0.023	0.000	0.005	0.117
	Idaho	Caribou	Mobile - Non-Road Equipment - Gasoline	0.006	0.017	0.411	0.000	0.001	0.874
	Idaho	Caribou	Mobile - Non-Road Equipment - Other	0.000	0.018	0.005	0.000	0.000	0.100
	Idaho	Cassia	Mobile - Aircraft	0.003	0.001	0.008	0.000	0.000	0.237
	Idaho	Cassia	Mobile - Locomotives	0.001	0.005	0.001	0.000	0.000	0.005
	Idaho	Cassia	Mobile - Non-Road Equipment - Diesel	0.040	0.462	0.047	0.000	0.010	0.243
	Idaho	Cassia	Mobile - Non-Road Equipment - Gasoline	0.009	0.014	0.390	0.000	0.001	1.237
	Idaho	Cassia	Mobile - Non-Road Equipment - Other	0.000	0.026	0.006	0.000	0.000	0.141
	Idaho	Jerome	Mobile - Aircraft	0.003	0.001	0.007	0.000	0.000	0.234
	Idaho	Jerome	Mobile - Non-Road Equipment - Diesel	0.000	0.058	0.006	0.000	0.001	0.030
	Idaho	Jerome	Mobile - Non-Road Equipment - Gasoline	0.000	0.008	0.046	0.000	0.000	0.698
	Idaho	Jerome	Mobile - Non-Road Equipment - Other	0.000	0.029	0.007	0.000	0.000	0.161
	Idaho	Lincoln	Mobile - Aircraft	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Lincoln	Mobile - Non-Road Equipment - Diesel	0.000	0.028	0.004	0.000	0.001	0.017
	Idaho	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.000	0.001	0.005	0.000	0.000	0.047
	Idaho	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.001	0.000	0.000	0.000	0.005
	Idaho	Minidoka	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.003
	Idaho	Minidoka	Mobile - Non-Road Equipment - Diesel	0.028	0.317	0.033	0.000	0.007	0.168
	Idaho	Minidoka	Mobile - Non-Road Equipment - Gasoline	0.002	0.008	0.120	0.000	0.001	0.802
	Idaho	Minidoka	Mobile - Non-Road Equipment - Other	0.000	0.040	0.010	0.000	0.000	0.218
	Idaho	Oneida	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.036
	Idaho	Oneida	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.002
	Idaho	Oneida	Mobile - Non-Road Equipment - Diesel	0.015	0.174	0.018	0.000	0.004	0.092
	Idaho	Oneida	Mobile - Non-Road Equipment - Gasoline	0.001	0.002	0.031	0.000	0.000	0.177
	Idaho	Oneida	Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.010
	Idaho	Power	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.377
	Idaho	Power	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.004
	Idaho	Power	Mobile - Non-Road Equipment - Diesel	0.022	0.257	0.026	0.000	0.006	0.132
	Idaho	Power	Mobile - Non-Road Equipment - Gasoline	0.027	0.024	1.217	0.000	0.003	1.871
	Idaho	Power	Mobile - Non-Road Equipment - Other	0.000	0.014	0.003	0.000	0.000	0.076
	Idaho	Twin Falls	Mobile - Aircraft	0.004	0.002	0.010	0.000	0.000	0.310
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Diesel	0.000	0.408	0.042	0.000	0.010	0.213
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Gasoline	0.000	0.041	0.234	0.000	0.002	3.546
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Other	0.000	0.089	0.022	0.000	0.000	0.474
	Utah	Carbon	Mobile - Non-Road Equipment - Diesel	0.039	0.353	0.065	0.000	0.008	0.272
	Utah	Carbon	Mobile - Non-Road Equipment - Gasoline	0.004	0.015	0.127	0.000	0.000	2.090
	Utah	Carbon	Mobile - Non-Road Equipment - Other	0.000	0.023	0.006	0.000	0.000	0.121
	Utah	Duchesne	Mobile - Non-Road Equipment - Diesel	0.006	0.095	0.010	0.000	0.002	0.062
	Utah	Duchesne	Mobile - Non-Road Equipment - Gasoline	0.133	0.070	5.737	0.000	0.002	16.240
	Utah	Duchesne	Mobile - Non-Road Equipment - Other	0.000	0.009	0.002	0.000	0.000	0.051

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
NonRoad Emissions by Non-Attainment Area - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Utah	Emery	Mobile - Non-Road Equipment - Diesel	0.032	0.278	0.051	0.000	0.005	0.237
	Utah	Emery	Mobile - Non-Road Equipment - Gasoline	0.001	0.003	0.029	0.000	0.000	0.426
	Utah	Emery	Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.012
	Utah	Juab	Mobile - Non-Road Equipment - Diesel	0.006	0.135	0.014	0.000	0.006	0.055
	Utah	Juab	Mobile - Non-Road Equipment - Gasoline	0.001	0.006	0.045	0.000	0.000	0.854
	Utah	Juab	Mobile - Non-Road Equipment - Other	0.000	0.009	0.002	0.000	0.000	0.056
	Utah	Millard	Mobile - Non-Road Equipment - Diesel	0.005	0.059	0.007	0.000	0.001	0.034
	Utah	Millard	Mobile - Non-Road Equipment - Gasoline	0.001	0.006	0.040	0.000	0.000	0.766
	Utah	Millard	Mobile - Non-Road Equipment - Other	0.000	0.014	0.004	0.000	0.000	0.079
	Utah	Morgan	Mobile - Non-Road Equipment - Diesel	0.004	0.073	0.007	0.000	0.002	0.033
	Utah	Morgan	Mobile - Non-Road Equipment - Gasoline	0.264	0.127	11.400	0.000	0.004	30.331
	Utah	Morgan	Mobile - Non-Road Equipment - Other	0.000	0.007	0.002	0.000	0.000	0.039
	Utah	Rich	Mobile - Non-Road Equipment - Diesel	0.003	0.038	0.004	0.000	0.001	0.020
	Utah	Rich	Mobile - Non-Road Equipment - Gasoline	0.997	0.459	43.149	0.000	0.014	112.373
	Utah	Rich	Mobile - Non-Road Equipment - Other	0.000	0.000	0.000	0.000	0.000	0.001
	Utah	Sanpete	Mobile - Non-Road Equipment - Diesel	0.007	0.147	0.014	0.000	0.008	0.066
	Utah	Sanpete	Mobile - Non-Road Equipment - Gasoline	0.087	0.043	3.719	0.000	0.001	10.136
	Utah	Sanpete	Mobile - Non-Road Equipment - Other	0.000	0.026	0.007	0.000	0.000	0.149
	Utah	Summit	Mobile - Non-Road Equipment - Diesel	0.043	0.810	0.084	0.000	0.048	0.361
	Utah	Summit	Mobile - Non-Road Equipment - Gasoline	0.070	0.048	2.898	0.000	0.001	9.537
	Utah	Summit	Mobile - Non-Road Equipment - Other	0.000	0.029	0.007	0.000	0.000	0.157
	Utah	Wasatch	Mobile - Non-Road Equipment - Diesel	0.024	0.346	0.040	0.000	0.015	0.181
	Utah	Wasatch	Mobile - Non-Road Equipment - Gasoline	0.118	0.059	5.057	0.000	0.002	13.723
	Utah	Wasatch	Mobile - Non-Road Equipment - Other	0.000	0.010	0.003	0.000	0.000	0.055
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Diesel	0.021	0.254	0.026	0.000	0.034	0.120
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.019	0.017	0.926	0.000	0.001	3.159
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.035	0.006	0.000	0.000	0.208
	Wyoming	Sublette	Mobile - Non-Road Equipment - Diesel	0.007	0.079	0.008	0.000	0.011	0.039
	Wyoming	Sublette	Mobile - Non-Road Equipment - Gasoline	0.044	0.019	2.129	0.000	0.003	5.643
	Wyoming	Sublette	Mobile - Non-Road Equipment - Other	0.000	0.008	0.001	0.000	0.000	0.045
	Wyoming	Uinta	Mobile - Non-Road Equipment - Diesel	0.014	0.181	0.018	0.000	0.024	0.079
	Wyoming	Uinta	Mobile - Non-Road Equipment - Gasoline	0.015	0.022	0.747	0.000	0.001	3.411
	Wyoming	Uinta	Mobile - Non-Road Equipment - Other	0.000	0.034	0.004	0.000	0.000	0.216
			Total	**2.282**	**7.671**	**82.745**	**0.004**	**0.289**	**236.511**
			Logan, UT-ID	0.134	1.571	2.131	0.000	0.082	11.596
			Provo, UT	0.340	4.253	2.861	0.000	0.178	26.546
			Salt Lake City, UT	1.141	16.390	12.040	0.000	0.579	146.329
			Surrounding Areas	2.282	7.671	82.745	0.004	0.289	236.511
				3.899	**29.884**	**99.776**	**0.005**	**1.128**	**420.982**
			Logan, UT-ID	3%	5%	2%	5%	7%	3%
			Provo, UT	9%	14%	3%	0%	16%	6%
			Salt Lake City, UT	29%	55%	12%	0%	51%	35%
			Surrounding Areas	59%	26%	83%	95%	26%	56%
				100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
NonRoad Mobile Emissions by Non-Attainment Area - Sector
Tons/Average Episode Day

This table (for PM2.5) shows non-road mobile source emissions by generalized groupings of source categories. Units are in tons per average episode day. The information is organized into groups approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Logan, UT / ID nonattainment area includes category-specific totals representing all sources within Cache County Utah and Franklin County Idaho. In actuality, the nonattainment area includes only portions of each of these counties, but for summary purposes emissions from the entire counties were used to compile these totals. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* Emissions were also temporally adjusted within the SMOKE pre-processor. The annual totals used for Episode 3 were compiled as an average of 2009 and 2010.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/209 - 1/22/2010
NonRoad Mobile Emissions by Non-Attainment - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Franklin	Mobile - Aircraft	0.001	0.000	0.002	0.000	0.000	0.058
	Idaho	Franklin	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.001
	Idaho	Franklin	Mobile - Non-Road Equipment - Diesel	0.010	0.116	0.012	0.000	0.003	0.061
	Idaho	Franklin	Mobile - Non-Road Equipment - Gasoline	0.014	0.007	0.548	0.000	0.001	1.028
	Idaho	Franklin	Mobile - Non-Road Equipment - Other	0.000	0.012	0.003	0.000	0.000	0.063
	Utah	Cache	Mobile - Non-Road Equipment - Diesel	0.022	0.364	0.149	0.000	0.068	0.666
	Utah	Cache	Mobile - Non-Road Equipment - Gasoline	0.017	0.254	0.073	0.000	0.005	1.499
	Utah	Cache	Mobile - Non-Road Equipment - Other	0.015	0.044	0.413	0.000	0.001	2.092
			Total	**0.080**	**0.799**	**1.200**	**0.000**	**0.077**	**5.470**
Provo, UT	Utah	Utah	Mobile - Non-Road Equipment - Diesel	0.010	0.436	0.213	0.000	0.118	1.098
	Utah	Utah	Mobile - Non-Road Equipment - Gasoline	0.013	0.145	0.040	0.000	0.002	0.538
	Utah	Utah	Mobile - Non-Road Equipment - Other	0.010	0.105	0.034	0.000	0.002	0.320
			Total	**0.033**	**0.686**	**0.287**	**0.000**	**0.122**	**1.956**
Salt Lake City, UT	Utah	Box Elder	Mobile - Non-Road Equipment - Diesel	0.013	0.423	0.053	0.000	0.031	0.449
	Utah	Box Elder	Mobile - Non-Road Equipment - Gasoline	0.011	0.118	0.271	0.000	0.001	3.975
	Utah	Box Elder	Mobile - Non-Road Equipment - Other	0.064	0.624	0.471	0.000	0.013	1.472
	Utah	Davis	Mobile - Non-Road Equipment - Diesel	0.022	0.365	0.145	0.000	0.030	0.387
	Utah	Davis	Mobile - Non-Road Equipment - Gasoline	0.049	0.535	0.156	0.000	0.009	1.286
	Utah	Davis	Mobile - Non-Road Equipment - Other	0.016	0.305	0.311	0.000	0.004	7.189
	Utah	Salt Lake	Mobile - Non-Road Equipment - Diesel	0.006	1.295	0.272	0.000	0.193	1.134
	Utah	Salt Lake	Mobile - Non-Road Equipment - Gasoline	0.011	0.121	0.051	0.000	0.002	0.726
	Utah	Salt Lake	Mobile - Non-Road Equipment - Other	0.054	0.828	0.134	0.000	0.015	1.277
	Utah	Tooele	Mobile - Non-Road Equipment - Diesel	0.017	0.588	0.353	0.000	0.051	1.169
	Utah	Tooele	Mobile - Non-Road Equipment - Gasoline	0.014	0.273	0.306	0.000	0.002	4.186
	Utah	Tooele	Mobile - Non-Road Equipment - Other	0.130	0.071	3.688	0.000	0.001	11.047
	Utah	Weber	Mobile - Non-Road Equipment - Diesel	0.006	0.302	0.095	0.000	0.031	0.661
	Utah	Weber	Mobile - Non-Road Equipment - Gasoline	0.014	0.147	0.185	0.000	0.003	0.852
	Utah	Weber	Mobile - Non-Road Equipment - Other	0.029	0.316	0.066	0.000	0.006	0.911
			Total	**0.456**	**6.311**	**6.557**	**0.000**	**0.390**	**36.722**
Surrounding Areas	Idaho	Bannock	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.004
	Idaho	Bannock	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.019
	Idaho	Bannock	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.002
	Idaho	Bannock	Mobile - Non-Road Equipment - Diesel	0.026	0.312	0.032	0.000	0.008	0.163
	Idaho	Bannock	Mobile - Non-Road Equipment - Gasoline	0.020	0.035	0.837	0.000	0.003	3.341
	Idaho	Bannock	Mobile - Non-Road Equipment - Other	0.001	0.093	0.024	0.000	0.000	0.513
	Idaho	Bear Lake	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Bear Lake	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.020

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/209 - 1/22/2010
NonRoad Mobile Emissions by Non-Attainment - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Idaho	Bear Lake	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.001
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Diesel	0.011	0.140	0.013	0.000	0.003	0.066
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Gasoline	0.041	0.041	1.874	0.000	0.004	2.740
	Idaho	Bear Lake	Mobile - Non-Road Equipment - Other	0.000	0.004	0.001	0.000	0.000	0.019
	Idaho	Bingham	Mobile - Aircraft	0.014	0.006	0.034	0.000	0.001	1.062
	Idaho	Bingham	Mobile - Non-Road Equipment - Diesel	0.000	0.158	0.016	0.000	0.004	0.082
	Idaho	Bingham	Mobile - Non-Road Equipment - Gasoline	0.000	0.013	0.078	0.000	0.001	1.052
	Idaho	Bingham	Mobile - Non-Road Equipment - Other	0.000	0.047	0.012	0.000	0.000	0.260
	Idaho	Blaine	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.381
	Idaho	Blaine	Mobile - Non-Road Equipment - Diesel	0.000	0.542	0.057	0.000	0.013	0.286
	Idaho	Blaine	Mobile - Non-Road Equipment - Gasoline	0.000	0.016	0.384	0.000	0.001	2.015
	Idaho	Blaine	Mobile - Non-Road Equipment - Other	0.000	0.019	0.005	0.000	0.000	0.100
	Idaho	Caribou	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Caribou	Mobile - Aircraft	0.001	0.000	0.003	0.000	0.000	0.086
	Idaho	Caribou	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.002
	Idaho	Caribou	Mobile - Non-Road Equipment - Diesel	0.019	0.227	0.023	0.000	0.005	0.117
	Idaho	Caribou	Mobile - Non-Road Equipment - Gasoline	0.006	0.016	0.373	0.000	0.001	0.826
	Idaho	Caribou	Mobile - Non-Road Equipment - Other	0.000	0.018	0.005	0.000	0.000	0.100
	Idaho	Cassia	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Cassia	Mobile - Aircraft	0.003	0.001	0.008	0.000	0.000	0.237
	Idaho	Cassia	Mobile - Locomotives	0.001	0.004	0.001	0.000	0.000	0.003
	Idaho	Cassia	Mobile - Non-Road Equipment - Diesel	0.040	0.462	0.047	0.000	0.010	0.243
	Idaho	Cassia	Mobile - Non-Road Equipment - Gasoline	0.008	0.014	0.354	0.000	0.001	1.168
	Idaho	Cassia	Mobile - Non-Road Equipment - Other	0.000	0.026	0.006	0.000	0.000	0.141
	Idaho	Jerome	Mobile - Aircraft	0.003	0.001	0.007	0.000	0.000	0.234
	Idaho	Jerome	Mobile - Non-Road Equipment - Diesel	0.000	0.058	0.006	0.000	0.001	0.030
	Idaho	Jerome	Mobile - Non-Road Equipment - Gasoline	0.000	0.008	0.048	0.000	0.000	0.704
	Idaho	Jerome	Mobile - Non-Road Equipment - Other	0.000	0.029	0.007	0.000	0.000	0.161
	Idaho	Lincoln	Mobile - Aircraft	0.000	0.000	0.000	0.000	0.000	0.003
	Idaho	Lincoln	Mobile - Non-Road Equipment - Diesel	0.000	0.028	0.004	0.000	0.001	0.017
	Idaho	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.000	0.001	0.006	0.000	0.000	0.049
	Idaho	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.001	0.000	0.000	0.000	0.005
	Idaho	Minidoka	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Minidoka	Mobile - Locomotives	0.000	0.003	0.001	0.000	0.000	0.002
	Idaho	Minidoka	Mobile - Non-Road Equipment - Diesel	0.028	0.317	0.033	0.000	0.007	0.168
	Idaho	Minidoka	Mobile - Non-Road Equipment - Gasoline	0.002	0.008	0.109	0.000	0.001	0.757
	Idaho	Minidoka	Mobile - Non-Road Equipment - Other	0.000	0.040	0.010	0.000	0.000	0.218
	Idaho	Oneida	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Oneida	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.036
	Idaho	Oneida	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.001
	Idaho	Oneida	Mobile - Non-Road Equipment - Diesel	0.015	0.174	0.018	0.000	0.004	0.092

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/209 - 1/22/2010
NonRoad Mobile Emissions by Non-Attainment - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Idaho	Oneida	Mobile - Non-Road Equipment - Gasoline	0.001	0.002	0.028	0.000	0.000	0.167
	Idaho	Oneida	Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.010
	Idaho	Power	interpolated MRPO Non-Road	0.000	0.000	0.000	0.000	0.000	0.002
	Idaho	Power	Mobile - Aircraft	0.005	0.002	0.012	0.000	0.000	0.377
	Idaho	Power	Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.002
	Idaho	Power	Mobile - Non-Road Equipment - Diesel	0.022	0.257	0.026	0.000	0.006	0.132
	Idaho	Power	Mobile - Non-Road Equipment - Gasoline	0.024	0.023	1.106	0.000	0.003	1.766
	Idaho	Power	Mobile - Non-Road Equipment - Other	0.000	0.014	0.003	0.000	0.000	0.076
	Idaho	Twin Falls	Mobile - Aircraft	0.004	0.002	0.010	0.000	0.000	0.310
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Diesel	0.000	0.408	0.042	0.000	0.010	0.213
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Gasoline	0.000	0.041	0.244	0.000	0.002	3.573
	Idaho	Twin Falls	Mobile - Non-Road Equipment - Other	0.000	0.089	0.022	0.000	0.000	0.474
	Utah	Carbon	Mobile - Non-Road Equipment - Diesel	0.030	0.181	0.793	0.000	0.004	2.327
	Utah	Carbon	Mobile - Non-Road Equipment - Gasoline	0.013	0.177	0.072	0.000	0.003	1.175
	Utah	Carbon	Mobile - Non-Road Equipment - Other	0.034	0.351	1.478	0.000	0.001	23.060
	Utah	Duchesne	Mobile - Non-Road Equipment - Diesel	0.012	0.083	0.230	0.000	0.002	0.529
	Utah	Duchesne	Mobile - Non-Road Equipment - Gasoline	0.012	0.072	0.220	0.000	0.001	2.932
	Utah	Duchesne	Mobile - Non-Road Equipment - Other	0.015	0.219	0.334	0.000	0.003	4.064
	Utah	Emery	Mobile - Non-Road Equipment - Diesel	0.007	0.060	0.131	0.000	0.001	0.947
	Utah	Emery	Mobile - Non-Road Equipment - Gasoline	0.024	0.317	0.061	0.000	0.005	1.078
	Utah	Emery	Mobile - Non-Road Equipment - Other	0.034	0.622	0.335	0.000	0.010	5.696
	Utah	Juab	Mobile - Non-Road Equipment - Diesel	0.017	0.179	0.281	0.000	0.006	1.411
	Utah	Juab	Mobile - Non-Road Equipment - Gasoline	0.028	0.388	0.116	0.000	0.007	0.644
	Utah	Juab	Mobile - Non-Road Equipment - Other	0.333	0.369	13.309	0.000	0.006	46.219
	Utah	Millard	Mobile - Non-Road Equipment - Diesel	0.007	0.087	0.061	0.000	0.001	1.478
	Utah	Millard	Mobile - Non-Road Equipment - Gasoline	0.073	0.264	1.719	0.000	0.005	4.848
	Utah	Millard	Mobile - Non-Road Equipment - Other	0.028	0.281	0.182	0.000	0.005	1.261
	Utah	Morgan	Mobile - Non-Road Equipment - Diesel	0.012	0.138	0.038	0.000	0.003	0.455
	Utah	Morgan	Mobile - Non-Road Equipment - Gasoline	0.025	0.331	0.120	0.000	0.006	0.630
	Utah	Morgan	Mobile - Non-Road Equipment - Other	0.048	0.712	0.115	0.000	0.013	0.769
	Utah	Rich	Mobile - Non-Road Equipment - Diesel	0.006	0.066	0.042	0.000	0.001	0.651
	Utah	Rich	Mobile - Non-Road Equipment - Gasoline	0.032	0.418	0.135	0.000	0.004	1.875
	Utah	Rich	Mobile - Non-Road Equipment - Other	0.096	0.496	1.227	0.000	0.008	3.563
	Utah	Sanpete	Mobile - Non-Road Equipment - Diesel	0.007	0.097	0.054	0.000	0.007	0.280
	Utah	Sanpete	Mobile - Non-Road Equipment - Gasoline	0.017	0.107	0.083	0.000	0.002	0.694
	Utah	Sanpete	Mobile - Non-Road Equipment - Other	0.081	1.592	0.536	0.000	0.011	9.043
	Utah	Summit	Mobile - Non-Road Equipment - Diesel	0.020	0.462	0.113	0.000	0.043	1.196
	Utah	Summit	Mobile - Non-Road Equipment - Gasoline	0.026	0.367	0.075	0.000	0.007	1.323
	Utah	Summit	Mobile - Non-Road Equipment - Other	0.013	0.104	0.087	0.000	0.002	0.958
	Utah	Wasatch	Mobile - Non-Road Equipment - Diesel	0.003	0.167	0.089	0.000	0.008	1.563
	Utah	Wasatch	Mobile - Non-Road Equipment - Gasoline	0.041	0.470	0.387	0.000	0.009	1.412

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/209 - 1/22/2010
NonRoad Mobile Emissions by Non-Attainment - Sector

Tons/Average Episode Day

NA-Area	State	County	Sector	PM2.5	NOX	VOC	NH3	SO2	CO
Surrounding Areas	Utah	Wasatch	Mobile - Non-Road Equipment - Other	0.026	0.101	0.317	0.000	0.002	0.693
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Diesel	0.021	0.252	0.026	0.000	0.034	0.119
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Gasoline	0.023	0.018	1.104	0.000	0.001	3.601
	Wyoming	Lincoln	Mobile - Non-Road Equipment - Other	0.000	0.035	0.006	0.000	0.000	0.208
	Wyoming	Sublette	Mobile - Non-Road Equipment - Diesel	0.007	0.079	0.008	0.000	0.011	0.039
	Wyoming	Sublette	Mobile - Non-Road Equipment - Gasoline	0.053	0.022	2.552	0.001	0.003	6.693
	Wyoming	Sublette	Mobile - Non-Road Equipment - Other	0.000	0.008	0.001	0.000	0.000	0.045
	Wyoming	Uinta	Mobile - Non-Road Equipment - Diesel	0.014	0.180	0.017	0.000	0.024	0.078
	Wyoming	Uinta	Mobile - Non-Road Equipment - Gasoline	0.018	0.023	0.882	0.000	0.001	3.747
	Wyoming	Uinta	Mobile - Non-Road Equipment - Other	0.000	0.034	0.004	0.000	0.000	0.216
			Total	**1.561**	**13.645**	**33.288**	**0.004**	**0.353**	**162.154**
			Logan, UT-ID	0.080	0.799	1.200	0.000	0.077	5.470
			Provo, UT	0.033	0.686	0.287	0.000	0.122	1.956
			Salt Lake City, UT	0.456	6.311	6.557	0.000	0.390	36.722
			Surrounding Areas	1.561	13.645	33.288	0.004	0.353	162.154
				2.129	21.442	41.331	0.005	0.943	206.301
			Logan, UT-ID	4%	4%	3%	5%	8%	3%
			Provo, UT	2%	3%	1%	0%	13%	1%
			Salt Lake City, UT	21%	29%	16%	0%	41%	18%
			Surrounding Areas	73%	64%	81%	95%	37%	79%
				100%	100%	100%	100%	100%	100%

TECHNICAL SUPPORT DOCUMENT FOR NON-ROAD MOBILE SOURCES: PM2.5 EMISSIONS INVENTORIES FOR PM2.5 SIP BASE YEARS

Four Episodes:
January 11-21, 2007
February 13-19, 2008
January 8-27, 2009
December 7, 2009 to January 23, 2010

(PEAK WINTER EPISODE WEEKDAYS AND WEEKEND DAYS)

June 2011
Utah Division of Air Quality
Planning Branch/Mobile Sources

TABLE OF CONTENTS

ii. Introduction
iii. Non-road Emission Sources and Models
(1) EPA NONROAD Model
Fuel Reid Vapor Pressure (RVP) of Gasoline
Sulfur Content of Non-road Diesel, Gasoline, LPG and CNG
VMT Conversion Factors
Daily Minimum and Maximum Temperatures by County
(2) Emissions and Dispersion Modeling System (EDMS) Model
(3) Locomotives
iv. 2007 – 2010 Episode Year Summary Tables
(4) Non-road Miscellaneous Engines
(5) Aircraft
(6) Locomotives
v. Idaho Non-road Inventory
vi. References

ii. Introduction

This inventory includes emissions of PM10, PM2.5, sulfur dioxide (SO2), nitrogen oxides (NOx), volatile organic compounds (VOC), carbon monoxide (CO) and ammonia (NH3) from miscellaneous non-road engines, locomotives and aircraft.

Inventories were computed for four PM2.5 episodes:

Episode #1: Thursday, January 11, 2007 through Sunday, January 21, 2007 inclusive (11 days);
Episode #2: Wednesday, February 13 through Tuesday, February 19, 2008 inclusive (7 days);
Episode #3: Thursday, January 8 through Tuesday, January 27, 2009 inclusive (20 days);
Episode #4: Monday, December 7, 2009 through Tuesday, January 23, 2010 inclusive (48 days).

Both urban and rural county emission inventories are discussed in this document. The counties in the PM2.5 domain are the following:

Urban: Cache, Davis, Salt Lake, Utah and Weber Counties

Rural:	Box Elder	Emery	Morgan	Summit
	Carbon	Juab	Rich	Tooele
	Duchesne	Millard	Sanpete	Wasatch

Non-road mobile sources are comprised of three main source categories: 1) miscellaneous non-road engines, 2) locomotives and 3) aircraft. Miscellaneous non-road engine emissions were computed by using the EPA NONROAD Model, version 2008.1.0. Locomotive emissions were estimated by applying EPA emission factors to the total amount of fuel used by locomotives. Aircrafts emissions were estimated by applying aircraft specific activity data and *Emissions Dispersion Modeling System (EDMS)*, version 5.1.2.

For most pollutants, the majority of non-road mobile source emissions come from miscellaneous non-road engines. However, emissions of NOx and SOx are higher from diesel locomotives than miscellaneous non-road engines. Emissions from aircraft contribute a relatively small part of total non-road mobile source emissions.

iii. Non-road Emission Source and Models

Non-road Miscellaneous Engines

Mobile source emissions are disaggregated into on-road and non-road emission categories. The EPA NONROAD Model, version 2008.1.0 (December 8, 2008) was used to compute non-road emissions. There are nine categories for non-road emissions which result from the use of fuel in a diverse collection of vehicles and equipment[1]. The nine categories include recreational vehicles, logging equipment, agricultural equipment, construction equipment, industrial equipment, residential and commercial lawn and garden equipment, recreational and commercial marine vessels, locomotive equipment, and aircraft. Commercial marine, locomotive, and aircraft emissions are not predicted in this version of the non-road emissions model. The model includes more than 80 basic and 260 specific types of non-road equipment, and further stratifies equipment types by horsepower rating. Fuel types include gasoline, diesel, compressed natural gas (CNG), and liquefied petroleum gas (LPG).

The NONROAD model estimates emissions for six exhaust pollutants: hydrocarbons (HC), NOx,

carbon monoxide (CO), carbon dioxide (CO2), sulfur oxides (SOX), and particulate matter (PM10 and PM2.5).

Emissions were computed for a winter weekday and a winter weekend day. The NONROAD model is not sensitive to the changes in temperature observed during the PM2.5 episodes. However, NONROAD emissions are sensitive to the choice of weekday versus weekend day. Annual average emissions were calculated by the following equation:

Annual average emission (tons per year) = [(average weekday *5 + average weekend days *2)/7]*365

Input Data

Fuel Reid Vapor Pressure (RVP) of Gasoline
Fuel Reid Vapor Pressure values are obtained from the NONROAD model database C: \non-road\DATA\DAILY\DAYTMPRV.DAT. The following table shows RVP values for State of Utah.

Table 1. RVP Values for the State of Utah

Month	RVP Daily Value
1	12.5
2	11.3
3	11.3
4	9.8
5	8.5
6	8.5
7	7.7
8	7.7
9	8.5
10	8.5
11	9.8
12	11.3

Sulfur Content of Non-road Diesel, Gasoline, LPG and CNG

EPA document assumed the gasoline sulfur limits set under the Tier 2/Sulfur program would apply to gasoline used by non-road equipment. Table 2 shows the scenario specific parameters that were used for NONROAD runs[2]. Table 3 shows the diesel sulfur content[3].

Table 2. Input parameters Used in NONROAD Model

Parameter	Base Case	Tier 2/Sulfur Case
Fuel RVP (psi)	9.0	9.0

Fuel Oxygen Weight %	0.0	0.0
Gasoline Sulfur %	0.034	0.003
LPG/CNG Sulfur %	0.033	0.003

Table 3. Diesel Sulfur Content

Year	Diesel Sulfur ppm
2007	1139
2008	351
2009	351
2010	165

Daily Minimum and Maximum Temperatures by County

The minimum and maximum temperature is the average low and high for the time period selected in each county. Temperature data is from Western Region Climate Center[3] (WRCC). A typical monitor station was selected for each county. Monthly average minimum and maximum temperatures for each county and each episode year were used in NONROAD input files.

Table 4a. January 2007 Average Maximum and Minimum Temperature

		January 2007 Weekday			January 2007 Weekend		
County	**FIPS**	Min (F)	Max (F)	Avg (F)	Min (F)	Max (F)	Avg (F)
Box Elder	49003	10.63	26.99	18.81	12.38	25.07	18.73
Cache	49005	2.79	18.83	10.81	3.02	18.82	10.92
Carbon	49007	4.20	23.90	14.05	4.01	23.22	13.62
Davis	49011	9.86	21.70	15.78	9.34	20.63	14.98
Duchesne	49013	4.20	23.90	14.05	4.01	23.22	13.62
Emery	49015	4.20	23.90	14.05	4.01	23.22	13.62
Juab	49023	4.20	23.90	14.05	4.01	23.22	13.62
Millard	49027	4.20	23.90	14.05	4.01	23.22	13.62
Morgan	49029	2.79	18.83	10.81	3.02	18.82	10.92
Rich	49033	4.20	23.90	14.05	4.01	23.22	13.62
Salt Lake	49035	10.21	23.17	16.69	9.99	21.60	15.79
Sanpete	49039	4.20	23.90	14.05	4.01	23.22	13.62
Summit	49043	-4.79	27.07	11.14	-8.70	24.13	7.71
Tooele	49045	10.37	26.57	18.47	10.58	26.02	18.30
Utah	49049	6.61	21.13	13.87	6.23	17.68	11.95
Wasatch	49051	-1.51	24.57	11.53	-4.68	21.50	8.41
Weber	49057	9.16	24.26	16.71	8.48	23.33	15.90

Table 4b. February 2008 Average Maximum and Minimum Temperature

		February 2008 Weekday			February 2008 Weekend		
County	**FIPS**	Min (F)	Max (F)	Avg (F)	Min (F)	Max (F)	Avg (F)
Box Elder	49003	21.45	36.61	29.03	20.84	36.77	28.81
Cache	49005	13.68	27.50	20.59	11.75	28.67	20.21

Carbon	49007	15.94	38.19	27.07	10.58	38.03	24.31
Davis	49011	22.89	36.50	29.70	23.63	34.70	29.17
Duchesne	49013	15.94	38.19	27.07	10.58	38.03	24.31
Emery	49015	15.94	38.19	27.07	10.58	38.03	24.31
Juab	49023	15.94	38.19	27.07	10.58	38.03	24.31
Millard	49027	15.94	38.19	27.07	10.58	38.03	24.31
Morgan	49029	13.68	27.50	20.59	11.75	28.67	20.21
Rich	49033	15.94	38.19	27.07	10.58	38.03	24.31
Salt Lake	49035	23.14	39.31	31.23	23.45	36.59	30.02
Sanpete	49039	15.94	38.19	27.07	10.58	38.03	24.31
Summit	49043	2.40	33.80	18.10	3.00	31.50	17.25
Tooele	49045	22.96	41.00	31.98	23.54	40.73	32.14
Utah	49049	19.04	39.81	29.43	16.07	38.21	27.14
Wasatch	49051	-2.80	32.00	14.60	-4.00	30.50	13.25
Weber	49057	21.20	36.82	29.01	20.93	35.96	28.45

Table 4c. January 2009 Average Maximum and Minimum Temperature

		January 2009 Weekday			**January 2009 Weekend**		
County	**FIPS**	Min (F)	Max (F)	Avg (F)	Min (F)	Max (F)	Avg (F)
Box Elder	49003	23.70	39.26	31.48	24.38	39.08	31.73
Cache	49005	17.88	31.54	24.71	19.52	29.60	24.56
Carbon	49007	15.08	36.20	25.64	16.76	35.54	26.15
Davis	49011	25.60	38.70	32.15	26.42	38.24	32.33
Duchesne	49013	15.08	36.20	25.64	16.76	35.54	26.15
Emery	49015	15.08	36.20	25.64	16.76	35.54	26.15
Juab	49023	15.08	36.20	25.64	16.76	35.54	26.15
Millard	49027	15.08	36.20	25.64	16.76	35.54	26.15
Morgan	49029	17.00	37.67	27.33	15.00	37.67	26.33
Rich	49033	13.89	34.22	24.06	12.67	33.00	22.83
Salt Lake	49035	25.78	41.54	33.66	26.36	40.76	33.56
Sanpete	49039	15.08	36.20	25.64	16.76	35.54	26.15
Summit	49043	13.67	38.72	26.19	10.67	36.67	23.67
Tooele	49045	29.28	42.98	36.13	28.52	41.96	35.24
Utah	49049	20.64	39.32	29.98	20.42	38.36	29.39
Wasatch	49051	12.56	36.33	24.44	11.67	33.00	22.33
Weber	49057	24.78	38.66	31.72	25.46	36.86	31.16

Table 4d. December 2009 and January 2010 Average Maximum and Minimum Temperature

		December 2009			**January 2010**		
County	**FIPS**	Min (F)	Max (F)	Avg (F)	Min (F)	Max (F)	Avg (F)
Box Elder	49003	12.55	29.87	21.21	14.13	34.23	24.18
Cache	49005	7.74	27.10	17.42	12.16	29.19	20.68
Carbon	49007	-0.65	27.91	13.63	8.25	34.00	21.13
Davis	49011	16.23	30.84	23.54	22.29	37.35	29.82

Duchesne	49013	-1.26	33.00	15.87	4.26	34.32	19.29
Emery	49015	2.39	26.94	14.67	6.97	28.19	17.58
Juab	49023	11.68	29.71	20.70	19.23	36.84	28.04
Millard	49027	9.87	32.94	21.41	20.13	40.32	30.23
Morgan	49029	5.74	27.19	16.47	12.87	34.06	23.47
Rich	49033	-0.87	26.16	12.65	6.55	30.84	18.70
Salt Lake	49035	16.52	30.61	23.57	21.48	36.61	29.05
Sanpete	49039	-2.10	27.06	12.48	5.03	30.52	17.78
Summit	49043	6.35	29.13	17.74	15.45	37.23	26.34
Tooele	49045	23.48	30.77	27.13	23.58	39.06	31.32
Utah	49049	15.00	30.52	22.76	17.13	37.55	27.34
Wasatch	49051	11.16	31.37	21.27	11.94	34.52	23.23
Weber	49057	15.03	29.94	22.49	22.10	34.73	28.42

Aircraft Emissions

The aircraft source category includes all aircraft types used for public, private, and military purposes. The aircraft emissions inventories are grouped by type of operation rather than aircraft type. Four types of aircraft activity, shown Table 5, are included: commercial, air taxi, general aviation and military aircraft.

Table 5. Four Main Operation Types for Aircraft

Operation Type	Description	Source of Emission Factors	SCC Code Groups
Commercial Flights/Air Carriers	Operations at Salt Lake City International Airport and 8 smaller municipal airports.	EDMS and EPA guidance documents for PM from commercial aircraft	2275000000
Air Taxi	Small privately-owned commuter planes	EDMS and EPA guidance documents for air taxi	2275000000
General Aviation	Small municipal airport operations (aircraft are "based" in small cities and towns)	EDMS and EPA guidance documents for general aviation	2275000000
Military Aircraft	Military operations	Military installations and EPA guidance	2275000000

Criteria pollutant emissions for commercial air carriers were calculated differently than the other three aircraft categories. They were estimated by applying aircraft specific activity data from FAA's *Airport Activity Statistics of Certificated Route Air Carriers* to FAA's *Emissions and Dispersion Modeling System (EDMS)*, version 5.1.2, November 6, 2009[5]. The FAA's T100

Segment data obtained from the Bureau of Transportation Statistics (BTS), which is updated every month, were used in conjunction with the EDMS model. EDMS generates emissions for CO, VOC, NOx, SOx, PM10 and PM2.5 emissions by aircraft type. EDMS does not give emission factors (EF) for PM10 and PM2.5 exhaust for some aircraft types. UDAQ assumed those values were insignificant or too small to count.

Annual aircraft operations data for air taxis, general aviation, and military aircraft are reported by the Utah Department of Transportation, Division of Aeronautics. Criteria pollutant emission estimates were calculated by combining aircraft operations data and EDMS emission factors by aircraft type.

Airport Ground Support Equipment (GSE)

The EPA NONROAD model runs emissions for Airport Ground Support Equipment (GSE). The model produces 3 SCC categories for GSE:

226-500-8005 4-stroke
226-700-8005 LPG
227-000-8005 Diesel

Davis County shows zero emissions for Airport GSE. Tooele County has a small value. This might be for Tooele City airport. Salt Lake County has a bigger value, which indicates that emissions from Salt Lake International Airport are included in the NONROAD model. The NONROAD model covers GSE for other counties and small airports. GSE for Davis County and Tooele County were reported in point sources under Hill Air Force Base and Dugway Proving Ground.

Locomotive (Diesel) Emissions

The locomotive source category includes railroad locomotives powered by diesel-electric engines and does not include locomotives powered by electricity or steam. Locomotive diesel engines are significant contributors to air pollution; they emit especially large amounts of nitrogen oxides (NOx) and particulate matter (PM) which contribute to serious public health problems.

All of the criteria pollutants, VOC, CO, NO_x, SO_x, PM_{10}, and $PM_{2.5}$, are included in the locomotive inventory. The emissions were estimated by applying emission factors to the total amount of distillate fuel oil used by locomotives. Emission factors for the criteria pollutants were obtained from *Emission Factors for Locomotives* (U.S. EPA, 1997)[6]. The estimated average emission rates are shown in Table 6 in grams of pollutant emitted per gallon of fuel consumed (g/gal).

Table 6 - Estimated Baseline In-Use Emission Rates (g/gal)

	HC	CO	NOx	PM
Line-Haul	10	26.6	270	6.7

Switch	21	38.1	362	9.2

Diesel locomotives are grouped by two operations: line haul and yard, or switch.

Emissions from diesel locomotives were reported to UDAQ by the individual railroad companies that operate in Utah. For incomplete data, UDAQ computed missing emissions using EPA guidance. As of 2008 and 2009, these companies include: Amtrak, Burlington Northern Sante Fe Railway (BNSF), Union Pacific Railroad Company (UPRR), Salt Lake Garfield & Western Railway, and Utah Transit Authority (UTA). Commuter rail operated by UTA were also included in the inventory. It started operations on April 26, 2008. Therefore the 2007 inventory did not include commuter rail emissions. About 83% of diesel locomotive emissions come from UPRR.

iv. 2007 – 2010 Episode Year Summary Tables (Appendix)

(7) Non-road Miscellaneous Engines
(8) Aircraft
(9) Locomotives

v. Idaho Non-road Inventory

vi. REFERENCES

The following documents were used as references in creating the non-road mobile source PM2.5 SIP emissions inventories:

1) U.S. Environmental Protection Agency, User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, December 2005, http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2005/420r05013.pdf

2. U.S. Environmental Protection Agency, http://www.epa.gov/otaq/models/tier2/tec2nrsa.pdf

3. U.S. Environmental Protection Agency, *Suggested Nationwide Average Fuel Properties*, Office of Transportation and Air Quality, EPA-420-B-09-018, April 2009, http://www.epa.gov/oms/models/nonrdmdl/nonrdmdl2008/420b09018.pdf.

4. Western Regional Climate Center, http://www.wrcc.dri.edu/Climsum.html (on map, click on "Utah").

5. Federal Aviation Administration, *Emissions and Dispersion Modeling System (EDMS) User's Manual*, FAA-AEE-07-01, (Rev. 7 – 11/06/09), November 2009, http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/edms_model/media/EDMS%205.0.2%20User%20Manual.pdf

6. U.S. Environmental Protection Agency, *Emission Factors for Locomotives* (U.S. EPA, 1997).

Table heading: Modeling Domain
Temporally and Spatially Adjusted
OnRoad Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of on-road mobile source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all on-road mobile source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* All on-road mobile source emissions were temporally adjusted within the SMOKE pre-processor. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
OnRoad Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	Exhaust PM2.5	Brake, Tire, & Road Dust PM2.5	Total PM2.5	NOX	Exhaust VOC	Evaporative VOC	Total VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.042	0.507	0.549	0.856	0.612	0.044	0.656	0.009	0.006	7.647
	Utah	Cache	0.442	0.268	0.710	7.420	5.684	0.767	6.451	0.135	0.078	71.367
		Total	**0.484**	**0.775**	**1.259**	**8.276**	**6.297**	**0.811**	**7.107**	**0.145**	**0.084**	**79.015**
Provo, UT	Utah	Utah	1.636	0.713	2.349	30.250	16.749	1.916	18.665	0.454	0.284	229.518
		Total	**1.636**	**0.713**	**2.349**	**30.250**	**16.749**	**1.916**	**18.665**	**0.454**	**0.284**	**229.518**
Salt Lake City, UT	Utah	Box Elder	0.447	0.167	0.614	9.979	3.287	0.467	3.754	0.118	0.070	48.329
	Utah	Davis	0.977	0.394	1.371	18.895	11.266	1.456	12.721	0.328	0.199	156.152
	Utah	Salt Lake	3.271	1.519	4.789	59.959	38.850	5.397	44.247	1.148	0.711	549.868
	Utah	Tooele	0.927	0.356	1.284	21.360	4.469	0.763	5.232	0.187	0.141	68.670
	Utah	Weber	0.836	0.307	1.142	15.863	9.157	1.225	10.382	0.216	0.141	124.531
		Total	**6.458**	**2.742**	**9.200**	**126.056**	**67.028**	**9.308**	**76.335**	**1.997**	**1.261**	**947.549**
Surrounding Areas	Idaho	Bannock	0.396	1.424	1.820	8.428	3.976	0.334	4.310	0.085	0.058	50.937
	Idaho	Bear Lake	0.058	0.505	0.562	1.171	0.454	0.033	0.487	0.009	0.007	5.362
	Idaho	Blaine	0.115	1.464	1.578	2.513	1.267	0.117	1.385	0.030	0.019	16.901
	Idaho	Caribou	0.049	0.367	0.416	0.923	0.486	0.032	0.518	0.008	0.006	5.628
	Idaho	Cassia	0.159	0.808	0.967	4.003	1.138	0.114	1.252	0.032	0.023	15.376
	Idaho	Jerome	0.211	1.082	1.293	5.462	1.212	0.119	1.332	0.037	0.029	16.152

Modeling Domain
Temporally and Spatially Adjusted
Episode 1: 1/11/2007 - 1/20/2007
OnRoad Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	Exhaust PM2.5	Brake, Tire, & Road Dust PM2.5	Total PM2.5	NOX	Exhaust VOC	Evaporative VOC	Total VOC	NH3	SO2	CO
Surrounding Areas	Idaho	Lincoln	0.038	0.488	0.526	0.901	0.286	0.031	0.317	0.009	0.006	3.951
	Idaho	Minidoka	0.108	0.659	0.767	2.509	1.040	0.094	1.134	0.024	0.016	13.830
	Idaho	Oneida	0.078	0.302	0.379	2.101	0.328	0.040	0.368	0.013	0.010	4.573
	Idaho	Power	0.094	0.312	0.407	2.377	0.532	0.049	0.581	0.016	0.012	6.918
	Utah	Carbon	0.170	0.137	0.307	3.204	1.558	0.208	1.766	0.035	0.023	20.116
	Utah	Duchesne	0.164	0.091	0.254	2.695	1.381	0.122	1.503	0.023	0.018	16.083
	Utah	Emery	0.205	0.109	0.314	4.870	1.000	0.145	1.145	0.038	0.027	13.726
	Utah	Juab	0.176	0.058	0.235	4.450	0.896	0.148	1.044	0.047	0.027	14.390
	Utah	Millard	0.231	0.096	0.327	5.500	1.165	0.186	1.351	0.051	0.033	17.206
	Utah	Morgan	0.073	0.024	0.097	1.447	0.638	0.067	0.705	0.016	0.010	8.064
	Utah	Rich	0.037	0.010	0.047	0.327	0.262	0.021	0.283	0.006	0.003	2.937
	Utah	Sanpete	0.136	0.080	0.216	2.153	1.587	0.170	1.757	0.029	0.017	19.572
	Utah	Summit	0.427	0.182	0.609	9.222	2.788	0.294	3.082	0.079	0.061	36.436
	Utah	Wasatch	0.165	0.092	0.256	2.843	1.487	0.137	1.624	0.032	0.021	17.313
	Wyoming	Lincoln	0.040	0.000	0.040	2.043	1.493	0.000	1.493	0.086	0.056	19.147
	Wyoming	Sublette	0.021	0.000	0.021	1.101	0.812	0.000	0.812	0.046	0.030	10.420
	Wyoming	Uinta	0.063	0.000	0.063	3.127	1.648	0.000	1.648	0.099	0.080	22.246
		Total	**3.211**	**8.289**	**11.500**	**73.367**	**27.436**	**2.462**	**29.898**	**0.848**	**0.592**	**357.282**
		Logan, UT-ID	0.484	0.775	1.259	8.276	6.297	0.811	7.107	0.145	0.084	79.015
		Provo, UT	1.636	0.713	2.349	30.250	16.749	1.916	18.665	0.454	0.284	229.518
		Salt Lake City, UT	6.458	2.742	9.200	126.056	67.028	9.308	76.335	1.997	1.261	947.549
		Surrounding Areas	3.211	8.289	11.500	73.367	27.436	2.462	29.898	0.848	0.592	357.282
			11.790	**12.519**	**24.309**	**237.949**	**117.510**	**14.496**	**132.006**	**3.444**	**2.220**	**1,613.364**
		Logan, UT-ID	4%	6%	5%	3%	5%	6%	5%	4%	4%	5%
		Provo, UT	14%	6%	10%	13%	14%	13%	14%	13%	13%	14%
		Salt Lake City, UT	55%	22%	38%	53%	57%	64%	58%	58%	57%	59%
		Surrounding Areas	27%	66%	47%	31%	23%	17%	23%	25%	27%	22%
			100%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table heading: Modeling Domain
Temporally and Spatially Adjusted
OnRoad Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of on-road mobile source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all on-road mobile source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* All on-road mobile source emissions were temporally adjusted within the SMOKE pre-processor. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
OnRoad Emissios by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	Exhaust PM2.5	Brake,Tire, Road Dust PM2.5	Total PM2.5	NOX	Exhaust VOC	Evaporative VOC	Total VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.028	0.596	0.624	0.711	0.459	0.039	0.498	0.008	0.004	5.441
	Utah	Cache	0.321	0.266	0.587	6.666	4.492	0.687	5.179	0.128	0.054	56.054
		Total	**0.350**	**0.862**	**1.211**	**7.377**	**4.952**	**0.725**	**5.677**	**0.136**	**0.058**	**61.495**
Provo, UT	Utah	Utah	1.123	0.693	1.816	26.112	11.658	1.934	13.593	0.411	0.200	177.552
		Total	**1.123**	**0.693**	**1.816**	**26.112**	**11.658**	**1.934**	**13.593**	**0.411**	**0.200**	**177.552**
Salt Lake City, UT	Utah	Box Elder	0.335	0.168	0.503	8.823	2.548	0.457	3.006	0.108	0.050	37.116
	Utah	Davis	0.661	0.392	1.053	16.050	7.806	1.366	9.172	0.292	0.135	110.803
	Utah	Salt Lake	2.104	1.416	3.520	49.654	26.379	5.087	31.466	0.998	0.470	382.754
	Utah	Tooele	0.624	0.322	0.946	16.342	3.154	0.651	3.805	0.146	0.092	47.018
	Utah	Weber	0.571	0.307	0.878	13.344	6.490	1.174	7.664	0.189	0.096	90.217
		Total	**4.295**	**2.605**	**6.900**	**104.213**	**46.377**	**8.735**	**55.112**	**1.734**	**0.844**	**667.908**
Surrounding Areas	Idaho	Bannock	0.289	1.575	1.864	7.350	2.979	0.306	3.284	0.081	0.044	36.622
	Idaho	Bear Lake	0.044	0.596	0.640	1.064	0.340	0.029	0.369	0.010	0.005	3.818
	Idaho	Blaine	0.075	1.141	1.215	2.085	0.897	0.115	1.011	0.028	0.013	11.697
	Idaho	Caribou	0.035	0.499	0.534	0.815	0.354	0.028	0.383	0.007	0.004	3.962
	Idaho	Cassia	0.115	0.449	0.564	3.383	0.819	0.113	0.932	0.031	0.018	10.825
	Idaho	Jerome	0.158	0.611	0.769	4.700	0.890	0.116	1.006	0.035	0.022	11.469
	Idaho	Lincoln	0.026	0.378	0.404	0.759	0.200	0.030	0.230	0.008	0.004	2.711
	Idaho	Minidoka	0.075	0.437	0.512	2.139	0.742	0.096	0.838	0.022	0.012	9.704
	Idaho	Oneida	0.059	0.163	0.222	1.764	0.250	0.039	0.289	0.011	0.007	3.313
	Idaho	Power	0.071	0.293	0.364	2.078	0.406	0.044	0.450	0.014	0.008	5.042
	Utah	Carbon	0.127	0.131	0.258	3.157	1.182	0.204	1.386	0.035	0.018	15.758
	Utah	Duchesne	0.141	0.099	0.240	2.711	1.142	0.122	1.264	0.024	0.015	13.132
	Utah	Emery	0.165	0.117	0.282	4.599	0.798	0.141	0.939	0.037	0.023	10.959
	Utah	Juab	0.143	0.060	0.203	4.305	0.718	0.166	0.884	0.047	0.022	12.305

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
OnRoad Emissios by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	Exhaust PM2.5	Brake,Tire, Road Dust PM2.5	Total PM2.5	NOX	Exhaust VOC	Evaporative VOC	Total VOC	NH3	SO2	CO
Surrounding Areas	Utah	Millard	0.186	0.094	0.280	5.285	0.936	0.183	1.119	0.051	0.027	13.959
	Utah	Morgan	0.057	0.025	0.082	1.398	0.509	0.061	0.570	0.015	0.007	6.518
	Utah	Rich	0.013	0.010	0.023	0.316	0.149	0.020	0.169	0.005	0.002	2.082
	Utah	Sanpete	0.089	0.080	0.169	1.987	1.189	0.176	1.365	0.028	0.013	15.044
	Utah	Summit	0.349	0.173	0.522	8.532	2.188	0.258	2.445	0.074	0.049	28.611
	Utah	Wasatch	0.138	0.095	0.233	2.783	1.222	0.134	1.356	0.033	0.017	14.120
	Wyoming	Lincoln	0.040	0.000	0.040	2.043	1.493	0.000	1.493	0.086	0.056	19.147
	Wyoming	Sublette	0.021	0.000	0.021	1.101	0.812	0.000	0.812	0.046	0.030	10.420
	Wyoming	Uinta	0.063	0.000	0.063	3.128	1.649	0.000	1.649	0.099	0.080	22.255
		Total	**2.479**	**7.025**	**9.504**	**67.481**	**21.863**	**2.381**	**24.244**	**0.828**	**0.496**	**283.477**
		Logan, UT-ID	0.350	0.862	1.211	7.377	4.952	0.725	5.677	0.136	0.058	61.495
		Provo, UT	1.123	0.693	1.816	26.112	11.658	1.934	13.593	0.411	0.200	177.552
		Salt Lake City, UT	4.295	2.605	6.900	104.213	46.377	8.735	55.112	1.734	0.844	667.908
		Surrounding Areas	2.479	7.025	9.504	67.481	21.863	2.381	24.244	0.828	0.496	283.477
			8.246	**11.185**	**19.432**	**205.183**	**84.850**	**13.776**	**98.626**	**3.108**	**1.598**	**1,190.432**
		Logan, UT-ID	4%	8%	6%	4%	6%	5%	6%	4%	4%	5%
		Provo, UT	14%	6%	9%	13%	14%	14%	14%	13%	12%	15%
		Salt Lake City, UT	52%	23%	36%	51%	55%	63%	56%	56%	53%	56%
		Surrounding Areas	30%	63%	49%	33%	26%	17%	25%	27%	31%	24%
			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table heading: Modeling Domain
Temporally and Spatially Adjusted
OnRoad Emissions by Non-Attainment Area
Tons/Average Episode Day

This table shows county totals of on-road mobile source emissions for each pollutant of interest. Units are in tons per average episode day, and the information is organized into groups of county totals approximating each of the PM2.5 nonattainment areas within the modeling domain. For instance, the box labeled Provo, UT nonattainment area reports a total that would include all on-road mobile source emissions within the county. In actuality, the nonattainment area includes only a portion of Utah County. Emission totals for the box labeled Surrounding Areas includes the county totals for each county belonging, at least in part, to the modeling domain but not extending into any of the three PM2.5 nonattainment Areas. *Emissions from any of the counties bisected by the modeling domain were adjusted within the SMOKE pre-processor to account for only that portion belonging to the domain. Typically, the adjustment is made based on either geographic area or population.* All on-road mobile source emissions were temporally adjusted within the SMOKE pre-processor. Subtotals for each of the regions within the domain are compared, below the last box, in terms of both emission rates and percentages.

Modeling Domain
Temporally and Spatially Adjusted
Episode 3: 12/8/2009 - 1/20/2010 (44 days)
OnRoad Emissions by Non-Attainment Area

Tons/Average Episode Day

NA-Area	State	County	Exhaust PM2.5	Brakewear, Tirewear, Road Dust PM2.5	Total PM2.5	NOX	Exhaust VOC	Evaporative VOC	Total VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	0.027	0.429	0.456	0.640	0.414	0.036	0.450	0.008	0.003	5.445
	Utah	Cache	0.281	0.221	0.501	5.322	3.968	0.554	4.522	0.105	0.030	50.417
		Total	**0.307**	**0.650**	**0.957**	**5.962**	**4.382**	**0.590**	**4.972**	**0.113**	**0.033**	**55.862**
Provo, UT	Utah	Utah	1.055	0.708	1.763	22.847	10.614	1.577	12.191	0.381	0.134	163.281
		Total	**1.055**	**0.708**	**1.763**	**22.847**	**10.614**	**1.577**	**12.191**	**0.381**	**0.134**	**163.281**
Salt Lake City, UT	Utah	Box Elder	0.317	0.166	0.483	7.681	2.397	0.389	2.785	0.099	0.037	34.961
	Utah	Davis	0.676	0.480	1.156	14.380	7.551	1.244	8.795	0.294	0.095	114.423
	Utah	Salt Lake	2.061	1.488	3.548	43.043	24.713	4.351	29.064	0.925	0.296	380.609
	Utah	Tooele	0.510	0.315	0.825	12.788	2.755	0.510	3.265	0.122	0.063	41.798
	Utah	Weber	0.552	0.315	0.866	11.688	6.157	1.084	7.241	0.180	0.065	92.309
		Total	**4.117**	**2.763**	**6.880**	**89.580**	**43.573**	**7.577**	**51.151**	**1.620**	**0.556**	**664.100**
Surrounding Areas	Idaho	Bannock	0.238	1.432	1.669	6.303	2.403	0.306	2.709	0.075	0.031	34.004
	Idaho	Bear Lake	0.034	0.419	0.453	0.863	0.285	0.029	0.313	0.008	0.004	3.666
	Idaho	Blaine	0.069	1.278	1.347	1.878	0.769	0.108	0.877	0.026	0.010	11.198
	Idaho	Caribou	0.027	0.400	0.426	0.679	0.277	0.028	0.305	0.007	0.003	3.644
	Idaho	Cassia	0.100	0.517	0.617	2.961	0.726	0.109	0.835	0.028	0.014	10.573
	Idaho	Jerome	0.134	0.691	0.826	4.006	0.780	0.113	0.893	0.033	0.018	11.077
	Idaho	Lincoln	0.023	0.417	0.440	0.658	0.173	0.028	0.200	0.008	0.003	2.585
	Idaho	Minidoka	0.066	0.479	0.545	1.868	0.647	0.090	0.737	0.021	0.009	9.357
	Idaho	Oneida	0.050	0.153	0.204	1.538	0.218	0.036	0.254	0.012	0.007	3.188
	Idaho	Power	0.059	0.293	0.352	1.742	0.338	0.046	0.384	0.014	0.008	4.752
	Utah	Carbon	0.126	0.133	0.259	2.623	1.179	0.162	1.341	0.031	0.013	15.271
	Utah	Duchesne	0.098	0.086	0.184	2.110	0.883	0.106	0.989	0.020	0.010	11.102
	Utah	Emery	0.143	0.109	0.252	3.616	0.754	0.108	0.861	0.031	0.016	9.939
	Utah	Juab	0.121	0.055	0.175	3.394	0.633	0.126	0.758	0.040	0.016	10.255
	Utah	Millard	0.174	0.095	0.270	4.504	0.906	0.147	1.053	0.046	0.020	13.066
	Utah	Morgan	0.047	0.024	0.070	1.114	0.433	0.054	0.487	0.013	0.005	5.913
	Utah	Rich	0.012	0.010	0.022	0.247	0.132	0.018	0.150	0.005	0.001	1.853
	Utah	Sanpete	0.075	0.073	0.148	1.618	1.046	0.149	1.195	0.024	0.008	13.655
	Utah	Summit	0.279	0.170	0.450	6.841	1.830	0.228	2.058	0.063	0.034	25.829
	Utah	Wasatch	0.100	0.090	0.190	2.241	0.944	0.116	1.060	0.028	0.011	12.116
	Wyoming	Lincoln	0.040	0.000	0.040	2.043	1.493	0.000	1.493	0.086	0.056	19.147
	Wyoming	Sublette	0.021	0.000	0.021	1.101	0.812	0.000	0.812	0.046	0.030	10.420
	Wyoming	Uinta	0.063	0.000	0.063	3.128	1.649	0.000	1.649	0.099	0.080	22.255
		Total	**2.099**	**6.924**	**9.023**	**57.076**	**19.307**	**2.105**	**21.412**	**0.767**	**0.408**	**264.864**
		Logan, UT-ID	0.307	0.650	0.957	5.962	4.382	0.590	4.972	0.113	0.033	55.862
		Provo, UT	1.055	0.708	1.763	22.847	10.614	1.577	12.191	0.381	0.134	163.281
		Salt Lake City, UT	4.117	2.763	6.880	89.580	43.573	7.577	51.151	1.620	0.556	664.100
		Surrounding Areas	2.099	6.924	9.023	57.076	19.307	2.105	21.412	0.767	0.408	264.864
			7.577	11.045	18.623	175.464	77.876	11.849	89.725	2.881	1.131	1,148.107
		Logan, UT-ID	4%	6%	5%	3%	6%	5%	6%	4%	3%	5%
		Provo, UT	14%	6%	9%	13%	14%	13%	14%	13%	12%	14%
		Salt Lake City, UT	54%	25%	37%	51%	56%	64%	57%	56%	49%	58%
		Surrounding Areas	28%	63%	48%	33%	25%	18%	24%	27%	36%	23%
			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

On-Road Mobile Source SIP Inventory – EPA MOVES2010a Overview

The purpose of this document is to explain how EPA MOVES2010a (Motor Vehicle Emission Simulator) released in August 2010 was utilized to design a PM2.5 SIP on-road mobile source SIP inventory for air dispersion modeling. The inventory episodes covered 86 wintertime days in 2007, 2008 and 2009 - 2010 covering 17 counties. Counties that are members of a Metropolitan Planning Organization (MPO) were modeled by their respective MPO. The Utah Division of Air Quality (UDAQ) created inventories for the remaining rural counties.

The modeling goal for this project was to provide a mobile source inventory that approximates transportation conditions based upon best practices in transportation and air quality modeling. Model development relied primarily on interagency consultation procedures to ensure the best mix of local and default MOVES2010a inputs. Model development included discussions on the following topics: MOVES default database scale modifications, GUI selections, County Data Manager input development utilizing local and default data, and output selection for air dispersion modeling. The following agencies provided MOVES modeling development through the interagency consultation procedures.

Cache Metropolitan Planning Organization (CMPO)
EPA Office of Transportation and Air Quality: MOVES Team (OTAQ)
FHWA Resource Center: Air Quality Team (FHWA)
Utah Department of Transportation Systems Planning & Programming: Traffic Analysis
Utah Division of Air Quality (UDAQ)
Utah Division of Motor Vehicles (UDMV)
Mountainland Association of Governments (MAG)
Wasatch Front Regional Council (WFRC)

(1) PM2.5 SIP Modeling Domain Responsibilities

The modeling domain is divided into two groups: counties modeled by a Metropolitan Planning Organization (MPO); and counties modeled by UDAQ Planning Branch (Mobile Sources and Transportation Section):

Agency	Non-Attainment	County(-ies)	Coordinator
CMPO	Logan, UT	Cache	Jeff Gilbert
MAG	Provo, UT	Utah	Susan Hardy
WFRC	Salt Lake City, UT	Box Elder, Davis, Salt Lake, Tooele, Weber	Kip Billings
UDAQ	none	Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit, Wasatch	Rick McKeague Peter Verschoor

(2) PM10 and PM2.5 Fugitive Dust from Paved Roads

PM10 and PM2.5 fugitive dust from paved roads (re-entrained road dust) was modeled by UDAQ for each of the 17 counties and 86 episode days.
The latest EPA-approved version of AP-42, Chapter 13, "Miscellaneous Sources", Section 13.2.1, "Paved Roads" (January 2011), was used to compute the emission factors for PM10 and PM2.5 fugitive dust.

Key inputs to compute the emission factors are:

Average vehicle weight for each data pair (county, road type); units are tons
Silt loading factor for each road type; units are grams per square meter (gm/m2)
Particle size multiplier "k" for PM10 and PM2.5; (unitless)
Precipitation for each data pair (county, episode day); units are number of hours per episode day with precipitation greater than 0.01 inch.

Vehicle miles traveled (VMT) were identical to VMT used in the MOVES model.

(3) <u>VOC Refueling Emissions Included under Total Hydrocarbons</u>

VOC refueling emissions are included under "Total Hydrocarbon" emissions in the base year inventories created from MOVES201A.

In past inventories modeled using MOBILE6.2, VOC refueling emissions were equal to about 6% of VOC exhaust plus evaporative emissions during a typical winter day.

Separate runs using MOVES2010A will be performed to compute VOC refueling emissions. In a post-model adjustment, these emissions will be subtracted from the on-road inventory and will be moved to the Area Source (Non-point) inventory.

Baseline and Projection-Year Inventory Overview

State Implementation Plan (SIP) for $PM_{2.5}$ requires a quantitative demonstration of attainment. This typically involves forecasting $PM_{2.5}$ concentrations using an air quality model, and the basis for these forecasts is an accurate inventory of emissions.

The air quality modeling for the Utah and Utah/Idaho nonattainment areas is done in a relative sense, meaning that for each future projection of $PM_{2.5}$ concentration, the model (CMAQ) is run twice, once using the baseline inventory and then again using a projection-year inventory. Each projection-year inventory is constructed by adjusting the baseline inventory to reflect growth in population, vehicle miles traveled, and industrial activity as well as the benefits of emission controls resulting from the SIP or otherwise. The baseline inventory is therefore essential to this process.

The baseline inventory should correspond to the period with a recently observed design value. In this case, monitored concentrations from 2006 – 2010 will be considered in constructing the monitored design values that are used in conjunction with the modeled concentrations. 2008 falls within this range and also represents a year for which the most recent tri-annual inventory was compiled. Hence, 2008 will represent the baseline period, and all future projections will be based on these values.

The baseline inventory includes estimates of actual emissions for the following criteria pollutants: $PM_{2.5}$, SO_2, NO_x, VOC, CO, and NH_3.

It also includes contribution from a number of sectors. The Utah Division of Air Quality (UDAQ) routinely considers emissions from the following generalized source groupings:

- Large industrial *point sources*;
- *Area sources*, which include smaller, and more numerous, industrial sources as well as activities like space heating that may be well approximated by surrogate indicators such as population;
- *On-road mobile sources;* and
- *Non-road mobile sources.*

Projection year inventories were prepared for 2014, 2017, and 2019. Each of these years has a significance. 2014 represents the calendar year that precedes the earliest attainment date specified by the Clean Air Act (no later than five years from the date such area was designated nonattainment). Similarly, 2019 represents the calendar year preceding the latest attainment date allowed by the Act (for a period no greater than ten years from the date of designation). In such cases where the Administrator has in fact granted an extension of the attainment date for a period of four or five years, there is an additional requirement to demonstrate Reasonable Further Progress at a check-point that would be represented by 2017.

To assist the reader, the baseline and projection-year inventory portion of the TSD is organized using the categorizations discussed above.

A summary table of emissions for each of these time horizons is presented here in the overview. Following that is more in-depth information for point sources, area sources, on-road mobile sources and non-road mobile sources, including summary tables for each.

Summary Emissions Typical Winter Inversion Weekday Emissions (tpd)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
NA -Area	Source Category	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Logan, UT-ID	Area Sources	0.452	1.747	6.116	11.614	0.322	0.409	1.771	4.738	10.032	0.273	0.420	1.735	4.955	10.202	0.277	0.394	1.332	5.026	9.773	0.276
	Mobile Sources	0.455	8.252	6.496	0.133	0.086	0.330	5.418	4.351	0.116	0.037	0.288	4.483	3.670	0.109	0.038	0.266	4.049	3.411	0.107	0.038
	NonRoad	0.109	1.055	1.890	0.000	0.066	0.109	1.008	1.879	0.000	0.050	0.095	1.020	1.530	0.000	0.031	0.085	0.695	1.682	0.000	0.021
	Point Sources	0.002	0.017	0.412	0.000	0.000	0.004	0.040	0.340	0.000	0.000	0.004	0.047	0.392	0.000	0.001	0.005	0.051	0.430	0.000	0.001
	Logan, UT-ID Total	1.0	11.1	14.9	11.7	0.5	0.9	8.2	11.3	10.1	0.4	0.8	7.3	10.5	10.3	0.3	0.8	6.1	10.5	9.9	0.3
Provo, UT	Area Sources	1.429	5.473	12.512	6.495	0.225	1.367	5.753	11.982	6.313	0.192	1.348	5.319	12.708	6.167	0.195	1.161	3.023	13.047	6.082	0.182
	Mobile Sources	1.621	31.822	16.788	0.483	0.344	1.306	22.378	13.024	0.408	0.155	1.135	18.444	10.410	0.397	0.162	1.076	16.870	9.306	0.406	0.167
	NonRoad	0.248	2.760	2.437		0.112	0.246	2.647	2.397		0.082	0.201	2.250	2.090		0.043	0.173	1.676	2.329		0.030
	Point Sources	0.258	0.894	0.605	0.284	0.026	0.558	1.348	0.949	0.528	0.097	0.558	1.440	1.036	0.530	0.098	0.565	1.504	1.097	0.531	0.099
	Provo, UT Total	3.6	40.9	32.3	7.3	0.7	3.5	32.1	28.4	7.2	0.5	3.2	27.5	26.2	7.1	0.5	3.0	23.1	25.8	7.0	0.6
Salt Lake City, UT	Area Sources	4.466	21.649	50.426	17.931	0.770	3.792	22.490	41.308	18.247	0.621	3.816	20.246	42.308	18.568	0.633	3.490	15.826	43.624	18.677	0.606
	Mobile Sources	6.142	119.040	65.575	2.037	1.414	4.611	81.147	47.332	1.612	0.585	4.114	68.024	40.363	1.511	0.587	3.501	56.099	33.381	1.425	0.576
	NonRoad	0.933	14.004	12.795		0.753	0.921	13.641	12.609		0.716	0.802	12.372	11.981		0.389	0.710	10.901	12.824		0.730
	Point Sources	4.674	23.676	7.283	0.637	10.178	5.713	27.448	9.332	0.704	8.597	5.749	27.942	9.817	0.740	8.835	5.389	22.065	9.340	0.760	7.191
	Salt Lake City, UT Total	16.2	178.4	136.1	20.6	13.1	15.0	144.7	110.6	20.6	10.5	14.5	128.6	104.5	20.8	10.4	13.1	104.9	99.2	20.9	9.1
Surrounding Areas	Area Sources	9.463	35.538	50.999	185.356	10.310	9.863	35.500	50.568	184.820	10.291	10.138	34.921	51.140	184.339	10.326	10.385	36.153	51.721	183.848	10.343
	Mobile Sources	2.887	65.508	28.559	0.612	0.419	1.633	37.157	20.630	0.496	0.152	1.404	32.539	18.946	0.476	0.152	1.109	25.563	16.630	0.462	0.153
	NonRoad	2.387	9.125	73.491	0.004	0.257	2.387	9.009	73.477	0.004	0.242	2.215	9.851	64.890	0.004	0.227	2.094	10.011	59.673	0.004	0.225
	Point Sources	7.161	185.795	2.664	2.306	113.149	6.950	157.966	3.021	2.851	106.071	7.090	161.388	3.098	2.894	106.921	7.192	164.331	3.163	2.933	107.722
	Surrounding Areas Total	21.9	296.0	155.7	188.3	124.1	20.8	239.6	147.7	188.2	116.8	20.8	238.7	138.1	187.7	117.6	20.8	236.1	131.2	187.2	118.4
	Grand Total	42.7	526.4	339.0	227.9	138.4	40.2	424.7	297.9	226.1	128.2	39.4	402.0	279.3	225.9	128.9	37.6	370.1	266.7	225.0	128.4

Summary Emissions Typical Winter Inversion Weekday Emissions (tpd)	2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Area Sources	15.809	64.407	120.052	221.396	11.628	15.432	65.514	108.596	219.412	11.378	15.722	62.222	111.111	219.276	11.430	15.430	56.334	113.418	218.380	11.408
Mobile Sources	11.104	224.622	117.419	3.265	2.263	7.880	146.100	85.337	2.633	0.929	6.941	123.489	73.389	2.494	0.939	5.951	102.581	62.728	2.400	0.934
NonRoad	3.676	26.945	90.612	0.004	1.188	3.663	26.304	90.363	0.004	1.089	3.313	25.493	80.492	0.004	0.690	3.063	23.283	76.508	0.004	1.006
Point Sources	12.095	210.381	10.964	3.227	123.353	13.224	186.802	13.642	4.083	114.765	13.401	190.816	14.344	4.164	115.855	13.150	187.951	14.031	4.224	115.013
Grand Total	42.7	526.4	339.0	227.9	138.4	40.2	424.7	297.9	226.1	128.2	39.4	402.0	279.3	225.9	128.9	37.6	370.1	266.7	225.0	128.4

Summary Emissions Typical Winter Inversion Weekday Emissions (tpd)	2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Area Sources	37.04%	12.24%	35.41%	97.15%	8.40%	38.39%	15.43%	36.45%	97.03%	8.88%	39.93%	15.48%	39.78%	97.05%	8.87%	41.04%	15.22%	42.53%	97.05%	8.89%
Mobile Sources	26.01%	42.67%	34.63%	1.43%	1.63%	19.60%	34.40%	28.64%	1.16%	0.72%	17.63%	30.72%	26.27%	1.10%	0.73%	15.83%	27.71%	23.52%	1.07%	0.73%
NonRoad	8.61%	5.12%	26.73%	0.00%	0.86%	9.11%	6.19%	30.33%	0.00%	0.85%	8.41%	6.34%	28.82%	0.00%	0.54%	8.15%	6.29%	28.69%	0.00%	0.78%
Point Sources	28.34%	39.97%	3.23%	1.42%	89.11%	32.90%	43.98%	4.58%	1.81%	89.55%	34.03%	47.46%	5.14%	1.84%	89.87%	34.98%	50.78%	5.26%	1.88%	89.60%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Summary Emissions Typical Winter Inversion Weekday Emissions (tpd)	2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Logan, UT-ID	1.018	11.072	14.913	11.747	0.474	0.852	8.237	11.307	10.149	0.360	0.806	7.284	10.548	10.312	0.346	0.750	6.126	10.549	9.880	0.336
Provo, UT	3.556	40.949	32.342	7.262	0.706	3.477	32.126	28.353	7.249	0.525	3.242	27.453	26.245	7.094	0.498	2.975	23.074	25.780	7.019	0.478
Salt Lake City, UT	16.214	178.368	136.079	20.605	13.115	15.038	144.726	110.581	20.562	10.519	14.483	128.583	104.469	20.818	10.444	13.090	104.890	99.170	20.861	9.103
Surrounding Areas	21.897	295.966	155.713	188.279	124.135	20.833	239.632	147.696	188.172	116.756	20.847	238.699	138.074	187.713	117.627	20.780	236.058	131.187	187.248	118.444
Grand Total	42.7	526.4	339.0	227.9	138.4	40.2	424.7	297.9	226.1	128.2	39.4	402.0	279.3	225.9	128.9	37.6	370.1	266.7	225.0	128.4

Summary Emissions Typical Winter Inversion Weekday Emissions (tpd)	2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Logan, UT-ID	2.4%	2.1%	4.4%	5.2%	0.3%	2.1%	1.9%	3.8%	4.5%	0.3%	2.0%	1.8%	3.8%	4.6%	0.3%	2.0%	1.7%	4.0%	4.4%	0.3%
Provo, UT	8.3%	7.8%	9.5%	3.2%	0.5%	8.7%	7.6%	9.5%	3.2%	0.4%	8.2%	6.8%	9.4%	3.1%	0.4%	7.9%	6.2%	9.7%	3.1%	0.4%
Salt Lake City, UT	38.0%	33.9%	40.1%	9.0%	9.5%	37.4%	34.1%	37.1%	9.1%	8.2%	36.8%	32.0%	37.4%	9.2%	8.1%	34.8%	28.3%	37.2%	9.3%	7.1%
Surrounding Areas	51.3%	56.2%	45.9%	82.6%	89.7%	51.8%	56.4%	49.6%	83.2%	91.1%	52.9%	59.4%	49.4%	83.1%	91.2%	55.3%	63.8%	49.2%	83.2%	92.3%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Baseline $PM_{2.5}$ SIP Point Source Inventory

The $PM_{2.5}$ SIP requires a point source inventory for baseline evaluation. Baseline inventories are used to establish an inventory for the base-year that can be compared to future-year inventories for the purpose of attainment. The baseline inventory selected for this evaluation was the 2008 tri-annual inventory.

As with all inventories collected for this analysis, the pollutants of concern included PM_{10}, $PM_{2.5}$, SO_X, NO_X, VOC, CO, and NH_3 and the unit of measurement was tons per year (tpy).

Source Selection:

Industrial point sources are one of the fundamental pieces of this inventory. As of the outset of this project the 2008 tri-annual inventory was the latest and most current inventory available for point sources. This included all major sources, Title V sources, and any sources included in the PM_{10} or ozone maintenance plans.

For the SIP base-year inventory, UDAQ and IDEQ used the definition of a major source under Title V of the Clean Air Act (as specified in 40 CFR 51.20) to define the thresholds for reporting actual emissions. These thresholds are the potential to emit annual emissions of 100 tons for all relevant criteria air pollutants except CO, for which it is 1000 tons. The 2008 periodic, three-year inventory was used to make this assessment. Emissions from sources under the above thresholds will be included in the area source base-year inventory.

It was determined that according to the above definition, 56 major sources were contained within the prescribed modeling domain, with an additional seven major sources in the Idaho portion of the domain. The table in Section 3.b.i.A of this TSD lists the 56 major sources in Utah along with their annual emissions for PM_{10}, $PM_{2.5}$, SO_X, NO_X, VOC, CO and NH_3. It should be noted that Proctor & Gamble (Paper Manufacturing Facility) had not yet completed construction of their facility and therefore had no emissions for 2008.

Data Collection and QA/QC

The 2008 point source inventory data was collected in electronic and hard copy form during the spring of 2009. Data collected electronically was uploaded via an electronic upload program into the UDAQ TEMPO database. Summary data for hard copy inventories were entered by hand into the database by UDAQ inventory staff.

UDAQ has constructed Microsoft Excel inventory workbooks for most of the larger point sources. These workbooks provide a better interface with sources, a more thorough

quality assurance/quality control (QA/QC), and allow for seamless upload to our database. Construction of these workbooks required a very careful evaluation of the emissions calculations and their representativeness of each particular facility. After receiving completed workbooks from the sources they were individually inspected and updated to reflect any necessary changes requested by the sources before being uploaded into the database. UDAQ utilized inventory workbooks for 53 of the 56 major point sources contained in the prescribed modeling domain to collect the 2008 annual emissions inventory. The only exceptions were Geneva Rock Products (Point of the Mountain Facility), Hill Air Force Base (Main Base), and Proctor & Gamble (Paper Manufacturing Facility). Workbooks have not been completed for Geneva Rock Products (Point of the Mountain Facility) and Hill Air Force Base (Main Base). Proctor & Gamble (Paper Manufacturing Facility) had not yet begun operations at their site and therefore had not yet submitted an annual emissions inventory. These 53 inventory workbooks encompass approximately 99% of the total calculations for Utah's 2008 major point source SIP emissions inventory thereby greatly surpassing EPA guidance requiring 10% QA/QC as the minimum criteria necessary for a SIP inventory QA/QC check. Electronic versions of the 53 major point source emissions inventory workbooks along with hard copy submittals from Geneva Rock Products (Point of the Mountain Facility), and Hill Air Force Base (Main Base) are maintained at UDAQ and are available for inspection upon request.

Idaho 2008 point source data was gathered between January and April of 2009. It was collected through direct survey using a Web application called the Point Source Survey Tool (POSST) to meet all Air Emissions Reporting Requirements (40 CFR Part 51). The data was quality assured in part by POSST as data entry took place and the remainder manually so that 100% of the data fields were reviewed and corrected as necessary. Idaho DEQ provided the data to UDAQ for joint modeling in Excel tables.

Condensable Particulate Emissions:

Condensable particulate matter (PM) is material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM after discharge from the stack. Note that all condensable PM, if present, is typically in the $PM_{2.5}$ size fraction; therefore, all of it is a component of both primary $PM_{2.5}$ and primary PM_{10}.

It was determined that condensable emissions were often not included in the inventories submitted by the sources in 2008. In discussions with EPA it was determined that condensable emissions for sources in the non-attainment areas should be included in the baseline inventory. DAQ staff then went through each of the 2008 emissions inventories received from the sources in the non-attainment areas and included condensable emissions where appropriate. This involved identifying sources of condensable emissions, obtaining emission factors, and performing calculations. Appropriate data and emission factors were obtained from AP-42 and existing stack test data. Condensable emissions data was also obtained from the sources 2011 emissions inventories since the

sources were required to include condensable emissions data in their 2011 annual emissions inventory submittals. Calculations along with all pertinent data were included in the workbook for each source. Worksheets to calculate condensable emissions were developed for sources that submitted a hard copy inventory. Electronic versions of the emissions inventory workbooks for the major point sources in the non-attainment areas along with hard copy submittals and condensable emissions calculation worksheets for Geneva Rock Products (Point of the Mountain Facility), and Hill Air Force Base (Main Base) are maintained at UDAQ and are available for inspection upon request.

The SMOKE Emissions Model and Processor

The emissions processing model takes the annual, county wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory that, in the end, produces a refined version of the inventory. These include temporal processing, spatial processing, and speciation. Temporal processing converts emissions from annual to daily and hourly values. Spatial processing locates emissions from the county to specific grid cells within the modeling domain. Speciation breaks PM_{10} and VOC emissions into their component subspecies.

The emissions processing for air quality modeling is done with sets of activity profiles based on various Source Classification Codes (SCCs) and associated cross reference files developed using source-provided temporal data. This feature essentially establishes the level of detail required of the point source inventories, wherein each "source component" has with it an associated SCC. These SCCs and the cross reference files are created for area sources and mobile sources, too.

Once developed, these activity profiles serve to establish the temporal allocation of emissions within the model (e.g. eight-hour workdays), and also determine the speciation of $PM_{2.5}$ and VOC emissions.

In the case of spatial processing, the emissions from large industrial sources are placed in the location of the source itself. As with area and mobile sources, the emissions from the smaller point sources are spatially distributed using various surrogates like population density.

Table 1. 56 Major Point Sources with 2008 Actual Annual Emissions (Condensables Included)

Modeling Area	Count	Company Name	Site ID	Site Name	2008 Actual Inventory Emissions							
					PM_{10}	$PM_{2.5}$	SO_X	NO_X	VOC	CO	NH_3	TOTAL
Cache Non-Attainment Area	1	Pepperidge Farm Incorporated	11841	Commercial Bakery	0.59	0.50	0.04	5.33	150.20	4.40	0.03	161.09
				Subtotal:	**0.59**	**0.50**	**0.04**	**5.33**	**150.20**	**4.40**	**0.03**	**161.09**
Provo Non-Attainment Area	2	Brigham Young University	10790	Main Campus	10.95	9.48	122.32	163.00	6.49	47.13	0.34	359.71
	3	Geneva Nitrogen LLC	10825	Geneva Nitrogen Plant	38.92	18.71	0.01	111.93	0.09	1.33	2.70	173.68
	4	Pacific States Cast Iron Pipe Company	10794	Pipe Casting Plant	8.79	5.62	2.15	69.76	194.88	39.63	0.74	321.56
	5	PacifiCorp	13031	Lakeside Power Plant	65.88	59.48	5.81	87.13	20.07	92.21	87.92	418.49
	6	Payson City Corporation	10823	Payson City Power	0.10	0.10	0.08	4.01	2.15	2.33	0.00	8.78
	7	Provo City Power	10795	Power Plant	0.25	0.25	0.01	20.03	2.39	13.58	0.00	36.52
	8	Springville City Corporation	10819	Whitehead Power Plant	0.07	0.07	0.00	0.05	0.14	0.04	0.00	0.38
				Subtotal:	**124.96**	**93.72**	**130.38**	**455.90**	**226.20**	**196.25**	**91.70**	**1319.12**
Salt Lake Non-Attainment Area	9	ATK Launch Systems Incorporated	10009	Promontory Plant	389.83	178.02	11.59	197.25	47.87	114.78	0.63	939.96
	10	Bountiful City Light and Power	10120	Power Plant	10.24	10.24	0.75	19.02	3.61	8.55	0.00	52.41
	11	Central Valley Water Reclamation Fac.	10414	Wastewater Treatment Plant	1.05	0.92	1.03	13.98	29.82	26.96	0.02	73.78
	12	CER Generation II LLC	12495	West Valley Power Plant	15.12	15.12	2.36	37.99	4.81	30.80	0.00	106.22
	13	Chemical Lime Company	10707	Grantsville Plant	131.73	84.55	14.19	111.74	11.68	132.73	0.97	487.58
	14	Chevron Products Co - SL Refinery	10119	Salt Lake Refinery	170.52	156.69	591.85	946.03	221.32	292.22	8.05	2386.67
	15	Flying J Incorporated	10122	Flying J Refinery (Big West Oil Co.)	61.81	60.04	377.39	228.48	462.02	169.53	110.97	1470.24
	16	Geneva Rock Products	10565	Point of the Mountain Facility	82.81	26.02	14.13	102.11	18.61	58.25	0.00	301.93
	17	Great Salt Lake Minerals Corporation	10917	Production Plant	205.44	38.58	6.25	84.10	7.72	50.64	0.75	393.47
	18	Hexcel Corporation	11386	Salt Lake Operations	36.99	20.17	10.51	102.47	69.91	38.87	32.12	311.04
	19	Hill Air Force Base	10121	Main Base	22.69	9.23	2.08	134.73	215.96	115.89	1.43	502.01
	20	Holly Refining & Marketing Company	10123	Phillips Refinery	53.32	50.65	452.99	293.20	227.39	340.85	19.69	1438.08
	21	Interstate Brick Company	10423	Brick Manufacturing Plant	69.52	49.78	10.72	33.52	3.03	68.55	0.00	235.11
	22	Kennecott Utah Copper Corporation	10571	Mine & Copperton Concentrator	1028.90	247.22	3.00	3198.58	190.14	847.65	1.33	5516.81
	23	Kennecott Utah Copper Corporation	10572	Power Plant/ Lab/ Tailings Impoundment	234.91	102.42	3144.80	2521.30	13.20	121.41	0.39	6138.43
	24	Kennecott Utah Copper Corporation	10346	Smelter & Refinery	233.45	197.92	970.08	154.25	8.66	109.76	4.94	1679.05
	25	Murray City Power Department	10348	Electrical Generation Plant	0.92	0.92	0.05	7.19	0.30	11.40	0.00	20.78
	26	Nucor Steel	10008	Nucor Steel	87.81	60.97	44.95	188.58	76.14	739.81	2.23	1200.48
	27	Olympia Sales Company	10562	Cabinet Manufacturing Facility	7.66	4.28	0.00	0.32	20.88	0.27	0.00	33.40
	28	PacifiCorp	10355	Gadsby Power Plant	30.89	21.61	1.95	184.66	11.72	130.02	18.12	398.97
	29	PacifiCorp	10973	Little Mountain Power Plant	7.10	7.10	3.62	340.70	2.30	87.97	0.00	448.79
	30	* Procter & Gamble	14107	Paper Manufacturing Facility	---	---	---	---	---	---	---	---
	31	Silver Eagle Refining - Woods Cross Inc.	10124	Petroleum Products Refining	4.26	4.08	0.96	89.05	130.80	44.16	4.54	277.85
	32	Tesoro West Coast	10335	Salt Lake City Refinery	282.84	240.72	931.90	388.01	274.28	281.17	3.75	2402.65
	33	University of Utah	10354	University of Utah facilities	6.30	6.00	0.73	76.76	5.60	66.99	2.17	164.55
	34	Utility Trailer Manufacturing Company	10156	Trailer Manufacturing Facility	0.51	0.51	0.20	30.52	55.78	6.79	0.00	94.31
	35	Vulcraft - Division of Nucor Corporation	10028	Steel Products Manufacturing	22.91	4.26	0.39	5.71	39.32	10.81	0.03	83.43
	36	Wasatch Integrated Waste Mgt District	10129	DCERF	17.09	5.83	86.75	270.35	11.77	56.20	11.41	459.41
				Subtotal:	**3216.60**	**1603.83**	**6685.22**	**9760.59**	**2164.63**	**3963.01**	**223.54**	**27617.42**
Surrounding Area	37	Ash Grove Cement Company	10303	Leamington Cement Plant	113.10	99.17	2.02	1978.99	52.46	2990.32	4.19	5240.25
	38	Brush Resources Incorporated	10311	Delta Mill	19.56	4.02	0.32	12.38	97.89	8.56	102.39	245.11
	39	Clean Harbors Aragonite LLC	10725	Hazardous Waste Storage/Incineration	4.68	2.75	32.52	130.55	5.77	39.08	0.01	215.36
	40	Clean Harbors Grassy Mountain LLC	10720	Grassy Mountain Landfill Facility	10.14	2.03	0.58	7.99	2.03	25.36	0.00	48.13
	41	Deseret Chemical Depot	11339	Deseret Chemical Depot (South Area)	3.60	3.10	5.78	67.54	6.21	13.08	0.03	99.34
	42	Dugway Proving Ground	10706	U.S. Army-Dugway Proving Ground	201.47	40.03	22.85	43.42	22.94	17.89	0.32	348.91
	43	El Paso Field Operations Company	10211	Altamont South Compressor Station	2.52	2.52	0.07	455.26	93.89	50.91	0.01	605.17
	44	El Paso Field Operations Company	10210	Altamont West Compressor Station	0.06	0.06	0.00	23.67	66.64	1.01	0.00	91.44
	45	Heber Light and Power Company	10884	Power Plant	0.39	0.39	0.05	36.62	3.16	27.45	0.00	68.05
	46	Hill Air Force Base	11284	Utah Test and Training Range	46.35	23.62	0.01	11.13	4.34	50.35	1.66	137.45
	47	Holcim (US) Inc.	10007	Devil's Slide Plant	171.66	28.26	241.61	1056.08	43.00	909.90	3.42	2453.93

	48	Intermountain Power Service Corporation	10327	Intermountain Generation Station	565.35	152.91	5694.17	26331.71	15.14	1534.16	1.87	34295.32
	49	Mountain Gas Resources Incorporated	10680	Yellow Creek Gas Plant	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.47
	50	PacifiCorp	10081	Carbon Power Plant	271.69	98.76	5057.47	3308.24	17.75	148.21	0.22	8902.33
	51	PacifiCorp	12524	Currant Creek Power Plant	76.34	76.34	5.72	181.48	20.25	92.07	87.65	539.84
	52	PacifiCorp	10238	Huntington Power Plant	1076.36	399.56	3365.97	10147.61	91.63	765.52	0.98	15847.64
	53	Questar Pipeline Company	12103	Oak Spring Turbine Compressor Station	5.51	5.51	0.18	33.04	0.91	22.09	0.00	67.23
	54	US Magnesium LLC	10716	Rowley Plant	347.41	226.35	25.47	1079.30	416.50	320.39	2.29	2417.71
	55	Utelite Corporation	10676	Shale Processing	29.95	11.15	136.39	207.79	4.79	16.49	0.03	406.58
	56	Whiting Oil and Gas Corporation	10679	Bridger Lake Compressor Station	1.97	1.97	0.06	127.66	6.36	194.59	0.39	332.99
				Subtotal:	**2948.09**	**1178.49**	**14591.25**	**45240.43**	**972.14**	**7227.42**	**205.44**	**72363.25**

* Proctor & Gamble (Paper Manufacturing Facility) had not yet not begun operations in 2008 and therefore did not submit an actual emissions inventory.

Projection $PM_{2.5}$ SIP Point Source Inventory

The $PM_{2.5}$ SIP requires a point source inventory for projections. Projection or future-year inventories are compared to the baseline inventory to verify attainment of the air quality standard. The modeling analysis that supports this SIP evaluated three projection-year inventories. The years selected included 2014, 2017, and 2019. For further information on how the specific years were determined, refer to Section 3.a.i of this Technical Support Document (TSD).

The pollutants of concern for this analysis included PM_{10}, $PM_{2.5}$, SO_X, NO_X, VOC, CO, and NH_3 and the unit of measurement was tons per year (tpy).

Source Selection:

Industrial point sources are one of the fundamental pieces to this inventory. As of the outset of this project the 2008 tri-annual inventory was the latest and most current inventory available for point sources. This included all major sources, Title V sources, and any sources included in the PM_{10} or ozone maintenance plans.

For the SIP base-year inventory, UDAQ and IDEQ used the definition of a major source under Title V of the Clean Air Act (as specified in 40 CFR 51.20) to define the thresholds for reporting actual emissions. These thresholds are the potential to emit (PTE) annual emissions of 100 tons for all relevant criteria air pollutants except CO, for which it is 1000 tons. The 2008 periodic, tri-annual inventory was used to make this assessment. Emissions from sources under the above thresholds will be included in the area source base-year inventory.

It was determined that according to the above definition that as of 2008, 56 major sources were contained within the prescribed modeling domain, with an additional 7 major sources in the Idaho portion of the domain. Between 2008 and 2014 however, four of the 56 major sites were either designated as minor sources or ceased operations. These sites included Questar Pipeline Company: Oak Spring Turbine Compressor Station, Mountain Gas Resources Incorporated: Yellow Creek Gas Plant, and Whiting Oil and Gas Corporation: Bridger Lake Compressor Station which were all designated as minor sources, along with PacifiCorp: Little Mountain Power Plant which ceased operations. The remaining 52 sites were then projected to the future years of 2014, 2017, and 2019.

Table 1 lists the 52 major sources in Utah along with their annual emissions for PM_{10}, $PM_{2.5}$, SO_X, NO_X, VOC, CO and NH_3. It should be noted that Proctor & Gamble (Paper Manufacturing Facility) had not yet completed construction of their facility and therefore had no emissions for 2008. It was determined that 90% of the PTE emissions for Proctor & Gamble (Paper Manufacturing Facility) would be used for projecting to future years. Therefore the emissions listed in Table 1 for Proctor & Gamble (Paper Manufacturing Facility) are 90% of their PTE emissions.

Reasonably Available Control Technology (RACT) Adjustments:

In order to meet national requirements, RACT was applied to each of the sources in the non-attainment areas. Once RACT was applied, the 2008 actual emissions inventory was adjusted for each of the sources accordingly. The RACT adjusted inventory for each source was then used for projecting to future years. For further information on how RACT was applied to each individual source, refer to Section 5 of this TSD.

Projections:

As indicated above, the projection years of 2014, 2017 and 2019 were used in the $PM_{2.5}$ modeling analysis. It was determined that data from the Regional Economic Models, Inc. (REMI) would be used to project the RACT adjusted 2008 actual point source emissions to future years. Since REMI data did not exist for military installations it was determined that data from the Bureau of Economic Analysis (BEA) along with data from the Governors Office of Planning and Budget (GOPB) would be used for projecting emissions at military bases. Sources were also contacted to determine if site specific growth data would be more valid than the REMI and BEA & GOPB data when projecting to future years. Table 2 lists the sources that requested the use of site specific growth along with the reported factors and data for each. The data from the REMI model, BEA & GOPB, and site specific growth along with a description of how the projection data for military installations was developed may be found in Appendix 1.

A representative inventory was developed for each period by projecting the RACT adjusted 2008 actual inventory forward to 2014, 2017 and 2019 using economic data from REMI, BEA & GOPB, and site specific growth. Exceptions included two groups of sources that were held constant through the projection years and not grown using projection data. These groups included refineries in the modeling domain and utilities in the non-attainment areas and are discussed below.

Refineries

It was determined that emissions for refineries in the modeling domain would be held constant and not grown using projection data. Reasons for this included the fact that two refineries had each just submitted a notice of intent (NOI) that included projected actual emissions. In addition a third refinery had recently submitted an NOI and been issued an approval order (AO) that included projected actual emissions. Because these three refineries represent the majority of the refinery-related emissions in the modeling domain, and in order to prevent those three refineries from violating the premise of their NOI's, all refineries as a group were kept at zero percent projected growth.

Utilities

It was discovered that the REMI data for utilities in the non-attainment areas generally showed negative growth which would cause decreased emissions in the projection years. It was therefore determined that in order to be conservative the emissions for utilities in the non-attainment areas would be held constant for the projection years.

The 52 major sources in Utah along with their emissions of PM_{10}, $PM_{2.5}$, SO_X, NO_X, VOC, CO and NH_3 for the projection years of 2014, 2017, and 2019 are listed in Tables 3, 4, and 5 respectively.

The RACT adjusted 2008 inventory along with the projection-year inventories for 2014, 2017, and 2019 were reported and compiled in terms of tons per year (tpy). Since the $PM_{2.5}$ SIP is designed to protect the 24-hour standard, the model (CMAQ) evaluates emissions on an hourly basis. It uses a pre-processor called SMOKE in order to convert the annual inventory to a 24-hour basis (explained in further detail below).

Because the model is evaluating the buildup of $PM_{2.5}$ concentrations over the span of multi-day episodes, an (annual) inventory worksheet was developed for each episode day. The entry for each of these days will generally be the same, although there are exceptions (see below.) This stands in contrast to the mobile source portion of the inventory wherein differences between weekdays and weekends (among other factors) will result in daily variations.

Major sources located in the Idaho portion of the modeling domain do not fall directly within the Logan UT/ID $PM_{2.5}$ nonattainment area boundaries. These facilities were "maxed-out" to their permitted limits to the Source Classification Code level for the projection years.

Data Collection and QA/QC

The 2008 point source inventory data was collected in electronic and hard copy form during the spring of 2009. Data collected electronically was uploaded via an electronic upload program into the UDAQ TEMPO database. Summary data for hard copy inventories were entered by hand into the database by UDAQ inventory staff.

UDAQ has constructed Microsoft Excel inventory workbooks for most of the larger point sources. These workbooks provide a better interface with sources, a more thorough quality assurance/quality control (QA/QC), and allow for seamless upload to our database. Construction of these workbooks required a very careful evaluation of the emissions calculations and their representativeness of each particular facility. After receiving completed workbooks from the sources they were individually inspected and updated to reflect any necessary changes requested by the sources before being uploaded into the database. UDAQ utilized inventory workbooks for 49 of the 52 major point sources contained in the prescribed modeling domain to collect the 2008 annual emissions inventory. The only exceptions were Geneva Rock Products (Point of the Mountain Facility), Hill Air Force Base (Main Base), and Proctor & Gamble (Paper

Manufacturing Facility). Workbooks have not been completed for Geneva Rock Products (Point of the Mountain Facility) and Hill Air Force Base (Main Base). Proctor & Gamble (Paper Manufacturing Facility) had not yet begun operations at their site and therefore had not yet submitted an annual emissions inventory for 2008. In order to project emissions for Proctor & Gamble (Paper Manufacturing Facility) it was determined that 90% of their PTE emissions would be calculated and projected from 2008 to the future years. It was estimated that these 49 inventory workbooks encompass approximately 98% of the total calculations for Utah's 2008 major point source SIP emissions inventory thereby greatly surpassing EPA guidance requiring 10% QA/QC as the minimum criteria necessary for a SIP inventory QA/QC check. Electronic versions of the 49 major point source emissions inventory workbooks along with hard copy submittals from Geneva Rock Products (Point of the Mountain Facility), and Hill Air Force Base (Main Base) are maintained at UDAQ and are available for inspection upon request.

Idaho 2008 point source data was gathered between January and April of 2009. It was collected through direct survey using a Web application called the Point Source Survey Tool (POSST) to meet all Air Emissions Reporting Requirements (40 CFR Part 51). The data was quality assured in part by POSST as data entry took place and the remainder manually so that 100% of the data fields were reviewed and corrected as necessary. Idaho DEQ provided the data to UDAQ for joint modeling in Excel tables.

Condensable Particulate Emissions:

Condensable particulate matter (PM) is material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM after discharge from the stack. Note that all condensable PM, if present is typically in the $PM_{2.5}$ size fraction, and therefore all of it is a component of both primary $PM_{2.5}$ and primary PM_{10}.

It was determined that condensable emissions were often not included in the inventories submitted by the sources in 2008. In discussions with EPA it was determined that condensable emissions for sources in the non-attainment areas should be included in the projection inventories. DAQ staff then went through each of the 2008 emissions inventories received from the sources in the non-attainment areas and included condensable emissions where appropriate. This involved identifying sources of condensable emissions, obtaining emission factors, and performing calculations. Appropriate data and emission factors were obtained from AP-42 and existing stack test data. Condensable emissions data was also obtained from the sources' 2011 emissions inventories since the sources were required to include condensable emissions data in their 2011 annual emissions inventory submittals. Calculations along with all pertinent data were included in the workbook for each source. Worksheets to calculate condensable emissions were developed for sources that submitted a hard copy inventory. Electronic versions of the inventory workbooks for the major point sources in the non-attainment areas are maintained at UDAQ and are available for inspection upon request.

Condensable emissions worksheets for Proctor & Gamble (Paper Manufacturing Facility) along with hard copy submittals and condensable emissions worksheets for Geneva Rock Products (Point of the Mountain Facility), and Hill Air Force Base (Main Base) are maintained at UDAQ and are also available for inspection upon request.

The SMOKE Emissions Model and Processor

The emissions processing model takes the annual, county-wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory that, in the end, produce a refined version of the inventory. These include temporal processing, spatial processing, and speciation. Temporal processing converts emissions from annual to daily and hourly values. Spatial processing locates emissions from the county to specific grid cells within the modeling domain. Speciation breaks PM_{10} and VOC emissions into their component subspecies.

The emissions processing for air quality modeling is done with sets of activity profiles based on various Source Classification Codes (SCCs) and associated cross reference files developed using source provided temporal data. This feature essentially establishes the level of detail required of the point source inventories, wherein each "source component" has with it an associated SCC. These SCCs and the cross reference files are created for area sources and mobile sources too.

Once developed, these activity profiles serve to establish the temporal allocation of emissions within the model (e.g. eight-hour workdays), and also determine the speciation of $PM_{2.5}$ and VOC emissions.

In the case of spatial processing, the emissions from large industrial sources are placed in the location of the source itself. As with area and mobile sources, the emissions from the smaller point sources are spatially distributed using various surrogates like population density.

Development of Projection Data for Military Installations

Since REMI data did not exist for military installations it was necessary to use projection data from another source. In order to determine the best data to be used when projecting the 2008 actual annual point source emissions, a phone call was placed to the Utah Governor's Office of Planning and Budget (GOPB). In a phone conversation with Peter Donner of the GOPB on 4/27/2011, he indicated that current employment data from the Bureau of Economic Analysis (BEA) was considered to be better than current GOPB employment data. The reason for this is that the BEA has taken into account the economic downturn that occurred in late 2008 while the current GOPB employment data had not yet been revised to take this into account. As of 4/27/2011 the BEA employment data included years up to and through 2009. However, data for 2014, 2017 and 2019 was also necessary for performing projections. Peter Donner indicated that GOPB still considered the GOPB projection data from 2020 forward to be good data. Therefore it was determined that DAQ would use BEA employment data up to 2009 and then GOPB employment data from 2020 forward. In order to develop data for the years between 2009 and 2020 it was agreed that a straight line analysis would be the best method. Therefore, data for the years between 2009 and 2020 were determined by performing a straight line analysis between the two sets of data.

Area Source Baseline and Projection Inventories

This section of the Technical Support Documentation (TSD) gives information describing how the Area Baseline and Projection Inventories are developed.

The **base-year inventory** is the primary inventory from which other inventories are derived. Thus, all inventories are consistent with data provided in the base-year inventory. The Clean Air Act requires state agencies to ensure that the base-year inventory is comprehensive, accurate, and current for all actual emissions. The inventory includes emissions estimates from stationary point and area sources, on-road mobile sources, and non-road mobile sources.

Every three years, state agencies are required to develop periodic inventories called the **triennial cycle inventories** based on actual emissions. State and local agencies have the option to report smaller point sources every three years. This option is not available for reporting emissions for a designated base-year inventory.

The year 2008 was selected as the base-year for this SIP. The 2008 base-year harmonizes dates for the reporting requirements of the National Emissions Inventory that requires agencies to submit emission inventories for all criteria pollutants and their precursors every three years, on a schedule that includes the emission year 2008.

A 2008 emissions inventory for the Idaho counties in the modeling domain is provided by IDEQ (Idaho Department of Environmental Quality). For future-year projections, the inventory is generally held "flat," assuming no growth. There are two exceptions: mobile on-road is modeled in MOVES for 2014 and 2019 by IDEQ and baseline livestock inventories in Franklin County, Idaho are projected to 2014 and 2019 using growth factors provided by IDEQ. An email and spreadsheets explaining IDEQ's projection methods are found in Sections 3.c.iv.C of the TSD.

Adjustments were made to the 2008 Consolidated Emissions Reporting Rule (CERR) required inventory by adjusting the point source data that was subtracted out of the area source inventory to prevent double counting. The VMTs and temperature data were adjusted to simulate a normal year.
See section 2.c.iv.B of the TSD for an explanation of which area source categories were affected by the changes to the 2008 baseline inventory.

The **projection-year inventories** project future air pollution emissions. The goal in developing emission projections is to attempt to account for as many of the important variables that affect future year emissions as possible. Emission projections provide a basis for developing control strategies and conducting attainment analyses for this SIP and tracking progress towards meeting air quality standards.

Emission projections are a function of change in activity (growth or decline) combined with changes in the emission rate or controls applicable to the source. To a large extent, projection inventories are based on forecasts of industrial growth, population growth,

changes in land use patterns, and transportation growth. Sources for the rates of growth used include the State of Utah Governor's Office of Planning and Budget, U.S. Census Bureau, and Bureau of Economic Analysis, among others. Interpolation was used where projected annual population data or employment data where not available for each future year.

Sources for activity data projection are listed in Section 3.c.iv.B of the TSD.

Area Sources Emissions Typical Winter Inversion Weekday Emissions (tpd)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
NA -Area	Sector	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Logan, UT-ID	Agriculture - Crops & Livestock Dust	0.008					0.008					0.008					0.008				
	Agriculture - Livestock Waste	0.012		1.616	11.342		0.010		1.348	9.730		0.010		1.386	9.891		0.011		1.375	9.452	
	Bulk Gasoline Terminals			0.123					0.043					0.048					0.044		
	Commercial Cooking	0.137		0.020			0.148		0.020			0.159		0.022			0.166		0.023		
	Dust - Construction Dust	0.040					0.038					0.040					0.041				
	Fuel Comb - Comm/Institutional - Biomass	0.000	0.000				0.000	0.000				0.000	0.000				0.000	0.000			
	Fuel Comb - Comm/Institutional - Coal	0.000	0.002	0.000	0.000	0.011	0.001	0.003	0.000	0.000	0.013	0.001	0.003	0.000	0.000	0.013	0.001	0.003	0.000	0.000	0.013
	Fuel Comb - Comm/Institutional - Natural Gas	0.047	0.655	0.034	0.003	0.004	0.051	0.707	0.037	0.003	0.004	0.050	0.700	0.036	0.003	0.004	0.018	0.267	0.013	0.001	0.001
	Fuel Comb - Comm/Institutional - Oil	0.004	0.064	0.001	0.001	0.091	0.003	0.034	0.001	0.001	0.064	0.003	0.035	0.001	0.001	0.066	0.003	0.036	0.001	0.001	0.068
	Fuel Comb - Comm/Institutional - Other	0.002	0.031	0.002	0.000	0.000	0.002	0.028	0.001	0.000	0.000	0.002	0.029	0.002	0.000	0.000	0.002	0.029	0.002	0.000	0.000
	uel Comb - Industrial Boilers, ICEs - Natural Gas	0.001	0.045	0.001	0.001	0.000	0.001	0.045	0.001	0.001	0.000	0.001	0.045	0.001	0.001	0.000	0.001	0.045	0.001	0.001	0.000
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.005	0.040	0.000	0.001	0.122	0.005	0.040	0.000	0.001	0.122	0.005	0.040	0.000	0.001	0.122	0.005	0.040	0.000	0.001	0.122
	Fuel Comb - Industrial Boilers, ICEs - Other	0.000	0.002			0.000	0.000	0.002			0.000	0.000	0.002			0.000	0.000	0.002			0.000
	Fuel Comb - Residential - Natural Gas	0.002	0.438	0.026	0.093	0.003	0.002	0.460	0.027	0.098	0.003	0.002	0.438	0.026	0.093	0.003	0.002	0.451	0.026	0.096	0.003
	Fuel Comb - Residential - Oil	0.003	0.032	0.001	0.002	0.083	0.002	0.022	0.001	0.001	0.058	0.002	0.023	0.001	0.001	0.059	0.003	0.023	0.001	0.001	0.060
	Fuel Comb - Residential - Other	0.001	0.042	0.002	0.000	0.001	0.001	0.039	0.001	0.000	0.001	0.001	0.039	0.001	0.000	0.001	0.001	0.039	0.001	0.000	0.001
	Fuel Comb - Residential - Wood	0.148	0.014	0.227	0.000	0.003	0.107	0.010	0.152	0.000	0.002	0.109	0.010	0.155	0.000	0.002	0.110	0.010	0.156	0.000	0.002
	Gas Stations			0.623					0.088					0.096					0.090		
	Industrial Processes - Chemical Manuf				0.007					0.007					0.007					0.007	
	Industrial Processes - NEC	0.022		0.054	0.001		0.010		0.062	0.001		0.006		0.067	0.001		0.003		0.070	0.001	
	Miscellaneous Non-Industrial NEC	0.001	0.001	0.009	0.088	0.000	0.001	0.002	0.010	0.103	0.000	0.001	0.002	0.010	0.110	0.000	0.001	0.002	0.011	0.115	0.000
	Mobile - Locomotives	0.011	0.379	0.020	0.000	0.006	0.011	0.379	0.020	0.000	0.006	0.010	0.368	0.019	0.000	0.006	0.011	0.385	0.021	0.000	0.006
	Solvent - Consumer & Commercial Solvent Use			1.091	0.008				1.246	0.009				1.327	0.010				1.381	0.010	
	Solvent - Degreasing			0.417					0.138					0.136					0.139		
	Solvent - Dry Cleaning			0.048					0.048					0.048					0.048		
	Solvent - Graphic Arts			0.241	0.000				0.114	0.000				0.114	0.000				0.114	0.000	
	olvent - Industrial Surface Coating & Solvent Use			1.021					0.792					0.833					0.861		
	Solvent - Non-Industrial Surface Coating			0.456	0.000				0.526	0.000				0.562	0.000				0.586	0.000	
	Waste Disposal	0.008		0.084	0.065		0.009		0.060	0.076		0.010		0.063	0.081		0.011		0.064	0.085	
	Logan, UT-ID Total	0.5	1.7	6.1	11.6	0.3	0.4	1.8	4.7	10.0	0.3	0.4	1.7	5.0	10.2	0.3	0.4	1.3	5.0	9.8	0.3
Provo, UT	Agriculture - Livestock Waste	0.015		1.259	5.334		0.013		1.144	4.980		0.012		1.085	4.776		0.012		1.043	4.633	
	Bulk Gasoline Terminals			0.177					0.201					0.208					0.194		
	Commercial Cooking	0.636		0.093			0.705		0.097			0.762		0.104			0.800		0.110		
	Dust - Construction Dust	0.220					0.188					0.203					0.213				
	Fuel Comb - Comm/Institutional - Coal	0.001	0.007	0.000	0.000	0.019	0.003	0.015	0.000	0.000	0.041	0.003	0.015	0.000	0.000	0.041	0.003	0.015	0.000	0.000	0.041
	Fuel Comb - Comm/Institutional - Natural Gas	0.193	2.534	0.139	0.012	0.015	0.213	2.808	0.154	0.014	0.017	0.195	2.568	0.141	0.013	0.015					
	Fuel Comb - Comm/Institutional - Oil	0.004	0.066	0.001	0.001	0.081	0.003	0.032	0.001	0.001	0.052	0.003	0.033	0.001	0.001	0.054	0.003	0.034	0.001	0.001	0.055
	Fuel Comb - Comm/Institutional - Other	0.004	0.055	0.003	0.000	0.000	0.004	0.049	0.003	0.000	0.000	0.004	0.051	0.003	0.000	0.000	0.004	0.051	0.003	0.000	0.000
	Fuel Comb - Residential - Natural Gas	0.007	1.605	0.094	0.341	0.010	0.008	1.674	0.098	0.356	0.011	0.007	1.587	0.093	0.338	0.010	0.008	1.678	0.098	0.357	0.011
	Fuel Comb - Residential - Oil	0.003	0.032	0.001	0.002	0.077	0.002	0.021	0.001	0.001	0.050	0.002	0.021	0.001	0.001	0.051	0.002	0.022	0.001	0.001	0.052
	Fuel Comb - Residential - Other	0.000	0.063	0.003	0.000	0.001	0.001	0.056	0.003	0.000	0.003	0.001	0.057	0.003	0.000	0.003	0.001	0.056	0.003	0.000	0.003
	Fuel Comb - Residential - Wood	0.053	0.005	0.096		0.001															
	Gas Stations			0.303					0.341					0.352					0.333		
	Industrial Processes - NEC	0.228		0.249			0.158		0.298			0.086		0.322			0.038		0.338		
	Miscellaneous Non-Industrial NEC	0.000	0.004	0.031	0.410	0.000	0.000	0.004	0.036	0.489	0.000	0.000	0.005	0.038	0.529	0.000	0.000	0.005	0.040	0.555	0.000
	Mobile - Locomotives	0.026	1.103	0.051	0.001	0.019	0.026	1.093	0.050	0.001	0.019	0.022	0.983	0.041	0.001	0.020	0.028	1.162	0.054	0.001	0.020
	Solvent - Consumer & Commercial Solvent Use			4.391	0.036				5.247	0.043				5.668	0.046				5.951	0.048	
	Solvent - Degreasing			0.443					0.000					0.000					0.001		
	Solvent - Dry Cleaning			0.004					0.004					0.005					0.005		
	Solvent - Graphic Arts			0.297					0.137					0.137					0.136		
	olvent - Industrial Surface Coating & Solvent Use			2.650					1.471					1.601					1.687		
	Solvent - Non-Industrial Surface Coating			1.959					2.340					2.529					2.655		
	Waste Disposal	0.037		0.268	0.358		0.045		0.357	0.428		0.048		0.377	0.462		0.051		0.395	0.485	
	Provo, UT Total	1.4	5.5	12.5	6.5	0.2	1.4	5.8	12.0	6.3	0.2	1.3	5.3	12.7	6.2	0.2	1.2	3.0	13.0	6.1	0.2
Salt Lake City, UT	Agriculture - Livestock Waste	0.031		3.066	13.841		0.030		2.970	13.791		0.030		3.003	14.049		0.031		3.008	14.180	
	Bulk Gasoline Terminals			0.941					0.759					0.699					0.733		
	Commercial Cooking	2.038		0.297			2.113		0.290			2.221		0.304			2.290		0.314		
	Dust - Construction Dust	0.701					0.329					0.346					0.357				
	Fuel Comb - Comm/Institutional - Coal	0.002	0.011	0.000	0.000	0.029	0.005	0.023	0.000	0.000	0.064	0.005	0.023	0.000	0.000	0.065	0.005	0.023	0.000	0.000	0.065
	Fuel Comb - Comm/Institutional - Natural Gas	0.457	6.011	0.331	0.029	0.036	0.522	6.866	0.378	0.034	0.041	0.480	6.315	0.347	0.031	0.038	0.039	0.518	0.028	0.003	0.003
	Fuel Comb - Comm/Institutional - Oil	0.014	0.212	0.004	0.005	0.263	0.008	0.103	0.002	0.003	0.166	0.009	0.107	0.002	0.003	0.173	0.009	0.109	0.002	0.003	0.177
	Fuel Comb - Comm/Institutional - Other	0.011	0.144	0.008	0.000	0.001	0.010	0.130	0.007	0.000	0.001	0.010	0.133	0.007	0.000	0.001	0.010	0.134	0.007	0.000	0.001
	Fuel Comb - Residential - Natural Gas	0.032	6.926	0.405	1.474	0.044	0.033	7.203	0.421	1.533	0.046	0.031	6.824	0.399	1.452	0.044	0.029	6.410	0.375	1.364	0.041
	Fuel Comb - Residential - Oil	0.010	0.105	0.004	0.006	0.249	0.007	0.067	0.003	0.004	0.159	0.007	0.069	0.003	0.004	0.164	0.008	0.070	0.003	0.004	0.166
	Fuel Comb - Residential - Other	0.001	0.165	0.007	0.000	0.002	0.001	0.147	0.007	0.000	0.004	0.001	0.148	0.007	0.000	0.004	0.001	0.148	0.007	0.000	0.004
	Fuel Comb - Residential - Wood	0.333	0.032	0.607		0.005	0.013	0.001	0.024		0.000	0.015	0.001	0.028		0.000	0.017	0.002	0.031		0.000
	Gas Stations			2.331					1.271					1.184					1.232		
	Industrial Processes - NEC	0.543		0.798			0.418		0.473			0.390		0.498			0.371		0.513		
	Miscellaneous Non-Industrial NEC	0.001	0.039	0.128	1.312	0.004	0.001	0.044	0.137	1.468	0.004	0.001	0.048	0.146	1.543	0.005	0.001	0.047	0.148	1.591	0.004
	Mobile - Locomotives	0.187	8.003	0.375	0.007	0.137	0.185	7.907	0.371	0.006	0.136	0.146	6.576	0.283	0.007	0.140	0.196	8.365	0.391	0.007	0.144
	Solvent - Consumer & Commercial Solvent Use			14.075	0.114				15.751	0.128				16.540	0.134				17.064	0.138	
	Solvent - Degreasing			2.902					0.502					0.128					0.527		
	Solvent - Dry Cleaning			0.036					0.040					0.042					0.044		
	Solvent - Graphic Arts			1.381					0.557					0.557					0.557		

	olvent - Industrial Surface Coating & Solvent Use			15.363					9.119					9.512					9.769		
	Solvent - Non-Industrial Surface Coating			6.272					7.019					7.377					7.607		
	Waste Disposal	0.105		1.095	1.143		0.117		1.207	1.279		0.123		1.241	1.344		0.126		1.264	1.386	
	Salt Lake City, UT Total	**4.5**	**21.6**	**50.4**	**17.9**	**0.8**	**3.8**	**22.5**	**41.3**	**18.2**	**0.6**	**3.8**	**20.2**	**42.3**	**18.6**	**0.6**	**3.5**	**15.8**	**43.6**	**18.7**	**0.6**
Surrounding Areas	Agriculture - Crops & Livestock Dust	0.588					0.588					0.588					0.588				
	Agriculture - Fertilizer Application				0.102					0.102					0.102					0.102	
	Agriculture - Livestock Waste	0.065		15.129	182.364		0.062		14.871	181.768		0.060		14.710	181.250		0.059		14.548	180.757	
	Bulk Gasoline Terminals			0.855					0.589					0.616					0.594		
	Commercial Cooking	0.259		0.038			0.295		0.043			0.317		0.046			0.331		0.048		
	Dust - Construction Dust	0.540					0.510					0.518					0.523				
	Fuel Comb - Comm/Institutional - Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Fuel Comb - Comm/Institutional - Coal	0.065	0.312	0.001	0.001	1.170	0.085	0.405	0.002	0.001	1.427	0.086	0.408	0.002	0.001	1.433	0.086	0.408	0.002	0.001	1.433
	Fuel Comb - Comm/Institutional - Natural Gas	0.065	1.984	0.046	0.004	0.005	0.066	1.992	0.046	0.004	0.005	0.065	1.980	0.046	0.004	0.005	0.084	2.229	0.059	0.006	0.007
	Fuel Comb - Comm/Institutional - Oil	0.052	0.550	0.012	0.016	1.096	0.043	0.374	0.008	0.013	0.942	0.043	0.381	0.009	0.013	0.954	0.044	0.384	0.009	0.013	0.961
	Fuel Comb - Comm/Institutional - Other	0.012	0.171	0.007	0.000	0.001	0.011	0.160	0.007	0.000	0.001	0.012	0.163	0.007	0.000	0.001	0.012	0.164	0.007	0.000	0.001
	uel Comb - Industrial Boilers, ICEs - Natural Gas	0.048	1.886	0.042	0.024	0.005	0.048	1.886	0.042	0.024	0.005	0.048	1.886	0.042	0.024	0.005	0.048	1.886	0.042	0.024	0.005
	Fuel Comb - Industrial Boilers, ICEs - Oil	0.227	2.163	0.013	0.050	6.013	0.227	2.163	0.013	0.050	6.013	0.227	2.163	0.013	0.050	6.013	0.227	2.163	0.013	0.050	6.013
	Fuel Comb - Industrial Boilers, ICEs - Other	0.007	0.091			0.009	0.007	0.091			0.009	0.007	0.091			0.009	0.007	0.091			0.009
	Fuel Comb - Residential - Natural Gas	0.005	2.103	0.123	0.421	0.013	0.005	2.180	0.127	0.437	0.014	0.005	2.221	0.130	0.446	0.014	0.005	2.134	0.125	0.427	0.014
	Fuel Comb - Residential - Oil	0.028	0.274	0.011	0.015	0.798	0.024	0.214	0.008	0.012	0.654	0.024	0.217	0.008	0.012	0.662	0.025	0.219	0.009	0.012	0.665
	Fuel Comb - Residential - Other	0.047	0.470	0.073	0.002	0.178	0.050	0.461	0.079	0.003	0.193	0.050	0.462	0.079	0.003	0.194	0.050	0.462	0.079	0.003	0.194
	Fuel Comb - Residential - Wood	4.877	0.453	7.582	0.013	0.080	5.275	0.491	8.308	0.013	0.086	5.549	0.518	8.808	0.013	0.090	5.732	0.535	9.142	0.013	0.092
	Gas Stations			2.921					1.245					1.285					1.253		
	Industrial Processes - Chemical Manuf			0.085	0.082				0.085	0.082				0.085	0.082				0.085	0.082	
	Industrial Processes - Mining	0.859					0.859					0.859					0.859				
	Industrial Processes - NEC	0.061		0.083	1.579		0.046		0.097	1.579		0.037		0.105	1.579		0.031		0.111	1.579	
	Industrial Processes - Non-ferrous Metals				0.004					0.004					0.004					0.004	
	Industrial Processes - Oil & Gas Production			0.060					0.060					0.060					0.060		
	Industrial Processes - Storage and Transfer			0.099					0.099					0.099					0.099		
	Miscellaneous Non-Industrial NEC	0.802	0.173	2.149	0.278	0.077	0.802	0.173	2.151	0.301	0.077	0.802	0.173	2.152	0.315	0.077	0.802	0.174	2.152	0.324	0.077
	Mobile - Locomotives	0.495	18.557	0.924	0.009	0.694	0.495	18.557	0.924	0.009	0.694	0.474	17.906	0.871	0.010	0.699	0.505	18.951	0.942	0.010	0.702
	Mobile - On-Road Diesel Heavy Duty Vehicles	0.089	2.898	0.148	0.007	0.087	0.089	2.898	0.148	0.007	0.087	0.089	2.898	0.148	0.007	0.087	0.089	2.898	0.148	0.007	0.087
	Mobile - On-Road Diesel Light Duty Vehicles	0.001	0.007	0.004		0.000	0.001	0.007	0.004		0.000	0.001	0.007	0.004		0.000	0.001	0.007	0.004		0.000
	Mobile - On-Road Gasoline Heavy Duty Vehicles	0.005	0.328	0.100	0.003	0.006	0.005	0.328	0.100	0.003	0.006	0.005	0.328	0.100	0.003	0.006	0.005	0.328	0.100	0.003	0.006
	Mobile - On-Road Gasoline Light Duty Vehicles	0.029	3.045	3.710	0.221	0.073	0.029	3.045	3.710	0.221	0.073	0.029	3.045	3.710	0.221	0.073	0.029	3.045	3.710	0.221	0.073
	Solvent - Consumer & Commercial Solvent Use			5.458	0.012				5.692	0.014				5.849	0.015				5.946	0.016	
	Solvent - Degreasing			5.299					5.307					5.178					5.329		
	Solvent - Dry Cleaning			0.476					0.476					0.477					0.477		
	Solvent - Graphic Arts			0.134	0.001				0.132	0.001				0.132	0.001				0.132	0.001	
	olvent - Industrial Surface Coating & Solvent Use			3.318					3.909					4.021					4.096		
	Solvent - Non-Industrial Surface Coating			1.560	0.009				1.672	0.009				1.737	0.009				1.782	0.009	
	Waste Disposal	0.237	0.074	0.542	0.138	0.005	0.242	0.076	0.614	0.160	0.005	0.244	0.077	0.614	0.173	0.005	0.246	0.078	0.620	0.182	0.006
	Surrounding Areas Total	**9.5**	**35.5**	**51.0**	**185.4**	**10.3**	**9.9**	**35.5**	**50.6**	**184.8**	**10.3**	**10.1**	**34.9**	**51.1**	**184.3**	**10.3**	**10.4**	**36.2**	**51.7**	**183.8**	**10.3**
	Grand Total	**15.8**	**64.4**	**120.1**	**221.4**	**11.6**	**15.4**	**65.5**	**108.6**	**219.4**	**11.4**	**15.7**	**62.2**	**111.1**	**219.3**	**11.4**	**15.4**	**56.3**	**113.4**	**218.4**	**11.4**

Area Sources Typical Winter Inversion Weekday Emissions (tpd)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
NA -Area	Sector	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Logan, UT-ID	Agriculture - Crops & Livestock Dust	1.7%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%
	Agriculture - Livestock Waste	2.6%	0.0%	26.4%	97.7%	0.0%	2.4%	0.0%	28.4%	97.0%	0.0%	2.5%	0.0%	28.0%	97.0%	0.0%	2.7%	0.0%	27.3%	96.7%	0.0%
	Bulk Gasoline Terminals	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%
	Commercial Cooking	30.3%	0.0%	0.3%	0.0%	0.0%	36.1%	0.0%	0.4%	0.0%	0.0%	37.9%	0.0%	0.4%	0.0%	0.0%	42.1%	0.0%	0.5%	0.0%	0.0%
	Dust - Construction Dust	8.7%	0.0%	0.0%	0.0%	0.0%	9.2%	0.0%	0.0%	0.0%	0.0%	9.4%	0.0%	0.0%	0.0%	0.0%	10.3%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Biomass	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Coal	0.1%	0.1%	0.0%	0.0%	3.3%	0.1%	0.2%	0.0%	0.0%	4.7%	0.1%	0.2%	0.0%	0.0%	4.7%	0.1%	0.2%	0.0%	0.0%	4.7%
	Fuel Comb - Comm/Institutional - Natural Gas	10.4%	37.5%	0.6%	0.0%	1.2%	12.5%	39.9%	0.8%	0.0%	1.5%	12.0%	40.4%	0.7%	0.0%	1.4%	4.5%	20.1%	0.3%	0.0%	0.5%
	Fuel Comb - Comm/Institutional - Oil	1.0%	3.7%	0.0%	0.0%	28.1%	0.7%	1.9%	0.0%	0.0%	23.5%	0.7%	2.0%	0.0%	0.0%	24.0%	0.8%	2.7%	0.0%	0.0%	24.5%
	Fuel Comb - Comm/Institutional - Other	0.5%	1.8%	0.0%	0.0%	0.1%	0.5%	1.6%	0.0%	0.0%	0.1%	0.5%	1.7%	0.0%	0.0%	0.1%	0.6%	2.2%	0.0%	0.0%	0.1%
	uel Comb - Industrial Boilers, ICEs - Natural Gas	0.3%	2.6%	0.0%	0.0%	0.0%	0.3%	2.5%	0.0%	0.0%	0.0%	0.3%	2.6%	0.0%	0.0%	0.0%	0.3%	3.4%	0.0%	0.0%	0.0%
	Fuel Comb - Industrial Boilers, ICEs - Oil	1.0%	2.3%	0.0%	0.0%	37.9%	1.1%	2.3%	0.0%	0.0%	44.7%	1.1%	2.3%	0.0%	0.0%	44.2%	1.2%	3.0%	0.0%	0.0%	44.3%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%
	Fuel Comb - Residential - Natural Gas	0.4%	25.1%	0.4%	0.8%	0.9%	0.5%	26.0%	0.6%	1.0%	1.1%	0.4%	25.2%	0.5%	0.9%	1.0%	0.5%	33.8%	0.5%	1.0%	1.0%
	Fuel Comb - Residential - Oil	0.7%	1.9%	0.0%	0.0%	25.6%	0.6%	1.3%	0.0%	0.0%	21.2%	0.6%	1.3%	0.0%	0.0%	21.4%	0.6%	1.7%	0.0%	0.0%	21.7%
	Fuel Comb - Residential - Other	0.2%	2.4%	0.0%	0.0%	0.2%	0.2%	2.2%	0.0%	0.0%	0.3%	0.2%	2.2%	0.0%	0.0%	0.3%	0.2%	2.9%	0.0%	0.0%	0.3%
	Fuel Comb - Residential - Wood	32.8%	0.8%	3.7%	0.0%	0.8%	26.2%	0.6%	3.2%	0.0%	0.7%	25.9%	0.6%	3.1%	0.0%	0.7%	27.8%	0.8%	3.1%	0.0%	0.7%
	Gas Stations	0.0%	0.0%	10.2%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%
	Industrial Processes - Chemical Manuf	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
	Industrial Processes - NEC	4.9%	0.0%	0.9%	0.0%	0.0%	2.4%	0.0%	1.3%	0.0%	0.0%	1.3%	0.0%	1.4%	0.0%	0.0%	0.7%	0.0%	1.4%	0.0%	0.0%
	Miscellaneous Non-Industrial NEC	0.3%	0.1%	0.1%	0.8%	0.0%	0.3%	0.1%	0.2%	1.0%	0.0%	0.3%	0.1%	0.2%	1.1%	0.0%	0.3%	0.1%	0.2%	1.2%	0.0%
	Mobile - Locomotives	2.4%	21.7%	0.3%	0.0%	1.8%	2.6%	21.4%	0.4%	0.0%	2.1%	2.5%	21.2%	0.4%	0.0%	2.1%	2.7%	28.9%	0.4%	0.0%	2.1%
	Solvent - Consumer & Commercial Solvent Use	0.0%	0.0%	17.8%	0.1%	0.0%	0.0%	0.0%	26.3%	0.1%	0.0%	0.0%	0.0%	26.8%	0.1%	0.0%	0.0%	0.0%	27.5%	0.1%	0.0%
	Solvent - Degreasing	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%
	Solvent - Dry Cleaning	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%
	Solvent - Graphic Arts	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%
	olvent - Industrial Surface Coating & Solvent Use	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	16.8%	0.0%	0.0%	0.0%	0.0%	17.1%	0.0%	0.0%
	Solvent - Non-Industrial Surface Coating	0.0%	0.0%	7.5%	0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	11.3%	0.0%	0.0%	0.0%	0.0%	11.7%	0.0%	0.0%
	Waste Disposal	1.8%	0.0%	1.4%	0.6%	0.0%	2.3%	0.0%	1.3%	0.8%	0.0%	2.4%	0.0%	1.3%	0.8%	0.0%	2.7%	0.0%	1.3%	0.9%	0.0%

	Logan, UT-ID Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Provo, UT	Agriculture - Livestock Waste	1.1%	0.0%	10.1%	82.1%	0.0%	0.9%	0.0%	9.5%	78.9%	0.0%	0.9%	0.0%	8.5%	77.4%	0.0%	1.0%	0.0%	8.0%	76.2%	0.0%
	Bulk Gasoline Terminals	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%
	Commercial Cooking	44.5%	0.0%	0.7%	0.0%	0.0%	51.5%	0.0%	0.8%	0.0%	0.0%	56.5%	0.0%	0.8%	0.0%	0.0%	68.9%	0.0%	0.8%	0.0%	0.0%
	Dust - Construction Dust	15.4%	0.0%	0.0%	0.0%	0.0%	13.7%	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%	0.0%	0.0%	18.3%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Coal	0.1%	0.1%	0.0%	0.0%	8.2%	0.2%	0.3%	0.0%	0.0%	21.3%	0.2%	0.3%	0.0%	0.0%	21.2%	0.3%	0.5%	0.0%	0.0%	22.7%
	Fuel Comb - Comm/Institutional - Natural Gas	13.5%	46.3%	1.1%	0.2%	6.8%	15.6%	48.8%	1.3%	0.2%	8.8%	14.5%	48.3%	1.1%	0.2%	7.9%	0.0%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Oil	0.3%	1.2%	0.0%	0.0%	36.3%	0.2%	0.6%	0.0%	0.0%	26.9%	0.2%	0.6%	0.0%	0.0%	27.7%	0.2%	1.1%	0.0%	0.0%	30.3%
	Fuel Comb - Comm/Institutional - Other	0.3%	1.0%	0.0%	0.0%	0.1%	0.3%	0.9%	0.0%	0.0%	0.2%	0.3%	1.0%	0.0%	0.0%	0.2%	0.3%	1.7%	0.0%	0.0%	0.2%
	Fuel Comb - Residential - Natural Gas	0.5%	29.3%	0.8%	5.3%	4.6%	0.6%	29.1%	0.8%	5.6%	5.6%	0.5%	29.8%	0.7%	5.5%	5.2%	0.7%	55.5%	0.8%	5.9%	5.9%
	Fuel Comb - Residential - Oil	0.2%	0.6%	0.0%	0.0%	34.4%	0.2%	0.4%	0.0%	0.0%	25.9%	0.2%	0.4%	0.0%	0.0%	26.2%	0.2%	0.7%	0.0%	0.0%	28.3%
	Fuel Comb - Residential - Other	0.0%	1.1%	0.0%	0.0%	0.6%	0.0%	1.0%	0.0%	0.0%	1.4%	0.0%	1.1%	0.0%	0.0%	1.4%	0.0%	1.9%	0.0%	0.0%	1.5%
	Fuel Comb - Residential - Wood	3.7%	0.1%	0.8%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gas Stations	0.0%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%
	Industrial Processes - NEC	16.0%	0.0%	2.0%	0.0%	0.0%	11.6%	0.0%	2.5%	0.0%	0.0%	6.4%	0.0%	2.5%	0.0%	0.0%	3.3%	0.0%	2.6%	0.0%	0.0%
	Miscellaneous Non-Industrial NEC	0.0%	0.1%	0.2%	6.3%	0.0%	0.0%	0.1%	0.3%	7.8%	0.0%	0.0%	0.1%	0.3%	8.6%	0.1%	0.0%	0.2%	0.3%	9.1%	0.1%
	Mobile - Locomotives	1.8%	20.2%	0.4%	0.0%	8.6%	1.9%	19.0%	0.4%	0.0%	10.0%	1.7%	18.5%	0.3%	0.0%	10.2%	2.4%	38.4%	0.4%	0.0%	11.1%
	Solvent - Consumer & Commercial Solvent Use	0.0%	0.0%	35.1%	0.5%	0.0%	0.0%	0.0%	43.8%	0.7%	0.0%	0.0%	0.0%	44.6%	0.7%	0.0%	0.0%	0.0%	45.6%	0.8%	0.0%
	Solvent - Degreasing	0.0%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Solvent - Dry Cleaning	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Solvent - Graphic Arts	0.0%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%
	olvent - Industrial Surface Coating & Solvent Use	0.0%	0.0%	21.2%	0.0%	0.0%	0.0%	0.0%	12.3%	0.0%	0.0%	0.0%	0.0%	12.6%	0.0%	0.0%	0.0%	0.0%	12.9%	0.0%	0.0%
	Solvent - Non-Industrial Surface Coating	0.0%	0.0%	15.7%	0.0%	0.0%	0.0%	0.0%	19.5%	0.0%	0.0%	0.0%	0.0%	19.9%	0.0%	0.0%	0.0%	0.0%	20.4%	0.0%	0.0%
	Waste Disposal	2.6%	0.0%	2.1%	5.5%	0.0%	3.3%	0.0%	3.0%	6.8%	0.0%	3.6%	0.0%	3.0%	7.5%	0.0%	4.4%	0.0%	3.0%	8.0%	0.0%
	Provo, UT Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Salt Lake City, UT	Agriculture - Livestock Waste	0.7%	0.0%	6.1%	77.2%	0.0%	0.8%	0.0%	7.2%	75.6%	0.0%	0.8%	0.0%	7.1%	75.7%	0.0%	0.9%	0.0%	6.9%	75.9%	0.0%
	Bulk Gasoline Terminals	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%
	Commercial Cooking	45.6%	0.0%	0.6%	0.0%	0.0%	55.7%	0.0%	0.7%	0.0%	0.0%	58.2%	0.0%	0.7%	0.0%	0.0%	65.6%	0.0%	0.7%	0.0%	0.0%
	Dust - Construction Dust	15.7%	0.0%	0.0%	0.0%	0.0%	8.7%	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	10.2%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Coal	0.1%	0.0%	0.0%	0.0%	3.8%	0.1%	0.1%	0.0%	0.0%	10.3%	0.1%	0.1%	0.0%	0.0%	10.2%	0.1%	0.1%	0.0%	0.0%	10.7%
	Fuel Comb - Comm/Institutional - Natural Gas	10.2%	27.8%	0.7%	0.2%	4.7%	13.8%	30.5%	0.9%	0.2%	6.6%	12.6%	31.2%	0.8%	0.2%	6.0%	1.1%	3.3%	0.1%	0.0%	0.5%
	Fuel Comb - Comm/Institutional - Oil	0.3%	1.0%	0.0%	0.0%	34.1%	0.2%	0.5%	0.0%	0.0%	26.7%	0.2%	0.5%	0.0%	0.0%	27.4%	0.3%	0.7%	0.0%	0.0%	29.3%
	Fuel Comb - Comm/Institutional - Other	0.2%	0.7%	0.0%	0.0%	0.1%	0.3%	0.6%	0.0%	0.0%	0.1%	0.3%	0.7%	0.0%	0.0%	0.1%	0.3%	0.8%	0.0%	0.0%	0.1%
	Fuel Comb - Residential - Natural Gas	0.7%	32.0%	0.8%	8.2%	5.7%	0.9%	32.0%	1.0%	8.4%	7.4%	0.8%	33.7%	0.9%	7.8%	6.9%	0.8%	40.5%	0.9%	7.3%	6.8%
	Fuel Comb - Residential - Oil	0.2%	0.5%	0.0%	0.0%	32.4%	0.2%	0.3%	0.0%	0.0%	25.6%	0.2%	0.3%	0.0%	0.0%	25.9%	0.2%	0.4%	0.0%	0.0%	27.4%
	Fuel Comb - Residential - Other	0.0%	0.8%	0.0%	0.0%	0.3%	0.0%	0.7%	0.0%	0.0%	0.7%	0.0%	0.7%	0.0%	0.0%	0.7%	0.0%	0.9%	0.0%	0.0%	0.7%
	Fuel Comb - Residential - Wood	7.5%	0.1%	1.2%	0.0%	0.6%	0.4%	0.0%	0.1%	0.0%	0.0%	0.4%	0.0%	0.1%	0.0%	0.0%	0.5%	0.0%	0.1%	0.0%	0.0%
	Gas Stations	0.0%	0.0%	4.6%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%
	Industrial Processes - NEC	12.2%	0.0%	1.6%	0.0%	0.0%	11.0%	0.0%	1.1%	0.0%	0.0%	10.2%	0.0%	1.2%	0.0%	0.0%	10.6%	0.0%	1.2%	0.0%	0.0%
	Miscellaneous Non-Industrial NEC	0.0%	0.2%	0.3%	7.3%	0.5%	0.0%	0.2%	0.3%	8.0%	0.7%	0.0%	0.2%	0.3%	8.3%	0.7%	0.0%	0.3%	0.3%	8.5%	0.7%
	Mobile - Locomotives	4.2%	37.0%	0.7%	0.0%	17.8%	4.9%	35.2%	0.9%	0.0%	21.8%	3.8%	32.5%	0.7%	0.0%	22.1%	5.6%	52.9%	0.9%	0.0%	23.8%
	Solvent - Consumer & Commercial Solvent Use	0.0%	0.0%	27.9%	0.6%	0.0%	0.0%	0.0%	38.1%	0.7%	0.0%	0.0%	0.0%	39.1%	0.7%	0.0%	0.0%	0.0%	39.1%	0.7%	0.0%
	Solvent - Degreasing	0.0%	0.0%	5.8%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%
	Solvent - Dry Cleaning	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
	Solvent - Graphic Arts	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%
	olvent - Industrial Surface Coating & Solvent Use	0.0%	0.0%	30.5%	0.0%	0.0%	0.0%	0.0%	22.1%	0.0%	0.0%	0.0%	0.0%	22.5%	0.0%	0.0%	0.0%	0.0%	22.4%	0.0%	0.0%
	Solvent - Non-Industrial Surface Coating	0.0%	0.0%	12.4%	0.0%	0.0%	0.0%	0.0%	17.0%	0.0%	0.0%	0.0%	0.0%	17.4%	0.0%	0.0%	0.0%	0.0%	17.4%	0.0%	0.0%
	Waste Disposal	2.4%	0.0%	2.2%	6.4%	0.0%	3.1%	0.0%	2.9%	7.0%	0.0%	3.2%	0.0%	2.9%	7.2%	0.0%	3.6%	0.0%	2.9%	7.4%	0.0%
	Salt Lake City, UT Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Surrounding Areas	Agriculture - Crops & Livestock Dust	6.2%	0.0%	0.0%	0.0%	0.0%	6.0%	0.0%	0.0%	0.0%	0.0%	5.8%	0.0%	0.0%	0.0%	0.0%	5.7%	0.0%	0.0%	0.0%	0.0%
	Agriculture - Fertilizer Application	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
	Agriculture - Livestock Waste	0.7%	0.0%	29.7%	98.4%	0.0%	0.6%	0.0%	29.4%	98.3%	0.0%	0.6%	0.0%	28.8%	98.3%	0.0%	0.6%	0.0%	28.1%	98.3%	0.0%
	Bulk Gasoline Terminals	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%
	Commercial Cooking	2.7%	0.0%	0.1%	0.0%	0.0%	3.0%	0.0%	0.1%	0.0%	0.0%	3.1%	0.0%	0.1%	0.0%	0.0%	3.2%	0.0%	0.1%	0.0%	0.0%
	Dust - Construction Dust	5.7%	0.0%	0.0%	0.0%	0.0%	5.2%	0.0%	0.0%	0.0%	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Biomass	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Fuel Comb - Comm/Institutional - Coal	0.7%	0.9%	0.0%	0.0%	11.3%	0.9%	1.1%	0.0%	0.0%	13.9%	0.8%	1.2%	0.0%	0.0%	13.9%	0.8%	1.1%	0.0%	0.0%	13.9%
	Fuel Comb - Comm/Institutional - Natural Gas	0.7%	5.6%	0.1%	0.0%	0.1%	0.7%	5.6%	0.1%	0.0%	0.1%	0.6%	5.7%	0.1%	0.0%	0.1%	0.8%	6.2%	0.1%	0.0%	0.1%
	Fuel Comb - Comm/Institutional - Oil	0.5%	1.5%	0.0%	0.0%	10.6%	0.4%	1.1%	0.0%	0.0%	9.2%	0.4%	1.1%	0.0%	0.0%	9.2%	0.4%	1.1%	0.0%	0.0%	9.3%
	Fuel Comb - Comm/Institutional - Other	0.1%	0.5%	0.0%	0.0%	0.0%	0.1%	0.4%	0.0%	0.0%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%
	uel Comb - Industrial Boilers, ICEs - Natural Gas	0.5%	5.3%	0.1%	0.0%	0.0%	0.5%	5.3%	0.1%	0.0%	0.0%	0.5%	5.4%	0.1%	0.0%	0.0%	0.5%	5.2%	0.1%	0.0%	0.0%
	Fuel Comb - Industrial Boilers, ICEs - Oil	2.4%	6.1%	0.0%	0.0%	58.3%	2.3%	6.1%	0.0%	0.0%	58.4%	2.2%	6.2%	0.0%	0.0%	58.2%	2.2%	6.0%	0.0%	0.0%	58.1%
	Fuel Comb - Industrial Boilers, ICEs - Other	0.1%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%	0.0%	0.1%
	Fuel Comb - Residential - Natural Gas	0.0%	5.9%	0.2%	0.2%	0.1%	0.1%	6.1%	0.3%	0.2%	0.1%	0.1%	6.4%	0.3%	0.2%	0.1%	0.0%	5.9%	0.2%	0.2%	0.1%
	Fuel Comb - Residential - Oil	0.3%	0.8%	0.0%	0.0%	7.7%	0.2%	0.6%	0.0%	0.0%	6.4%	0.2%	0.6%	0.0%	0.0%	6.4%	0.2%	0.6%	0.0%	0.0%	6.4%
	Fuel Comb - Residential - Other	0.5%	1.3%	0.1%	0.0%	1.7%	0.5%	1.3%	0.2%	0.0%	1.9%	0.5%	1.3%	0.2%	0.0%	1.9%	0.5%	1.3%	0.2%	0.0%	1.9%
	Fuel Comb - Residential - Wood	51.5%	1.3%	14.9%	0.0%	0.8%	53.5%	1.4%	16.4%	0.0%	0.8%	54.7%	1.5%	17.2%	0.0%	0.9%	55.2%	1.5%	17.7%	0.0%	0.9%
	Gas Stations	0.0%	0.0%	5.7%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%
	Industrial Processes - Chemical Manuf	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
	Industrial Processes - Mining	9.1%	0.0%	0.0%	0.0%	0.0%	8.7%	0.0%	0.0%	0.0%	0.0%	8.5%	0.0%	0.0%	0.0%	0.0%	8.3%	0.0%	0.0%	0.0%	0.0%
	Industrial Processes - NEC	0.6%	0.0%	0.2%	0.9%	0.0%	0.5%	0.0%	0.2%	0.9%	0.0%	0.4%	0.0%	0.2%	0.9%	0.0%	0.3%	0.0%	0.2%	0.9%	0.0%
	Industrial Processes - Non-ferrous Metals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Industrial Processes - Oil & Gas Production	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
	Industrial Processes - Storage and Transfer	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
	Miscellaneous Non-Industrial NEC	8.5%	0.5%	4.2%	0.1%	0.7%	8.1%	0.5%	4.3%	0.2%	0.7%	7.9%	0.5%	4.2%	0.2%	0.7%	7.7%	0.5%	4.2%	0.2%	0.7%
	Mobile - Locomotives	5.2%	52.2%	1.8%	0.0%	6.7%	5.0%	52.3%	1.8%	0.0%	6.7%	4.7%	51.3%	1.7%	0.0%	6.8%	4.9%	52.4%	1.8%	0.0%	6.8%
	Mobile - On-Road Diesel Heavy Duty Vehicles	0.9%	8.2%	0.3%	0.0%	0.8%	0.9%	8.2%	0.3%	0.0%	0.8%	0.9%	8.3%	0.3%	0.0%	0.8%	0.9%	8.0%	0.3%	0.0%	0.8%
	Mobile - On-Road Diesel Light Duty Vehicles	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Mobile - On-Road Gasoline Heavy Duty Vehicles	0.1%	0.9%	0.2%	0.0%	0.1%	0.0%	0.9%	0.2%	0.0%	0.1%	0.0%	0.9%	0.2%	0.0%	0.1%	0.0%	0.9%	0.2%	0.0%	0.1%
	Mobile - On-Road Gasoline Light Duty Vehicles	0.3%	8.6%	7.3%	0.1%	0.7%	0.3%	8.6%	7.3%	0.1%	0.7%	0.3%	8.7%	7.3%	0.1%	0.7%	0.3%	8.4%	7.2%	0.1%	0.7%

	Solvent - Consumer & Commercial Solvent Use	0.0%	0.0%	10.7%	0.0%	0.0%	0.0%	0.0%	11.3%	0.0%	0.0%	0.0%	0.0%	11.4%	0.0%	0.0%	0.0%	0.0%	11.5%	0.0%	0.0%
	Solvent - Degreasing	0.0%	0.0%	10.4%	0.0%	0.0%	0.0%	0.0%	10.5%	0.0%	0.0%	0.0%	0.0%	10.1%	0.0%	0.0%	0.0%	0.0%	10.3%	0.0%	0.0%
	Solvent - Dry Cleaning	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%
	Solvent - Graphic Arts	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
	olvent - Industrial Surface Coating & Solvent Use	0.0%	0.0%	6.5%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	7.9%	0.0%	0.0%	0.0%	0.0%	7.9%	0.0%	0.0%
	Solvent - Non-Industrial Surface Coating	0.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%
	Waste Disposal	2.5%	0.2%	1.1%	0.1%	0.0%	2.5%	0.2%	1.2%	0.1%	0.1%	2.4%	0.2%	1.2%	0.1%	0.1%	2.4%	0.2%	1.2%	0.1%	0.1%
	Surrounding Areas Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Area Sources Typical Winter Inversion Weekday Emissions (tpd)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)			
Source Category	NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3
Area Sources	Logan, UT-ID	0.452	1.747	6.116	11.614	0.322	0.409	1.771	4.738	10.032	0.273	0.420	1.735	4.955	10.202	0.277	0.394	1.332	5.026	9.773
	Provo, UT	1.429	5.473	12.512	6.495	0.225	1.367	5.753	11.982	6.313	0.192	1.348	5.319	12.708	6.167	0.195	1.161	3.023	13.047	6.082
	Salt Lake City, UT	4.466	21.649	50.426	17.931	0.770	3.792	22.490	41.308	18.247	0.621	3.816	20.246	42.308	18.568	0.633	3.490	15.826	43.624	18.677
	Surrounding Areas	9.463	35.538	50.999	185.356	10.310	9.863	35.500	50.568	184.820	10.291	10.138	34.921	51.140	184.339	10.326	10.385	36.153	51.721	183.848
	Grand Total	15.8	64.4	120.1	221.4	11.6	15.4	65.5	108.6	219.4	11.4	15.7	62.2	111.1	219.3	11.4	15.4	56.3	113.4	218.4

Area Sources Typical Winter Inversion Weekday Emissions (%)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)			
Source Category	NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3
Area Sources	Logan, UT-ID	2.86%	2.71%	5.09%	5.25%	2.77%	2.65%	2.70%	4.36%	4.57%	2.40%	2.67%	2.79%	4.46%	4.65%	2.42%	2.56%	2.36%	4.43%	4.48%
	Provo, UT	9.04%	8.50%	10.42%	2.93%	1.93%	8.86%	8.78%	11.03%	2.88%	1.68%	8.58%	8.55%	11.44%	2.81%	1.70%	7.52%	5.37%	11.50%	2.79%
	Salt Lake City, UT	28.25%	33.61%	42.00%	8.10%	6.63%	24.57%	34.33%	38.04%	8.32%	5.46%	24.27%	32.54%	38.08%	8.47%	5.54%	22.62%	28.09%	38.46%	8.55%
	Surrounding Areas	59.85%	55.18%	42.48%	83.72%	88.67%	63.91%	54.19%	46.57%	84.23%	90.45%	64.48%	56.12%	46.03%	84.07%	90.34%	67.30%	64.18%	45.60%	84.19%
	Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

PROJECTION INPUT DATA

ACTIVITY DATA FOR PROJECTIONS

Control strategy projections are estimates of future year emissions that also include the expected impact of modified or additional control regulations. State and local planners should determine if any future scheduled regulations, whether at the Federal, State, or local level, apply to sources in their area.

Future year emissions may also be affected by fuel switching, fuel efficiency improvements, improvements in performance due to economic influences, or any occurrence that alters the emission producing process. Programs other than those aimed at reducing the emissions of the criteria pollutants of interest may affect the future year emissions. These may include energy efficiency programs, pollution prevention programs, and greenhouse gas or global warming initiatives. These should all be reflected in the projections through the future year control factor, emission factor, or in some cases, by adjusting the activity growth forecast.

Control factors and emission factors vary by source category and are continuously being revised and improved based on field and laboratory measurements. State and local agencies should maintain close coordination with the appropriate EPA Regional Office to ensure that all factors reflect current EPA guidance. States must also examine the future year control factor or emission factor in relation to the base year value to ensure any existing controls are not double-counted by taking additional credit in the future year. The control factor and emission factor may also be a weighted composite in some cases, such as diesel construction engines versus each individual equipment type within the category.

Technical documents from EPA, including Alternative Control Techniques (ACT) documents and Control Techniques Guidelines (CTG) documents, are collected at the Clean Air Technology Center on EPA's TTN web site: **http://www.epa.gov/ttn/catc/products.html**. ACT documents provide technical information, based on data collected from model plants, for use by State and local agencies to develop and implement regulatory programs to control emissions. The model plants in the ACT documents represent typical emitters; area-specific factors may cause discrepancies and deviations and should be accounted for when comparing ACT document costs to actual performance. CTG documents provide federal guidelines to State and local agencies to assist those areas when formulating a plan to meet federal air quality requirements.

In determining the future year control factor or emission factor, three basic parameters must be quantified: regulation control, rule effectiveness, and rule penetration. Regulation control is the level of reduction expected by assuming a fully complied measure. Rule effectiveness accounts for the level of expected compliance with the regulation. Rule penetration indicates the fraction of emissions within a source category which are subject to the regulation, accounting for size cutoffs and other exemptions.

Emissions from area sources are nearly always estimated using some type of calculation procedure. Direct measurement of area source emissions is hardly ever practical because of technical and cost considerations.

There are four basic approaches for developing an area source emission estimate:

- Extrapolation from a sample set of the sources (surveys, permit files, or other databases);
- Material balance method
- Mathematical models; and
- Emission factors applied to activity levels.

The calculation procedures determine what data is used to estimate the area source emissions. The activity data is in the "Episode Activity Data Workbook" available upon request from UDAQ. This data are used in the calculations to estimate emissions for area sources. Section 2.c iii (1).doc lists the data tables and reference documents used in the area source calculations.

Included in the Annual Emission Episode Workbooks are emissions for January 2009 and December 2009. This is included because in April of 2009 petroleum companies and gas stations in certain counties were required to begin using Stage 1 in the gasoline process. Because there were potential episodes in the beginning of 2009 and the end of 2009, summary tables for January 2009 without Stage 1 in some counties and December 2009 with Stage 1 in the additional counties were developed.

Since one of the episodes that was analyzed for this SIP extended over two calendar years, an average of the emissions from December 2009 and 2010 was input into the model to account for the changes in the annual numbers. This was done to prevent the entire change in annual emissions to be attributed to December 31, 2009, and January 1, 2010. The Episodic Annual Summary Workbook includes the average emissions of these two sets of data.

Area sources collectively represent individual sources that have not been inventoried as specific point or mobile sources. These sources are typically too small, numerous, or difficult to inventory using the methods for the other classes of sources. Area sources represent a collection of emission points for a specific geographic area, most commonly at the county level; however, any area can be used to define the boundaries of an area source.

Area sources are both natural and manmade sources of pollution and can encompass such wide ranging activities as consumer solvents, agricultural burning, roadway paving, residential heaters, wildfires, and wind erosion. Area source emissions are typically identified at the county level by its Area Source Classification code (ASC). A complete listing of 10-digit ASCs can be found at: **http://www.epa.gov/ttn/chief/scccodes.html**. EPA's *Compilation of Air Pollutant Emission Factors* (AP-42) contains extensive data on area sources (referred to in the document as "miscellaneous sources"), including types of

area sources and pollutants produced by them, and can be found at: **http://www.epa.gov/ttn/chief/ap42.html**. Further information on area sources can be found at the EIIP Area Source Committee site: **http://www.epa.gov/ttn/chief/eiip/eiip_ar.htm**.

3.1 Overview of Projection Methods

Emission projections for area sources depend upon the change in source level activity and changes in the emission factor applicable to the source. For area sources, the most appropriate equation used to project emissions is:

$E_{fy} = E_{by} * G * C$ (Equation 3.1-1)
3-2
where E_{fy} = projection year emissions
E_{by} = base year emissions
G = growth factor
C = control factor, accounting for changes in emission factors or controls

The base year activity (fuel use, employment, population) will vary depending on the source category. The growth activity indicator should align with the base year activity indicator as closely as possible. The above equation is only an example of the necessary calculation for emission projections; further complicating factors required for an accurate projection may require the development of a more vigorous equation.

3.1.1 GROWTH FACTOR

As with point sources, area source projections can be made using local studies or surveys or through surrogate growth indicators, such as E-GAS, to approximate the rise and fall in expected activity. The most commonly used surrogate growth indicators are those parameters typically projected by local metropolitan planning organizations (MPOs) such as population, housing, land use, and employment.

The Overview Chapter references several common surrogate growth indicators. Area sources rarely have detailed information based on surveys of individual emitters. Generally surrogate growth rates, as characterized by source type, must be used. While surrogate growth indicators such as GSP, employment, and population are reasonable estimators of future air pollution generating activity for traditional area source emitters (manufacturing, population-based activities), other indicators may be more appropriate for non-traditional emitters. Policy changes which may lead to increased or decreased activity in a category must also be considered. For example, future emissions from agricultural tilling will be affected by trends towards conservation tillage as well as total acres tilled. Projections of total acres tilled may not trend with agricultural earnings or GSP as operations due to changes in crop yields. The amount of prescribed burning which takes place each year is driven by the policy of Federal and State forest and land management agencies. There is currently an agreement to significantly increase the amount of prescribed burning by the year 2010. This will impact future projections of

prescribed burning emissions as well as emissions from wildfires. For these nontraditional area source emitters, Federal, State, and local trade associations and agencies should be consulted to identify the best indicators of future activity. Table 3.1-1 references specific growth indicators for projecting emissions for various area source categories.

3.1.2 CONTROL FACTORS

The projection year control factor for area sources should account for both changes in emissions due to new levels of control required by regulations and process modifications or technology improvements. Emitters in the manufacturing sector, such as industrial, commercial, and institutional fuel combustion, may be assigned a traditional control measure to limit emissions. However, for many area sources, conventional control methods are often inapplicable; instead, control of area source emissions may involve process modifications such as limiting agricultural burning practices, paving with emulsified asphalt or concrete, or stabilization of dirt roads. The control factors should also account for marketdriven process changes, such as the move toward lower-solvent or water-based paints (this can be both market and regulatory-driven) and conservation tillage.

Technical documents from EPA, including Alternative Control Techniques (ACT) documents and Control Techniques Guidelines (CTG) documents, are collected at the Clean Air Technology Center on EPA's TTN web site: **http://www.epa.gov/ttn/catc/products.html**.

ACT documents provide technical information, based on data collected from model sites, for use by State and local agencies to develop and implement regulatory programs to control emissions. The model sites in the ACT documents represent typical emitters; area-specific factors may cause discrepancies and deviations and should be accounted for when comparing ACT document costs to actual performance. CTG documents provide federal guidelines to State and local agencies to assist those areas in planning and meeting federal air quality requirements.

Area source projections should account for Federal, State, and local regulations. For federally mandated controls, the EPA documents and the models referenced in the following sections will be the best available resources for determining the appropriate emission factor to apply in projected inventories. The latest regulatory actions from the Office of Air and Radiation (OAR) can be found at: **http://www.epa.gov/ttn/oarpg/new.html**. OAR also provides a page devoted to policy, guidance, and regulations, sorted by the Title of the Clean Air Act Amendments (CAAA) to which they apply: **http://www.epa.gov/ttn/oarpg/amend.html**.

3.1.3 OTHER CONSIDERATIONS

Spatial issues may also impact area source projections. Urban sprawl may result in decreases in area source emissions related to farming, such as agricultural tillage and managed burning. Conversely, urban sprawl may then result in increases in other area source emissions associated with residential areas, such as dry cleaning and consumer solvent use.

3.1.4 AVAILABLE MODELS AND RESOURCES

Table 3.1-2 delineates available resources and models related to area source emission projections.

3.2 ALTERNATIVE METHODS

Area sources are normally calculated using a variety of estimation procedures that include related, but cumbersome, estimation tools to derive either a "top-down" estimate or a county-level "bottom-up" emissions inventory for area sources. An area source emission estimation model, named the Area Source Emissions Model (ASEM), consolidating these methods is under development. An alpha test version that provides estimates for a few categories has been completed and a beta version is currently under development. The beta test version is designed to combine existing calculation methods into a consolidated model with an easy to use user interface and report generator. The model will estimate area source emissions and will facilitate: 1) the use of consistent methodologies and the use of consistent activity data to estimate emissions from area sources and will enable the user to vary selected parameters and recalculate the emissions estimate for one or more categories; 2) ease of calculation when using location-specific data; and 3) development of summary outputs and exchange of the data among States and with EPA. By inputting appropriate activity data and control factors, later versions of the ASEM can be used by EPA, State, and local agencies to estimate emission projections for certain area source categories.

3.3 REFERENCES

ERG, 1996: Eastern Research Group, Inc., *Introduction to Area Source Emission InventoryDevelopment*, Eastern Research Group, Inc., Prepared for: Area Sources Committee, Emission Inventory Improvement Program, August 1996.

EPA, 1991b: U.S. Environmental Protection Agency, *Procedures for Preparing Emissions Projections*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, July 1991.

EPA, 1993: U.S. Environmental Protection Agency, *Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, March, 1993.

EPA, 1995: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors: Fifth Edition*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, January 1995. 3-5

Pechan-Avanti, 1997: The Pechan-Avanti Group, *The Emission Reduction and Cost Analysis Model for NOx (ERCAM-NOx)*, E.H. Pechan & Associates, Inc, prepared for the U.S. Environmental Protection Agency, Ozone Policy and Strategies Group, September 1997.

TABLE 3.1-1

GROWTH INDICATORS FOR PROJECTING EMISSIONS FOR AREA SOURCE CATEGORIES

Source Category Growth Indicators Information Sources

Gasoline Marketing projected gasoline consumption MOBILE5 fuel consumption model
Dry Cleaning population; retail service employment; solvent suppliers; trade associations
Degreasing (Cold Cleaning) industrial employment trade associations,
Architectural Surface Coating population or residential dwelling units local MPO
Automobile Refinishing industrial employment BEA or E-GAS
Small Industrial Surface Coating industrial employment BEA or E-GAS
Graphic Arts population state planning agencies; local MPO
Asphalt Use - Paving consult industry consult industry
Asphalt Use - Roofing industrial employment local industry representatives
Pesticide Applications historical trends in agricultural operations state department of agriculture; local MPO
Commercial/Consumer Solvent Use population local MPO; state planning agencies
Publicly Owned Treatment Works (POTWs) site-specific information state planning agencies
Hazardous Waste Treatment, Storage and Disposal Facilities (TSDFs) state planning forecasts state planning agencies; local MPO
Municipal Solid Waste Landfills state waste disposal plan local MPO; state planning agencies
Residential Fuel Combustion residential housing units or population local MPO
Commercial/Institutional Fuel Combustion commercial/institutional employment; population local MPO; land use map projections
Industrial Fuel Combustion industrial employment; or industrial land use local MPO; land use projections; state planning agencies
On-site Incineration based on information gathered from local regulatory agencies local regulating agencies and MPO; state planning agencies Open Burning based on information gathered from
local regulatory agencies local regulating agencies and MPO; state planning agencies
Fires: Managed Burning, Agricultural Field Burning, Frost Control (Orchard Heaters)
areas where these activities occur U.S. Forest Service, state agricultural extension office
Forest Wildfires historical average local, state, and federal forest management officials
Commercial Bakeries population U.S. Census Data
Paved Roads/Unpaved Roads Vehicle Miles Traveled (VMT) U.S. Census Data
Agricultural Tilling historical trends in agricultural operations state department of agriculture; local MPO
Construction Activity construction employment local MPO; consult industry
Structural Fires population local MPO; state planning agencies

TABLE 3.1-2
AVAILABLE MODELS AND RESOURCES
Resource Where To Go Brief Description
National Air Pollutant Emission Trends Report (Trends)
http://www.epa.gov/oar/aqtrnd97
Report contains a general approach for developing projections estimates for national criteria pollutants.

Multiple Projections System(MPS)

http://www.epa.gov/ttn/chief/ei_data.html#PS

Stand-alone computer program designed to facilitate the projection of future emissions of ozone precursors, specifically carbon monoxide (CO), volatile organic compounds (VOCs), and oxides of nitrogen (NOx). California Emission Forecasting System (CEFS)
http://www.arb.ca.gov/emisinv/pubs/pubs.htm
Computer analysis program capable of predicting future emission levels in the State of California.

TECHNICAL SUPPORT DOCUMENT FOR NON-ROAD MOBILE SOURCES: PM2.5 EMISSIONS INVENTORY FOR PM2.5 SIP 2008 BASELINE YEAR AND PROJECTION YEARS 2014, 2017 AND 2019

September 2012
Utah Division of Air Quality
Planning Branch/Mobile Sources

TABLE OF CONTENTS

i. Introduction
ii. Nonroad Emission Sources and Models
    1. EPA Nonroad Model
        - Gasoline Fuel-related inputs
        - Sulfur Content of Non-road Diesel
        - Daily Minimum and Maximum Temperatures by County
    2. Aircraft
    3. Locomotives
        Locomotive Emission Factors
        Scaling Factors
iii. Summary of all Nonroad Mobile Source Emissions
    2008 Baseline PM2.5 SIP Nonroad Emission Inventory
    2014 Projection PM2.5 SIP Nonroad Emission Inventory
    2017 Projection PM2.5 SIP Nonroad Emission Inventory
    2019 Projection PM2.5 SIP Nonroad Emission Inventory
iv. References

LIST OF TABLES

Table 1. 2008 Gasoline Fuel-related inputs
Table 2. 2014 Gasoline Fuel-related inputs
Table 3. Diesel Sulfur Content
Table 4. 2007-2010 Average Maximum and Minimum Temperature
Table 5. Four Main Operation Types for Aircraft
Table 6. 2014 Locomotive Emission Factors (g/gal)
Table 7. 2017 Locomotive Emission Factors (g/gal)
Table 9. 2019 Locomotive Emission Factors (g/gal)
Table 10. Tier 4 Line Haul Emission Factors (g/bhp-hr)
Table 11. Tier 4 Line Haul Emission Factors (g/gal)
Table 12. Fuel Consumption (quadrillion Btu)
Table 13. 2008 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)
Table 14. 2014 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)
Table 15. 2017 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)
Table 16. 2019 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)

i. Introduction

This report discusses the nonroad mobile source emission inventories of the PM2.5 SIP 2008 baseline and projection-year inventories in 2014, 2017 and 2019 for the domain comprising seventeen counties around the Wasatch Front in Utah. The inventory includes emissions of PM_{10}, $PM_{2.5}$, sulfur dioxide (SO2), nitrogen oxides (NO_x), volatile organic compounds (VOC), and carbon monoxide (CO) from miscellaneous non-road engines, locomotives and aircraft.

Both urban and rural county emission inventories are discussed in this document. The counties in the PM2.5 domain are the following:

Urban: Cache, Davis, Salt Lake, Utah and Weber Counties

Rural:	Box Elder	Emery	Morgan	Summit
	Carbon	Juab	Rich	Tooele
	Duchesne	Millard	Sanpete	Wasatch

Non-road mobile sources are comprised of three main source categories: 1) miscellaneous non-road engines, 2) locomotives and 3) aircraft. Miscellaneous non-road engine emissions were computed by using the EPA NONROAD Model, version 2008.1.0. Locomotive emissions were estimated by applying EPA emission factors to the total amount of fuel used by locomotives. Aircraft emissions were estimated by applying aircraft specific activity data to the *Emissions Dispersion Modeling System (EDMS)*, version 5.1.2.

For most pollutants, the majority of non-road mobile source emissions come from miscellaneous non-road engines. However, diesel locomotives contribute more than 40% of the emissions of NO_x. Except SO_x other emissions from aircraft contribute a relatively small part of total non-road mobile source emissions.

ii. Non-road Emission Source and Models

1. EPA Nonroad Model

Mobile source emissions are disaggregated into on-road and non-road emission categories. Nonroad mobile sources include off-highway vehicles and engines that move or are moved within a 12-month period. The EPA NONROAD Model, version 2008.1.0 (December 8, 2008), was used to estimate emission inventories of important air emissions from diverse nonroad equipment. There are ten categories for non-road emissions which result from the use of fuel in a diverse collection of vehicles and equipment[1]. Nonroad mobile sources are vehicles and engines that fall under the following categories:

1. Agricultural equipment, such as tractors, combines, irrigation sets and balers;
2. Airport ground support equipment, such as baggage tugs and terminal tractors;
3. Commercial equipment, such as generators, air compressors and pumps;
4. Industrial equipment, such as forklifts and sweepers;
5. Construction and mining equipment, such as graders, back hoes and trenchers;
6. Lawn and garden equipment, such as leaf blowers and lawn mowers;
7. Logging equipment, such as chain saws and shredders;
8. Pleasure craft, such as power boats and personal watercraft;
9. Railway maintenance equipment, such as rail straighteners;

10. Recreational equipment, such as all-terrain vehicles and off-road motorcycles;

Commercial marine, locomotive, and aircraft emissions are not predicted in this version of the non-road emissions model. The output inventories for criteria pollutants include carbon monoxide (CO), oxides of nitrogen (NOx), oxides of sulfur (SO2), and particulate matter (PM10 and PM2.5), as well as other emissions including total volatile organic compounds (VOC) and carbon dioxide (CO2). The model can output the emissions by equipment type, size, technology group and further stratifies equipment types by horsepower rating. Fuel types include gasoline, diesel, compressed natural gas (CNG), and liquefied petroleum gas (LPG).

The NONROAD model uses 2008 as a base year, and then projects emissions for 2014, 2017 and 2019 based on growth factors inherent in the model. Emissions were computed for each year January data. Annual average emissions were calculated by the following equation:

Annual average emission (tons per year) = (January / 31)*366

Gasoline Fuel-related inputs

UDEQ chose the MOVES2010 default database "moves20100830"for Nonroad gasoline fuel related inputs which includes Reid Vapor Pressure (RVP) and gasoline, LPG and CNG Sulfur contents. MOVES2010 gasoline default fuel formulations are shown below for calendar year 2008 and 2014.

Table 1. 2008 Gasoline Fuel-related inputs

Year	County	FIPS	Month	Gasoline RVP (psi)	Oxygen Weight %	Gas sulfur %	CNG/LPG sulfur %	EtOH Blend % Mkt	EtOH Vol %
2008	Box Elder	49003	January	12.61	0	0.00546	0.003	0	0
2008	Cache	49005	January	12.61	0	0.00546	0.003	0	0
2008	Carbon	49007	January	12.61	0	0.00546	0.003	0	0
2008	Davis	49011	January	13.04	0	0.00546	0.003	0	0
2008	Duchesne	49013	January	12.61	0	0.00546	0.003	0	0
2008	Emery	49015	January	12.61	0	0.00546	0.003	0	0
2008	Juab	49023	January	12.61	0	0.00546	0.003	0	0
2008	Millard	49027	January	12.61	0	0.00546	0.003	0	0
2008	Morgan	49029	January	13.04	0	0.00546	0.003	0	0
2008	Rich	49033	January	12.61	0	0.00546	0.003	0	0
2008	Salt Lake	49035	January	13.04	0	0.00546	0.003	0	0
2008	Sanpete	49039	January	12.61	0	0.00546	0.003	0	0
2008	Summit	49043	January	13.04	0	0.00546	0.003	0	0
2008	Tooele	49045	January	13.04	0	0.00546	0.003	0	0
2008	Utah	49049	January	13.04	0	0.00546	0.003	0	0
2008	Wasatch	49051	January	12.61	0	0.00546	0.003	0	0
2008	Weber	49057	January	13.39	0	0.00546	0.003	0	0

Table 2. 2014 Gasoline Fuel-related inputs

Year	County	FIPS	Month	Fuel RVP for gas	Oxygen Weight %	Gas sulfur %	CNG/LPG sulfur %	EtOH Blend % Mkt	EtOH Vol %
2014	Box Elder	49003	January	13.30	3.488	0.0028	0.003	100	10
2014	Cache	49005	January	13.30	3.488	0.0028	0.003	100	10
2014	Carbon	49007	January	13.30	3.488	0.0028	0.003	100	10
2014	Davis	49011	January	13.30	3.488	0.0028	0.003	100	10
2014	Duchesne	49013	January	13.30	3.488	0.0028	0.003	100	10
2014	Emery	49015	January	13.30	3.488	0.0028	0.003	100	10
2014	Juab	49023	January	13.30	3.488	0.0028	0.003	100	10
2014	Millard	49027	January	13.30	3.488	0.0028	0.003	100	10
2014	Morgan	49029	January	13.30	3.488	0.0028	0.003	100	10
2014	Rich	49033	January	13.30	3.488	0.0028	0.003	100	10
2014	Salt Lake	49035	January	13.30	3.488	0.0028	0.003	100	10
2014	Sanpete	49039	January	13.30	3.488	0.0028	0.003	100	10
2014	Summit	49043	January	13.30	3.488	0.0028	0.003	100	10
2014	Tooele	49045	January	13.30	3.488	0.0028	0.003	100	10
2014	Utah	49049	January	14.10	3.488	0.0028	0.003	100	10
2014	Wasatch	49051	January	13.30	3.488	0.0028	0.003	100	10
2014	Weber	49057	January	14.10	3.488	0.0028	0.003	100	10

Sulfur Content of Nonroad Diesel

On June 29, 2004 EPA adopted a new Nonroad Diesel Rule (Tier 4 Final Rule) for nonroad diesel engines and sulfur reductions in nonroad diesel fuel that would dramatically reduce harmful emissions and provide enormous public health benefits. Beginning June 1, 2007, refiners were required to produce nonroad, locomotive and marine (NRLM) diesel fuel with a maximum sulfur content of 500 ppm. From June 1, 2010, the sulfur content for nonroad diesel fuel would be reduced to a maximum of 15 ppm. The new rule would remove 99% of the sulfur in diesel fuel by 2010, resulting in dramatic reductions in soot from all diesel engines.[2] The new rule would cut emission of particulate matter by 96% and nitrogen oxides by 99%[3] from nonroad diesel engines used in construction, agricultural, industrial, and airport service equipment, nonroad construction and industrial jobsites and farm fields.

Nationwide average fuel properties are used for Nonroad model input values.

Table 3. Diesel Sulfur Content [4]

Year	Diesel Sulfur (ppm)	Marine Sulfur (ppm)
2008	351	435
2014	20	52
2017	11	56
2019	11	55

Daily Minimum and Maximum Temperatures by County

The NONROAD model is not sensitive to the changes in temperature observed during the $PM_{2.5}$ episodes. The minimum and maximum temperature is the average low and high for the time period selected in each county. Temperature data is based on average temperatures recorded during the four winter $PM_{2.5}$ episode studies, which took place from January, 2007 through January, 2010 inclusive.

Table 4. 2007-2010 Average Maximum and Minimum Temperature

County	FIPS	Minimum (F)	Maximum (F)	Average (F)
Box Elder	49003	21.70	32.33	26.12
Cache	49005	16.94	25.88	20.96
Carbon	49007	16.26	29.47	21.70
Davis	49011	23.29	31.19	26.70
Duchesne	49013	13.37	29.06	19.42
Emery	49015	16.26	29.47	21.70
Juab	49023	23.92	32.52	27.39
Millard	49027	16.26	29.47	21.70
Morgan	49029	11.52	29.14	18.56
Rich	49033	14.30	22.61	18.00
Salt Lake	49035	23.50	32.76	27.42
Sanpete	49039	19.34	32.29	24.67
Summit	49043	11.52	29.14	18.56
Tooele	49045	23.92	32.52	27.39
Utah	49049	21.25	30.53	25.55
Wasatch	49051	13.37	29.06	19.42
Weber	49057	21.58	33.07	26.13

2. Aircraft

The aircraft source category includes all aircraft types used for public, private, and military purposes. The aircraft emissions inventories are grouped by type of operation rather than aircraft type. Four types of aircraft activity, shown in Table 5, are included: commercial, air taxi, general aviation and military aircraft.

Table 5. Four Main Operation Types for Aircraft

Operation Type	Description	Source of Emission Factors	SCC Code Groups
Commercial Flights/Air Carriers	Operations at Salt Lake City International Airport and 8 smaller municipal airports.	EDMS and EPA guidance documents for PM from commercial aircraft	2275000000
Air Taxi	Small privately-owned commuter planes	EDMS and EPA guidance documents for air taxi	2275000000
General Aviation	Small municipal airport operations (aircraft are "based" in small cities and towns)	EDMS and EPA guidance documents for general aviation	2275000000
Military Aircraft	Military operations	Military installations and EPA guidance	2275000000

Criteria pollutant emissions for commercial air carriers were calculated differently than the other three aircraft categories. They were estimated by applying aircraft specific activity data from FAA's *Airport Activity Statistics of Certificated Route Air Carriers* to FAA's *Emissions and Dispersion Modeling System (EDMS)*, version 5.1.2, November 6, 2009[5]. The FAA's T100 Segment data obtained from the Bureau of Transportation Statistics (BTS), which is updated every month, were used in conjunction with the EDMS model. EDMS generates emissions for CO, VOC, NOx, SOx, PM10 and PM2.5 emissions by aircraft type. EDMS does not give emission factors (EF) for PM10 and PM2.5 exhaust for some aircraft types. UDAQ assumed those values were insignificant or too small to count.

Annual aircraft operations data for air taxis, general aviation, and military aircraft are reported by the Utah Department of Transportation, Division of Aeronautics. Criteria pollutant emission estimates were calculated by combining aircraft operations data and EDMS emission factors by aircraft type.

Airport Ground Support Equipment (GSE)

The EPA NONROAD model runs emissions for Airport Ground Support Equipment (GSE). The model produces 3 SCC categories for GSE:

226-500-8005 4-stroke
226-700-8005 LPG
227-000-8005 Diesel

Davis County shows zero emissions for Airport GSE. Tooele County has a small value. This might be for Tooele City airport. Salt Lake County has a bigger value, which indicates that

emissions from Salt Lake International Airport are included in the NONROAD model. The NONROAD model covers GSE for other counties and small airports. GSE for Davis County and Tooele County were reported in point sources under Hill Air Force Base and Dugway Proving Ground.

3. Locomotives

The locomotive source category includes railroad locomotives powered by diesel-electric engines and does not include locomotives powered by electricity or steam. Locomotive diesel engines are significant contributors to air pollution; they emit especially large amounts of nitrogen oxides (NOx) and particulate matter (PM) which contribute to serious public health problems.

Annual emissions from locomotives were calculated based on diesel fuel usage provided by individual railroad companies that operate in Utah. For incomplete data, UDAQ computed missing emissions using EPA guidance. As of 2008, these companies include: Amtrak, Burlington Northern Sante Fe Railway (BNSF), Union Pacific Railroad Company (UPRR), Salt Lake Garfield & Western Railway, and Utah Transit Authority (UTA). Railway operations from these companies fall into two categories: line-haul and yard/switching operations. Emissions from yard locomotives are from idling and some line-haul activity.

About 85% of diesel locomotive emissions come from UPRR. Currently 70% of UPRR yard locomotives, including those in Utah, are retrofitted with Automatic Engine Stop/Start (AESS) units[6]. Commuter rail operated by UTA were also included in the inventory. It started operations on April 26, 2008.

Locomotive Emission Factors

All of the criteria pollutants, VOC, CO, NO_x, SO_x, PM_{10}, and $PM_{2.5}$, are included in the locomotive inventory. The emissions were estimated by applying emission factors to the total amount of distillate fuel oil used by locomotives. Emission factors for the criteria pollutants PM10, NOx and VOC were obtained from *Emission Factors for Locomotives* (U.S. EPA, 1997)[8]. Emission factor for CO and SO2 were obtained from *Revised Inventory Guidance for Locomotive Emissions* (Sierra Research, Inc., 2004).

The SO2 emission factor for 2014 above is 5.33 lbs/1000gallons. It is adjusted as follows.
SO2 Emission Factor = 5.33 lbs/1000gallons * 453.59 gram/lb = 2.418 gram/gallon

The CO emission factor for 2014 above is 62.05 lbs/1000gallons. It is adjusted as follows.
CO Emission Factor = 62.05 lbs/1000gallons * 453.59 gram/lb = 28.15 gram/gallon

The estimated average emission rates for projection years 2014, 2017 and 2019 are shown in following tables in grams of pollutant emitted per gallon of fuel consumed (g/gal).

Table 6. 2014 Locomotive Emission Factors (g/gal)

Application	PM10	PM2.5	SO2	NOx	VOC	CO
Line-Haul	3.6	3.24	2.42	135	6.1	28.15
Switch Yard	4.8	4.32	2.42	217	12.7	28.15
Commuter	3.6	3.24	2.42	138	6.3	28.15

Table 7. 2017 Locomotive Emission Factors (g/gal)

Application	PM10	PM2.5	SO2	NOx	VOC	CO
Line-Haul	2.9	2.61	2.42	114	4.6	28.15
Switch Yard	4.5	4.05	2.42	206	11.8	28.15
Commuter	2.8	2.52	2.42	112	4.6	28.15

Table 8. 2019 Locomotive Emission Factors (g/gal)

Application	PM10	PM2.5	SO2	NOx	VOC	CO
Line-Haul	2.5	2.25	2.42	103	3.9	28.15
Switch Yard	4.4	3.96	2.42	200	11.4	28.15
Commuter	2.3	2.07	2.42	98	3.5	28.15

Nonroad Diesel Rule (Tier 4 Final Rule) requires the sulfur content of locomotive and marine diesel fuel will be reduced to 15 ppm (ultra-low sulfur diesel fuel) beginning June 1, 2012[2]. The Tier 4 standards for newly-built engines phase in beginning in 2015 for locomotives. These standards are based on catalytic aftertreatment technology such as diesel particulate filters and selective catalytic reduction (SCR). UTA plans to replace their current locomotive engines with Tier 4 technology in 2015[7].

Line-haul emission factors for Tier 4 standards were used for UTA locomotive emission inventory in 2017 and 2019. It is common to express emission rates as grams of pollutant emitted per gallon of fuel consumed (g/gal). This can be done by multiplying the emission rates in grams per brake horsepower-hour (g/bhp-hr) by a conversion factor relating the fuel consumption (gal/hr) and the usable power (bhp) of the engine. EPA has estimated the conversion factor for line-haul service is 20.8 bhp-hr/gal[8].

Table 9. Tier 4 Line-Haul Emission Factors (g/bhp-hr) [8]

Application	PM10	PM2.5	NOx	VOC
Line-Haul	0.015	0.0135	1	0.04

Table 10. Tier 4 Line-Haul Emission Factors (g/gal)

Application	PM10	PM2.5	NOx	VOC
Line-Haul	0.31	0.28	20.80	0.83

Scaling Factors

Fuel consumption data for projection years were obtained from the U.S. Energy Information Administration[9]. The data for Transportation Sector Key Indicators and Delivered Energy Consumption were used to calculate the projection-year scaling factors.

Table 11. Fuel Consumption (quadrillion Btu)

Energy Use by Mode (quadrillion Btu)	2008	2009	2014	2017	2019
Rail, Passenger	0.0493	0.0494	0.0533	0.0556	0.0568
Rail, Freight	0.5752	0.5109	0.5625	0.5858	0.6015

iii. Summary of all Nonroad Mobile Source Emissions

Tables 13 through 16 summarizes 2008 baseline, 2014, 2017 and 2019 projection-year annual emissions from nonroad mobile sources in Utah PM2.5 non-attainment area.

Table 12. 2008 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)

County	FIPs	CO	NOx	VOC	PM10	PM2.5	SO2	CO2
Box Elder	49003	3,599.04	1,358.53	687.75	63.70	59.60	86.09	100,912.86
Cache	49005	3,800.60	596.31	474.36	45.27	43.67	11.98	66,299.99
Carbon	49007	944.15	708.65	96.15	31.53	29.61	39.96	39,425.79
Davis	49011	7,474.88	1,519.12	726.22	116.02	107.62	43.65	164,449.61
Duchesne	49013	2,373.56	69.49	697.28	22.77	22.31	0.71	19,001.28
Emery	49015	329.02	370.45	45.37	20.01	18.95	20.27	22,923.26
Juab	49023	740.65	490.48	115.43	20.43	18.65	37.25	32,462.27
Millard	49027	896.92	834.66	190.29	33.49	30.82	60.87	51,342.38
Morgan	49029	3,740.86	429.79	1,237.83	46.94	44.92	33.45	48,953.00
Rich	49033	12,677.85	83.73	4,646.96	123.82	121.34	2.95	88,850.40
Salt Lake	49035	44,155.48	5,263.45	3,722.77	330.19	319.26	195.09	738,988.39
Sanpete	49039	1,516.96	68.15	447.09	16.24	15.92	0.48	14,486.12
Summit	49043	2,169.49	886.64	468.30	51.71	48.82	56.80	69,665.03
Tooele	49045	1,797.60	889.28	391.66	41.96	38.27	60.76	65,120.84
Utah	49049	12,443.15	2,237.95	1,087.48	154.22	148.92	66.36	216,782.42
Wasatch	49051	2,184.08	189.43	598.20	25.63	24.86	6.02	27,052.59
Weber	49057	7,137.70	1,265.63	654.78	77.28	73.78	52.08	116,985.24
Total		**107,981.97**	**17,261.75**	**16,287.93**	**1,221.21**	**1,167.32**	**774.76**	**1,883,701.47**

Table 13. 2014 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)

County	FIPs	CO	NOx	VOC	PM10	PM2.5	SO2	CO2
Box Elder	49003	2,456.26	1,049.25	408.61	41.26	38.74	14.92	104,164.66
Cache	49005	2,774.84	357.17	358.72	33.96	32.81	2.92	69,442.09
Carbon	49007	734.81	399.21	65.93	20.12	19.10	5.57	37,273.16
Davis	49011	5,542.77	1,243.67	517.18	95.81	87.91	14.55	188,337.67
Duchesne	49013	1,757.88	72.76	578.09	20.39	19.99	0.43	21,814.16
Emery	49015	273.41	267.04	32.81	14.13	13.46	3.45	24,430.46
Juab	49023	648.67	372.12	92.07	13.19	12.05	6.75	32,916.10
Millard	49027	672.67	577.77	116.29	19.43	17.97	9.23	48,507.54
Morgan	49029	2,746.61	367.79	1,031.59	39.37	37.94	6.11	52,745.62
Rich	49033	9,040.15	205.56	3,891.22	116.86	114.52	1.73	103,418.66
Salt Lake	49035	33,723.16	4,038.64	2,886.78	271.90	262.80	152.97	839,250.48
Sanpete	49039	1,095.08	61.41	369.54	14.31	14.03	0.26	16,617.85
Summit	49043	1,620.48	686.27	375.08	37.56	35.70	9.61	73,486.45
Tooele	49045	1,432.54	678.56	293.95	28.60	25.93	12.41	68,042.63
Utah	49049	9,561.91	1,433.98	798.90	114.81	111.38	12.13	229,296.71
Wasatch	49051	1,657.62	137.08	498.92	21.67	21.06	1.62	29,906.00
Weber	49057	5,448.56	989.31	484.33	60.51	57.82	12.35	131,876.77
Total		**81,187.43**	**12,937.60**	**12,799.99**	**963.88**	**923.20**	**267.00**	**2,071,527.00**

Table 14. 2017 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)

County	FIPs	CO	NOx	VOC	PM10	PM2.5	SO2	CO2
Box Elder	49003	2,306.50	915.98	317.47	33.28	31.19	15.53	108,793.89
Cache	49005	2,665.89	284.11	322.72	27.27	26.26	2.96	73,206.32
Carbon	49007	739.17	375.62	62.11	18.03	17.09	5.78	38,975.66
Davis	49011	5,410.47	896.01	436.19	76.76	73.31	13.71	197,347.41
Duchesne	49013	1,669.28	71.98	500.39	18.10	17.74	0.45	23,048.59
Emery	49015	269.55	237.12	29.02	12.08	11.51	3.58	25,510.89
Juab	49023	650.16	324.81	82.68	11.01	10.03	6.99	34,237.18
Millard	49027	657.76	507.70	90.91	15.99	14.77	9.59	50,565.30
Morgan	49029	2,567.01	342.84	894.47	35.30	34.06	6.35	55,455.55
Rich	49033	8,349.53	258.96	3,371.72	106.87	104.73	1.83	109,628.95
Salt Lake	49035	34,036.95	3,571.25	2,816.78	231.92	223.68	162.83	892,358.65
Sanpete	49039	1,029.73	57.57	320.32	12.56	12.31	0.27	17,597.69
Summit	49043	1,577.94	594.05	326.64	31.44	29.89	10.00	77,170.49
Tooele	49045	1,418.30	593.94	275.88	23.42	21.17	12.97	70,933.60
Utah	49049	9,435.37	1,177.57	731.56	93.40	90.52	12.45	242,033.96
Wasatch	49051	1,571.33	124.78	437.74	18.89	18.34	1.66	31,564.62
Weber	49057	5,369.78	801.07	439.92	49.01	46.80	12.75	138,659.17
Total		**79,724.72**	**11,135.38**	**11,456.54**	**815.33**	**783.38**	**279.71**	**2,187,087.93**

Table 15. 2019 Nonroad Mobile, Aircraft, Locomotives Emissions Inventory (tons/year)

County	FIPs	CO	NOx	VOC	PM10	PM2.5	SO2	CO2
Box Elder	49003	2,261.79	1,045.49	286.20	35.74	33.22	15.93	111,906.69
Cache	49005	2,648.42	258.12	306.00	23.88	22.92	2.99	75,698.84
Carbon	49007	751.24	403.83	63.86	18.36	17.33	5.93	40,118.58
Davis	49011	5,434.22	882.55	422.44	70.89	67.43	14.50	203,352.18
Duchesne	49013	1,612.25	72.01	451.06	16.60	16.27	0.45	23,753.20
Emery	49015	269.79	266.92	30.57	12.57	11.90	3.65	26,153.11
Juab	49023	653.39	384.84	83.75	12.64	11.46	7.16	35,117.75
Millard	49027	653.61	597.59	86.84	18.35	16.84	9.84	51,934.33
Morgan	49029	2,447.56	406.64	811.06	35.18	33.79	6.52	57,051.77
Rich	49033	7,882.52	290.53	3,034.20	99.76	97.76	1.88	112,934.28
Salt Lake	49035	34,692.48	3,450.06	2,831.31	213.00	204.93	169.24	926,808.68
Sanpete	49039	990.88	56.09	289.25	11.46	11.23	0.28	18,176.93
Summit	49043	1,559.52	677.55	307.26	32.26	30.43	10.26	79,575.10
Tooele	49045	1,409.68	684.55	269.03	25.33	22.77	13.25	72,786.18
Utah	49049	9,477.06	1,139.83	711.46	84.20	81.33	12.65	250,401.56
Wasatch	49051	1,517.09	122.71	398.90	17.22	16.70	1.69	32,567.35
Weber	49057	5,399.54	838.13	430.88	47.02	44.64	12.97	142,988.88
Total		**79,661.03**	**11,577.43**	**10,814.07**	**774.45**	**740.96**	**289.19**	**2,261,325.41**

iv. REFERENCES

The following documents were used as references in creating the non-road mobile source PM2.5 SIP emissions inventories:

1. U.S. Environmental Protection Agency, User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, December 2005, http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2005/420r05013.pdf

2, U.S. Environmental Protection Agency, FR-2004-06-29, *Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel*, Final Rule, Vol. 69, No. 124, June 29, 2004, Rules and Regulations, http://www.gpo.gov/fdsys/pkg/FR-2004-06-29/pdf/04-11293.pdf

3. Clean Diesel Technology, *For Off-road Engines and Equipment: Tier 4 and more*, http://www.aem.org/PDF/DTF_Tier4WP_FIN.pdf

4. U.S. Environmental Protection Agency, *Suggested Nationwide Average Fuel Properties*, Office of Transportation and Air Quality, EPA-420-B-09-018, April 2009, http://www.epa.gov/oms/models/nonrdmdl/nonrdmdl2008/420b09018.pdf.

5. Federal Aviation Administration, *Emissions and Dispersion Modeling System (EDMS) User's Manual*, FAA-AEE-07-01, (Rev. 7 – 11/06/09), November 2009,

http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/edms_model/media/EDMS%205.0.2%20User%20Manual.pdf

6. Union Pacific Railroad Company (UPRR), Jon Germer, Manager Environmental Affair, July 11, 2012.

7. Utah Transit Authority (UTA), Daniel Locke, May 10, 2012.

8. U.S. Environmental Protection Agency, *Emission Factors for Locomotives*, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009, http://www.epa.gov/nonroad/locomotv/420f09025.pdf

9. Energy Information Administration, A7 Transportation Sector Key Indicators and Delivered Energy Consumption, *Annual Projections to 2035,* http://www.eia.gov/analysis/projection-data.cfm#annualproj

Off-Road Mobile Emissions Typical Winter Inversion Weekday Emissions (tpd)				2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	NA-Area	County	Sector	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
NonRoad Mobile	Logan, UT-ID	Cache, UT	Mobile - Aircraft	0.003	0.013	0.235		0.005	0.003	0.013	0.235		0.005	0.004	0.236	0.013		0.003	0.003	0.013	0.236		0.005
			Mobile - Non-Road Equipment - Diesel	0.048	0.740	0.092		0.056	0.048	0.692	0.081		0.040	0.034	0.504	0.062		0.023	0.026	0.402	0.051		0.012
			Mobile - Non-Road Equipment - Gasoline	0.034	0.072	1.085		0.001	0.034	0.072	1.085		0.001	0.033	0.078	0.995		0.001	0.032	0.083	0.840		0.001
			Mobile - Non-Road Equipment - Other	0.003	0.094	0.046		0.001	0.003	0.094	0.046		0.001	0.003	0.067	0.028		0.001	0.003	0.060	0.024		0.001
		Franklin, ID	Mobile - Aircraft	0.001	0.000	0.002	0.000	0.000	0.001	0.000	0.002	0.000	0.000	0.001	0.000	0.002	0.000	0.000	0.001	0.000	0.002	0.000	0.000
			Mobile - Locomotives	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Mobile - Non-Road Equipment - Diesel	0.010	0.117	0.012	0.000	0.003	0.010	0.117	0.012	0.000	0.003	0.010	0.117	0.012	0.000	0.003	0.010	0.117	0.012	0.000	0.003
			Mobile - Non-Road Equipment - Gasoline	0.011	0.007	0.415	0.000	0.001	0.011	0.007	0.415	0.000	0.001	0.011	0.007	0.415	0.000	0.001	0.011	0.007	0.415	0.000	0.001
			Mobile - Non-Road Equipment - Other	0.000	0.012	0.003	0.000	0.000	0.000	0.012	0.003	0.000	0.000	0.000	0.012	0.003	0.000	0.000	0.000	0.012	0.003	0.000	0.000
			Logan, UT-ID Total	0.109	1.055	1.890	0.000	0.066	0.109	1.008	1.879	0.000	0.050	0.095	1.020	1.530	0.000	0.031	0.085	0.695	1.682	0.000	0.021
	Provo, UT	Utah, UT	Mobile - Aircraft	0.002	0.020	0.269		0.009	0.002	0.019	0.266		0.009	0.003	0.268	0.019		0.002	0.002	0.020	0.268		0.009
			Mobile - Non-Road Equipment - Diesel	0.178	2.428	0.269		0.101	0.176	2.318	0.249		0.071	0.128	1.734	0.199		0.040	0.100	1.422	0.171		0.019
			Mobile - Non-Road Equipment - Gasoline	0.064	0.138	1.810		0.001	0.063	0.137	1.793		0.001	0.065	0.123	1.815		0.001	0.066	0.122	1.841		0.001
			Mobile - Non-Road Equipment - Other	0.005	0.175	0.090		0.001	0.005	0.174	0.089		0.001	0.005	0.125	0.067		0.001	0.006	0.112	0.048		0.001
			Provo, UT Total	0.248	2.760	2.437	0.000	0.112	0.246	2.647	2.397	0.000	0.082	0.201	2.250	2.090	0.000	0.043	0.173	1.676	2.329	0.000	0.030
	Salt Lake City, UT	Box Elder, UT	Mobile - Aircraft	0.000	0.003	0.027		0.001	0.000	0.003	0.027		0.001	0.000	0.027	0.003		0.000	0.000	0.003	0.027		0.001
			Mobile - Non-Road Equipment - Diesel	0.017	0.424	0.047		0.025	0.016	0.371	0.040		0.020	0.011	0.277	0.032		0.015	0.008	0.224	0.027		0.011
			Mobile - Non-Road Equipment - Gasoline	0.005	0.013	0.146		0.000	0.005	0.013	0.145		0.000	0.005	0.010	0.149		0.000	0.005	0.009	0.153		0.000
			Mobile - Non-Road Equipment - Other	0.003	0.084	0.038		0.000	0.003	0.083	0.038		0.000	0.003	0.058	0.021		0.001	0.003	0.052	0.017		0.001
		Davis, UT	Mobile - Aircraft	0.033	0.261	0.186		0.014	0.033	0.258	0.183		0.014	0.045	0.114	0.193		0.041	0.041	0.193	0.114		0.012
			Mobile - Non-Road Equipment - Diesel	0.120	1.654	0.170		0.029	0.119	1.608	0.165		0.026	0.086	1.266	0.142		0.024	0.067	1.089	0.131		0.023
			Mobile - Non-Road Equipment - Gasoline	0.036	0.088	0.993		0.000	0.036	0.087	0.981		0.000	0.037	0.075	1.011		0.000	0.038	0.073	1.039		0.000
			Mobile - Non-Road Equipment - Other	0.003	0.110	0.057		0.001	0.003	0.108	0.057		0.001	0.003	0.078	0.037		0.001	0.003	0.071	0.031		0.001
		Salt Lake, UT	Mobile - Aircraft	0.044	2.826	2.991		0.381	0.043	2.792	2.955		0.377	0.054	3.091	2.990		0.046	0.048	3.124	3.183		0.420
			Mobile - Non-Road Equipment - Diesel	0.339	5.381	0.646		0.202	0.335	5.177	0.610		0.177	0.239	4.153	0.538		0.166	0.186	3.628	0.502		0.159
			Mobile - Non-Road Equipment - Gasoline	0.184	0.579	5.315		0.003	0.181	0.572	5.251		0.003	0.190	0.497	5.390		0.003	0.196	0.485	5.538		0.003
			Mobile - Non-Road Equipment - Other	0.018	0.637	0.349		0.003	0.017	0.629	0.345		0.003	0.019	0.461	0.234		0.004	0.019	0.416	0.202		0.004
		Tooele, UT	Mobile - Aircraft	0.006	0.032	0.369		0.007	0.006	0.032	0.365		0.007	0.008	0.405	0.034		0.005	0.005	0.035	0.406		0.007
			Mobile - Non-Road Equipment - Diesel	0.017	0.623	0.063		0.048	0.017	0.615	0.062		0.048	0.012	0.571	0.059		0.048	0.009	0.548	0.058		0.048
			Mobile - Non-Road Equipment - Gasoline	0.004	0.006	0.099		0.000	0.004	0.006	0.098		0.000	0.004	0.005	0.101		0.000	0.004	0.005	0.104		0.000
			Mobile - Non-Road Equipment - Other	0.000	0.013	0.006		0.000	0.000	0.013	0.006		0.000	0.000	0.009	0.004		0.000	0.000	0.008	0.003		0.000
		Weber, UT	Mobile - Aircraft	0.002	0.015	0.250		0.006	0.002	0.015	0.247		0.006	0.003	0.248	0.015		0.002	0.002	0.015	0.248		0.006
			Mobile - Non-Road Equipment - Diesel	0.069	1.058	0.140		0.029	0.068	1.064	0.143		0.031	0.048	0.876	0.133		0.032	0.038	0.783	0.128		0.033
			Mobile - Non-Road Equipment - Gasoline	0.029	0.074	0.839		0.000	0.029	0.073	0.829		0.000	0.030	0.063	0.855		0.000	0.031	0.061	0.878		0.000
			Mobile - Non-Road Equipment - Other	0.004	0.124	0.064		0.001	0.004	0.123	0.064		0.001	0.004	0.088	0.041		0.001	0.004	0.079	0.034		0.001
			SaltLake City, UT Total	0.933	14.004	12.795	0.000	0.753	0.921	13.641	12.609	0.000	0.716	0.802	12.372	11.981	0.000	0.389	0.710	10.901	12.824	0.000	0.730
		Bannock, ID	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
			Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
			Mobile - Non-Road Equipment - Diesel	0.026	0.314	0.033	0.000	0.008	0.026	0.314	0.033	0.000	0.008	0.026	0.314	0.033	0.000	0.008	0.026	0.314	0.033	0.000	0.008
			Mobile - Non-Road Equipment - Gasoline	0.015	0.031	0.634	0.000	0.003	0.015	0.031	0.634	0.000	0.003	0.015	0.031	0.634	0.000	0.003	0.015	0.031	0.634	0.000	0.003
			Mobile - Non-Road Equipment - Other	0.001	0.093	0.024	0.000	0.000	0.001	0.093	0.024	0.000	0.000	0.001	0.093	0.024	0.000	0.000	0.001	0.093	0.024	0.000	0.000
		Bear Lake, ID	Mobile - Aircraft	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
			Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
			Mobile - Non-Road Equipment - Diesel	0.011	0.141	0.013	0.000	0.003	0.011	0.141	0.013	0.000	0.003	0.011	0.141	0.013	0.000	0.003	0.011	0.141	0.013	0.000	0.003
			Mobile - Non-Road Equipment - Gasoline	0.031	0.037	1.419	0.000	0.003	0.031	0.037	1.419	0.000	0.003	0.031	0.037	1.419	0.000	0.003	0.031	0.037	1.419	0.000	0.003
			Mobile - Non-Road Equipment - Other	0.000	0.004	0.001	0.000	0.000	0.000	0.004	0.001	0.000	0.000	0.000	0.004	0.001	0.000	0.000	0.000	0.004	0.001	0.000	0.000
		Bingham, UT	Mobile - Aircraft	0.015	0.006	0.035	0.000	0.001	0.015	0.006	0.035	0.000	0.001	0.015	0.006	0.035	0.000	0.001	0.015	0.006	0.035	0.000	0.001
			Mobile - Non-Road Equipment - Diesel		0.158	0.016		0.004		0.158	0.016		0.004		0.158	0.016		0.004		0.158	0.016		0.004
			Mobile - Non-Road Equipment - Gasoline		0.013	0.078		0.001		0.013	0.078		0.001		0.013	0.078		0.001		0.013	0.078		0.001
			Mobile - Non-Road Equipment - Other		0.047	0.012		0.000		0.047	0.012		0.000		0.047	0.012		0.000		0.047	0.012		0.000
		Blaine, ID	Mobile - Aircraft	0.014	0.006	0.042	0.000	0.001	0.014	0.006	0.042	0.000	0.001	0.014	0.006	0.042	0.000	0.001	0.014	0.006	0.042	0.000	0.001
			Mobile - Non-Road Equipment - Diesel		0.538	0.056		0.013		0.538	0.056		0.013		0.538	0.056		0.013		0.538	0.056		0.013
			Mobile - Non-Road Equipment - Gasoline		0.016	0.384		0.001		0.016	0.384		0.001		0.016	0.384		0.001		0.016	0.384		0.001
			Mobile - Non-Road Equipment - Other		0.019	0.005		0.000		0.019	0.005		0.000		0.019	0.005		0.000		0.019	0.005		0.000
		Carbon, UT	Mobile - Aircraft	0.000	0.003	0.031		0.001	0.000	0.003	0.031		0.001	0.000	0.032	0.003		0.000	0.000	0.003	0.033		0.001
			Mobile - Non-Road Equipment - Diesel	0.028	0.276	0.045		0.001	0.028	0.280	0.045		0.002	0.024	0.261	0.041		0.002	0.023	0.255	0.039		0.002
			Mobile - Non-Road Equipment - Gasoline	0.003	0.014	0.093		0.000	0.003	0.014	0.093		0.000	0.003	0.012	0.095		0.000	0.003	0.012	0.097		0.000
			Mobile - Non-Road Equipment - Other	0.000	0.009	0.005		0.000	0.000	0.009	0.005		0.000	0.000	0.007	0.004		0.000	0.000	0.006	0.004		0.000
		Caribou, ID	Mobile - Aircraft	0.001	0.000	0.003	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.001	0.000	0.003	0.000	0.000
			Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
			Mobile - Non-Road Equipment - Diesel	0.019	0.228	0.023	0.000	0.005	0.019	0.228	0.023	0.000	0.005	0.019	0.228	0.023	0.000	0.005	0.019	0.228	0.023	0.000	0.005
			Mobile - Non-Road Equipment - Gasoline	0.004	0.015	0.283	0.000	0.001	0.004	0.015	0.283	0.000	0.001	0.004	0.015	0.283	0.000	0.001	0.004	0.015	0.283	0.000	0.001
			Mobile - Non-Road Equipment - Other	0.000	0.018	0.005	0.000	0.000	0.000	0.018	0.005	0.000	0.000	0.000	0.018	0.005	0.000	0.000	0.000	0.018	0.005	0.000	0.000
		Cassia, ID	Mobile - Aircraft	0.003	0.001	0.008	0.000	0.000	0.003	0.001	0.008	0.000	0.000	0.003	0.001	0.008	0.000	0.000	0.003	0.001	0.008	0.000	0.000
			Mobile - Locomotives	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
			Mobile - Non-Road Equipment - Diesel	0.041	0.465	0.047	0.000	0.011	0.041	0.465	0.047	0.000	0.011	0.041	0.465	0.047	0.000	0.011	0.041	0.465	0.047	0.000	0.011
			Mobile - Non-Road Equipment - Gasoline	0.006	0.012	0.268	0.000	0.001	0.006	0.012	0.268	0.000	0.001	0.006	0.012	0.268	0.000	0.001	0.006	0.012	0.268	0.000	0.001
			Mobile - Non-Road Equipment - Other	0.000	0.026	0.007	0.000	0.000	0.000	0.026	0.007	0.000	0.000	0.000	0.026	0.007	0.000	0.000	0.000	0.026	0.007	0.000	0.000
		Duchesne, UT	Mobile - Aircraft	0.000	0.001	0.006		0.000	0.000	0.001	0.006		0.000	0.000	0.006	0.001		0.000	0.000	0.001	0.006		0.000
			Mobile - Non-Road Equipment - Diesel	0.004	0.058	0.007		0.001	0.004	0.058	0.006		0.000	0.003	0.045	0.005		0.000	0.002	0.038	0.005		0.000
			Mobile - Non-Road Equipment - Gasoline	0.146	0.238	5.046		0.002	0.146	0.238	5.046		0.002	0.134	0.312	4.387		0.002	0.126	0.356	3.958		0.002
			Mobile - Non-Road Equipment - Other	0.000	0.004	0.004		0.000	0.000	0.004	0.004		0.000	0.000	0.003	0.004		0.000	0.000	0.003	0.003		0.000
		Emery, UT	Mobile - Aircraft	0.000	0.001	0.010		0.000	0.000	0.001	0.010		0.000	0.000	0.010	0.001		0.000	0.000	0.001	0.011		0.000
			Mobile - Non-Road Equipment - Diesel	0.023	0.230	0.035		0.000	0.023	0.229	0.035		0.000	0.020	0.210	0.031		0.000	0.018	0.203	0.030		0.000
			Mobile - Non-Road Equipment - Gasoline	0.001	0.002	0.022		0.000	0.001	0.002	0.022		0.000	0.001	0.002	0.023		0.000	0.001	0.002	0.023		0.000
			Mobile - Non-Road Equipment - Other	0.000	0.001	0.001		0.000	0.000	0.001	0.001		0.000	0.000	0.001	0.001		0.000	0.000	0.001	0.001		0.000
			Mobile - Aircraft	0.003	0.001	0.007	0.000	0.000	0.003	0.001	0.007	0.000	0.000	0.003	0.001	0.007	0.000	0.000	0.003	0.001	0.007	0.000	0.000

Surrounding Areas	Jerome, UT	Mobile - Non-Road Equipment - Diesel		0.058	0.006		0.001		0.058	0.006		0.001		0.058	0.006		0.001		0.058	0.006		0.001
		Mobile - Non-Road Equipment - Gasoline		0.008	0.048		0.000		0.008	0.048		0.000		0.008	0.048		0.000		0.008	0.048		0.000
		Mobile - Non-Road Equipment - Other		0.029	0.007		0.000		0.029	0.007		0.000		0.029	0.007		0.000		0.029	0.007		0.000
	Juab, UT	Mobile - Aircraft	0.001	0.004	0.098		0.002	0.001	0.004	0.098		0.002	0.002	0.099	0.004		0.001	0.001	0.004	0.099		0.002
		Mobile - Non-Road Equipment - Diesel	0.004	0.103	0.010		0.005	0.004	0.095	0.009		0.004	0.003	0.083	0.008		0.004	0.002	0.077	0.008		0.004
		Mobile - Non-Road Equipment - Gasoline	0.001	0.004	0.034		0.000	0.001	0.004	0.034		0.000	0.001	0.004	0.035		0.000	0.001	0.004	0.035		0.000
		Mobile - Non-Road Equipment - Other	0.000	0.003	0.003		0.000	0.000	0.003	0.003		0.000	0.000	0.003	0.003		0.000	0.000	0.002	0.002		0.000
	Lincoln, UT	Mobile - Aircraft	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Mobile - Non-Road Equipment - Diesel		0.022	0.003		0.001		0.022	0.003		0.001		0.022	0.003		0.001		0.022	0.003		0.001
		Mobile - Non-Road Equipment - Gasoline		0.001	0.006		0.000		0.001	0.006		0.000		0.001	0.006		0.000		0.001	0.006		0.000
		Mobile - Non-Road Equipment - Other		0.001	0.000		0.000		0.001	0.000		0.000		0.001	0.000		0.000		0.001	0.000		0.000
		Mobile - Non-Road Equipment - Diesel	0.020	0.246	0.025	0.000	0.034	0.020	0.246	0.025	0.000	0.034	0.020	0.246	0.025	0.000	0.034	0.020	0.246	0.025	0.000	0.034
		Mobile - Non-Road Equipment - Gasoline	0.023	0.018	1.104	0.000	0.001	0.023	0.018	1.104	0.000	0.001	0.023	0.018	1.104	0.000	0.001	0.023	0.018	1.104	0.000	0.001
		Mobile - Non-Road Equipment - Other	0.000	0.035	0.006		0.000	0.000	0.035	0.006		0.000	0.000	0.035	0.006		0.000	0.000	0.035	0.006		0.000
	Millard, ID	Mobile - Aircraft	0.000	0.001	0.003		0.000	0.000	0.001	0.003		0.000	0.000	0.004	0.001		0.000	0.000	0.001	0.004		0.000
		Mobile - Non-Road Equipment - Diesel	0.003	0.034	0.003		0.000	0.003	0.034	0.003		0.000	0.002	0.027	0.003		0.000	0.002	0.023	0.003		0.000
		Mobile - Non-Road Equipment - Gasoline	0.001	0.005	0.029		0.000	0.001	0.005	0.029		0.000	0.001	0.004	0.029		0.000	0.001	0.004	0.030		0.000
		Mobile - Non-Road Equipment - Other	0.000	0.005	0.003		0.000	0.000	0.005	0.003		0.000	0.000	0.004	0.002		0.000	0.000	0.003	0.002		0.000
	Minidoka, ID	Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
		Mobile - Non-Road Equipment - Diesel	0.028	0.319	0.033	0.000	0.007	0.028	0.319	0.033	0.000	0.007	0.028	0.319	0.033	0.000	0.007	0.028	0.319	0.033	0.000	0.007
		Mobile - Non-Road Equipment - Gasoline	0.001	0.007	0.083	0.000	0.001	0.001	0.007	0.083	0.000	0.001	0.001	0.007	0.083	0.000	0.001	0.001	0.007	0.083	0.000	0.001
		Mobile - Non-Road Equipment - Other	0.000	0.040	0.010	0.000	0.000	0.000	0.040	0.010	0.000	0.000	0.000	0.040	0.010	0.000	0.000	0.000	0.040	0.010	0.000	0.000
	Morgan, UT	Mobile - Aircraft	0.000	0.002	0.010		0.001	0.000	0.002	0.010		0.001	0.000	0.010	0.002		0.000	0.000	0.002	0.010		0.001
		Mobile - Non-Road Equipment - Diesel	0.003	0.042	0.005		0.001	0.003	0.041	0.005		0.001	0.002	0.033	0.004		0.001	0.002	0.029	0.004		0.001
		Mobile - Non-Road Equipment - Gasoline	0.290	0.466	10.045		0.004	0.290	0.466	10.045		0.004	0.266	0.616	8.715		0.005	0.249	0.705	7.847		0.005
		Mobile - Non-Road Equipment - Other	0.000	0.003	0.002		0.000	0.000	0.003	0.002		0.000	0.000	0.002	0.002		0.000	0.000	0.002	0.002		0.000
	Oneida, ID	Mobile - Aircraft	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000
		Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
		Mobile - Non-Road Equipment - Diesel	0.015	0.175	0.018	0.000	0.004	0.015	0.175	0.018	0.000	0.004	0.015	0.175	0.018	0.000	0.004	0.015	0.175	0.018	0.000	0.004
		Mobile - Non-Road Equipment - Gasoline	0.000	0.002	0.021	0.000	0.000	0.000	0.002	0.021	0.000	0.000	0.000	0.002	0.021	0.000	0.000	0.000	0.002	0.021	0.000	0.000
		Mobile - Non-Road Equipment - Other	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	Power, ID	Mobile - Aircraft	0.009	0.004	0.024	0.000	0.000	0.009	0.004	0.024	0.000	0.000	0.009	0.004	0.024	0.000	0.000	0.009	0.004	0.024	0.000	0.000
		Mobile - Locomotives	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
		Mobile - Non-Road Equipment - Diesel	0.022	0.259	0.026	0.000	0.006	0.022	0.259	0.026	0.000	0.006	0.022	0.259	0.026	0.000	0.006	0.022	0.259	0.026	0.000	0.006
		Mobile - Non-Road Equipment - Gasoline	0.018	0.020	0.837	0.000	0.002	0.018	0.020	0.837	0.000	0.002	0.018	0.020	0.837	0.000	0.002	0.018	0.020	0.837	0.000	0.002
		Mobile - Non-Road Equipment - Other	0.000	0.014	0.003	0.000	0.000	0.000	0.014	0.003	0.000	0.000	0.000	0.014	0.003	0.000	0.000	0.000	0.014	0.003	0.000	0.000
	Rich, UT	Mobile - Non-Road Equipment - Diesel	0.002	0.025	0.003		0.000	0.002	0.025	0.003		0.000	0.002	0.019	0.002		0.000	0.001	0.016	0.002		0.000
		Mobile - Non-Road Equipment - Gasoline	1.097	1.749	38.041		0.017	1.097	1.749	38.041		0.017	1.007	2.321	32.998		0.018	0.942	2.659	29.705		0.018
		Mobile - Non-Road Equipment - Other	0.000	0.000	0.000			0.000	0.000	0.000			0.000	0.000	0.000			0.000	0.000	0.000		
	Sanpete, UT	Mobile - Aircraft	0.000	0.000	0.002		0.000	0.000	0.000	0.002		0.000	0.000	0.002	0.000		0.000	0.000	0.000	0.002		0.000
		Mobile - Non-Road Equipment - Diesel	0.005	0.082	0.011		0.006	0.005	0.071	0.008		0.003	0.003	0.053	0.006		0.002	0.003	0.043	0.005		0.001
		Mobile - Non-Road Equipment - Gasoline	0.095	0.151	3.270		0.001	0.095	0.151	3.270		0.001	0.087	0.199	2.849		0.002	0.082	0.227	2.575		0.002
		Mobile - Non-Road Equipment - Other	0.000	0.008	0.004		0.000	0.000	0.008	0.004		0.000	0.000	0.006	0.002		0.000	0.000	0.005	0.002		0.000
	Sublette, WY	Mobile - Non-Road Equipment - Diesel	0.007	0.079	0.008		0.011	0.007	0.079	0.008		0.011	0.007	0.079	0.008		0.011	0.007	0.079	0.008		0.011
		Mobile - Non-Road Equipment - Gasoline	0.053	0.022	2.552	0.001	0.003	0.053	0.022	2.552	0.001	0.003	0.053	0.022	2.552	0.001	0.003	0.053	0.022	2.552	0.001	0.003
		Mobile - Non-Road Equipment - Other	0.000	0.008	0.001			0.000	0.008	0.001			0.000	0.008	0.001			0.000	0.008	0.001		
	Summit, UT	Mobile - Non-Road Equipment - Diesel	0.029	0.518	0.064		0.036	0.029	0.549	0.056		0.027	0.021	0.400	0.044		0.018	0.017	0.312	0.036		0.012
		Mobile - Non-Road Equipment - Gasoline	0.075	0.123	2.523		0.001	0.075	0.123	2.523		0.001	0.069	0.156	2.225		0.001	0.066	0.176	2.033		0.001
		Mobile - Non-Road Equipment - Other	0.000	0.010	0.006		0.000	0.000	0.010	0.006		0.000	0.000	0.008	0.005		0.000	0.000	0.007	0.004		0.000
	Twin Falls, ID	Mobile - Aircraft	0.008	0.003	0.021	0.000	0.000	0.008	0.003	0.021	0.000	0.000	0.008	0.003	0.021	0.000	0.000	0.008	0.003	0.021	0.000	0.000
		Mobile - Non-Road Equipment - Diesel		0.408	0.042		0.010		0.408	0.042		0.010		0.408	0.042		0.010		0.408	0.042		0.010
		Mobile - Non-Road Equipment - Gasoline		0.041	0.244		0.002		0.041	0.244		0.002		0.041	0.244		0.002		0.041	0.244		0.002
		Mobile - Non-Road Equipment - Other		0.089	0.022		0.000		0.089	0.022		0.000		0.089	0.022		0.000		0.089	0.022		0.000
	Uinta, WY	Mobile - Non-Road Equipment - Diesel	0.013	0.173	0.016	0.000	0.023	0.013	0.173	0.016	0.000	0.023	0.013	0.173	0.016	0.000	0.023	0.013	0.173	0.016	0.000	0.023
		Mobile - Non-Road Equipment - Gasoline	0.018	0.023	0.882	0.000	0.001	0.018	0.023	0.882	0.000	0.001	0.018	0.023	0.882	0.000	0.001	0.018	0.023	0.882	0.000	0.001
		Mobile - Non-Road Equipment - Other	0.000	0.034	0.004		0.000	0.000	0.034	0.004		0.000	0.000	0.034	0.004		0.000	0.000	0.034	0.004		0.000
	Wasatch, UT	Mobile - Aircraft	0.001	0.005	0.079		0.002	0.001	0.005	0.079		0.002	0.001	0.080	0.006		0.001	0.001	0.006	0.081		0.002
		Mobile - Non-Road Equipment - Diesel	0.016	0.298	0.029		0.008	0.016	0.269	0.026		0.006	0.012	0.206	0.022		0.004	0.010	0.171	0.019		0.004
		Mobile - Non-Road Equipment - Gasoline	0.129	0.206	4.449		0.002	0.129	0.206	4.449		0.002	0.119	0.272	3.869		0.002	0.111	0.311	3.492		0.002
		Mobile - Non-Road Equipment - Other	0.000	0.003	0.002		0.000	0.000	0.003	0.002		0.000	0.000	0.002	0.001		0.000	0.000	0.002	0.001		0.000
		Surrounding Area Total	2.387	9.125	73.491	0.004	0.257	2.387	9.009	73.477	0.004	0.242	2.215	9.851	64.890	0.004	0.227	2.094	10.011	59.673	0.004	0.225
		Grand Total	3.7	26.9	90.6	4.5E-03	1.2	3.7	26.3	90.4	0.0	1.1	3.3	25.5	80.5	0.0045	0.7	3.1	23.3	76.5	0.0045	1.0

Off-Road Mobile Emissions Typical Winter Inversion Weekday Emissions (tpd)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Non-Road	Logan, UT-ID	0.109	1.055	1.890	0.000	0.066	0.109	1.008	1.879	0.000	0.050	0.095	1.020	1.530	0.000	0.031	0.085	0.695	1.682	0.000	0.02138
	Provo, UT	0.248	2.760	2.437		0.112	0.246	2.647	2.397		0.082	0.201	2.250	2.090		0.043	0.173	1.676	2.329		0.030
	Salt Lake City, UT	0.933	14.004	12.795		0.753	0.921	13.641	12.609		0.716	0.802	12.372	11.981		0.389	0.710	10.901	12.824		0.72972
	Surrounding Areas	2.387	9.125	73.491	0.004	0.257	2.387	9.009	73.477	0.004	0.242	2.215	9.851	64.890	0.004	0.227	2.094	10.011	59.673	0.004	0.22522
	Grand Total	3.676	26.945	90.612	0.004	1.188	3.663	26.304	90.363	0.004	1.089	3.313	25.493	80.492	0.004	0.690	3.063	23.283	76.508	0.004	1.006

Off-Road Mobile Emissions		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Non-Road	Logan, UT-ID	3.0%	3.9%	2.1%	4.4%	5.5%	3.0%	3.8%	2.1%	4.4%	4.6%	2.9%	4.0%	1.9%	4.4%	4.4%	2.6%	3.0%	2.2%	4.4%	2.1%
	Provo, UT	6.8%	10.2%	2.7%	0.0%	9.4%	6.7%	10.1%	2.7%	0.0%	7.5%	6.1%	8.8%	2.6%	0.0%	6.3%	5.7%	7.2%	3.0%	0.0%	3.0%
	Salt Lake City, UT	25.4%	52.0%	14.1%	0.0%	63.4%	25.2%	51.9%	14.0%	0.0%	65.7%	24.2%	48.5%	14.9%	0.0%	56.4%	23.2%	46.8%	16.8%	0.0%	72.5%
	Surrounding Areas	64.9%	33.9%	81.1%	95.6%	21.6%	65.2%	34.2%	81.3%	95.6%	22.2%	66.9%	38.6%	80.6%	95.6%	32.9%	68.4%	43.0%	78.0%	95.6%	22.4%
	Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Overview of On-Road Mobile Sources Baseline and Projection Inventories

The purpose of this document is to explain how EPA MOVES2010a (Motor Vehicle Emission Simulator) released in August 2010 was used to create the $PM_{2.5}$ SIP on-road mobile source base-year (2008) and projection-year (2014, 2017 and 2019) motor vehicle emission inventories.

The "baseline inventory" covered winter weekdays and winter weekend days in 2008, based on temperatures recorded during the coldest $PM_{2.5}$ episode studied which took place from Thursday, January 11 through Sunday, January 21, 2007 inclusive.

The baseline inventory covers seventeen counties which are part of the $PM_{2.5}$ SIP domain along the Wasatch Front in Utah. Five of these counties fall under the jurisdiction of a Metropolitan Planning Organization (MPO). Cache County was modeled by Cache MPO, Utah County was modeled by Mountainlands Association of Governments (MAG), and Weber, Davis, and Salt Lake Counties were modeled by Wasatch Front Regional Council (WFRC). In addition, WFRC modeled Box Elder and Tooele Counties because they are part of the Salt Lake $PM_{2.5}$ non-attainment area and are associated with the WFRC area. The Utah Division of Air Quality (UDAQ) developed inventories for the remaining ten counties in the domain.

No.	County	FIPs	No.	County	FIPs
1	Box Elder	49003	10	Rich	49033
2	Cache	49005	11	Salt Lake	49035
3	Carbon	49007	12	Sanpete	49039
4	Davis	49011	13	Summit	49043
5	Duchesne	49013	14	Tooele	49045
6	Emery	49015	15	Utah	49049
7	Juab	49023	16	Wasatch	49051
8	Millard	49027	17	Weber	49057
9	Morgan	49029			

Projection-year inventories were created using the same method used to create the base-year inventory. Emissions units for the baseline and projection-year inventories were tons per winter weekday and tons per winter weekend day.

Meteorology - For the baseline and projection-year inventories, modeled temperatures were taken from the coldest $PM_{2.5}$ episode, which took place from Thursday, January 11 through Sunday, January 21, 2007 inclusive. Specifically, for each of these days, sets of 24 hourly temperatures were obtained from representative monitors in each of the seventeen counties. An average temperature was obtained for each separate hour by averaging the daily temperatures for each specific hour.

The resulting daily temperature profile is a set of 24 average hourly temperatures. Each hourly temperature in the profile is the average of the eleven hourly temperatures that were recorded over the eleven episode days.

Projected vehicle miles traveled (VMT) for the seven counties that were modeled by one of the Metropolitan Planning Organizations (MPO) were obtained from their respective Travel Demand Models. VMT projections for the ten remaining, mostly rural counties were obtained as follows:

1. Utah Department of Transportation (UDOT) provided historical VMT in units of Average Annual Daily Traffic (AADT) for calendar years 1996 - 2009.

2. Utah Division of Air Quality (Planning Branch, Mobile Sources and Transportation Section) performed linear regressions on historical AADT VMT to obtain future year AADT VMT projections.

3. UDOT provided conversion factors to change AADT VMT to winter average weekday and weekend day traffic (win AWKDT and win AWKNDT). Conversion factors were provided for six major road types: urban interstate/freeway, urban arterial and local roads; and rural interstate/freeway, rural arterial and local roads. In addition, conversion factors were provided for the month of January and separately for a weekday and a weekend day. The composite weekday factor was obtained from the five weekday (Monday - Friday) factors; the composite weekend day factor was obtained from the two weekend day (Saturday, Sunday) factors.

EPA guidance requires that states create a mobile source inventory that uses the most recent available data for fleet characterization, transportation/traffic conditions, fuel parameters and meteorological data. Model development relied primarily on interagency consultation procedures to ensure the best mix of local and default MOVES2010a inputs.

Model development included discussions on the following topics: MOVES default database scale modifications, GUI selections, County Data Manager input development utilizing local and default data, and output selection for air dispersion modeling. The following agencies provided MOVES modeling development through the interagency consultation procedures.

Cache Metropolitan Planning Organization (CMPO)
EPA Office of Transportation and Air Quality: MOVES Team (OTAQ)
FHWA Resource Center: Air Quality Team (FHWA)
Utah Department of Transportation Systems Planning & Programming: Traffic Analysis
Utah Division of Air Quality (UDAQ)
Utah Division of Motor Vehicles (UDMV)
Mountainland Association of Governments (MAG)
Wasatch Front Regional Council (WFRC)

In the discussion below, each topic will be discussed along with modifications that were made to model the 2008 baseline inventory and the 2014, 2017 and 2019 projection-year inventories.

(1) <u>$PM_{2.5}$ SIP Modeling Domain Responsibilities</u>

As was done to create the episode day inventories, the modeling domain was divided into four groups: counties modeled by each Metropolitan Planning Organization (MPO), and counties

modeled by UDAQ Planning Branch (Mobile Sources and Transportation Section):

Agency	Non-Attainment	County(-ies)	Coordinator
Cache MPO	Logan, UT	Cache	Jeff Gilbert
MAG	Provo, UT	Utah	Susan Hardy
WFRC	Salt Lake City, UT	Box Elder, Davis, Salt Lake, Tooele, Weber	Kip Billings
UDAQ	none	Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit, Wasatch	Rick McKeague Peter Verschoor

(2) PM_{10} and $PM_{2.5}$ Fugitive Dust from Paved Roads

PM_{10} and $PM_{2.5}$ fugitive dust from paved roads (re-entrained road dust) was modeled by UDAQ for each of the seventeen counties.

The latest EPA-approved version of AP-42, Chapter 13, "Miscellaneous Sources", Section 1.2.1, "Paved Roads" (January 2011), was used to compute the emission factors for PM_{10} and $PM_{2.5}$ fugitive dust.

Key inputs to compute the emission factors are:

Average vehicle weight for each data pair (county, road type); units are tons
Silt loading factor for each road type; units are grams per square meter (gm/m2)
Particle size multiplier "k" for PM_{10} and $PM_{2.5}$; (unitless)
Precipitation for each data pair (county, episode day); units are number of hours per episode day with precipitation greater than 0.01 inch.

Vehicle miles traveled (VMT) were identical to VMT used in the MOVES model.

(3) VOC Refueling Emissions

The baseline (2008) and projection-year inventories that were initially modeled with MOVES2010a included VOC refueling emissions in all 17 counties modeled.

For purposes of SIP motor vehicle budgets and conformity demonstrations, UDAQ and the MPOs have traditionally set motor vehicle budgets which do not include VOC refueling emissions. Subsequent conformity determinations will also exclude refueling emissions. The MPOs performed a second run using MOVES2010a to isolate VOC refueling emissions. Affected counties include Box Elder, Cache, Davis, Salt Lake, Tooele, Utah and Weber. VOC refueling emissions for these counties were reported to the Area Source inventory.

Results showed that VOC refueling emissions are small compared to VOC emissions in the on-road mobile source inventory. VOC refueling emissions are shown below by county in units of

tons per winter weekday:

Cal Years	County	FIPs	VOC Emissions (On-road)	VOC Refuel Emissions	Refueling Emissions (magnitude as % of On- Road VOC)
2008	Box Elder	49003	3.270	0.1756	5.37%
	Cache	49005	5.457	0.2193	4.02%
	Davis	49011	11.08	0.4554	4.11%
	Salt Lake	49035	39.26	1.662	4.23%
	Tooele	49045	3.727	0.1862	5.00%
	Utah	49049	16.87	0.7036	4.17%
	Weber	49057	9.147	0.3491	3.82%

On-Road Mobile Emissions Typical Winter Inversion Weekday Emissions (tpd)			2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	NA -Area	County	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Mobile Sources	Logan, UT-ID	Cache	0.413	7.354	5.452	0.123	0.081	0.306	4.906	3.506	0.109	0.035	0.263	3.971	2.825	0.102	0.036	0.248	3.680	2.642	0.101	0.036
		Franklin, ID	0.042	0.898	1.044	0.010	0.005	0.024	0.512	0.845	0.007	0.002	0.024	0.512	0.845	0.007	0.002	0.018	0.368	0.769	0.007	0.002
		Logan, UT-ID Total	**0.46**	**8.25**	**6.50**	**0.13**	**0.09**	**0.33**	**5.42**	**4.35**	**0.12**	**0.04**	**0.29**	**4.48**	**3.67**	**0.11**	**0.04**	**0.27**	**4.05**	**3.41**	**0.11**	**0.04**
	Provo, UT	Utah	1.621	31.822	16.788	0.483	0.344	1.306	22.378	13.024	0.408	0.155	1.135	18.444	10.410	0.397	0.162	1.076	16.870	9.306	0.406	0.167
		Provo, UT Total	**1.62**	**31.82**	**16.79**	**0.48**	**0.34**	**1.31**	**22.38**	**13.02**	**0.41**	**0.15**	**1.14**	**18.44**	**10.41**	**0.40**	**0.16**	**1.08**	**16.87**	**9.31**	**0.41**	**0.17**
	Salt Lake City, UT	Box Elder	0.449	10.245	3.252	0.123	0.079	0.281	6.288	2.307	0.104	0.030	0.233	5.172	2.011	0.095	0.029	0.186	4.089	1.711	0.087	0.029
		Davis	0.983	19.010	10.924	0.342	0.232	0.777	12.910	8.037	0.274	0.103	0.709	10.995	6.836	0.260	0.103	0.608	9.029	5.507	0.245	0.100
		Salt Lake	3.367	62.439	38.628	1.229	0.847	2.484	40.760	26.642	0.911	0.341	2.283	34.783	22.859	0.859	0.341	1.976	28.997	18.826	0.811	0.334
		Tooele	0.507	11.304	3.825	0.115	0.091	0.424	9.482	3.583	0.135	0.044	0.347	7.708	3.147	0.128	0.045	0.279	6.246	2.772	0.122	0.046
		Weber	0.836	16.042	8.946	0.228	0.164	0.645	11.707	6.763	0.188	0.069	0.543	9.366	5.510	0.169	0.069	0.453	7.737	4.564	0.159	0.068
		Salt Lake City, UT Total	**6.14**	**119.04**	**65.58**	**2.04**	**1.41**	**4.61**	**81.15**	**47.33**	**1.61**	**0.59**	**4.11**	**68.02**	**40.36**	**1.51**	**0.59**	**3.50**	**56.10**	**33.38**	**1.42**	**0.58**
	Surrounding Areas	Bannock, ID	0.394	8.454	5.038	0.088	0.049	0.220	4.615	3.643	0.065	0.020	0.220	4.615	3.643	0.065	0.020	0.162	3.242	2.958	0.061	0.020
		Bear Lake, ID	0.054	1.151	0.854	0.009	0.006	0.029	0.620	0.715	0.007	0.002	0.029	0.620	0.715	0.007	0.002	0.020	0.438	0.668	0.007	0.002
		Blaine, ID	0.111	2.485	2.466	0.029	0.015	0.063	1.395	2.045	0.021	0.006	0.063	1.395	2.045	0.021	0.006	0.046	0.994	1.914	0.020	0.006
		Carbon	0.161	3.291	1.561	0.036	0.027	0.093	1.958	1.039	0.031	0.009	0.071	1.517	0.837	0.027	0.009	0.061	1.308	0.751	0.026	0.009
		Caribou, ID	0.046	0.922	0.825	0.008	0.005	0.026	0.507	0.674	0.006	0.002	0.026	0.507	0.674	0.006	0.002	0.019	0.361	0.612	0.006	0.002
		Cassia ID	0.151	3.886	1.562	0.032	0.020	0.077	2.041	1.164	0.024	0.007	0.077	2.041	1.164	0.024	0.007	0.052	1.409	0.996	0.023	0.007
		Duchesne	0.151	2.708	1.356	0.024	0.020	0.086	1.618	0.890	0.020	0.007	0.067	1.314	0.720	0.019	0.007	0.058	1.167	0.643	0.019	0.007
		Emery	0.180	4.466	1.002	0.036	0.028	0.098	2.542	0.671	0.031	0.009	0.068	1.919	0.537	0.028	0.009	0.056	1.639	0.480	0.027	0.009
		Jerome, ID	0.201	5.332	1.827	0.036	0.025	0.098	2.753	1.398	0.028	0.009	0.098	2.753	1.398	0.028	0.009	0.064	1.890	1.233	0.027	0.009
		Juab	0.164	4.214	0.882	0.046	0.029	0.097	2.531	0.588	0.040	0.010	0.072	1.943	0.464	0.036	0.010	0.062	1.680	0.413	0.035	0.011
		Lincoln, ID	0.037	0.891	0.685	0.009	0.005	0.019	0.480	0.597	0.007	0.002	0.019	0.480	0.597	0.007	0.002	0.013	0.337	0.584	0.006	0.002
		Millard	0.206	5.188	1.145	0.049	0.034	0.119	3.070	0.775	0.043	0.012	0.087	2.353	0.627	0.040	0.012	0.073	2.022	0.557	0.038	0.012
		Minidoka, ID	0.106	2.510	1.484	0.024	0.014	0.057	1.361	1.118	0.018	0.006	0.057	1.361	1.118	0.018	0.006	0.041	0.953	0.959	0.017	0.006
		Morgan	0.068	1.411	0.632	0.016	0.011	0.042	0.823	0.417	0.013	0.004	0.034	0.641	0.330	0.012	0.004	0.030	0.558	0.286	0.012	0.004
		Oneida,	0.072	2.008	0.424	0.012	0.009	0.034	1.017	0.310	0.010	0.003	0.034	1.017	0.310	0.010	0.003	0.021	0.690	0.266	0.009	0.003
		Power	0.092	2.381	0.728	0.015	0.011	0.045	1.221	0.543	0.012	0.004	0.045	1.221	0.543	0.012	0.004	0.030	0.836	0.465	0.012	0.004
		Rich	0.036	0.322	0.255	0.005	0.003	0.023	0.206	0.171	0.005	0.001	0.020	0.164	0.139	0.004	0.001	0.018	0.143	0.121	0.004	0.001
		Sanpete	0.123	2.071	1.547	0.027	0.018	0.075	1.340	1.061	0.022	0.006	0.060	1.056	0.846	0.020	0.006	0.053	0.913	0.747	0.018	0.006
		Summit	0.370	8.763	2.774	0.077	0.064	0.228	5.136	1.793	0.067	0.023	0.176	4.050	1.418	0.066	0.023	0.154	3.572	1.250	0.067	0.024
		Wasatch	0.162	3.055	1.510	0.033	0.026	0.104	1.924	1.019	0.028	0.010	0.083	1.574	0.822	0.027	0.010	0.074	1.410	0.726	0.027	0.010
		Surrounding Areas Total	**2.9**	**65.5**	**28.6**	**0.6**	**0.4**	**1.6**	**37.2**	**20.6**	**0.5**	**0.2**	**1.4**	**32.5**	**18.9**	**0.5**	**0.2**	**1.1**	**25.6**	**16.6**	**0.5**	**0.2**
	Grand Total		**11.1**	**224.6**	**117.4**	**3.3**	**2.3**	**7.9**	**146.1**	**85.3**	**2.6**	**0.9**	**6.9**	**123.5**	**73.4**	**2.5**	**0.9**	**6.0**	**102.6**	**62.7**	**2.4**	**0.9**

On-Road Mobile Emissions Typical Winter Inversion Weekday Emissions (tpd)		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Mobile Sources	Logan, UT-ID	0.455	8.252	6.496	0.133	0.086	0.330	5.418	4.351	0.116	0.037	0.288	4.483	3.670	0.109	0.038	0.266	4.049	3.411	0.107	0.038
	Provo, UT	1.621	31.822	16.788	0.483	0.344	1.306	22.378	13.024	0.408	0.155	1.135	18.444	10.410	0.397	0.162	1.076	16.870	9.306	0.406	0.167
	Salt Lake City, UT	6.142	119.040	65.575	2.037	1.414	4.611	81.147	47.332	1.612	0.585	4.114	68.024	40.363	1.511	0.587	3.501	56.099	33.381	1.425	0.576
	Surrounding Areas	2.887	65.508	28.559	0.612	0.419	1.633	37.157	20.630	0.496	0.152	1.404	32.539	18.946	0.476	0.152	1.109	25.563	16.630	0.462	0.153
Grand Total		**11.1**	**224.6**	**117.4**	**3.3**	**2.3**	**7.9**	**146.1**	**85.3**	**2.6**	**0.9**	**6.9**	**123.5**	**73.4**	**2.5**	**0.9**	**6.0**	**102.6**	**62.7**	**2.4**	**0.9**

On-Road Mobile Emissions		2008 Baseline (E10_R10DM3)					2014 Growth & Control (E10_R21DM3)					2017 Growth & Control (E10_R1DM3)					2019 Growth & Control (E10_R36DM3)				
Source Category	NA -Area	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Mobile Sources	Logan, UT-ID	4.10%	3.67%	5.53%	4.07%	3.79%	4.19%	3.71%	5.10%	4.42%	3.95%	4.14%	3.63%	5.00%	4.38%	4.03%	4.47%	3.95%	5.44%	4.47%	4.11%
	Provo, UT	14.60%	14.17%	14.30%	14.79%	15.19%	16.57%	15.32%	15.26%	15.51%	16.64%	16.36%	14.94%	14.18%	15.94%	17.21%	18.07%	16.45%	14.84%	16.91%	17.86%
	Salt Lake City, UT	55.31%	53.00%	55.85%	62.39%	62.48%	58.51%	55.54%	55.47%	61.22%	63.01%	59.27%	55.08%	55.00%	60.58%	62.54%	58.83%	54.69%	53.22%	59.35%	61.66%
	Surrounding Areas	26.00%	29.16%	24.32%	18.76%	18.53%	20.72%	25.43%	24.17%	18.85%	16.40%	20.23%	26.35%	25.82%	19.10%	16.22%	18.63%	24.92%	26.51%	19.26%	16.37%
Grand Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

TECHNICAL SUPPORT DOCUMENT FOR ON-ROAD MOBILE SOURCES: PM2.5 EMISSIONS INVENTORY FOR PM2.5 SIP 2008 BASELINE YEAR AND PROJECTION YEARS 2014, 2017 AND 2019

Winter Weekday and Winter Weekend Days

September 2012
Utah Division of Air Quality
Planning Branch/Mobile Sources

Abstract

This report discusses the on-road mobile source section of the PM2.5 SIP 2008 baseline inventory ("Baseline Inventory") and projection year inventories (2014, 2017 and 2019) for the domain comprising seventeen counties around the Wasatch Front in Utah.

The on-road mobile source baseline and projection year inventories were developed for a winter weekday and a winter weekend day based on temperatures recorded during the coldest PM2.5 episode studied, which took place from Thursday, January 11 through Sunday, January 21, 2007 inclusive.

Vehicle miles traveled (VMT) on winter weekday and winter weekend days are very different. In general, weekend traffic is lower than weekday traffic in each of the seventeen counties in the PM2.5 SIP domain.

VMT for the counties modeled by the Metropolitan Planning Organizations (MPOs) were produced from their respective Travel Demand Models. Wasatch Front Regional Council (WFRC) agreed to model Box Elder and Tooele Counties in addition to Davis, Salt Lake and Weber Counties.

VMT for the remaining (largely rural) counties in the domain was obtained from Utah Department of Transportation Highway Performance Management System. VMT in units of AADT were projected to 2019 from linear regressions of baseline AADT VMT from calendar years 1996 - 2009.

For these counties, VMT factors for the month of January and for weekday and weekend days were provided by Utah Department of Transportation, Division of Systems Planning and Programming/ Traffic Statistics. Factors were provided for six major road types: rural freeway/interstate, rural arterial, rural local roads, urban freeway/interstate, urban arterial and urban local roads.

Summary tables of inventories for winter weekdays in 2008, 2014, 2017 and 2019 are found at the beginning of the next section.

On-road inventories were computed using the EPA MOVES2010a (Motor Vehicle Emission Simulator) released August 2010. PM2.5 fugitive dust from paved roads was compiled using AP-42 Chapter 13.2.1, "Introduction to Fugitive Dust Sources, section 13.2.1, "Paved Roads" (published in Federal Register on Feb. 4, 2011).

Idaho DEQ developed MOVES2010a and PM2.5/PM10 fugitive dust inventories for the base year (2008) and projection years 2014 and 2019. Counties modeled include Franklin County (adjacent to Cache County) and ten additional surrounding counties in Idaho.

iv. PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2008 Winter Weekday Emissions (Tons per Winter Weekday)
(On-road emissions below do not include VOC refueling emissions.)

Cal Year	No.	County	FIPs	PM10 Exh	PM2.5 Exh	CO	NOx	VOC	PM10 Fug Dust	PM2.5 Fug Dust
2008	1	Box Elder	49003	0.4643	0.4391	47.93	10.02	3.270	0.6759	0.1690
2008	2	Cache	49005	0.4323	0.4036	69.59	7.191	5.457	0.9569	0.2392
2008	3	Carbon	49007	0.1671	0.1575	20.00	3.218	1.581	0.5317	0.1329
2008	4	Davis	49011	1.025	0.9613	154.8	18.59	11.08	1.503	0.3759
2008	5	Duchesne	49013	0.1561	0.1473	16.24	2.648	1.343	0.3723	0.0931
2008	6	Emery	49015	0.1844	0.1758	12.89	4.367	0.9984	0.4233	0.1058
2008	7	Juab	49023	0.1686	0.1600	13.76	4.121	0.9357	0.2258	0.0565
2008	8	Millard	49027	0.2124	0.2019	16.31	5.074	1.189	0.3759	0.0940
2008	9	Morgan	49029	0.0712	0.0670	8.023	1.380	0.6496	0.0983	0.0246
2008	10	Rich	49033	0.0379	0.0351	2.934	0.3146	0.2584	0.0417	0.0104
2008	11	Salt Lake	49035	3.514	3.293	555.3	61.06	39.26	5.965	1.491
2008	12	Sanpete	49039	0.1292	0.1206	19.34	2.025	1.589	0.2977	0.0744
2008	13	Summit	49043	0.3815	0.3620	34.66	8.569	2.772	0.7210	0.1802
2008	14	Tooele	49045	0.5214	0.4954	50.06	11.05	3.727	1.474	0.3684
2008	15	Utah	49049	1.684	1.585	233.0	31.12	16.87	2.700	0.6748
2008	16	Wasatch	49051	0.1683	0.1588	18.19	2.988	1.514	0.3852	0.0963
2008	17	Weber	49057	0.8676	0.8174	120.1	15.69	9.147	1.168	0.2920
2008	**All**	**SUM**		**10.19**	**9.581**	**1,393.**	**189.4**	**101.6**	**17.92**	**4.479**

Cal Year	No.	County	FIPs	NH3	PM10 Brake	PM2.5 Brake	PM10 Tire	PM2.5 Tire	SO2	VMT
2008	1	Box Elder	49003	0.1199	0.0363	0.0095	0.0181	0.0043	0.0772	2,460,187
2008	2	Cache	49005	0.1207	0.0768	0.0201	0.0199	0.0048	0.0789	2,417,451
2008	3	Carbon	49007	0.0354	0.0164	0.0043	0.0062	0.0015	0.0260	725,942
2008	4	Davis	49011	0.3344	0.1627	0.0426	0.0519	0.0125	0.2269	7,096,992
2008	5	Duchesne	49013	0.0232	0.0118	0.0031	0.0049	0.0012	0.0197	542,661
2008	6	Emery	49015	0.0349	0.0104	0.0027	0.0066	0.0016	0.0269	766,583
2008	7	Juab	49023	0.0448	0.0062	0.0016	0.0062	0.0015	0.0285	914,362
2008	8	Millard	49027	0.0484	0.0110	0.0029	0.0077	0.0018	0.0335	1,006,855
2008	9	Morgan	49029	0.0153	0.0032	0.0008	0.0022	0.0005	0.0107	319,949
2008	10	Rich	49033	0.0054	0.0013	0.0003	0.0007	0.0002	0.0033	112,054

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2008 Winter Weekday Emissions (Tons per Winter Weekday)

(continued)

Cal Year	No.	County	FIPs	NH3	PM10 Brake	PM2.5 Brake	PM10 Tire	PM2.5 Tire	SO2	VMT
2008	11	Salt Lake	49035	1.202	0.6864	0.1797	0.1961	0.0470	0.8288	25,842,233
2008	12	Sanpete	49039	0.0262	0.0100	0.0026	0.0039	0.0009	0.0174	505,181
2008	13	Summit	49043	0.0748	0.0221	0.0058	0.0139	0.0033	0.0627	1,813,779
2008	14	Tooele	49045	0.1122	0.0851	0.0223	0.0225	0.0054	0.0893	2,348,627
2008	15	Utah	49049	0.4721	0.2714	0.0710	0.0787	0.0189	0.3362	10,071,985
2008	16	Wasatch	49051	0.0325	0.0201	0.0053	0.0062	0.0015	0.0251	721,622
2008	17	Weber	49057	0.2233	0.1424	0.0373	0.0385	0.0092	0.1603	4,583,153
2008	All	SUM		2.926	1.574	0.4119	0.4842	0.1161	2.051	62,249,616

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2014 Winter Weekday Emissions (Tons per Winter Weekday)
(On-road emissions below do not include VOC refueling emissions.)

Cal Year	No.	County	FIPs	PM10 Exh	PM2.5 Exh	CO	NOx	VOC	PM10 Fug Dust	PM2.5 Fug Dust
2014	1	Box Elder	49003	0.2922	0.2752	36.66	6.183	2.272	0.8213	0.2053
2014	2	Cache	49005	0.3211	0.2991	54.39	5.063	3.671	1.236	0.3089
2014	3	Carbon	49007	0.0972	0.0913	14.04	1.915	1.005	0.6138	0.1534
2014	4	Davis	49011	0.8170	0.7633	136.7	12.73	8.115	2.128	0.5319
2014	5	Duchesne	49013	0.0898	0.0845	11.88	1.582	0.8523	0.4091	0.1023
2014	6	Emery	49015	0.1007	0.0957	8.966	2.486	0.6340	0.4526	0.1131
2014	7	Juab	49023	0.0999	0.0944	9.739	2.475	0.6086	0.2517	0.0629
2014	8	Millard	49027	0.1229	0.1164	11.51	3.002	0.7713	0.4302	0.1076
2014	9	Morgan	49029	0.0439	0.0411	6.062	0.8048	0.4208	0.1168	0.0292
2014	10	Rich	49033	0.0241	0.0223	2.217	0.2014	0.1701	0.0457	0.0114
2014	11	Salt Lake	49035	2.613	2.439	455.1	40.21	26.84	7.303	1.826
2014	12	Sanpete	49039	0.0790	0.0736	14.31	1.310	1.070	0.3252	0.0813
2014	13	Summit	49043	0.2365	0.2234	26.41	5.023	1.712	0.9050	0.2262
2014	14	Tooele	49045	0.4386	0.4144	49.10	9.323	3.323	2.256	0.5639
2014	15	Utah	49049	1.370	1.283	215.1	22.07	12.96	3.811	0.9526
2014	16	Wasatch	49051	0.1084	0.0259	13.94	1.882	0.9803	0.4593	0.1148

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2014 Winter Weekday Emissions (Tons per Winter Weekday)
(On-road emissions below do not include VOC refueling emissions.)

(continued)

Cal Year	No.	County	FIPs	PM10 Exh	PM2.5 Exh	CO	NOx	VOC	PM10 Fug Dust	PM2.5 Fug Dust
2014	17	Weber	49057	0.6754	0.6334	103.5	11.55	6.950	1.474	0.3684
2014	All	SUM		7.530	7.052	1,170.	127.8	72.36	23.04	5.759

Cal Year	No.	County	FIPs	NH3	PM10 Brake	PM2.5 Brake	PM10 Tire	PM2.5 Tire	SO2	VMT
2014	1	Box Elder	49003	0.1013	0.0447	0.0117	0.0217	0.0052	0.0289	2,918,146
2014	2	Cache	49005	0.1070	0.1017	0.0266	0.0260	0.0062	0.0337	3,139,086
2014	3	Carbon	49007	0.0298	0.0200	0.0052	0.0070	0.0017	0.0090	788,803
2014	4	Davis	49011	0.3034	0.2489	0.0652	0.0715	0.0171	0.1019	9,387,728
2014	5	Duchesne	49013	0.0199	0.0131	0.0034	0.0054	0.0013	0.0066	598,158
2014	6	Emery	49015	0.0299	0.0114	0.0030	0.0074	0.0018	0.0089	858,072
2014	7	Juab	49023	0.0387	0.0071	0.0018	0.0073	0.0017	0.0102	1,072,320
2014	8	Millard	49027	0.0422	0.0131	0.0034	0.0089	0.0034	0.0117	1,163,504
2014	9	Morgan	49029	0.0124	0.0039	0.0010	0.0025	0.0006	0.0038	366,239
2014	10	Rich	49033	0.0044	0.0014	0.0004	0.0008	0.0002	0.0012	127,424
2014	11	Salt Lake	49035	1.009	0.8551	0.2238	0.2421	0.0581	0.3375	31,743,818
2014	12	Sanpete	49039	0.0219	0.0109	0.0029	0.0043	0.0010	0.0062	561,301
2014	13	Summit	49043	0.0658	0.0287	0.0075	0.0169	0.0041	0.0225	2,162,440
2014	14	Tooele	49045	0.1324	0.1315	0.0344	0.0341	0.0082	0.0428	3,555,173
2014	15	Utah	49049	0.4520	0.3727	0.0976	0.1080	0.0259	0.1532	13,991,478
2014	16	Wasatch	49051	0.0275	0.0259	0.0068	0.0075	0.0018	0.0093	848,179
2014	17	Weber	49057	0.2079	0.1892	0.0495	0.0500	0.0120	0.0679	5,913,152
2014	All	SUM		2.605	2.079	0.5543	0.6216	0.1491	0.8554	79,194,021

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2017 Winter Weekday Emissions (Tons per Winter Weekday)
(On-road emissions below do not include VOC refueling emissions.)

Cal Year	No.	County	FIPs	PM10 Exh	PM2.5 Exh	CO	NOx	VOC	PM10 Fug Dust	PM2.5 Fug Dust
2017	1	Box Elder	49003	0.2444	0.2291	34.62	5.079	1.959	0.8410	0.2103
2017	2	Cache	49005	0.2783	0.2585	49.66	4.095	2.877	1.367	0.3417
2017	3	Carbon	49007	0.0738	0.0690	11.92	1.483	0.7814	0.6323	0.1581
2017	4	Davis	49011	0.7478	0.6962	134.2	10.83	6.863	2.217	0.5543
2017	5	Duchesne	49013	0.0696	0.0651	10.77	1.285	0.6714	0.4314	0.1079
2017	6	Emery	49015	0.0702	0.0663	7.763	1.876	0.4867	0.4603	0.1151
2017	7	Juab	49023	0.0752	0.0707	8.567	1.900	0.4698	0.2611	0.0653
2017	8	Millard	49027	0.0904	0.0851	10.13	2.301	0.6024	0.4539	0.1135
2017	9	Morgan	49029	0.0355	0.0331	5.539	0.6266	0.3274	0.1286	0.0322
2017	10	Rich	49033	0.0207	0.0191	2.068	0.1601	0.1364	0.0471	0.0118
2017	11	Salt Lake	49035	2.410	2.242	451.2	34.27	22.88	7.633	1.908
2017	12	Sanpete	49039	0.0635	0.0590	12.30	1.032	0.8416	0.3317	0.0829
2017	13	Summit	49043	0.1832	0.1721	24.61	3.961	1.307	0.9925	0.2481
2017	14	Tooele	49045	0.3620	0.3405	46.77	7.569	2.802	2.445	0.6112
2017	15	Utah	49049	1.197	1.115	208.6	18.17	10.15	4.231	1.058
2017	16	Wasatch	49051	0.0868	0.0813	12.94	1.539	0.7672	0.4952	0.1238
2017	17	Weber	49057	0.5704	0.5329	98.36	9.228	5.608	1.545	0.3863
2017	All	SUM		6.579	6.135	1,130.	105.4	61.78	24.51	6.128

Cal Year	No.	County	FIPs	NH3	PM10	PM2.5 Brake	PM10 Brake	PM2.5 Tire	SO2 Tire	VMT
2017	1	Box Elder	49003	0.0932	0.0458	0.0120	0.0222	0.0053	0.0286	2,988,107
2017	2	Cache	49005	0.0998	0.1117	0.0292	0.0286	0.0069	0.0349	3,434,691
2017	3	Carbon	49007	0.0266	0.0207	0.0054	0.0071	0.0017	0.0087	799,470
2017	4	Davis	49011	0.2876	0.2614	0.0684	0.0747	0.0179	0.1019	9,773,674
2017	5	Duchesne	49013	0.0190	0.0139	0.0036	0.0058	0.0014	0.0066	632,688
2017	6	Emery	49015	0.0272	0.0117	0.0031	0.0076	0.0018	0.0087	876,319
2017	7	Juab	49023	0.0357	0.0074	0.0019	0.0076	0.0018	0.0103	1,128,618

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2017 Winter Weekday Emissions (Tons per Winter Weekday)

(continued)

Cal Year	No.	County	FIPs	NH3	PM10 Brake	PM2.5 Brake	PM10 Tire	PM2.5 Tire	SO2	VMT
2017	8	Millard	49027	0.0388	0.0141	0.0037	0.0093	0.0022	0.0118	1,211,526
2017	9	Morgan	49029	0.0117	0.0044	0.0011	0.0027	0.0006	0.0038	387,476
2017	10	Rich	49033	0.0041	0.0014	0.0004	0.0009	0.0002	0.0012	132,732
2017	11	Salt Lake	49035	0.9513	0.9010	0.2359	0.2537	0.0608	0.3377	33,152,583
2017	12	Sanpete	49039	0.0191	0.0112	0.0029	0.0044	0.0011	0.0060	569,466
2017	13	Summit	49043	0.0646	0.0317	0.0083	0.0183	0.0044	0.0228	2,318,707
2017	14	Tooele	49045	0.1249	0.1425	0.0373	0.0371	0.0089	0.0445	3,853,553
2017	15	Utah	49049	0.4402	0.4108	0.1075	0.1201	0.0288	0.1601	15,581,282
2017	16	Wasatch	49051	0.0263	0.0289	0.0076	0.0082	0.0020	0.0095	909,876
2017	17	Weber	49057	0.1872	0.1999	0.0523	0.0526	0.0126	0.0681	6,196,599
2017	All	SUM		2.457	2.218	0.5807	0.6609	0.1585	0.8651	83,947,367

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2019 Winter Weekday Emissions (Tons per Winter Weekday)
(On-road emissions below do not include VOC refueling emissions.)

Cal Year	No.	County	FIPs	PM10 Exh	PM2.5 Exh	CO	NOx	VOC	PM10 Fug Dust	PM2.5 Fug Dust
2019	1	Box Elder	49003	0.1947	0.1818	33.30	4.013	1.636	0.8656	0.2164
2019	2	Cache	49005	0.2611	0.2421	49.11	3.611	2.485	1.454	0.3635
2019	3	Carbon	49007	0.0643	0.0600	11.60	1.279	0.6853	0.6452	0.1613
2019	4	Davis	49011	0.6431	0.5969	131.7	8.888	5.459	2.241	0.5603
2019	5	Duchesne	49013	0.0611	0.0570	10.70	1.141	0.5877	0.4463	0.1116
2019	6	Emery	49015	0.0578	0.0544	7.469	1.603	0.4233	0.4655	0.1164
2019	7	Juab	49023	0.0642	0.0602	8.289	1.643	0.4118	0.2674	0.0668
2019	8	Millard	49027	0.0763	0.0716	9.764	1.977	0.5218	0.4697	0.1174
2019	9	Morgan	49029	0.0316	0.0294	5.491	0.5458	0.2809	0.1365	0.0341
2019	10	Rich	49033	0.0189	0.0175	2.072	0.1397	0.1173	0.0480	0.0120
2019	11	Salt Lake	49035	2.091	1.940	446.3	28.55	18.58	7.816	1.954

PM2.5 SIP On-road Mobile Sources Inventory for 17 Counties in Domain
2019 Winter Weekday Emissions (Tons per Winter Weekday)
(On-road emissions below do not include VOC refueling emissions.)

(continued)

Cal Year	No.	County	FIPs	PM10 Exh	PM2.5 Exh	CO	NOx	VOC	PM10 Fug Dust	PM2.5 Fug Dust
2019	12	Sanpete	49039	0.0564	0.0523	12.05	0.8931	0.7365	0.3365	0.0840
2019	13	Summit	49043	0.1613	0.1510	24.54	3.494	1.124	1.051	0.2627
2019	14	Tooele	49045	0.2911	0.2726	45.74	6.130	2.352	2.588	0.6470
2019	15	Utah	49049	1.136	1.056	216.0	16.61	8.964	4.560	1.140
2019	16	Wasatch	49051	0.0780	0.0728	12.89	1.379	0.6631	0.5190	0.1298
2019	17	Weber	49057	0.4777	0.4448	97.17	7.617	4.595	1.591	0.3979
2019	All	SUM		5.765	5.361	1,124	89.51	49.62	25.50	6.375

Cal Year	No.	County	FIPs	NH3	PM10 Brake	PM2.5 Brake	PM10 Tire	PM2.5 Tire	SO2	VMT
2019	1	Box Elder	49003	0.0853	0.0472	0.0124	0.0227	0.0054	0.0279	3,034,745
2019	2	Cache	49005	0.0985	0.1183	0.0310	0.0304	0.0073	0.0354	3,631,819
2019	3	Carbon	49007	0.0254	0.0212	0.0056	0.0072	0.0017	0.0086	806,611
2019	4	Davis	49011	0.2718	0.2634	0.0689	0.0759	0.0182	0.0992	10,029,895
2019	5	Duchesne	49013	0.0188	0.0144	0.0038	0.0060	0.0014	0.0066	655,706
2019	6	Emery	49015	0.0262	0.0118	0.0031	0.0077	0.0018	0.0086	888,514
2019	7	Juab	49023	0.0346	0.0076	0.0020	0.0079	0.0019	0.0103	1,166,829
2019	8	Millard	49027	0.0376	0.0148	0.0039	0.0096	0.0023	0.0118	1,243,510
2019	9	Morgan	49029	0.0115	0.0046	0.0012	0.0028	0.0007	0.0038	401,627
2019	10	Rich	49033	0.0039	0.0014	0.0004	0.0009	0.0002	0.0012	136,276
2019	11	Salt Lake	49035	0.8978	0.9349	0.2447	0.2621	0.0629	0.3309	34,091,811
2019	12	Sanpete	49039	0.0180	0.0113	0.0030	0.0045	0.0011	0.0059	574,896
2019	13	Summit	49043	0.0655	0.0377	0.0088	0.0193	0.0046	0.0231	2,422,887
2019	14	Tooele	49043	0.1197	0.1459	0.0382	0.0386	0.0093	0.0447	4,052,477
2019	15	Utah	49049	0.4496	0.4459	0.1167	0.1295	0.0310	0.1653	16,740,301
2019	16	Wasatch	49051	0.0263	0.0308	0.0086	0.0086	0.0021	0.0096	951,024
2019	17	Weber	49057	0.1759	0.2066	0.0541	0.0543	0.0130	0.0670	6,385,539

v. MOVES Modeling Components Received from Metropolitan Planning Organizations

The key components of the MOVES model process are:

- County Data Managers (CDMs)
- MOVES Run Specifications (MRSs)
- MOVES output summaries/inventories
- A written of discussion of MOVES modeling process that includes the above items

The above components are developed by the Metropolitan Planning Organizations (MPOs) representing each nonattainment area. To-date, UDAQ has received the following items from the MPOS:

Item	MAG	WFRC	Cache MPO
Episodic CDMs	X	X	X
2008 CDMs	X	X	X
2014 CDMs		X	X
2017 CDMs		X	X
2019 CDMs		X	X
Episodic MRSs	X	X	X
2008 MRSs	X	X	X
2014 MRSs		X	X
2017 MRSs		X	X
2019 MRSs		X	X
Episodic MOVES inventory	X	X	X
2008 MOVES inventory	X	X	X
2014 MOVES inventory	X	X	X
2017 MOVES inventory	X	X	X
2019 MOVES inventory	X	X	X

UDAQ has made multiple requests for the missing CDMs and MRSs from MAG, but has been told that these files are "delayed until upper management resolves some fundamental issues with Section IX.A.22 first." (as per email from Susan Hardy dated September 11, 2012).

3e. ON-ROAD MOBILE SOURCES

iii. Abstract..... 2

iv. Summary of Base Year (2008) and Projection Year (2014, 2017 and 2019) Inventories... 3

v. Table of Contents..... 9

vi. List of Tables..... 11

vii. Overview..... 12

(1) PM2.5 SIP Modeling Domain Responsibilities..... 13
(2) PM10 and PM2.5 Fugitive Dust from Paved Roads..... 14
(3) VOC Refueling Emissions..... 14

viii. Procedure..... 15

(1) MOVES2010a Procedures..... 15
(a) MOVES Default Modifications..... 15
(b) Daily VMT..... 15
(c) Local Roads..... 17
(d) Source Classification Codes (SCC's) for Local Roads..... 19
(2) MOVES2010a Graphical User Interface (GUI) Selections..... 20
(a) VOC Refueling Emissions..... 21
(b) Strategies: Alternative Vehicle Fuels & Technologies..... 22
(3) MOVES2010a County Data Manager Input Development..... 25
(a) County Data Manager Development Excel Workbooks..... 25
1. Meteorological Data..... 27
2. Source Type Population..... 29
3. Source Type Age Distribution..... 37
4. Vehicle Miles of Travel..... 38
5. Vehicle Type VMT Mix..... 42
6. Road Type Distribution..... 44
7. Average Speed Distribution..... 46
8. Ramp Fractions..... 48
9. Day VMT Fraction..... 48
10. Fuel Type ID..... 49
11. Hour VMT Fraction..... 50
12. I/M Coverage..... 50
13. Month VMT Fraction..... 51

ix. Model Outputs..... 52

x. General Output..... 52

(1) Units..... 52

(2) Activity..... 52
(3) Output Emissions..... 53
24) SCC..... 53
(5) Road Types..... 53
(6) Components of Pollutants..... 53
(7) Summary Reports..... 53
(a) Cache MPO..... 53
(1) 2008, 2014, 2017 and 2019 Body.tab (output) files without I/M.....
(2) 2008, 2014, 2017 and 2019 Body.tab (output) files with I/M.....
(b) Mountainland Association of Governments (MAG): 2008, 2014, 2017 and 2019 Body.tab (output) files (Utah County)..... 53
(c) Utah Division of Air Quality: 2008, 2014, 2017 and 2019 Body.tab (output) files (Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit and Wasatch Counties)..... 53
(d) Wasatch Front Regional Council (WFRC) 2008, 2014, 2017 and 2019 Body tab (output) files (Box Elder, Davis, Salt Lake, Tooele and Weber Counties).. 53

xi. Fugitive Dust (Paved Roads PM10 and PM2.5)..... 54

(1) Constants k for PM10 and PM2.5..... 54
(2) Average Vehicle Weight..... 54
(3) Silt Loading Factors..... 54
(4) Precipitation..... 55
(5) SMOKE Formats for PM2.5 and PM10 Fugitive Dust Inventories..... 55

xii. **REFERENCES**..... 56

vi. **LIST OF TABLES**

1. Episode Summary Tables..... 3
2. Daily Modifications Tables..... 16
3. Local Roads Modifications Tables..... 17
4. Source Classification Codes (SCC) and Road Types..... 19
5. Default AVFT for CNG Transit Buses..... 16
6. Source Type Populations..... 22
7. MOBILE6 and MOVES Vehicle/Source Types..... 29
8. UT DMV Database of Vehicles..... 31
9. Final 2008 Source Type Population for Salt Lake County..... 36
10. Source Type Age Distribution (Salt Lake County, 2009)..... 37
11. Vehicle Type Calculation Example 2008 February (Tuesday) Wasatch County. 48
12. HPMS and MOBILE6 Road Types..... 50
13. Day VMT Fractions..... 53
14. Fuel Type Tables..... 53
15. General Output Tables..... 58
    a. Units..... 58
    b. Activity..... 58
    c. Output Emissions..... 58
    d. SCC Codes and Vehicle Types..... 58
16. Road Type Codes..... 58
17. Pollutant Component Codes..... 59
18. MOVES Summary Reports by MPO and Episode Year (EXCEL)..... 60

vii. **Overview**

The purpose of this document is to explain how EPA MOVES2010a (Motor Vehicle Emission Simulator) released in August 2010 was used to create the PM2.5 SIP on-road mobile source base year (2008) and projection year (2014, 2017 and 2019) motor vehicle emission inventories.

The "baseline inventory" covered winter weekdays and winter weekend days in 2008, based on temperatures recorded during the coldest PM2.5 episode studied, which took place from Thursday, January 11 through Sunday, January 21, 2007 inclusive.

The baseline inventory covers seventeen counties which are part of the PM2.5 SIP domain along the Wasatch Front in Utah. Five of these counties fall under the jurisdiction of a Metropolitan Planning Organization (MPO). Cache County was modeled by Cache MPO, Utah County was modeled by Mountainlands Association of Governments (MAG), and Weber, Davis, and Salt Lake Counties were modeled by Wasatch Front Regional Council (WFRC). In addition, WFRC modeled Box Elder and Tooele Counties because they are part of the Salt Lake PM2.5 non-attainment area and are associated with the WFRC area. The Utah Division of Air Quality (UDAQ) developed inventories for the remaining ten counties in the domain.

No.	County	FIPs	No.	County	FIPs
1	Box Elder	49003	10	Rich	49033
2	Cache	49005	11	Salt Lake	49035
3	Carbon	49007	12	Sanpete	49039
4	Davis	49011	13	Summit	49043
5	Duchesne	49013	14	Tooele	49045
6	Emery	49015	15	Utah	49049
7	Juab	49023	16	Wasatch	49051
8	Millard	49027	17	Weber	49057
9	Morgan	49029			

Projection year inventories were created using the same method used to create the base year inventory. Emissions units for the baseline and projection year inventories were tons per winter weekday and tons per winter weekend day.

Meteorology - For the baseline and projection year inventories, modeled temperatures were taken from the coldest PM2.5 episode, which took place from Thursday, January 11 through Sunday, January 21, 2007 inclusive. Specifically, for each of these days, sets of 24 hourly temperatures were obtained from representative monitors in each of the seventeen counties. An average temperature was obtained for each separate hour by averaging the daily temperatures for each specific hour.

The resulting daily temperature profile is a set of 24 average hourly temperatures. Each hourly temperature in the profile is the average of the eleven hourly temperatures that were recorded over the eleven episode days.

Projected vehicle miles traveled (VMT) for the seven counties that were modeled by one of the Metropolitan Planning Organizations (MPO) were obtained from their respective Travel Demand Models. VMT projections for the ten remaining, mostly rural counties were obtained as follows:

1. Utah Department of Transportation (UDOT) provided historical VMT in units of Average Annual Daily Traffic (AADT) for calendar years 1996 - 2009.

2. Utah Division of Air Quality (Planning Branch, Mobile Sources and Transportation Section) performed linear regressions on historical AADT VMT to obtain future year AADT VMT projections.

3. UDOT provided conversion factors to change AADT VMT to winter average weekday and weekend day traffic (win AWKDT and win AWKNDT). Conversion factors were provided for six major road types: urban interstate/freeway, urban arterial and local roads; rural interstate/freeway, rural arterial and local roads. In addition, conversion factors were provided for the month of January and separately for a weekday and a weekend day. The composite weekday factor was obtained from the five weekday (Monday - Friday) factors; the composite weekend day factor was obtained from the two weekend day (Saturday, Sunday) factors.

EPA guidance requires that States create a mobile source inventory that uses the most recent available data for fleet characterization, transportation/traffic conditions, fuel parameters and meteorological data. Model development relied primarily on interagency consultation procedures to ensure the best mix of local and default MOVES2010a inputs.

Model development included discussions on the following topics: MOVES default database scale modifications, GUI selections, County Data Manager input development utilizing local and default data, and output selection for air dispersion modeling. The following agencies provided MOVES modeling development through the interagency consultation procedures.

Cache Metropolitan Planning Organization (CMPO)
EPA Office of Transportation and Air Quality: MOVES Team (OTAQ)
FHWA Resource Center: Air Quality Team (FHWA)
Utah Department of Transportation Systems Planning & Programming: Traffic Analysis
Utah Division of Air Quality (UDAQ)
Utah Division of Motor Vehicles (UDMV)
Mountainland Association of Governments (MAG)
Wasatch Front Regional Council (WFRC)

In the discussion below, each topic will be discussed along with modifications that were made to model the 2008 baseline inventory and the 2014, 2017 and 2019 projection year inventories.

(1) PM2.5 SIP Modeling Domain Responsibilities

As was done to create the episode day inventories, the modeling domain was divided into four groups: counties modeled by each Metropolitan Planning Organization (MPO), and counties

modeled by UDAQ Planning Branch (Mobile Sources and Transportation Section):

Agency	Non-Attainment	County(-ies)	Coordinator
Cache MPO	Logan, UT	Cache	Jeff Gilbert
MAG	Provo, UT	Utah	Susan Hardy
WFRC	Salt Lake City, UT	Box Elder, Davis, Salt Lake, Tooele, Weber	Kip Billings
UDAQ	none	Carbon, Duchesne, Emery, Juab, Millard, Morgan, Rich, Sanpete, Summit, Wasatch	Rick McKeague Peter Verschoor

(2) PM10 and PM2.5 Fugitive Dust from Paved Roads

PM10 and PM2.5 fugitive dust from paved roads (re-entrained road dust) was modeled by UDAQ for each of the seventeen counties.

The latest EPA-approved version of AP-42, Chapter 13, "Miscellaneous Sources", Section 1.2.1, "Paved Roads" (January 2011), was used to compute the emission factors for PM10 and PM2.5 fugitive dust.

Key inputs to compute the emission factors are:

Average vehicle weight for each data pair (county, road type); units are tons
Silt loading factor for each road type; units are grams per square meter (gm/m2)
Particle size multiplier "k" for PM10 and PM2.5; (unitless)
Precipitation for each data pair (county, episode day); units are number of hours per episode day with precipitation greater than 0.01 inch.

Vehicle miles traveled (VMT) were identical to VMT used in the MOVES model.

(3) VOC Refueling Emissions

The baseline (2008) and projection year inventories that were initially modeled with MOVES2010a included VOC refueling emissions in all 17 counties modeled.

For purposes of SIP motor vehicle budgets and conformity demonstrations, UDAQ and the MPOs have traditionally set motor vehicle budgets which *do not* include VOC refueling emissions. Subsequent conformity determinations will also *exclude* refueling emissions.

The MPOs performed a MOVES query to isolate VOC refueling emissions. Affected counties include Box Elder, Cache, Davis, Salt Lake, Tooele, Utah and Weber. VOC refueling emissions for these counties were reported to the Area Source inventory.

Results showed that VOC refueling emissions are small compared to VOC emissions in the on-road mobile source inventory. VOC refueling emissions are shown below by county in units of tons per winter weekday:

Cal Years	County	FIPs	VOC Emissions (On-road)	VOC Refuel Emissions	Refueling Emissions (magnitude as % of On- Road VOC)
2008	Box Elder	49003	3.270	0.1756	5.37%
	Cache	49005	5.457	0.2193	4.02%
	Davis	49011	11.08	0.4554	4.11%
	Salt Lake	49035	39.26	1.662	4.23%
	Tooele	49045	3.727	0.1862	5.00%
	Utah	49049	16.87	0.7036	4.17%
	Weber	49057	9.147	0.3491	3.82%

viii. **Procedure**

The same interagency consultation process was used to develop the base year and projection year inventories that were used when the episode inventories were developed.

The discussion below identifies the procedures followed to model the baseline and projection year inventories. A detailed explanation of each procedure is found below.

(1) **MOVES2010a Procedures**

1. MOVES Default Database Scale Modifications: daily VMT and local roads.
2. MOVES2010a GUI Selections: description, scale, time span, geographic bounds, road type, pollutants and processes, alternative vehicle fuels and technologies
3. MOVES2010a County Data Manager input development

(a) MOVES Default Modifications

Before the episode inventories were created, UDAQ consulted with the EPA OTAQ MOVES Team during the development and testing of MOVES2010a.

At that time, two changes were made to the MOVES2010a database:

1) a scale modification to daily instead of annual inputs; and

2) addition of rural and urban local roads along with their unique operational characteristics and inputs, particularly the difference in truck travel fractions on these roads compared to freeways and arterials.

The modified database has been named UTAH MOD MOVESDB20100830 and has been adopted by UDAQ and the MPOs: Cache MPO, Mountainland Association of Governments and Wasatch Front Regional Council. A discussion of the steps taken to modify the core MOVES database follows.

(b) Daily VMT

The scale modification developed by UDAQ and reviewed by the EPA MOVES Team allows the MOVES model to use daily VMT as an input. The MOVES default database requires the user to convert daily VMT into an annual VMT input before it is entered into the MOVES model. The

MOVES default database model operates on annual VMT; then MOVES converts the VMT internally, and the output is returned as daily VMT. The process of using MOVES to convert daily VMT to annual VMT and back to daily VMT is unlike the process used in the MOBILE model. The modifications to MOVES eliminate the process of converting daily VMT to annual and back to daily VMT.

The VMT scale modification to "daily" simplifies the use of MOVES, and allows the user to identify errors in inputs and outputs easily.

The scale modification allows the user multiple advantages: 1) Highway Performance Monitoring System (HPMS) VMT collected by UDOT for FHWA and Travel Demand Model VMT estimates are recorded in units of average daily VMT, so no annual conversion is necessary. 2) The MOBILE model historically used daily VMT, so comparison of results is easier.

The procedures used for creating the scale modifications for the UTAH MOD MOVESDB20100830 database are the same as were discussed in the episode day section of the TSD. The discussion on the modifications to MOVES inputs are presented below for the reader's convenience, and are identical to the modifications made to process the episode days:

Daily Modifications

Table Name	**Data Columns**	**Description of Changes**
dayofanyweek	noOfRealDays	Weekday number of real days changed from 5 to 7; weekend day number of real days changed from 2 to 7.

dayID	dayName	noOfRealDays
5	Weekdays	7
2	Weekend	7

Table Name	**Data Columns**	**Description of Changes**
dayvmtfraction	dayVMTFraction	All dayVMTFractions set to 1.

sourceTypeID	monthID	roadTypeID	dayID	dayVMTFraction
11	1	1	2	1
11	2	1	2	1
11	3	1	2	1
Etc				

Table Name	**Data Columns**	**Description of Changes**
monthofanyyear	noOfDays	All noOfDays set to 1.

monthID	monthName	noOfDays	monthGroupID
1	January	1	1
2	February	1	2
3	March	1	3
4	April	1	4
5	May	1	5
6	June	1	6

Etc

Table Name	Data Columns	Description of Changes
monthVMTfraction	monthVMTfraction	All number of days per month set to 1

sourceTypeID	isLeapYear	monthID	monthVMTFraction
11	N	1	1
11	N	2	1
11	N	3	1
11	N	4	1
11	N	5	1
11	N	6	1
Etc			

(c) Local Roads

The MOVES default database requires the user to use identical vehicle type profiles for arterial and local roads, but a local road modification allows MOVES to model local road types separately. UDAQ and the MPOs believe that arterial and local roads have different traffic characteristics, such as VMT, speed distribution and VMT mix. Modeling these road types separately will create a more accurate inventory than combining arterial and local roads into one road type.

Local Road Modifications

Table Name	Data Columns	Description of Changes
avgspeeddistribution	roadTypeID avgSpeedBinID	Road types rural local(32)and urban local(52)added. Local average speeds were set to a constant speed of 12.9 mph.

sourceTypeID	roadTypeID	hourDayID	avgSpeedBinID	avgSpeedFraction
21	32	135	3	0.42
21	32	135	4	0.58
21	52	135	3	0.42
21	52	135	4	0.58
Etc				

Table Name	Data Columns	Description of Changes
driveescheduleassoc	roadTypeID driveScheduleID	Road types rural local(32)and urban local(52) added. Road types 3 and 5 drive schedules copied to road types rural local(32)and urban local(52).

sourceTypeID	roadTypeID	isRamp	driveScheduleID
21	52	N	101
21	52	N	158
21	52	N	1009

21	52	N	1024
21	52	N	1025
21	52	N	1026
21	52	N	1029
21	52	N	1030
21	52	N	1041
21	52	Y	199

Etc.

Table Name	Data Columns	Description of Changes
hourvmtfraction	roadtypeid hourVMTFraction	Road types rural local(32) and urban local(52) added. Road types 3 and 5 hourvmtfraction copied to road types rural local(32)and urban local(52).

sourceTypeID	roadTypeID	dayID	hourID	hourVMTFraction
21	52	2	1	0.0214739
21	52	2	2	0.0144428
21	52	2	3	0.0109684
21	52	2	4	0.00749451
21	52	2	5	0.00683855
21	52	2	6	0.0103588

etc.

Table Name	Data Columns	Description of Changes
roadtype	roadTypeID roadDesc	Road types rural local(32) and urban local(52) added.

roadTypeID	roadDesc	rampFraction
1	Off-Network	0
2	Rural Freeway	0
3	Rural Arterial	0
4	Urban Freeway	0
5	Urban Arterial	0
32	Rural Local	0
52	Urban Local	0

Table Name	Data Columns	Description of Changes
roadtypedist	roadtypeID, roadTypeVMTFraction	Road types rural local(32) and urban local(52) added. RoadtypeVMTfractions for six road types normalized back to 1.000.

sourceTypeID	roadTypeID	roadTypeVMTFraction

21	1	0
21	2	0.352377
21	3	0.28582
21	4	0.105003
21	5	0.176076
21	32	0.0396498
21	52	0.0410736
Etc		

Table Name	Data Columns	Description of Changes
zoneroadtype	roadTypeID SHOAllocFactor	Road types rural local(32) and urban local(52) added. SHOAllocFactors for road types 3 and 5 copied to road types 32 and 52.

zoneID	roadTypeID	SHOAllocFactor
490030	2	0.00207141
490030	3	0.000346871
490030	4	0
490030	5	0.0000792
490030	32	0.000346871
490030	52	0.0000792

(d) Source Classification Codes (SCC's) for Local Roads

To allow local roads to be modeled separately and to use the correct SCC road type fractions, the SCC road type codes and fractions were modified. This modification allowed the modelers to quickly identify if the MOVES model was performing calculations on inputs used for urban and rural freeways, arterials, and local roads.

MOVES SCC Road Types

SCCRoadTypeID	SCCRoadTypeDesc
1	Off-Network
11	Rural Interstate
13	Rural Principal Arterial
15	Rural Minor Arterial
17	Rural Major Collector
19	Rural Minor Collector
21	Rural Local
23	Urban Interstate
25	Urban Freeway/Expressway
27	Urban Principal Arterial
29	Urban Minor Arterial
31	Urban Collector

33	Urban Local

Table Name	Data Columns	Description of Changes
sccroadtypedistribution	roadtypeid sccroadtypeid sccroadtypefraction	Road types rural local (32)and urban local (52)added. SCCroadtype ID consolidated to 1, 11, 13, 23, 27, 21, and 33. SCCroadtypefractions set to 1.

roadTypeID	zoneID	SCCRoadTypeID	SCCRoadTypeFraction
1	490310	1	1
2	490310	11	1
3	490310	13	1
4	490310	23	1
5	490310	27	1
32	490310	21	1
52	490310	33	1

(2) **MOVES2010a Graphical User Interface (GUI) Selections**

The following MOVES2010a GUI selection inputs were entered for each of seventeen counties and projection year winter weekdays and weekend days:

Description: Contains the name of the county being modeled, season and type of day and year.

Scale: Domain/Scale: County
Calculation Type: Inventory

Time Span: Years Season Days
Geographic Bounds: States: Utah

Counties: 17 counties in Utah

Vehicles/Equipment: On-road Vehicle Equipment
Fuels: Gasoline and Diesel (all vehicle gasoline and diesel fuel combinations allowed)

Road Type: Off-Network (exhaust and evaporative emissions emitted in areas other than roads, e.g., in parking lots, residential driveways and garages.
Rural Arterial
Rural Freeway
Rural Local
Urban Arterial
Urban Freeway
Urban Local

Not all counties include all of the above road types. For example, there are no freeways or interstates in Cache County.

Pollutants and Processes:

Pollutants	Processes
Ammonia (NH3) Carbon Monoxide (CO) Nitrogen Oxide (NO) Oxides of Nitrogen (NOx) Primary Exhaust PM10 & 2.5 Primary PM10 & 2.5 Elemental Carbon Primary PM10 & 2.5 Organic Carbon Primary PM10 & 2.5 Sulfate Particulate Primary PM10 & 2.5 Sulfate Particulate Sulfur Dioxide (SO2)	Running Exhaust, Start Exhaust, Crankcase, Idle
Primary PM10 & 2.5 Non-methane Hydrocarbons	Brake wear, Tire wear Crankcase, Refueling, Idle
Total Energy Total Gaseous Hydrocarbons Volatile Organic Compounds	Running Exhaust, Start Exhaust, Idle Running Exhaust, Start Exhaust, Evaporative, Crankcase, Refueling, Idle

(a) VOC Refueling Emissions

VOC refueling emissions are emitted when individual vehicles refuel at gasoline stations. In MOVES2010a, refueling emissions consist of two components:

1) refueling displacement vapor loss; and
2) refueling spillage loss.

When the baseline (2008) and projection year inventories were initially run using MOVES2010a, VOCs included refueling emissions.

For purposes of SIP motor vehicle budgets and conformity demonstrations, UDAQ and the MPOs have traditionally set motor vehicle budgets which *do not* include VOC refueling emissions. Subsequent conformity determinations will also *exclude* refueling emissions.

The MPOs performed MOVES query to isolate VOC refueling emissions. Affected counties include Box Elder, Cache, Davis, Salt Lake, Tooele, Utah and Weber. VOC refueling emissions for these counties were reported to the Area Source inventory.

Results showed that VOC refueling emissions are small compared to VOC emissions in the on-road mobile source inventory. VOC refueling emissions are shown below by county in units of tons per winter weekday:

Cal Years	County	FIPs	VOC Emissions (without refuel) (Tons/Win Wkdy)	VOC Refuel Emissions (Tons/Win Wkdy)	Refueling Emissions (magnitude as % of On-road VOC)
2008	Box Elder	49003	3.270	0.1756	5.37%
	Cache	49005	5.457	0.2193	4.02%
	Davis	49011	11.08	0.4554	4.11%
	Salt Lake	49035	39.26	1.662	4.23%

	Tooele	49045	3.727	0.1862	5.00%
	Utah	49049	16.87	0.7036	4.17%

Cal Years (cont.)	County	FIPs	VOC Emissions (without refuel) (Tons/Win Wkdy)	VOC Refuel Emissions (Tons/Win Wkdy)	Refueling Emissions (magnitude as % of On-road VOC)
2008	Weber	49057	9.147	0.3491	3.82%
2014	Box Elder	49003	2.272	0.1308	5.76%
	Cache	49005	3.671	0.1427	3.89%
	Davis	49011	8.115	0.3473	4.28%
	Salt Lake	49035	26.84	1.156	4.31%
	Tooele	49045	3.323	0.1982	5.96%
	Utah	49049	12.96	0.5511	4.25%
	Weber	49057	6.950	0.2868	4.13%
2017	Box Elder	49003	1.959	0.1067	5.45%
	Cache	49005	2.877	0.1156	4.02%
	Davis	49011	6.863	0.2798	4.08%
	Salt Lake	49035	22.88	0.9232	4.04%
	Tooele	49045	2.802	0.1633	5.83%
	Utah	49049	10.15	0.4395	4.33%
	Weber	49057	5.608	0.2176	3.88%
2019	Box Elder	49003	1.636	0.0893	5.46%
	Cache	49005	2.485	0.0954	3.84%
	Davis	49011	5.459	0.2307	4.23%
	Salt Lake	49035	18.58	0.7598	4.09%
	Tooele	49045	2.352	0.1419	6.03%
	Utah	49049	8.964	0.4008	4.47%
	Weber	49057	4.595	0.1813	3.95%

For the ten rural counties which are in attainment under the 24-hour NAAQS for PM2.5, UDAQ did not perform additional runs to isolate these.

(b) Strategies: Alternative Vehicle Fuels & Technologies (AVFT)

MOVES2010a includes a national default AVFT file that contains default fuel engine fractions for gasoline, diesel, and CNG vehicles by model year.

AVFT file fractions for diesel and gasoline were changed from default to local values in all 17 counties. The source of this data was Utah Tax Commission, Division of Motor Vehicles (DMV), who provided gasoline and diesel passenger and light truck counts for the five largest counties: Davis, Salt Lake, Utah, Weber and Cache. Data was current to March 2011. Only source types 21, 31 and 32 were changed, beginning with 1999:

SourceTypeID	Year	FuelTypeID	Local Value	Default Value
21	1999	1	0.998633	1.0
21	1999	2	0.001367	0.0
21	2000	1	0.998304	1.0
21	2000	2	0.001696	0.0
21	2001	1	0.997974	0.996156
21	2001	2	0.002026	0.003844
21	2002	1	0.997645	0.996156
21	2002	2	0.002355	0.003844
21	2003	1	0.997316	"
21	2003	2	0.002684	"
21	2004	1	0.996986	"
21	2004	2	0.003014	"
21	2005	1	0.996657	etc.

21	2005	2	0.003343	etc.
21	2006	1	0.996328	

SourceTypeID	Year	FuelTypeID	Local Value	Default Value
21	2006	2	0.003672	
21	2007	1	0.995998	
21	2007	2	0.004002	
21	2008	1	0.995669	
21	2008	2	0.004331	
21	2009	1	0.995340	
21	2009	2	0.004660	
21	2010	1	0.995010	
21	2010	2	0.004990	
21	2011	1	0.994681	
21	2011	2	0.005319	
21	2012 - 2050	1	0.994681	
21	2012 - 2050	2	0.005319	
31	1999	1	0.985820	0.976840
31	1999	2	0.014180	0.023160
31	2000	1	0.984390	0.976840
31	2000	2	0.015610	0.023160
31	2001	1	0.982961	0.987000
31	2001	2	0.017039	0.013000
31	2002	1	0.981531	0.987000
31	2002	2	0.018469	0.013000
31	2003	1	0.980102	0.987000
31	2003	2	0.019898	0.013000
31	2004	1	0.978672	0.987000
31	2004	2	0.021328	0.013000
31	2005	1	0.977243	0.987000
31	2005	2	0.022757	0.013000
31	2006	1	0.975813	0.976840
31	2006	2	0.024187	0.023160
31	2007	1	0.974384	0.976840
31	2007	2	0.025616	0.023160
31	2008	1	0.972954	0.976840
31	2008	2	0.027046	0.023160
31	2009	1	0.971525	"
31	2009	2	0.028475	"
31	2010	1	0.970095	"
31	2010	2	0.029905	"
31	2011	1	0.968666	etc.
31	2011	2	0.031334	etc.
32	1999	1	0.917793	0.833480
32	1999	2	0.082207	0.166520
32	2000	1	0.888496	0.877480
32	2000	2	0.111504	0.122520
32	2001	1	0.859199	0.827000
32	2001	2	0.140801	0.173000
32	2002	1	0.829902	0.843000
32	2002	2	0.170098	0.157000
32	2003	1	0.800605	0.867000
32	2003	2	0.199395	0.133000
32	2004	1	0.771307	0.819000
32	2004	2	0.228693	0.181000
32	2005	1	0.742010	0.890990
32	2005	2	0.257990	0.109010
32	2006	1	0.712713	0.921480
32	2006	2	0.287287	0.078520
32	2007	1	0.683416	0.913480
32	2007	2	0.316584	0.086520
32	2008	1	0.654119	0.894680
32	2008	2	0.345881	0.105320
32	2009	1	0.642821	0.894680
32	2009	2	0.375179	0.105320

32	2010	1	0.595524	0.894680
32	2010	2	0.404476	0.105320
32	2011	1	0.566227	0.894680
SourceTypeID	Year	FuelTypeID	Local Value	Default Value
32	2011	2	0.433773	0.105320
32	2012 - 2050	1	0.566227	"
32	2012 - 2050	2	0.433773	"

The default AVFT file contains CNG fractions for transit buses at 6%, but the Utah Transit Authority is currently only operates five CNG buses out of 501 buses as of 2009.[1] The AVFT file was modified by setting all CNG fractions for transit buses (42) to zero, and re-normalizing the sum of fractions for diesel and gasoline transit buses to exactly 1.0000.

AVFT for CNG Transit Buses

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction
42	2007	3	1	0.06
42	2008	3	1	0.06
42	2009	3	1	0.06
42	2010	3	1	0.06

Output/General Output: Units: Grams, Million BTU, Miles

Activity: Distance Traveled
Source Hours
Source Hours Idling
Source Hours Operating
Source Hours Parked

Population

Starts

Output/Output Emissions

Detail: Always: 24-hr and County
For All Vehicles: Emissions Process
On-road: SCC
Population
Starts
Detail: Always: 24-hr and County
For All Vehicles: Emissions Process
On-road: SCC

The MOVES input files are text files with a file name extension of ".mrs". All input files are found in Appendix Items on DVD.

UDAQ PM 2.5 MOVES Files.zip\Projections\UDAQ (rural)\MRS\
CMPO PM2.5 MOVES Files.zip\Projections\CMPO\I/M\MRS
CMPO PM2.5 MOVES Files.zip\Projections\CMPO\No I/M\MRS
MAG PM 2.5 MOVES Files.zip\Projections\MAG\MRS\
WFRC PM 2.5 MOVES Files.zip\Projections\WFRC\MRS\

[1]See UTA website, http://www.rideuta.com/. On the dark blue menu at the top of the page, choose "Media Room".

Then choose the underscored wording "UTA Publications". Then choose the underscored wording "Annual Reports". Click on "2009 Comprehensive Annual Financial Report". Statistical data begins on p. 63 of 85. Go to page 78 to find the number of buses in operation each calendar year.

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction
42	2007	3	1	0.06
42	2008	3	1	0.06
42	2009	3	1	0.06
42	2010	3	1	0.06

(3) **MOVES2010a County Data Manager Input Development**

The following inputs were developed for the MOVES County Data Manager:

(a) County Data Manager Excel Development Workbooks

MOVES organizes data inputs into tables called County Data Manager (CDM) tables.

Inputs can be conveniently viewed, copied or edited using the MySQL Query Browser, which is part of the MOVES2010a model downloadable file.

CDMs were developed for each of the seventeen counties in the domain for each modeled calendar year (2008, 2014, 2017, 2019). Some CDMs were developed by UDAQ, which one or more of the MPOs used. Other CDMs, depending on topic, were developed by each separate MPO.

The table below shows the names of the CDM tables, the agency who developed the data, and the agencies who used the data.

Name of CDM	Cache MPO (CMPO)	Mountainlands Association of Governments (MAG)	Wasatch Front Regional Council (WFRC)	UT Division of Air Quality (UDAQ)
Met Data	UDAQ	UDAQ	UDAQ	UDAQ
Source Type Age Distribution	UDAQ	UDAQ	WFRC	UDAQ
Vehicle Miles of Travel	CMPO	MAG	WFRC	UDAQ
Vehicle Type VMT Mix	UDAQ	UDAQ	UDAQ	UDAQ
Road Type Distribution	UDAQ	MAG	WFRC	UDAQ
Average Speed Distribution	CMPO	MAG	WFRC	UDAQ
Ramp Fractions	CMPO	MAG	WFRC	UDAQ
Day VMT Fractions	UDAQ	UDAQ	UDAQ	UDAQ
Fuel Type ID	Utah Petroleum Associa-	→	→	→

	tion			
Name of CDM	Cache MPO (CMPO)	Mountainlands Association of Governments (MAG)	Wasatch Front Regional Council (WFRC)	UT Division of Air Quality (UDAQ)
Hour VMT Fraction	MOVES Default	→	→	→
I/M Coverage	CMPO and UDAQ	MAG and UDAQ	WFRC and UDAQ	n/a (no IM programs in rural counties)
Month VMT Fraction	MOVES Default	→	→	→

CDMs

The CDMS are found in Appendix Items on DVD.

PM 2.5 MOVES Files\Projections\UDAQ\CDM\
PM 2.5 MOVES Files\Projections\CMPO\IM\CDM\
PM 2.5 MOVES Files\Projections\CMPO\No IM\CDM\
PM 2.5 MOVES Files\Projections\MAG\CDM\
PM 2.5 MOVES Files\Projections\WFRC\CDM\

County Data Manager Input Data Sets

Meteorology
Data
PM 2.5 MOVES Files\Projections\File Development\July 20, 2011 Temperature Study\
PM 2.5 MOVES Files\Projections\File Development\Met data\Zonemonthhour\Met Data\
Note: See CDMs above.

Source Type Population
PM 2.5 MOVES Files\Projections\UDAQ\File Development\Sourcetypeyear\
PM 2.5 MOVES Files\Projections\CMPO\File Development\Sourcetypeyear\
PM 2.5 MOVES Files\Projections\MAG\File Development\Sourcetypeyear\
PM 2.5 MOVES Files\Projections\WFRC\File Development\Vehicle Population\
Note: See CDMs above.

Age Distribution
PM 2.5 MOVES Files\Projections\UDAQ (rural)\File Development\Soucetypeagedistribution\
PM 2.5 MOVES Files\Projections\CMPO\File Development\Soucetypeagedistribution\
PM 2.5 MOVES Files\Projections\MAG\File Development\Soucetypeagedistribution\
PM 2.5 MOVES Files\Projections\WFRC\File Development\Vehicle Age\
Note: See CDMs above.

Vehicle Miles Traveled and Vehicle Type Mix
PM 2.5 MOVES Files\Projections\UDAQ (rural)\File Development\Hpmsvtypeyear\
PM 2.5 MOVES Files\Projections\CMPO\\File Development\Hpmsvtypeyear\
PM 2.5 MOVES Files\Projections\MAG\File Development\Hpmsvtypeyear\

PM 2.5 MOVES Files\Projections\WFRC\File Development\VMT Mix\

Average Speed Distribution
PM 2.5 MOVES Files\Projections\UDAQ (rural)\File Development\Avgspeeddistribution\EMIT & Rural Speeds\
Note: See CDMs above.

Fuel
PM 2.5 MOVES Files\Projections\File Development\Fuelsupply\
Note: See CDMs above.

I/M Programs
Note: See CDMs above.

Data for the CDMs discussed below were developed by UDAQ. However, for many of the CDM tables, the MPOs opted to develop their own inputs. The agency who developed each CDM is noted in the discussion of CDMs by topic below.

(1) Meteorological Data (Zone Month Hour)

UDAQ developed all meteorological data. All MPOs and UDAQ used these data, which was specific to each county in the domain.

Meteorological data is identified in the database as Zone Month Hour data. This data consists of hourly temperature (°F) and relative humidity values (%) for each separate county and episode day. Data were collected by the UDAQ Planning Branch, Technical Analysis Section.[2]

See Appendix Items on DVD:
PM 2.5 MOVES Files\Projections\File Development\July 20, 2011 Temperature Study\

The EPA document "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze", (Final-03-pm-rh-guidance.pdf) explains the difference between the base case and baseline inventories and the meteorological data to be used for each. Air quality episode dates must fall within the five-year air quality design value window discussed in that document.

Base case episode inventories are used for air dispersion model performance evaluation. Baseline (2008) inventories used by air dispersion model to determine the "Relative Reduction Factor" (RRF), which establishes the increment between the modeled and attainment concentration.

Four PM2.5 episodes were identified by UDAQ Air Modelers. Dates of these episodes were from 2007 to 2010.

Averages of 24-hour temperature data during each episode showed that January 2007 episode temperatures were considerably colder than the averages during the other three episodes (February 2008, January 2009 and December 2009 - January 2010). The MOVES model showed that, when all other inputs were held constant, emissions were highest when the coldest temperatures were modeled--those recorded during the January 2007 episode.
EPA Region 8, EPA OTAQ, the Metropolitan Planning Organizations and UDAQ concurred

that, for the baseline (2008) and projection year inventories, the January 2007 average hourly temperatures should be modeled, as use of these constitute the most conservative modeling approach, i.e., which models "worst-case" conditions.

Meteorology data for the baseline and projection year inventories includes a data set for each of the seventeen counties in the domain.

Temperature and relative humidity (RH) input data represent the average values recorded on episode days Thursday, January 11 through Sunday, January 21, 2007 inclusive (eleven days).

For each episode day, there are 24 hourly values of temperature (F) and RH (%).

Computation of average values can best be explained by example:

Consider Salt Lake County. Beginning with January 11 and ending with January 21, 2007 for the first hour (1:00), temperature and RH values were recorded as follows:

County	FIPs	Episode Day of Week	Date	Hour	T(F)	RH (%)
Salt Lake	49035	Thu	01-11-07	1:00	17.9	75
Salt Lake	49035	Fri	01-12-07	1:00	20.5	83
" "	49035	Sat	01-13-07	1:00	11.5	47
"	49035	Sun	01-14-07	1:00	8.2	66
"	"	Mon	01-15-07	1:00	7.5	76
"	"	Tue	01-16-07	1:00	9.9	77
"	"	Wed	01-17-07	1:00	11.1	80
"	"	Thu	01-18-07	1:00	13.3	85
"	"	Fri	01-19-07	1:00	15.6	84
"	"	Sat	01-20-07	1:00	16.7	91
"	"	Sun	01-21-07	1:00	25.0	76
"	"	AVERAGE	11 Days	1:00	17.9	75

Average values for the first hour (1:00), which are 17.9 F and 75% as seen above, are entered into the data set for the final episode average T and RH for the first hour.

For the *second* hour (2:00), data was collected the same way--the eleven daily values for the 2:00 hour were gathered and averaged. The process was repeated to calculate subsequent hourly averages for hours 3:00 through 24:00. The result consists of 48 average hourly values: 24 average hourly temperature values and 24 average hourly RH values.

Thus, from the above example, the episode average T and RH for the *first hour only* (1:00) are 17.9 F and 76% respectively.

The final data set contains 24 *hourly average temperatures* and 24 *hourly average RH* values.

[2]From the home page at, http://mesowest.utah.edu/index.html . On the map, click on the outline of Utah. On the upper menu (red bar), under "Product", choose "Current Weather Summary (instead of "Surface Weather Maps") and click on "GO". Then choose a station name, e.g., "Salt Lake City I" (Salt Lake City International Airport).

To find a different station, go to the menu on the left-hand side of the page. Under "MORE INFO", choose "Nearby Stations" and select a different city or station.

(2) Source Type Population

Source type population (vehicle population) is a new input for the MOVES model. MOVES2010a uses entirely different source (vehicle) types compared to MOBILE6.

The MOBILE6 input file required users to enter data for sixteen vehicles types. The MOBILE6 short output file defined eight vehicle types. Users could select the long output format, which defined 28 vehicle types.

MOVES2010a requires input for thirteen vehicle types. Output choices are thirteen vehicle types or twelve-vehicles. The 12-vehicle output is similar to the eight-vehicle output from MOBILE6 but expands heavy-duty diesel vehicles into five classes by Gross Vehicle Weight Rating (GVWR).

These twelve vehicle types are the following:

SCC	Vehicle Type and Description	GVWR (lb)	Loaded Vehicle Weight, LVW (lb)
2201001	Light-duty passenger car	0 < G < 3750	
2201020	Light-duty gasoline truck 1,2	0 < G < 6000	0 < L < 3750
2201040	Light-duty gasoline truck 3,4	0 < G < 6000	3750 < L < 6000
2201070	Heavy-duty gasoline vehicle	0 < G < 33000	
2201080	Motorcycle		
2230001	Light-duty diesel vehicle	0 < G < 3750	
2230060	Light-duty diesel truck	0 < G < 8500	
2230071	Heavy-duty diesel vehicle 2b	8500 < G < 10000	
2230072	Heavy-duty diesel vehicle 3,4,5	10000 < G < 19500	
2230073	Heavy-duty diesel vehicle 6, 7	19500 < G < 33000	
2230074	Heavy-duty diesel vehicle 8a, 8b	G > 33000	
2230075	Buses (intercity, sch & transit)	19500 < G < 33000	

The "crosswalk" between MOBILE6 and the thirteen MOVES source types is found in the EPA Age Distribution Importers, "Vehicle Type Mapping" tab:

Composite Vehicle Classes for Vehicle Registration Data from MOBILE6			
M6Vtype16ID	**Abbreviation**	**Description**	**HPMSVtypeID**
	LDV	Light-Duty Vehicles (Passenger Cars)	20
2	LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)	30
3	LDT2	Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)	30
4	LDT3	Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)	30
5	LDT4	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)	30
6	HDV2B	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)	30
7	HDV3	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)	50
8	HDV4	Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)	50
9	HDV5	Class 5 Heavy-Duty Vehicles (16,001-19,500 lbs. GVWR)	50
10	HDV6	Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)	50
11	HDV7	Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)	50
12	HDV8A	Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)	60
13	HDV8B	Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)	60
14	HDBS	School Buses	40
15	HDBT	Transit and Urban Buses	40
16	MC	Motorcycles (All)	10
MOVES SourceUseType Vehicle Categories			
SourceTypeID	**SourceTypeName**		**HMPSVtypeID**
11	Motorcycle		10
21	Passenger Car		20
31	Passenger Truck		30
32	Light Commercial Truck		30
41	Intercity Bus		40
42	Transit Bus		40
43	School Bus		40
51	Refuse Truck		50
52	Single Unit Short-Haul Truck		50
53	Single Unit Long-Haul Truck		50
54	Motor home		50
61	Combination Short-Haul Truck		60
62	Combination Long-Haul Truck		60

Development of Source (Vehicle) Type Population

UDAQ developed data for Source Type Population. CMPO and MAG used this data. WFRC developed its own data.

UDAQ Method

Ideally, states have sources that provide a statewide vehicle population.

In Utah, the Division of Motor Vehicles maintains a database of registered on-road vehicles. However, discussions with DMV found that the database does not include heavy-duty vehicles that travel interstate (into Utah and merely passing through to adjoining states).

In addition, the vehicle type classifications in the DMV db are very simple, and only include motorcycles, passenger car/light trucks as a second single group, and heavy-duty trucks.

Utah proposed to use DMV data to develop the population for light-duty passenger cars and light-duty trucks only. The heavy-duty truck count from DMV is incomplete.

To obtain an estimate of the heavy-duty truck population by MOVES types, EPA OTAQ assisted staff in performing a source type population run. The run specifications are described below.

In summary, source populations by type were obtained as follows:

1. Light-duty passenger cars and light-duty trucks: UT Division of Motor Vehicles (DMV)
2. Heavy-duty trucks: MOVES defaults

As shown in the diagram below, the UDMV class "light-duty vehicles" includes those with GVWR up to 12,000 lb. UDAQ assigned these to MOVES classes 11, 21, 21 and 32.

This assignment is only an approximation based on the following assumptions: Some vehicles in the light-duty group have GVWRs from 10,000 to 12,000 lbs. These vehicles belong in MOVES vehicle type decile 50 (see "crosswalk" above).

The more accurate way to assign light-duty vehicles with GVWR from 10,000 to 14,000 lbs is to distribute them among MOVES vehicle types 30 and 50. However, there is no way to determine the exact fractions of vehicles that belong in each class. For this reason, UDAQ believes the assignment of LDV's to MOVES classes 11, 21, 31 and 32 is sufficiently accurate. The UDMV class of heavy-duty vehicles is defined by a GVWR greater than 12,000 lbs. UDAQ assigned these to MOVES classes 41 through 62.

The diagram below illustrates how DMV and UDAQ grouped the vehicles:

UTAH DMV DATABASE OF VEHICLES
Current to Jan 1, 2010

Light-duty Vehicles	Heavy-duty Vehicles
MC, LDV & LDT 1-4, HDV2b	HDV 3 – 8b, Buses
GVWR ≤ 12,000 lb	GVWR > 12,000 lb

UT DOT Vehicle Apportionment by GVWR

LDV	LDV	HDV	HDV	HDV	HDV	HDV	HDV	HDV	HDV
≤ 6,000	6,000 > GVWR ≤ 8,500	8,500 > GVWR ≤ 10,000	10,000 > GVWR ≤ 14,000	14,000 > GVWR ≤ 16,000	16,000 > GVWR ≤ 19,500	19,500 > GVWR ≤ 26,000	26,000 > GVWR ≤ 33,000	33,000 > GVWR ≤ 60,000	> 60,000

M6 Types	MOVES Types	GVWR (lb)
MC	MC (11)	n/a
LDV	passenger car (21)	≤ 3,750
LDT 1-4	passenger truck (31)	≤ 8,500
HDV2b	light commercial truck (32)	8,500 < G ≤ 10,000

M6 Types	MOVES Types	GVWR (lb)
HDV 3-7	refuse truck, single-unit short- and long-haul truck (51 – 54)	10,000 < GVWR ≤ 33,000
HDBS, HDBT	buses (41 - 43)	n/a
HDV 8a, 8b	combination short- and long-haul truck (61, 62)	> 33,000

The table below contains vehicle counts from UDMV current to January 1, 2009:

	HEAVY TRUCK	MC	PASS VEH	LT TRUCK	SUM
Box Elder	1983	1605	27437	15922	44964
Cache	2809	3641	50987	24782	79410
Carbon	938	760	11252	8932	20944
Davis	3600	8891	151,157	55979	216,027
Duchesne	1873	549	8180	9803	18532
Emery	409	265	5451	4869	10585
Juab	505	253	5306	3905	9464
Millard	649	288	6676	5093	12057
Morgan	297	292	5394	3425	9111
Rich	117	46	1304	1119	2469
Salt Lake	22753	26897	524,480	191,640	743,017
Sanpete	977	463	12426	9301	22190
Summit	991	1583	25508	12480	39571
Tooele	972	1805	29601	15326	46732
Utah	7055	12827	210456	81570	304,853
Wasatch	635	828	12205	7417	20450
Weber	5436	6920	109608	51289	167,817
SUM	53348	67913	1197428	502852	1,768,193

Data current to January 1, 2011 are shown below:

	HEAVY TRUCK	MC	PASS VEH	LT TRUCK	SUM
Box Elder	1903	1472	27151	15733	44356
Cache	2940	3182	51831	24979	79992
Carbon	984	690	10996	8702	20388
Davis	3478	8120	151,957	54642	214,719
Duchesne	1994	519	8059	9735	18313
Emery	479	245	5399	4836	10480
Juab	540	187	5302	3951	9440
Millard	583	285	6610	5066	11961
Morgan	309	293	5585	3354	9232
Rich	92	41	1236	1095	2372
Salt Lake	21761	24468	521088	181764	727,320
Sanpete	989	462	12618	9482	22562
Summit	929	1500	26073	12187	39760
Tooele	1146	1734	30334	15509	47577
Utah	6853	11089	213850	80186	305,125
Wasatch	588	775	12530	7330	20635
Weber	4963	6420	108516	50490	165,426
SUM	50531	61482	1199135	489041	1,749,658

As discussed above, the UT DMV classifies registered vehicles as follows:

Vehicle Type	GVWR (lb)
Passenger Vehicle/Light Truck	$\leq$ 12,000
Heavy Truck	> 12,000

The DMV heavy truck count does not include vehicles merely passing through the state, such as heavy-duty long-haul trucks.

Therefore, MOVES defaults were used to estimate the populations of heavy-duty trucks.

MOVES Default Source Type Population Run

The starting point to develop heavy-duty (vehicle) type populations from MOVES is to set up a "national scale" run.

To perform the MOVES Population Run the following GUI selection inputs were used:

Settings: Configure MOVES Default Database: movesdb20100830
Description: Contains the name of all the counties modeled.

Scale: Domain/Scale: National, Calculation Type: Inventory

Time Span: Time Aggregation Level: Month, Years: 1990, 1999-2050
Months: January, Days: Weekend & Weekday, Hours: 24

Geographic Bounds: States: Utah
Counties: All 17 counties in the Utah PM 2.5 SIP modeling domain

Vehicles/Equipment: On-road Vehicle Equipment
Fuels: Gasoline and Diesel, all allowed vehicle gasoline and diesel fuel combinations

Road Type: Off-Network
Rural Restricted Access
Rural Unrestricted Access
Urban Restricted Access
Urban Unrestricted Access

Pollutants: At least one pollutant needs to be selected, e.g.,
Carbon Monoxide: running, start, crankcase, idle

Output/General Output: Units: Grams, Joules, Miles
Activity: Distance Traveled
Output/Output Emissions Detail: Always: Month and County
For All Vehicles: Fuel Type & Emissions Process
On-road: Road Type & Source Use Type

Advanced Performance Features: Save Data for the following Masterloop Components

Total Activity Generator (TAG)
Operating Mode Distribution Generation (running OMDG)
Start Operating Mode Distribution Generator
Tirewear Operating Mode Distribution Generator

Copy Saved Generator Data
Database: populationrunTAG

Upon completing the national scale run, MOVES outputs a directory called "populationruntag". The output tables "starts" and "starts per vehicle" contain the data required to compute the source populations. Source population is computed by the following equation:

Source Population = Vehicle Starts/Starts per Vehicle

The source type populations for heavy-duty vehicles (types 41-62) were extracted from the MOVES2010a default database.

For example, in Salt Lake County for calendar year 2010, the MOVES2010a default source populations are:

(The population data below are defaults from the "TAG" run using MOVES2010a.)

Vehicle Code	Vehicle Name	Vehicle Starts	Starts per Vehicle	Vehicle Population
11	motorcycle	129,460.2	5.291	24,468.00
21	passenger car	12,200,163.1	36.85	331,120.9
31	passenger truck	8,662,133.3	31.09	278,640.5
32	lt. comm truck	3,0465,585.2	32.73	93,090.62
41	intercity bus	5,313.579	13.73	387.0049
42	transit bus	5,917.900	27.27	217.0281
43	school bus	70,678.29	26.90	2,627.383
51	refuse truck	4,452.098	18.80	236.7877
52	single-unit short-haul truck	500,833.7	30.90	16,206.24
53	single-unit long-haul truck	43,650.01	20.96	2,082.908
54	motor home	12,944.48	3.454	3,747.729
61	combination short-haul truck	102,821.8	27.99	3,672.978
62	combination long-haul truck	92,083.54	20.96	4,394.077
SUM	**SL Co**			**760,892.1**

UDAQ believes an adjustment should be made on the default heavy-duty vehicle counts to better reflect local data. As already stated, DMV does not have an accurate count of heavy-duty vehicles traveling in Utah because interstate trucks (mostly types 61 and 62) driving through the state are not tracked.

Therefore, UDAQ proposed to adjust the MOVES default population for heavy-duty trucks by some metric that would better reflect the true local heavy-duty vehicle population.

An adjustment was made to the heavy-duty vehicle population as follows:

1. Default MOVES populations for the sum of *light-duty vehicles* (passenger cars and trucks and light commercial trucks) in each separate county were compared to UT DMV LDV counts by county to see how well the counts agreed.

2. A ratio of (DMV/MOVES) counts was computed separately for each group of LDV populations by county.

3. The heavy-duty vehicle counts were adjusted separately in each county by multiplying the MOVES default counts for heavy-duty vehicles by the ratio in step 2 above, i.e:

Adjusted HD Count = MOVES Default Population x (LDV DMV Count/LDV MOVES Count)

Thus if the ratio (LDV DMV/LDV MOVES) was < 1, then the HD default counts from MOVES would decrease, and if the ratio was > 1, the HD default counts would increase.

Conversion of Source Type Populations by Local UDMV data and MOVES Defaults

Passenger Cars/Light Trucks & Motorcycles	Heavy Trucks and Buses
Counts from UDMV	Counts from MOVES
11 motorcycle	41 intercity bus
21 passenger car	42 transit bus
31 passenger truck	43 school bus
32 light commercial truck	51 refuse truck
	52 single-unit short-haul truck
	53 single-unit long-haul truck
	54 motor home
	61 combination long-haul truck
	62 combination long-haul truck

Note that only CMPO and MAG used this data in modeling. WFRC developed its own source type populations.

WFRC Method

The WFRC process for determining vehicle population, like the DAQ process, also relies on Utah DMV data for light duty vehicles (MOVES vehicle types 11, 21, 31, and 32 or motor cycles, passenger cars, and light duty trucks). For heavy duty and commercial vehicles, the WFRC process again parallels the DAQ process by relying on MOVES vehicle population defaults since the local DMV data is not representative of the heavy duty and commercial vehicles operating in the Salt Lake PM2.5 non-attainment area.

Where the WFRC process differs with the DAQ process described above is in the forecasting method for estimating future year vehicle populations. This is a critical data input for SIP development as well as conformity determinations that will be required once the SIP is approved.

The WFRC desired to use human population projections as a surrogate for vehicle population. WFRC invests considerable effort in maintaining the latest human population projections for the region in order to keep travel demand model estimates grounded in the most up-to-date socio-economic data. It seems logical to base vehicle population forecasts on these human population forecasts so that vehicle population estimates are likewise base on the latest socio-economic forecasts.

WFRC compared vehicle population data from Utah DMV and human population data for the years 2002-2008 to establish the vehicle per capita relationship. Then, using the human population forecast by county as the independent variable, WFRC extrapolated the vehicle population for the years 2009-2040. Again, this approach was used for MOVES vehicle types 11, 21, 31, and 32 included in the Utah DMV data.

For heavy duty and commercial vehicle types (MOVES types 41-62), the 2008 MOVES default population for each of the Salt Lake PM2.5 non-attainment counties was identified. The default vehicle population was then extrapolated for years 2009-2040 as before using the population forecast as the independent variable.

(3) Source Type Age Distribution

UDAQ developed source type age distribution data for all counties. CMPO and MAG used this data. WFRC developed its own source type age distributions.

UDAQ Method

UDMV age distribution data current to January 1, 2010 was used to calculate the vehicle populations for motorcycle (type 11), passenger cars (type 21), and light trucks (types 31 and 32) with a gross vehicle weight rating up to 12,000 lbs with the assumption that these vehicles comprise a majority of travel within the PM2.5 SIP modeling domain.

UDMV data for heavy-duty vehicles is limited to vehicles registered in the state. The EPA MOBILE6 registration distribution converter (http://www.epa.gov/otaq/models/moves/tools.htm) was used to create age distribution files by county. UDMV data for passenger cars (type 21) and light trucks (types 31 and 32) were placed within the converter and MOVES defaults were used from the convertor for vehicle types 41 - 62.

Multiple phone conversations took place between UDAQ, the EPA MOVES Team and the FHWA Air Quality Team during the development of these files. All agencies involved found that the default MOVES data for heavy-duty vehicles for source type population and age distribution are probably more suitable than the limited local UDMV data.

WFRC Method

WFRC used a procedure very similar to that described above by DAQ for determining the age distribution of vehicles registered in Box Elder, Weber, Davis, Salt Lake, and Tooele Counties. Utah DMV data was used to determine the age profile of motorcycles, passenger cars, and light duty trucks, all of which are registered in the State. These vehicles correspond to the MOVES

vehicle types 11, 21, 31, and 32. Heavy duty and commercial vehicles (MOVES types 41-62) are not well represented in the Utah DMV data because these vehicles if registered in the State may accumulate much of their activity outside the State, or these types of vehicles active in the State may actually be registered in other States and thus not represented in the Utah DMV data. Thus, for MOVES vehicle types 41-62, the default MOVES age distribution was used.

(4) Vehicle Miles of Travel (VMT)

UDAQ developed VMT data for the ten rural counties it modeled. CMPO, MAG and WFRC developed their own data for vehicle miles of travel.

UDAQ Method

The starting point for development of VMT is historical FHWA or UDOT HPMS AADT VMT for calendar years 1996 - 2009. (At the time of inventory development, UDOT Division of Systems Planning and Programming had not yet posted 2010 AADT VMT on its website, http://www.udot.utah.gov/main/f?p=100:pg:0::::V,T:,530.)

HPMS reports AADT VMT for twelve "functional classes", or road types. UDAQ combined these road types to form the six major road types below:

The "Utah modified MOVES database" includes the following road types. A single county may have up to six different road types, as follows:

Road Type Code	Road Type
11	Rural Interstate
13	Rural Arterial
21	Rural Local
23	Urban Interstate
27	Urban Arterial
33	Urban Local

For the non-MPO counties, winter average weekday traffic (Win AWKDT) and winter average weekend day traffic (Win AWKNDT) is found in the MOVES output files for each respective calendar year (2014, 2017 and 2019).

To obtain AADT VMT for projection years, UDAQ used historical HPMS AADT VMT for calendar years 1996 - 2009 supplied by UDOT. Next, linear regressions of historical VMT versus calendar year were performed to obtain VMT projections for calendar years 2010 through 2050. The EXCEL workbook "10-04-11 AADT VMT Projections 2010 - 2050 All 17 Counties.xls" contains historical HPMS AADT, details of linear regressions and AADT VMT projections for years 2010 - 2050.

Note that AADT VMT in the above workbook is not correct for the counties modeled by MAG (Utah County) or WFRC (Box Elder, Davis, Salt Lake, Tooele and Weber Counties). These MPOs adjusted their AADT VMT using their respective Travel Demand Models.

UDAQ developed a method to convert AADT VMT into winter weekday and winter weekend day VMT. Conversion factors were obtained as follows:

For each road type, there are weekday and weekend day conversion factors for VMT. These conversion factors were obtained from UDOT.

UDOT also supplied winter (January) VMT conversion factors for each road type.

Using Carbon County as an example, the VMT reported in the HPMS data system is converted from average annual daily traffic (AADT) to winter weekday and winter weekend day VMT as shown below:

Many counties have zero VMT for one or more of the major road types.

Example: Converting Carbon County AADT VMT to a Winter Weekday in January 2014

Year	Month	Weekday or Week-end Day Factor	Road Type	Monthly Conver-sion Factor	Weekday Conver-sion Factor	HPMS AADT	win AWKDT or win AWKNDT
2014	Jan	Weekday	Rural Freeway	0.8511	0.9991	995,936	846,842
2007	"	Weekday	Rural Arterial	0.8097	1.0186	225,805	186,235
2007	"	Weekday	Rural Local	0.8711	1.0792	40,691	38,253
2007	"	Weekday	SUM			1,262,432	1,071,330

VMT Conversion Factors

For the PM2.5 SIP inventories, AADT VMT must be converted to winter average weekday traffic (Win AWKDT) and winter average weekend day traffic (Win AWKNDT).

MAG and WFRC Methods

MAG and WFRC condensed the above six road types to include, for the MPO counties (Box Elder, Davis, Salt Lake, Tooele, and Weber for WFRC, and Utah County for MAG), only three road types:

1. Urban Interstate/Freeway
2. Urban Arterials
3. Urban Local Roads

MPO Counties used their respective Travel Demand Models (TDM) to obtain modeled HPMS VMT for the base year (2008) and projection years (2014, 2017 and 2019).

Next, HPMS VMT was adjusted to match traffic conditions dictated by the TDMs. The result is Adjusted HPMS VMT.

AADT VMT was converted to Average Weekday Traffic (AWKDT) and Average Weekend Day Traffic (AWKNDT) using conversion factors obtained by the respective TDMs operated by the MPOs.

Lastly, winter (January) VMT conversion factors were supplied by UDOT or obtained from the TDMs.

Winter average weekday traffic (Win AWKDT) and winter average weekend day traffic (Win AWKNDT) is found in the MOVES output files for each respective calendar year (2014, 2017 and 2019) in the same way as for the base year VMT described above.

NOTE that, for the MPO counties, the above EXCEL workbooks do not show the actual projection year VMT used in modeling. Instead, VMT used is found in the MOVES output files.

CMPO Method

CMPO developed VMT for rural arterials, rural local roads, urban arterials and urban local roads. There are no interstates/freeways in Cache County.

1. UDOT HPMS AADT VMT was obtained for calendar years 2002 - 2009.
2. For calendar year 2010, UDOT VMT was not yet available at the time MOVES modeling was performed. CMPO performed a straight-line interpolation to obtain 2010 AADT VMT.
3. Using the Cache Travel Demand Model (TDM), UDOT HPMS AADT VMT for calendar years 2005 - 2010 was adjusted to account for traffic parameters such as average speed distribution, VMT by Hour and Vehicle Hours Traveled (VHT). In short, the result was that local road urban AADT VMT decreased slightly, while VMT on the remaining road types remained unchanged.

These corrections are summarized in the table below:

Cal Year	UDOT HPMS AADT VMT	Adjusted AADT VMT (from TDM)
2008	2,556,007	2,428,627
2009	2,357,550	2,359,077
2014	not available	3,156,282
2017	" "	3,451,167
2019	" "	3,647,756
2020	" "	3,746,051

Winter weekday and winter weekend day traffic for projection years was developed in a similar manner. The CMPO MOVES MIX displays winter weekday and winter weekend day VMT for all calendar years from 2008 through 2050 inclusive. The calculation incorporates the AADT VMT and weekday/weekend day conversion factors obtained from the Cache MPO Travel Demand Model, and the January (winter) conversion factors supplied by UDOT.

Cache MPO obtained historical HPMS AADT VMT for calendar years 2002 through 2009. The 2010 HPMS AADT VMT is estimated, and the final AADT VMT obtained after adjustment of HPMS VMT by the Travel Demand Model, resulting in the final AADT VMT.

Conversion factors from AADT to AWKDT for Cache County were obtained from the CMPO Travel demand Model. Winter (January) factors were provided by UDOT:

Cal Year	Road Type	Road Type No.	AADT VMT (from TDM)	AADT-to AWKDT	AWKDT	Winter Factor	Win AWKDT
2008	Rural Restricted (Fwy)	2	0	0.9991	0	0.8511	0
"	Rural Unrestricted (Art)	3	500,755	0.9926	497,049	0.8097	402,469
"	Urban Restricted (Fwy)	4	0	1.0957	0	0.9337	0
"	Urban Unrestricted (Art)	5	983,381	1.1150	1,096,470	0.9311	1,020,922
"	Rural Local	32	35,687	0.9926	35,423	0.8711	30,856
"	Urban Local	52	908,804	1.1150	1,013,316	0.9506	963,229
2008	SUM		2,428,627		2,642,259		2,417,476

WFRC Method

WFRC uses data from the travel demand model to prepare VMT by vehicle type distribution data required for running the MOVES model. WFRC has prepared a travel model program, named TDM2MOVES, to generate vehicle activity input files required for running the MOVES model. This program tallies VMT by facility type (freeway, ramp, arterial, and local) for each county. Adjustments are made to these totals for winter and summer traffic conditions as well as for HPMS correction factors. The TDM2MOVES program also incorporates VMT fractions by vehicle type data for each facility type and county as described in the section below. The VMT by facility values are then multiplied by the VMT by vehicle type fractions to obtain the VMT by vehicle type. The VMT for each of the MOVES vehicle types is then totaled for all facilities.

The WFRC travel demand model was run for the years 2007, 2009, 2016, and 2020. To prepare MOVES input files for SIP analysis years 2008, 2010, 2011, 2014, 2017, and 2019, it was necessary interpolate VMT by vehicle type data from the modeled years closest to the desired SIP analysis year.

VMT forecasts using the travel demand model are highly dependent on socio-economic data, primarily population and employment projections. These socio-economic forecasts are revised on a regular basis in response to the most recent trends in population growth and economic activity. For this reason, future VMT forecasts are subject to some margin of error or uncertainty.

There is also an ongoing effort to improve travel demand modeling practice. These refinements in travel demand model practice can also lead to variations in the forecast of VMT for future years.

To deal with this margin of error in VMT forecasts, the WFRC added a margin of error of 10% to the VMT forecasts for the year 2020. Other analysis years (2009-2019) also applied a margin of error on a sliding scale from 0% in 2008 to the 10% value used for 2020. This same margin of error was also applied to the vehicle population profile in order to keep the vehicle starts and vehicle trip length relationship consistent within the MOVES model.

(5) Vehicle Type VMT Mix

UDAQ Method

UDAQ developed Vehicle Type VMT Mix data for CMPO, MAG, WFRC and the ten rural counties.

"Vehicle Type VMT" is often referred to as "travel fraction" or "VMT fraction", indicating how VMT is distributed among the vehicle types.

For interstate and arterial facilities, UDAQ obtained raw VMT travel fractions for ten FHWA vehicle classes grouped by Gross Vehicle Weight Rating (GVWR) ranges from the UDOT Division of Systems Planning and Programming. The travel fractions were obtained by county from automated pneumatic counters that detect axle spacing and "weigh-in motion" (WIM) counters placed on arterials and interstates.

Since there are no counters on local roads, the UDAQ used travel fractions for LDVs and HDVs from the MPOs' local road surveys for urban counties.

The data was converted to MOBILE6 vehicle types and then to MOVES vehicle (source) types. The base year for these data was 2008.

VMT on each road type was divided among ten vehicle classes by Gross Vehicle Weight Rating (GVWR). The ten vehicle classes used by UDOT are as follows:

Vehicle	GVWR Range(lb)
LDV	≤ 6,000
LDV	6,000 < GVWR ≤ 8,500
HDV	8,500 < GVWR ≤ 10,000
HDV	10,000 < GVWR ≤ 14,000
HDV	14,000 < GVWR ≤ 16,000
HDV	16,000 < GVWR ≤ 19,500
HDV	19,500 < GVWR ≤ 26,000
HDV	26,000 < GVWR ≤ 33,000
HDV	33,000 < GVWR ≤ 60,000
HDV	GVWR > 60,000

Individual VMT values for the above ten vehicle types on each road type were converted to fractions. The EPA default VMT fractions for calendar year 2008 were then used to expand the fractions for ten vehicles to the sixteen vehicle types in MOBILE6.

MOBILE6 vehicle types were grouped into the six MOVES gross vehicle types by decile (i.e., 10 = motorcycle, 20 = passenger car, 30 = passenger truck and light commercial truck, 40 = buses, 50 = single-unit haul truck, and 60 = combination truck.).

The final step was to break up the VMT under each decile into fractions for all the MOVES vehicle types under that decile. For example, decile "30" is comprised of passenger truck and light commercial truck. The VMT fractions for these vehicle types were obtained from their respective MOVES default fractions. In the same way, MOVES default fractions for vehicle types in each respective "decile" were used to obtain the final VMT fractions for the thirteen vehicle types in MOVES.

To obtain VMT fractions for other calendar years (2014, 2017 and 2019), the annual percent change in the MOVES default VMT fractions by calendar year was used to grow the mix. The resulting VMT fractions were normalized to a sum of exactly 1.0000.

MOVES default VMT fractions for projection years were obtained by performing a special MOVES run. The following GUI selection inputs were used:

Settings:	Configure MOVES Default Database: movesdb20100830
Description:	Contains the name of all the counties modeled.
Scale:	Domain/Scale: National
	Calculation Type: Inventory
Time Span:	Time Aggregation Level: Month
	Years: 1990, 1999-2050
	Months: January
	Days: Weekday
	Hours: 24

Geographic Bounds: States: Utah
Counties: All 17 counties in the Utah PM 2.5 SIP modeling domain

Vehicles/Equipment: On-road Vehicle Equipment Fuels: Gasoline and Diesel

		All vehicle gasoline and diesel fuel combinations
Road Type:	Off-Network Rural Restricted Access Rural Unrestricted Access Urban Restricted Access Urban Unrestricted Access	
Pollutants:	Total Energy Consumption	
Output/General Output	Units: Activity: Distance Traveled	Grams, Joules, Miles
Output/Output Emissions Detail	Always: Hour and County	
On-road:	Road Type and Source Use Type	
Advanced Performance Features:	Save Data for the following Masterloop Components:	
	Total Activity Generator (TAG) Copy Saved Generator Data	
Database:	VMTgenTAG	

WFRC Method

VMT fraction data is used in the WFRC TDM2MOVES program to allocate VMT by vehicle type as required by the MOVES program.

(6) Road Type Distribution

For the ten rural counties modeled by UDAQ, road type distribution data is inherent in HPMS AADT VMT supplied by Utah Department of Transportation. MAG and WFRC developed their own road type distribution data from their respective Travel Demand Models. Cache County MPO and UDAQ developed road type distribution for Cache County.

Details of VMT development is already discussed in section (4) above.

In brief, the starting point to obtain VMT by road type distribution is HPMS AADT VMT. HPMS groups VMT into twelve functional classes. Not all counties show VMT under each of the twelve HPMS functional classes. For example, Cache County does not have any interstates. UDOT HPMS VMT was organized by UDAQ according to the following MOVES road type ID's:

Modified MOVES Road Type IDs	Road Type ID	UDOT HPMS Categories
Rural Restricted (Interstate and Fwy)	2	Rural Interstate (01) Rural Other Principal Arterial (02)
Rural Unrestricted (Arterial)	3	Rural Major Collector (07) Rural Minor Collector (08) Rural Minor Arterial (06)
Urban Restricted (Interstate and Fwy)	4	Urban Interstate (11) Urban Freeway and Expressway (12)
Urban Unrestricted	5	Urban Other Principal Arterial (14) Urban Minor Arterial (16) Urban Collector (17)
Rural Local	32	Rural Local (09)
Urban Local	52	Urban Local (19)

As already discussed in section 1c above ("Local Roads"), UDAQ modified the MOVES default database to add rural local and urban local roads.

Road Type Distribution Example: 2008 February (Tuesday) Wasatch County

sourceTypeID	roadTypeID	roadTypeVMT Fraction
11	1	0.000
11	2	0.000
11	3	0.698
11	4	0.000
11	5	0.172
11	32	0.084
11	52	0.046
21	1	0.000
21	2	0.000
21	3	0.698
21	4	0.000
21	5	0.172
21	32	0.084
21	52	0.046
etc		

WFRC Method

WFRC uses data from the travel demand model to prepare the road type distribution data required for running the MOVES model. The road type distribution data prepared by WFRC uses the same seven road type descriptions as defined above for the DAQ procedure. For the urbanized WFRC planning area, WFRC treats all VMT reported in the travel demand model as "urban" VMT.

WFRC has prepared a travel model program, named TDM2MOVES, to generate the vehicle activity input files required for running the MOVES model. This program includes adjustment factors to correct travel model values for VMT to weekday HPMS values for VMT as reported by the Utah Department of Transportation. The TDM2MOVES program also includes adjustment factors for winter and summer variations in vehicle activity.
The WFRC travel demand model was run for the years 2007, 2009, 2016, and 2020. To prepare MOVES input files for SIP analysis years 2008, 2010, 2011, 2014, 2017, and 2019, it was necessary use road type distribution files from the modeled year closest to the desired SIP analysis year.

(7) Average Speed Distribution

UDAQ developed average speed distribution data for the ten rural counties it modeled. CMPO, MAG and WFRC developed their own average speed distribution data.

UDAQ Method

The "Easy Mobile Inventory Tool" (EMIT) created by FHWA was used to compute MOBILE6 average speeds for restricted and unrestricted road types. EMIT creates a MOBILE6 speed input file utilizing the Highway Capacity Method to determine rural speeds based on HPMS data. This tool is important for estimating speeds in rural areas that do not have a travel demand model. UDOT Division of Systems Planning and Programming provided HPMS Rural County lane miles for 2008. The rural HPMS data is sorted by the following MOBILE6 road types for input into the FHWA Easy Mobile Inventory Tool (EMIT):

HPMS	MOBILE6 Road Types
Rural Interstate (01)	Interstate
Rural Other Principal Arterial (02)	Other Principal Arterial
Rural Minor Arterial (06)	Minor Arterial
Rural Major Collector (07)	Major Collector
Rural Minor Collector (08)	Minor Collector
Rural Local (09)	Local
Urban Interstate (11)	Interstate
Urban Freeway and Expressway (12)	Other Freeway
Urban Other Principal Arterial (14)	Other Principal Arterial
Urban Minor Arterial (16)	Minor Arterial
Urban Collector (17)	Major Collector
Urban Local (19)	Local

UDAQ created a modified database which added rural and urban local roads. Speeds for all local roads were set to 12.9 mph as in MOBILE6. MOBILE6 SPEEDVMT distributions were converted to MOVES average speed distributions using the EPA Average Speed Converter MOBILE6.xls tool.

CMPO Method

Cache MPO obtained average speed distributions from its Travel Demand Model. The TDM analyzes over 3,290 separate traffic segments called "links" that together comprise the network of roads in Cache County.
Each link is assigned, for each of the four major time periods during the day (AM peak, midday, PM peak and nighttime), an average speed, an increment of VMT and an increment of VHT (vehicle hours traveled).

A specific number of links are assigned to each of the UDOT HPMS functional classes (road types, e.g., rural local, urban local, rural minor arterial, urban minor arterial, and so on).

In effect, average speeds, VMT and VHT for each of the functional classes are combined to obtain average speed, VMT and VHT for rural arterials, urban arterials, rural local roads and urban local roads. (There are no interstates in Cache County).

The average speeds, VMT and VHT are converted to MOBILE6 VMT fractions for each of 16 speed ranges such that the VMT fractions represent the 24-hour speed profile of arterials and local roads weighted by VMT.

This file is known in MOBILE6 as the "Speedvmt" file. Using an EPA-provided converter tool, the M6 Speedvmt file is converted to the MOVES "averagespeeddistribution" file. Recall that the M6 speed file includes fourteen speed bins, but the MOVES file includes 16 speed bins. Lastly, the MOVES averagespeeddistribution file is imported into MOVES2010a as one of the input tables, or CDMs.

WFRC Method

WFRC uses data from the travel demand model to prepare the average speed distribution data required for running the MOVES model. The average speed distribution data prepared by WFRC uses the same seven road type descriptions as defined above for the WFRC road type distribution procedure. For the urbanized WFRC planning area, WFRC treats all VMT reported in the travel demand model as "urban" VMT.

WFRC has prepared a travel model program, named TDM2MOVES, to generate the vehicle activity input files required for running the MOVES model. This program does not distinguish speed variations by season as this detail is beyond the scope of the travel demand model. The travel demand model is calibrated to samples of actual highway speed data; the resulting speed profiles are treated as representative of actual travel speeds without further post-model adjustments for vehicle speeds.

The WFRC travel demand model was run for the years 2007, 2009, 2016, and 2020. To prepare MOVES input files for SIP analysis years 2008, 2010, 2011, 2014, 2017, and 2019, it was necessary use average speed distribution files from the modeled year closest to the desired SIP analysis year.

8. Ramp Fractions

UDAQ used the MOVES default ramp fraction of 8% for rural counties that have urban and rural freeways. The default was used because no ramps exist in the HPMS system. CMPO, MAG and WFRC developed their own ramp fraction data.

CMPO Method

There are no interstates or ramps in Cache County.

WFRC Method

WFRC uses data from the travel demand model to prepare the ramp fraction data required for running the MOVES model. The ramp fraction is calculated as:

Ramp Fraction = rampVHT / (rampVHT + freewayVHT)

where VHT represents vehicle hours traveled.

WFRC has prepared a travel model program, named TDM2MOVES, to generate the vehicle activity input files required for running the MOVES model.

The WFRC travel demand model was run for the years 2007, 2009, 2016, and 2020. To prepare MOVES input files for SIP analysis years 2008, 2010, 2011, 2014, 2017, and 2019, it was necessary use ramp fraction files from the modeled year closest to the desired SIP analysis year.

(9) DayVMTFraction

UDAQ developed Day VMT Fractions for all counties. CMPO, MAG and WFRC used the same fractions.

UDAQ Method

UDAQ exported the default fractions and replaced each value with a "1". The purpose of this is to allow MOVES to model a single day instead of a month, season or year. In the County Data Manager, this file must have day VMT fractions set to "1" for the corresponding month and day being modeled.

sourceTypeID	monthID	roadTypeID	dayID	dayVMTFraction
21	1	1	5	1
21	1	2	5	1
21	1	3	5	1
21	1	4	5	1
21	1	5	5	1
21	1	32	5	1

21	1	52	5	1
etc.				

(10) Fuel Type ID

Fuel type ID, fuel formulations and fuel supply were supplied by Utah Petroleum Association (UPA). Gasoline used in Utah was virtually 100% conventional in 2008, and was virtually 100% E-10 beginning around April 2010. CMPO, MAG, WFRC and UDAQ used the fuel formulations supplied by UPA.

The MOVES default database (MOVESDB20100830) includes a table called "fuel type". This is the starting point to determine the correct fuel for a given data triplet (county, year and month).

The table "fuel type" contains only the following basic fuel types:

fuelTypeID	defaultFormulationID	fuelTypeDesc
1	10	Gasoline
2	20	Diesel Fuel

fuelSubtypeID	fuelTypeIDfuelSubtypeDesc
10	1Conventional Gasoline
20	2Conventional Diesel Fuel

(a) Fuel Supply

The table "fuel supply" (in the MOVES default database) is organized by county, calendar year and month.

For example, for Salt Lake County in January 2008, the table shows the following:

county ID	fuelYear ID	monthGroup ID	fuelFormula-tion ID	marketShare	marketShareCV
49035	2008	1	2519	0.436743	0.5
49035	2008	1	7926	0.563257	0.5
49035	2008	1	20043	1.000000	0.5

UDAQ used the MOVES default fuel supply data for diesel fuel, and modified the gasoline portion according to the fuel formulations supplied by UPA. Discussions with UPA found that gasoline produced by the local refineries in Utah have somewhat different fuel formulations that those shown the MOVES default database "moves20100830".

UDAQ obtained fuel formulations from UPA for calendar years 2008 - 2011 and 2012- on. A copy of the MOVES default database was made and renamed "UTAH_CDM". UPA fuel formulations for the above years in each of the seventeen counties replaced the MOVES defaults as shown below.

Utah Petroleum Association gasoline fuel formulations are shown for calendar year 2008 and 2012:

Cal Year	County	FIPs	Fuel Formulation	January RVP (psi)	E-10 (vol %)	Sulfur Content (ppm)	Benzene (%)	Aromatics (%)
2008	All	49003 -		12.71	0.0	84.33	1.56	23.68
2012	All	49057		13.35	10.0	30.84	0.91	15.31

(11) Hour VMT Fraction

MAG, WFRC and UDAQ used the MOVES default hour VMT fractions. Cache MPO developed its own hour VMT fractions from its Travel Demand Model.

(12) I/M Coverage (Davis, Salt Lake, Utah and Weber Counties)

I/M inputs were developed by CMPO and UDAQ for Cache County. MAG and WFRC developed their I/M inputs with assistance from UDAQ.

Currently only Davis, Salt Lake, Utah and Weber Counties have ongoing I/M programs, which are described in the CDM.

CMPO (Cache County I/M Program)

An I/M program in Cache was modeled with test procedures as follows:

Calendar Year	Light-Duty Gasoline Vehicles (< 8,500 lb GVWR)	Model Years	Test Procedure	Frequency	Exempt Vehicles
2014	LDGV LDGT 1 LDGT 2	1968 - 1995 " "	Two-speed Idle	Biennial	None
	LDGV LDGT 1 LDGT 2	1996 - newer " "	OBDII Exhaust & Evaporative	Biennial	Four or less years old*

*Vehicle age equals (Cal Yr - Model Yr). For example, in 2014, a 2012 model-year vehicle is considered two years old.

Reductions from I/M Program

Calendar Year	NO I/M PROGRAM (Tons per Winter Weekday NOx	VOC	CO	PM2.5 Exhaust	Winter AWKDT
2014	5.063	3.814	54.39	0.2991	3,139,086
	WITH I/M PROGRAM (Tons per Winter Weekday) NOx	VOC	CO	PM2.5 Exhaust	
2014	4.824	3.590	50.74	0.2991	3,139,086

	PERCENT REDUCTIONS WITH I/M			
	NOx	VOC	CO	PM2.5 Exhaust
2014	4.72%	5.87%	6.71%	0.00%

(13) MonthVMTFraction

The default database contains different fractions for each month, to be used when an annual inventory is created. UDAQ set all fractions for the base year and projection years to "January", or "1". This is required in order to model single days with MOVES. CMPO, MAG, WFRC and UDAQ used the same "monthVMT fraction" in their modeling.

ix. **Model Outputs**

For emission inventory purposes, the seventeen counties were assigned to the MPOs and UDAQ as follows:

MPO	Counties
Cache MPO	Cache
Mountainland Association of Governments	Utah
Wasatch Front Regional Council	Box Elder, Davis, Salt Lake, Tooele, Weber
UDAQ	Carbon, Duchesne, Emery, Juab, Millard,
Morgan, Rich, Sanpete, Summit, Wasatch	

x. **General Output**

Working through the MOVES input screen under the menu item "Output" (on the left-hand side of the screen), the sub-menu item "General Output" allows the user to choose the desired units and other output data parameters. Units used by UDAQ appear in bold font below:

(1) Units (Output)

Mass Units	**grams**, kilograms, pounds, U.S. Tons
Energy Units	joules, kilojoules, **million BTU**
Distance Units	kilometers, **miles**

(2) Activity (Output)

The following data sets may be output:

Distance Traveled
Source Hours
Source Hours Idling
Source Hours Operating
Source Hours Parked
Population
Starts

(3) Output Emissions

Under the menu item "Always", UDAQ chose units that appear in bold font below:

Time	**24-hour day**, Hour, Portion of Week, Month, Year
Location	**County**, Nation, State, Zone
Pollutant	**Y** or N

The menu items "Estimate Uncertainty" and "Number of Iterations" do not function during an actual run.

Output from MOVES can be organized several ways, depending on the user's desired selections on the "Output Emissions" screen. UDAQ selected output by vehicle type (source classification code or SCC), and emission process. SCC identification and vehicle type is defined as follows:

(4) Source Classification Codes		Vehicle Type
220	1001	LDGV
220	1020	LDGT I
220	1040	LDGT II
220	1070	HDGV
220	1080	MC
223	0001	LDDV
223	0060	LDDT
223	0071	HDDV2b (8,500 < GVWR $\leq$ 10,000 lb)
223	0072	HDDV3, 4, 5 (10,000 < GVWR $\leq$ 19,500 lb)
223	0073	HDDV6, 7 (19,500 < GVWR $\leq$ 33,000 lb)
223	0074	HDDV8a (33,000 < GVWR $\leq$ 60,000 lb)
"	"	HDDV8b (> 60,000 lb)
223	0075	HDDB (school and transit bus)

(5) Road Types

UDAQ modified the MOVES database (20100830) by adding local roads to the road types. Codes assigned to the road types were defined as follows:

Code	Road Type
11	Rural Interstate
13	Rural Arterial
21	Rural Local
23	Urban Interstate
27	Urban Arterial
33	Urban Local

(6) Components of Pollutants

One or more of the following components were used for the various pollutants:

Code	Component
B	brake wear
T	tire wear
X	exhaust
V	evaporative

The workbooks that show the output emissions are found in the "Appendix Items on DVD", Base Year/Proj Yrs/Output Summaries/ (EXCEL or .csv format). There is a separate directory for each agency that performed the modeling:

CMPO	= Cache MPO
MAG	= Mountainland Association of Governments
UDAQ	= Utah Division of Air Quality
WFRC	= Wasatch Front Regional Council

(7) Summary Reports

MOVES produces summary reports after program execution. The user chooses the top menu item "Post-Processing" and then chooses "Produce Summary Report". The output can immediately be converted to EXCEL or some other format.

EXCEL workbooks were created for each county by corresponding agency (Cache MPO, MAG, UDAQ and WFRC). Within each county output dataset there is a separate workbook for each calendar year.

MOVES output summary reports are found in the following directory:

PM 2.5 MOVES Files\Projections\UDAQ (rural)\Output\
PM 2.5 MOVES Files\Projections\CMPO\IM\Outputs\
PM 2.5 MOVES Files\Projections\CMPO\No IM\Outputs\
PM 2.5 MOVES Files\Projections\MAG\Outputs\
PM 2.5 MOVES Files\Projections\WFRC\Outputs\
Note: See CDMs above.

Units for emissions shown above are grams per winter weekday. To convert grams per day to tons per year, multiply grams by 907,185 (= 453.59 x 2,000). Distance, or VMT, is in units of winter average weekday traffic (win AWKDT) or winter average weekend day traffic (win AWKNDT).

xi. **Fugitive Dust (PM10 and PM2.5) from Paved Roads (Re-entrained Road Dust)**

Fugitive Dust Emissions

PM10 and PM2.5 fugitive dust from paved roads ("re-entrained road dust") is not modeled by MOVES. Instead, the method from AP-42, Chapter 13, was used.

AP-42, Chapter 13.2, "Introduction to Fugitive Dust Sources", Section 13.2.1, "Paved Roads", has been revised since the November 2006 version. The new final version dated January 2011 was announced in the Federal Register on February 4, 2011.

UDAQ modeled fugitive dust from paved roads using the final January 2011 version.

Inputs are somewhat different between the models. Inputs common to both methods include the following:

Name of Input	Description	Detail	New Values	
(1) Constants k for PM10 and PM2.5 multiplier			1.0, 0.25 for PM10 and PM2.5 respectively	
(2) Average Vehicle Weight	tons	Interstate	var.	var.
		Arterial	var.	var.
		Local	var.	var. *

*In general, average vehicle weight is highest on interstates and lowest on local roads. In rural counties, average vehicle weight is often a factor of three or four times higher than in large urban counties due to the relatively higher percentage of large trucks in rural areas compared to urban areas with large volumes of commuter traffic.

(3) Silt Loading Factors (SLF)

UDAQ, after discussions with the Interagency Consultation Team, used the recently approved methodology in the latest version of AP-42, Ch 13.2.1 published in the FR January 2011. EPA default silt loading factors (SLF's) were used. The Team determined that the SLF's from an old local study on silt loading conducted in Salt Lake County were of questionable accuracy (see Reference #1).
The EPA default SLF's are shown below, copied from Table 13.2.1-2 of the January 2011 guidance in AP-42:

ADT Category	< 500	500-5,000	5,000-10,000	> 10,000
Ubiquitous Baseline (g/m2)	0.6	0.2	0.06	0.03 0.015 limited access

The workbooks for fugitive dust are found in the "Appendix Items on DVD" \Dust\.
Note that the inventories of fugitive dust from paved roads are in units of **tons per year** as

requested by UDAQ Technical Analysis Section.

(4) Precipitation

Precipitation inputs were obtained from the UDAQ Technical Analysis Section. Units are "number of hours per day with precipitation greater than 0.01 inch". As precipitation increases, fugitive dust decreases. The precipitation factor (1 - 1.2P/N) is less than or equal to 0 whenever the value of P is 20 or more (hours out of 24). In this case, the EF for dust equals zero. For P = 0, the EF is maximum.

Precipitation data for all episodes, counties and days are found in the "Appendix Items on DVD", Base Year/Proj Yrs/Fugitive Dust/EXCEL workbooks/.

(5) SMOKE Formats for PM2.5 and PM10 Fugitive Dust Inventories

Lastly, SMOKE formats for fugitive dust inventories were prepared by UDAQ. These formats contain only outputs with the following descriptors:

1. County FIPs
2. SCC
3. Pollutant
4. TPY

The SMOKE formats for fugitive dust are found Appendix Items on DVD", \Dust\.

(xiv) REFERENCES

The following documents were used as references in creating the on-road mobile source PM2.5 SIP emissions inventories:

1. Aerovironment, Report on Salt Lake County Road Dust Silt Loading, 1992.

2. Federal Register, Friday, February 4, 2011, "Official Release of the January 2011 AP–42 Method for Estimating Re-Entrained Road Dust From Paved Roads", Announcement of Availability.

3. U.S. Code of Federal Regulations (CFR) Title 40, Part 81, Section 345: Utah Designation of Areas for Air Quality Planning Purposes, http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol17/pdf/CFR-2010-title40-vol17-sec81-345.pdf.

4. United States Congress, Clean Air Act Law and Explanation, Public Law 88-206, 77 Stat. 392, 42 U.S.C. 7401 et seq., as last amended by the Clean Air Act Amendments of 1990, P.L. 101-549, CCH Incorporated, Chicago, IL 60646-6085, November 1994, http://www.epa.gov/oar/caa/title1.html.

5. U.S. Environmental Protection Agency, Clean Air Act, Title I, Part D, Subpart 2, "Additional Requirements for Ozone Nonattainment Areas", Section 182, "Plan Submission and Requirements, (b) Moderate Areas, http://www.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00007511---a000-.html.

6. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, RTP, NC, "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze", EPA-454/B-07-002, April 2007. http://www.epa.gov/scram001/guidance/guide/final-03-pm-rh-guidance.pdf

7. U.S. Environmental Protection Agency, Office of Transportation and Air Quality (OTAQ), Assessment and Standards Division, "Draft Motor Vehicle Emission Simulator (MOVES) 2009 Software Design and Reference Manual", EPA-420-B-09-007, http://www.epa.gov/otaq/models/moves/420b09007.pdf , March 2009.

8. United States Environmental Protection Agency, Emission Inventory Improvement Program (EIIP) Documents:

Chapter 1: Preferred and Alternate Methods for Gathering and Locating Specific Emission Inventory Data, vol. iv, June 1996, http://www.epa.gov/ttn/chief/eiip/techreport/volume04/iv01.pdf.

Chapter 2: Use of Locality-Specific Transportation Data for the Development of Mobile Source Emission Inventories, vol. iv, September 1996,

http://www.epa.gov/ttn/chief/eiip/techreport/volume04/iv02.pdf.

9. U.S. Environmental Protection Agency, Federal Register, Adequacy Status of the Utah County, Utah PM2.5 State Implementation Plan Revision for Transportation Conformity Purposes, Notice of Adequacy, vol. 67, no. 190, October 1, 2002, http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2002_register&docid=02-24916-filed.pdf.

10. U.S. Environmental Protection Agency, Office of Transportation and Air Quality (OTAQ), Assessment and Standards Division, "Motor Vehicle Emission Simulator (MOVES)", User Guide for MOVES2010a, EPA-420-B-10-036, http://www.epa.gov/otaq/models/moves/index.htm#user, August 2010.

11. U.S. Environmental Protection Agency, Office of Transportation and Air Quality (OTAQ), Beardsley, Megan, Brzezinski, David, Choi, David, Koupal, John, Warila, James, "MOVES Sensitivity Analysis: The Impacts of Temperature and Humidity on Emissions", 15 pp. http://www.epa.gov/ttnchie1/conference/ei19/session6/choi.pdf

12. U.S. Environmental Protection Agency, OTAQ, Transportation and Regional Programs Division, "Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity", EPA-420-B-10-023, http://www.epa.gov/oms/models/moves/, April 2010.

13. U.S. Environmental Protection Agency, Technology Transfer Network, AP 42, 5th ed., vol. 1, Chapter 13: Miscellaneous Sources, 13.2, "Introduction to Fugitive Dust Sources", 13.2.1, "Paved Roads", January 2011, http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf.

14. United States Federal Highway Administration, "Easy Mobile Inventory Tool", Federal Highway Administration Resource Center, Claggett, Michael, Ph.D. and Houk, Jeffrey, Nov. 20, 2007, http://www.fhwa.dot.gov/resourcecenter/teams/airquality/aq_emit.cfm.

15. Utah Department of Transportation (UDOT) Vehicle Miles Traveled Data, VMT by Functional Class by County, 2007 - 2009, http://www.udot.utah.gov/main/f?p=100:pg:0::::V,T:,530.

16. Utah State Tax Commission, Economics and Statistics (Economic and Statistical Unit, Analysis of Tax Collections & Business Activity in Utah, Motor Vehicle, Motor Vehicle and Watercraft Registrations, 2010, 2009, etc., "On-road Registrations by Model Year and Vehicle Type" and "On-road Registrations by County and Vehicle Type", http://tax.utah.gov/esu/motor/registration/index.html.

17. Wasatch Front Regional Council, Air Quality Memorandum: Conformity Analysis for the WFRC 2030 Regional Transportation Plan including PM2.5 Emissions Analysis, Report No. 26a, Sept. 10, 2010, http://www.wfrc.org/cms/rtp_amendments/Air_Quality_Memo_26.pdf.

18. McKeague, UT DEQ, Division of Air Quality, Mobile Source and Transportation Section, E-mail to Tim Russ, U.S. EPA Region VIII, 07/06/2011, 03:47 PM, Subject: "PM2.5 MOVES Baseline Inventory Utilizing 2007 PM2.5 Episode and County-Specific Hourly Average Temperature Profiles".

19. Russ, Tim, U.S. Environmental Protection Agency, Region VIII, E-mail to Richard McKeague (UDAQ), Wednesday - July 20, 2011 10:57 AM, Subject: "PM2.5 MOVES2010a Base Line Inventory Utilizing 2007 PM2.5 Episode and County Specific Hourly Average Temperature Profiles: EPA Concurrence".

Background

Summary and Organization

This section of the TSD describes the consideration of possible control measures and their inclusion or elimination from consideration as part of the overall control strategies in the various SIPs supported by the modeled attainment demonstrations.

A basic description of the process to be employed is followed by four sections, each addressing one of the fundamental sectors of the emissions inventories (area sources, large stationary point sources, on-road mobile sources, and off-road mobile sources).

Requirements

Section 172 of the CAA requires that each attainment plan "provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology), and shall provide for attainment of the NAAQS"

EPA has gone on to codify this requirement in 40 CFR 51, Subpart Z – Provisions for Implementation of PM2.5 National Ambient Air Quality Standards. Specifically, 51.1010 presents the requirements for addressing RACT and RACM in PM2.5 nonattainment areas. States must demonstrate that they have adopted all reasonably available control measures (including RACT for stationary sources) necessary to demonstrate attainment as expeditiously as practicable and to meet any RFP requirements. The SIP revision needs to contain the list of potential measures considered by the State, and information and analysis sufficient to support the State's judgment that it has adopted all RACM, including RACT.

Additional Guidance can be found in EPA's "Clean Air Fine Particle Implementation Rule" FR Vol.72 No.79, April 25, 2007. It is summarized below.

EPA interprets RACM as referring to measures of any type that may be applicable to a wide range of sources (mobile, area, or stationary), whereas RACT refers to measures applicable to stationary sources. Thus, RACT is a type of RACM specifically designed for stationary sources.

RACT would be determined as part of the broader RACM analysis, and identification of all measures (for stationary, mobile, and area sources) that are technically and economically feasible, and that would collectively contribute to advancing the attainment date (if possible, by at least one year.)

In general, the combined approach to RACT and RACM includes the following steps:

- identification of potential measures that are reasonable
- modeling to identify the attainment date that is as expeditious as practicable
- selection of RACT and RACM

Section 172 does not include any specific applicability thresholds to identify the size of sources that States and EPA must consider in the RACT and RACM analysis.

For each technologically feasible control technology or measure, the State should provide the following information:

- control efficiency, by pollutant (PM2.5, SO_2, NO_X, VOC)
- possible emission reductions by pollutant
- estimated $/ton reduced
- date by which the measure could be reasonably implemented

The cost effectiveness of a technology is expressed as its annualized cost divided by the emissions reduced per year ($/ton.) When making a determination as to whether an available control technology or measure is economically feasible, there are certain factors that should be taken into consideration. Similar sources may have different marginal costs, profit margins and abilities to pass costs through to the consumer. These factors are appropriate to consider.

Seasonal controls are acceptable, in situations such as Utah's, where PM and Ozone violations occur in winter and summer respectively.

Source Categories

In examining emission controls, it is helpful to categorize the sources of those emissions into the same basic groupings used in the compiling the emissions inventories: stationary point sources, area sources, on-road mobile sources, and off-road mobile sources. Each is discussed in turn.

Area Sources

Area Source Rulemaking

As part of the RACT analysis for area sources, consideration was given to a broad list of source categories. The following table identifies these categories as well as the pollutant(s) likely to be controlled, and provides some remarks as to whether a control strategy was ultimately pursued. In considering what source categories might be considered, Utah made use of EPA recommendations as well as control strategies from other states. DAQ evaluated each strategy for technical feasibility as part of the RACT analysis. The screening column in the table identifies whether or not a strategy was retained for rulemaking or screened out for impracticability.

Area Source Strategy Screening

Strategy	Constituent(s)	SCREENING STATUS	REMARKS
1. Repeal current surface coating rule, R307-340. Replace this rule with individual rules for each category. New rules include $PM_{2.5}$ nonattainment areas. New rules update applicability and control limits to most current CTG. Current rule includes: a. Paper b. Fabric and vinyl c. Metal furniture d. Large appliance e. Magnet wire f. Flat wood g. Miscellaneous metal parts h. Graphic arts	VOC	Retained	R307-340 currently applies to Davis and Salt Lake counties. R307-340 will be withdrawn and re-enacted as separate rules for each existing category. The new rules will be expanded to nonattainment areas.
2. New separate surface coating rules for following sources: a. High performance b. Architectural c. Aircraft d. Marine e. Sheet, strip & coil f. Traffic markings g. Plastic parts	VOC	See Remarks Column	High performance – screened, regulated under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Architectural – screened, research indicates that reducing VOC levels further would result in limited use coating that would not be practical for residential and

Strategy	Constituent(s)	SCREENING STATUS	REMARKS
			commercial use Aircraft – retained as new aerospace rule Marine – screened, only 1.2 tpy Sheet, strip & coil – retained as new rule Traffic markings - screened, regulated under FIFRA Plastic parts - retained as new rule
3. Agricultural practices using Natural Resources Conservation Service conservation practice standards	VOC, $PM_{2.5}$, ammonia	Screened	Complicated programs, difficult to implement in Utah livestock operations, limited use options in winter time with low control efficiency
4. Over the counter consumer products rule regulating VOC content of pesticide, automotive products etc.	VOC	Screened	Various federal regulations address these products
5. Over the counter for personal care and household products rule	VOC	Screened	Various federal regulations address these products
6. Adhesives and sealant rule	VOC	Screened	Various federal regulations address these products
7. Expand current solvent degreasing rule R307-335 to $PM_{2.5}$ nonattainment areas and add a new section on industrial solvent cleaning	VOC	Retained	
8. New automobile refinishing rule	VOC	Retained	
9. Expand wood furniture manufacturing rule to $PM_{2.5}$ nonattainment areas and update to most current CTG.	VOC	Retained	
10. Lower the red-day cut point for residential use of fireplaces and wood stoves. Require EPA certified stoves and prohibit the sale/resale of noncertified stoves in nonattainment areas.	VOC, $PM_{2.5}$, NO_x, SO_x, ammonia	Retained	
11. Ban new sales of outdoor wood	VOC, $PM_{2.5}$,	Retained	

Strategy	Constituent(s)	SCREENING STATUS	REMARKS
boilers	NO_x, SO_x, ammonia		
12. Industrial bakery rule	VOC	Retained	
13. Chain-driven charbroiler restaurant emission control	VOC, $PM_{2.5}$	Retained	
14. Pilot light phase out in gas fireplaces, stoves and home heaters	VOC, $PM_{2.5}$, NO_x, SO_x, ammonia	Retained	
15. Expand current fugitive dust rule, R307-309 to $PM_{2.5}$ nonattainment areas. Require BMP's for dust plans.	$PM_{2.5}$	Retained	
16. Amend fugitive dust rule to include cattle feed lot	$PM_{2.5}$	Screened	Feed lots are not located in nonattainment areas
17. Low NO_x burners in commercial and institutional water heaters	VOC, NO_x	Screened	NO_x reduction impairing attainment of $PM_{2.5}$
18. Chemical additives to manure	VOC, ammonia	Screened	Costly with limited control efficiency. Excess ammonia in inventory that would not be sufficient to be effective
19. Ban testing of back-up generators on red-alert days	VOC, $PM_{2.5}$, NO_x, SO_x	Retained	
20. Prohibit use of cutback asphalt	VOC	Screened	Cities and highway administration personnel need stockpile for winter time road repair. Very small inventory.
21. Control limits on aggregate processing operations	$PM_{2.5}$	Retained	
22. R307-307 Road Salt and Sanding	PM	Retained	Expand current rule to nonattainment areas

Area Source Rule Assessment

Control strategies that were retained as part of the SIP underwent additional analysis to determine costs and control effectiveness. The basic process for determining control effectiveness is described below.

Emission Reductions

SIP rule credits are based on emission reductions for each rule. Emission reductions are calculated as follows:

Emission Reduction = [control efficiency (CE) x rule effectiveness (RE)] x rule penetration (RP)

Control Efficiency Sources (CE)

- EPA databases, such as, AirControlNet
- EPA Control Techniques Guidelines
- Other state rules actuals

Rule Effectiveness Source (RE)

Derived from *Attachment 2: Non-Point Source Rule Effectiveness Ranges, Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards and Regional Haze Regulations,* EPA 12/2005.
New rule and expanding current rule in newly regulated county default value RE=80%

Rule Penetration (RP)

"Rule penetration is an estimate of the percentage of **emissions emitted** by facilities covered by a regulation" *(Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards and Regional Haze Regulations*, pg 18, EPA 12/2005).

Matrix

RP = 100% where no threshold, apply to all

RP = 98% for rule threshold of 2.7 tpy and when rule requires high efficiency add-on control

RP = 95% for rule threshold of 5 - 10 tpy and construction related emissions

Area Source Rule Documentation

Specific information summarizing control effectiveness and anticipated costs is presented below for each area source rule included in the SIP strategy. These rules include the following:

Rule: R307-302. Residential Fireplaces and Solid Fuel Burning Devices.
Rule: R307-303. Commercial Cooking.
Rule: R307-307. Road Salting and Sanding
Rule: R307-309. Fugitive Emissions and Fugitive Dust
Rule: R307-312. Aggregate Processing Operations.
Rule: R307-334. Industrial Baking Ovens.
Rule: R307-335. Degreasing and Solvent Cleaning Operations.
Rule: R307-343. Emissions Standards for Wood Furniture Manufacturing Operations.
Rule: R307-344. Paper, Film and Foil Surface Coatings.
Rule: R307-345. Fabric and Vinyl Coatings.
Rule: R307-346. Metal Furniture Surface Coatings.
Rule: R307-347. Large Appliance Surface Coatings.
Rule: R307-348. Magnet Wire Coatings.
Rule: R307-349. Flat Wood Panel Coatings.
Rule: R307-350. Miscellaneous Metal Parts and Products Coatings.
Rule: R307-351. Graphic Arts.
Rule: R307-352. Metal Container, Closure, and Coil Coatings.
Rule: R307-353. Plastic Part Coatings.
Rule: R307-354. Automotive Refinishing Coatings.
Rule: R307-355. Control of Emissions from Aerospace Manufacture and Rework Facilities.
Rule: R307-356. Appliance Pilot Light.

Rule: R307-302. Residential Fireplaces and Solid Fuel Burning Devices.

Purpose
Establish emission standards for solid fuel burning devices and establishes no burn period cut-points for PM2.5.

Applicability
Counties: Davis, Salt Lake, Utah, Weber
Residential fireplaces and wood stoves
PM2.5 red day cut-point = 35 $\mu g/m^3$

Amended Applicability
Counties: all nonattainment
Rename to bring into regulation all solid fuels
PM2.5 red day cut-point = 25 $\mu g/m^3$
Contingency plan PM2.5 cut-point = 15 $\mu g/m^3$
Require future sale of EPA certified stoves

Rulemaking Status
Public comment Period: September 2012
Air Quality Board Action: pending

Affected SCC
2104008001 Fireplaces
2104008010 Conventional Wood Stoves
2104008050 Non-catalytic Stoves
2104008030 Catalytic Stoves

Estimated Cost
None for current owners, cost-neutral for new EPA certified stoves due to higher efficiency

Discussion
Wood burning restriction program in Davis, Salt Lake and Weber counties is a mature program with strong public and media support allowing disbandment of smoke patrol used during the program infancy to insure compliance on red days. Compliance is based on annual smoke complaints during red days which have steadily declined. Average complaints: 20-30/year .

Cache County has a wood burning ordinance called *Mandatory Restriction in Cache County on Use of Solid Fuel and Used Oil Burning Devices* in place with strong public and media support. Their highest noncompliance has been 10-12 complaints/year.

Compliance = 40 complaints/1.6MM people =99.998% or 100% = EPA guidance Range 1 rule effectiveness of 100%

Rule Effectiveness for Davis, Salt Lake, Utah, and Weber Counties = 100%.
Rule Effectiveness for Box Elder, Cache and Tooele Counties = 95%. EPA guidance Range 1 based on newly implemented but well known state program.

Rule: R307-307. Road Salting and Sanding

Purpose
The purpose is to establish emissions control for winter time road salting.

Applicability
Counties: Davis, Salt Lake, Utah

Amended Applicability
Counties: all nonattainment

Rulemaking Status
Public comment Period: October 2012
Air Quality Board Action: pending

Estimated Cost: anticipated to be minimal

Reduction: unknown quantity, minimal

Large Stationary Point Sources

RACT Requirements specific to Point Sources

EPA's final rule requires States to conduct an analysis to identify RACT for all affected stationary sources. States can thereafter determine that RACT does not include controls that would not otherwise be necessary to meet Reasonable Further Progress requirements or to attain the NAAQS as expeditiously as practicable (this would be shown through modeling.)

SIPs for PM2.5 must assure that the RACT requirement is met, either through a new RACT determination or a certification, including the appropriate documentation , that previously required RACT controls (e.g. for another pollutant… say PM10) represent RACT for PM2.5.

With respect to prior technology determinations other than RACT, the rule provides:

- Prior BACT and LAER determinations, in many cases but not all, would assure at least RACT level controls. States may rely on information gathered from prior BACT or LAER analyses to make this determination.

- MACT standards affecting VOC - where a State has determined VOC to be a significant contributor to PM2.5, compliance with MACT standards may be considered in VOC RACT determinations. States should assess whether VOCs are well controlled under the applicable MACT, which source components have MACT controls, and whether there have been any new developments in technologies or costs. EPA thinks it will be unlikely that States can do much better than what the MACT controls currently require.

- The same reasoning would apply to MACT standards affecting PM2.5 – (where control of particulate may be a surrogate for control of hazardous metals).

EPA has determined that, for implementation of the PM2.5 NAAQS, RACT may vary in different nonattainment areas based on the reductions needed for attainment as expeditiously as practicable.

Source Criteria

When considering the spectrum of stationary point sources, from small to large, it is important to recognize that Utah's permitting rules include requirements that apply to new sources or modifications to existing sources that are much smaller than the federally mandated major source permitting rules. A result of this is that Utah has direct knowledge of many sources that may not, individually, have relevance within a modeled attainment test such as that which underlies this SIP.

As such, a distinction was made between large and small stationary sources. The large sources were given individual attention with regard to RACT, while the smaller sources were

collectively treated within the area-source inventory, and hence regulated by rules that affect specific source categories. This discussion concerns the large stationary sources.

Because RACT is included within RACM, there is no minimum emission threshold for evaluation of stationary source RACT.

In determining an appropriate cut-off for determining whether a source was large enough to warrant individual attention, UDAQ in consultation with EPA Region 8, elected to use the definition provided in the emission inventory requirements of 40 CFR Part 51. This criteria establishes that sources (for the pollutants of concern to this SIP) having emitted 100 tons per year or more would be above the cut-off. This criteria was then broadened a bit to also include any source that is permitted to emit 100 tons per year or more of any of these pollutants (PM2.5, SO_2, NOx, VOC, or ammonia).

A list was developed to include any of these sources located anywhere in the modeling domain (a geographic area including all three of Utah's nonattainment areas). For RACT purposes, this all-inclusive list was parsed to create a sub-set of large sources located within any of these nonattainment areas. Sources located outside of these nonattainment areas a) do not have a significant impact on the nonattainment areas during stagnant cold-pool weather conditions, and b) are not readily credited in the attainment demonstration for any emissions reductions.

The following table identifies these large stationary sources, by nonattainment area. It should be noted that, as the SIP development process transpired, there was some migration of sources on to and off of the list. Some sources revised their permits so as to no longer have the right to emit more than 100 tons per year. Other sources came into existence after the baseline year.

Company Name	Site Name	County	NA Area
Pepperidge Farm Incorporated	Commercial Bakery	Cache	Logan, UT-ID
Brigham Young University	Main Campus	Utah	Provo, UT
Geneva Nitrogen LLC	Geneva Nitrogen Plant	Utah	Provo, UT
Pacific States Cast Iron Pipe Company	Pipe Casting Plant	Utah	Provo, UT
PacifiCorp	Lakeside Power Plant	Utah	Provo, UT
Payson City Corporation	Payson City Power	Utah	Provo, UT
Provo City Power	Power Plant	Utah	Provo, UT
Springville City Corporation	Whitehead Power Plant	Utah	Provo, UT
ATK Launch Systems Incorporated	Promontory Plant	Box Elder	SLC, UT
Bountiful City Light and Power	Power Plant	Davis	SLC, UT
Central Valley Water Reclamation Fac.	Wastewater Treatment Plant	Salt Lake	SLC, UT
CER Generation II LLC	West Valley Power Plant	Salt Lake	SLC, UT
Chemical Lime Company	Grantsville Plant	Tooele	SLC, UT
Chevron Products Co - SL Refinery	Salt Lake Refinery	Davis	SLC, UT
Big West Oil Company	Flying J Refinery (Big West Oil Co.)	Davis	SLC, UT
Geneva Rock Products	Point of the Mountain Facility	Salt Lake	SLC, UT
Great Salt Lake Minerals Corporation	Production Plant	Weber	SLC, UT
Hexcel Corporation	Salt Lake Operations	Salt Lake	SLC, UT
Hill Air Force Base	Main Base	Davis	SLC, UT
Holly Refining & Marketing Company	Phillips Refinery	Davis	SLC, UT
Interstate Brick Company	Brick Manufacturing Plant	Salt Lake	SLC, UT
Kennecott Utah Copper Corporation	Power Plant/ Lab/ Tailings Impoundment	Salt Lake	SLC, UT
Kennecott Utah Copper Corporation	Smelter & Refinery	Salt Lake	SLC, UT
Kennecott Utah Copper Corporation	Mine & Copperton Concentrator	Salt Lake	SLC, UT
Murray City Power Department	Electrical Generation Plant	Salt Lake	SLC, UT
Nucor Steel	Nucor Steel	Box Elder	SLC, UT
Olympia Sales Company	Cabinet Manufacturing Facility	Salt Lake	SLC, UT
PacifiCorp	Little Mountain Power Plant	Weber	SLC, UT
PacifiCorp	Gadsby Power Plant	Salt Lake	SLC, UT
Procter & Gamble	Paper Manufacturing Facility	Box Elder	SLC, UT
Silver Eagle Refining - Woods Cross Inc.	Petroleum Products Refining	Davis	SLC, UT
Tesoro West Coast	Salt Lake City Refinery	Salt Lake	SLC, UT
University of Utah	University of Utah facilities	Salt Lake	SLC, UT
Utility Trailer Manufacturing Company	Trailer Manufacturing Facility	Davis	SLC, UT
Vulcraft - Division of Nucor Corporation	Steel Products Manufacturing	Box Elder	SLC, UT
Wasatch Integrated Waste Mgt District	County Landfill & Energy Recovery Facility (DCERF)	Davis	SLC, UT

UDAQ Source-specific RACT analysis

As mentioned above, individual attention was given to each of the large stationary sources identified using the criteria discussed before. The following pages discuss the undertaking of the RACT analysis for each of these sources.

As various emissions control measures were considered for each source, an estimate was also made as to when that particular strategy could be implemented. The range of implementation dates effectively changes what the emissions for the source would be in each of the horizon years analyzed by DAQ in the attainment demonstration (2014, 2017, and 2019). For this reason, a table is provided showing these emissions for each of the sources identified.

Beyond that table is a section devoted to each of the sources that describes the process and the outcome of the RACT evaluation.

Categorical Rules

There is one large stationary source located in the Salt Lake City, UT nonattainment area (Geneva Rock Products, Point of the Mtn. facility) that deserves special mention. Of all the sand and gravel sources operating , not only in this nonattainment area but in the others as well, the Point of the Mountain facility was the only one to rise above the 100 ton per year criteria. Rather than single out this operation and create an advantage for all other operators, it was decided to regulate the entire source category.

As such, a rule was developed to insure RACT throughout the entire industry. This rule (Rule: R307-312. Aggregate Processing Operations) is also discussed in the section of this chapter dealing with area sources, but some additional information relating to the development of this rule is presented here. There is some crossover in these materials with the overall rule development and its application to Geneva Rock Products' Point of the Mtn. facility. Information concerning the development of this rule and its application to the Geneva Rock facility appear in Section 5.c.XXXVIII of the TSD.

Site and Company/Owner Name: Pepperidge Farm Incorporated Commercial Bakery

Site ID: 11841

Facility Name/Address:

Pepperidge Farm, Inc.
901 North 200 West
Richmond, UT 84333-1499
Phone: (435) 750-8402
Fax: (435) 750-8466

Owner Name/Address:

Campbell Soup Company
1 Campbell Place
Camden, NJ 08103
Phone: (800) 257-8443

Description of Facility

The PF Richmond facility is located in Cache County, which is a non-attainment area for PM2.5. It is a commercial food processing facility that produces baked goods, including crackers, cookies, and pastries. The facility operates 24 hours a day, seven days a week. Raw materials are received at the facility by freight truck and tanker truck. PF produces a wide variety of cookies, crackers, and frozen food at the Richmond facility. PF refers to the cookies and cracker operations as "biscuit". The bread and roll production is generally referred to as "bakery". Both biscuit and bakery production are supported by various operations such as ingredient storage, maintenance, and other miscellaneous activities.

PF Richmond operates four (4) primary production lines which begin at the north end of the building and split off into sub-lines as operations proceed to the south. Ingredients are mixed/blended, deposited onto an oven band, baked, packaged, palletized and stored in a finished goods warehouse prior to shipment. Packaging and loading of finished products occurs at the south end of the building at the loading docks. All bulk shipping and receiving is done by commercial truck.

Current sources include:

Source ID	Source Name	Source Info
B1	Boiler	10.5 MMBtu/hr
PW1	Pan Washer and Dryer	0.8 MMBtu/hr
P1-3	Propane Storage Tanks	Two 30,000 gallon tank & one 1,000 gallon tank
L1	Process Line #1 Oven	3.2 MMBtu/hr
L2	Process Line #2 Oven	3.2 MMBtu/hr
DPI-3	Three Diesel Powered Pumps	0.38, 0.44, 0.17 MMBtu/hr

M1	Miscellaneous Equipment	Oil tanks, diesel tanks, refrigeration system, label printer, small sandblasting booth, etc.
SS	Storage Silos	6 flour silos and 1 sugar silo (*one more flour silo added in recent permit action*)
R1	Line #5 Radio Frequency Dryer	
L3	Process Line #3 Oven	5.17 MMBtu/hr
L5	Process Line #5 Oven	9.9 MMBtu/hr
L7	Process Line #7 Oven	5.3 MMBtu/hr
L10	Process Line #10 Oven	12.5 MMBtu/hr (*recent permit action*)
R10	Line #10 Radio Frequency Dryer	(*recent permit action*)

Recent Permitting Actions

A minor permit modification was submitted in December 2011 and was approved on March 23, 2012. This permit modification was for the installation of a new Goldfish line (#10) and to convert the Title V permit to a Synthetic Minor permit.

A BACT Analysis was conducted as part of this permitting exercise and it was determined that Catalytic Oxidation with a 95% destruction efficiency was BACT for the new Line 10 Oven. More detailed information is included in the VOC section of this report.

Emissions Information / Discussion

Pepperidge Farm Incorporated

Year	PM2.5	SO2	NOx	VOC
2008	0.50	0.04	5.33	312.06
2014	0.87	0.07	10.16	95.67
2017	0.87	0.07	10.16	95.67
2019	0.87	0.07	10.16	95.67

As shown by the above emissions, VOC is the major pollutant from Pepperidge Farm Richmond. As a result of the recent permitting action, the limit will be lowered to below 100 tons per year once the facility becomes a synthetic minor facility

Combustion emissions for all sources at the facility are calculated using AP-42 factors and the EPA FIRE database based on capacity of the equipment and 8,760 hours per year running time.

Bakery oven emissions are calculated as based on 8,760 hours of operation per year. The lb/hr capacity for each oven is used to calculate tons per year for production. The three bakery production lines VOC emissions are calculated as follows:

Line 3 Emission Factor is calculated from the following equation.
VOC E.F. = 0.95 Yi + 0.195 ti - 0.51S - 0.86ts + 1.9,
where
Yi = initial bakers percent of yeast = 1.084, ti = total yeast action time in hours = 6

S = final spike bakers percent yeast = 0, ts = spiking time in hours = 0
Line 5 Emission Factor is taken from current permit.
Line 7 Emission Factor is calculated from the following equation.
VOC E.F. = 0.95 Yi + 0.195 ti - 0.51S - 0.86ts + 1.9, where
Yi = initial bakers percent of yeast = 1.65, ti = total yeast action time in hours = 0.16
S = final spike bakers percent yeast = 0, ts = spiking time in hours = 0

PM10 and PM2.5 RACT Options

PM10 and PM2.5 emissions from this facility are primarily from the boiler and the ovens. These sources are very small (each under 12.5 MMBTU/hr) and control technologies are not economically feasible for such small equipment. In this case, RACM would apply as control measures are much more feasible for this equipment. Control measures in place for this equipment at Pepperidge Farm include:

RACM #1: Use of Natural Gas/Propane as fuel.

Natural gas is the cleanest fuel available for this type of equipment. The use of this fuel greatly reduces emissions as opposed to burning fuel oil. Propane is used very rarely as a backup fuel only.

Technical Feasibility: The boilers/ovens are currently running on natural gas/propane, so this option is technically feasible.

Economical Feasibility: The cost of natural gas varies with the economy. The current cost of natural gas is $6.60 per 1000/cf. The cost of using natural gas at the facility is approximately $2.5 million per year (using 385 MMCF/year). The use of #2 fuel oil to run this equipment would be approximately $9.2 million (assume oil price is $3.30/gallon).

Accordingly, the use of natural gas is both technologically and economically feasible.

RACM #2: Annual Boiler Inspection

In addition, Pepperidge Farm conducts an annual inspection and tuning of the boiler to determine whether it is working properly, which contributes to efficiency of the equipment. These practices include: inspection of burners, adjustment of flame, and inspection of air/fuel ratio controls and measurement of CO and oxygen levels as needed to confirm efficiency. These practices are consistent with proposed boiler MACT/GACT requirements that are planned to apply to liquid and solid fossil fuel sources (not natural gas-fired sources).

SO2 RACT Options

SO2 emissions from this facility are primarily from the boiler and the ovens. These sources are very small (each under 12.5 MMBTU/hr) and control technologies are not economically feasible for such small equipment. In this case, RACM would apply as control measures are much more feasible for this equipment. Control measures in place for this equipment at Pepperidge Farm include:

RACM #1: Use of Natural Gas/Propane as fuel.

Natural gas is the cleanest fuel available for this type of equipment. The use of this fuel greatly reduces emissions as opposed to burning fuel oil. Propane is used very rarely as a backup fuel only.

Technical Feasibility: The boilers/ovens are currently running on natural gas/propane, so this option is technically feasible.

Economical Feasibility: The cost of natural gas varies with the economy. The current cost of natural gas is $6.60 per 1000/cf. The cost of using natural gas at the facility is approximately $2.5 million per year (using 385 MMCF/year). The use of #2 fuel oil to run this equipment would be approximately $9.2 million (assume oil price is $3.30/gallon).

Accordingly, the use of natural gas is both technologically and economically feasible.

RACM #2: Annual Boiler Inspection

In addition, Pepperidge Farm conducts an annual inspection and tuning of the boiler to determine whether it is working properly, which contributes to efficiency of the equipment. These practices include: inspection of burners, adjustment of flame, and inspection of air/fuel ratio controls and measurement of CO and oxygen levels as needed to confirm efficiency. These practices are consistent with proposed boiler MACT/GACT requirements that are planned to apply to liquid and solid fossil fuel sources (not natural gas-fired sources).

NOx RACT Options

NOx emissions from this facility are primarily from the boiler and the ovens. These sources are very small (each under 12.5 MMBTU/hr) and control technologies are not economically feasible for such small equipment. In this case, RACM would apply as control measures are much more feasible for this equipment. Control measures in place for this equipment at Pepperidge Farm include:

RACM #1: Use of Natural Gas/Propane as fuel.

Natural gas is the cleanest fuel available for this type of equipment. The use of this fuel greatly reduces emissions as opposed to burning fuel oil. Propane is used very rarely as a backup fuel only.

Technical Feasibility: The boilers/ovens are currently running on natural gas/propane, so this option is technically feasible.

Economical Feasibility: The cost of natural gas varies with the economy. The current cost of natural gas is $6.60 per 1000/cf. The cost of using natural gas at the facility is approximately $2.5 million per year (using 385 MMCF/year). The use of #2 fuel oil to run this equipment would be approximately $9.2 million (assume oil price is $3.30/gallon).

Accordingly, the use of natural gas is both technologically and economically feasible.

RACM #2: Annual Boiler Inspection

In addition, Pepperidge Farm conducts an annual inspection and tuning of the boiler to determine whether it is working properly, which contributes to efficiency of the equipment. These practices include: inspection of burners, adjustment of flame, and inspection of air/fuel ratio controls and measurement of CO and oxygen levels as needed to confirm efficiency. These practices are consistent with proposed boiler MACT/GACT requirements that are planned to apply to liquid and solid fossil fuel sources (not natural gas-fired sources).

VOC RACT Options

Pepperidge Farm conducted a BACT Analysis in December 2011 for the installation of the new Goldfish Line #10. This BACT Analysis meets RACT Requirements and is being incorporated into this RACT Analysis. Each of the three goldfish cracker lines (#3, #5, and #7) and fugitive emissions will be evaluated in this assessment. The calculations have been changed to reflect each specific source.

Pepperidge Farm has reviewed USEPA's Alternative Control Technology Document for Bakery Oven Emissions (1992) and the following control devices were assessed for use of controlling bakery oven emissions:

- Carbon Adsorption – Not technically feasible, due to low efficiency and high cost of waste disposal
- Scrubber – Not technically feasible, due to high costs of waste disposal
- Condensation – Not technically feasible, due to high cost of waste disposal and low VOC recovery
- Biofiltration – Not technically efficient for this type of source
- Process and Formulation Changes – Not technically feasible, due to lower quality of product
- Direct Flame Thermal Oxidation – Technically feasible at up to 98% destruction efficiency. However, typical bakery oven exhaust requires a supplemental fuel, usually natural gas, added to make the mixture combustible. A heat exchanger may be installed to preheat incoming gas with heat from the exhaust gas which can minimize supplemental fuel consumption. These additional expenses increase the cost of this technology to a higher level than other oxidation technologies, and therefore this technology is not economically feasible for bakery oven emissions.
- Regenerative Oxidation – Technically and economically feasible
- Catalytic Oxidation – Technically and economically feasible, most common in USA

As demonstrated, Catalytic Oxidation and Regenerative Thermal Oxidation are the only control devices that are considered to be technically and economically feasible for a bakery oven. Both Catalytic Oxidation and Regenerative Thermal Oxidation can reach 98 percent destruction efficiency of VOC, which would make them equally capable of controlling VOC emissions.

However, there are numerous advantages that a Catalytic Oxidizer has over a Regenerative Thermal Oxidizer, which makes the Catalytic Oxidizer the best available control technology for this source. These reasons are discussed below.

From a technical standpoint, Catalytic Oxidizers are more suited to bakery processes. Catalytic Oxidizers are built for throughput tolerance of different flow rates from varying VOC loading on different lines and from turning baking lines on and off depending on production. A Catalytic Oxidizer can be turned down to accommodate a smaller production schedule. A Regenerative Thermal Oxidizer is built for a constant flow rate and cannot be turned down. A Catalytic Oxidizer has a quick startup of only about 20 minutes and can be turned off when not in use. This works for production flexibility in the baking industry. A Regenerative Thermal Oxidizer need 5-6 hours to start up and should be kept running when not in use. A Regenerative Thermal Oxidizer also emits to the atmosphere during regeneration, which the Catalytic Oxidizer does not do by design.

From an economic standpoint, Catalytic Oxidation has a lower capital cost, quicker installation time, and is less costly to run. Catalytic Oxidizers are more compatible with bakery equipment due to standardization of gas trane and safety equipment similar to a bakery oven. A Regenerative Thermal Oxidizer requires more maintenance work and costs. A Catalytic Oxidizer runs at a much lower temperature, approximately 600F compared to 1800F for a Regenerative Thermal Oxidizer. This lower temperature presents an energy cost savings and is a safety issue.

Over 95% of bakeries in the US use catalytic oxidation and it is considered to be the bakery standard. Pepperidge Farm as a corporation has standardized on Catalytic Oxidation. The Pepperidge Farm Richmond facility currently uses a catalytic oxidizer onsite to control VOC emissions. This presents a cost benefit as spare parts can be standardized and shared across different units and different facilities within the corporation.

It has been determined by Pepperidge Farm that Best Available Control Technology (BACT) for this type of process is a catalytic oxidizer for both technical and economic reasons.

Each of the following sections discusses one source of VOCs at the facility and the costs associated with controlling VOC emissions.

Line #3 Oven

Both the energy and environmental impacts of this control technology are assessed below in determining what is reasonably available control technology (RACT) for these sources.

Energy Impacts

Oxidizers at the facility would be fueled by natural gas. Propane is also used very rarely as a backup fuel. Using estimates from the BACT Analysis for the new Line 10 oxidizer, fuel usage will be approximately 2 MMCF/year. The costs for fuel to operate an oxidizer are included in the annual operating costs discussed in each source section. NOx and CO are the most prevalent pollutants, at 0.10 and 0.08 tons per year, respectively.

Environmental Impacts

Air Quality Impact Analysis
A catalytic oxidizer installed at Pepperidge Farm will have a destruction efficiency of 95%. Pre-control VOC potential to emit (PTE) is calculated to be 18.40 tons per year at maximum operation from the new process line. With the use of a catalytic oxidizer, potential to emit is decreased to 0.83 tons per year.

As noted above, this technology is capable of achieving control efficiencies that exceed 95% under certain operating conditions. However, BACT must be achievable on a consistent basis under normal operating conditions. Standard bakery operations include necessary process variations in order to produce quality products. Catalytic Oxidizers are adept at handling these process changes, but in order to provide the operational flexibility that bakeries need to achieve air pollution control compliance in addition to achieving necessary bakery operating performance, a required Destruction Efficiency of 95% is recommended.

Environmental Impacts Analysis
Pepperidge Farm has reviewed other environmental impacts from the use of a catalytic oxidizer. The only additional impacts would be the disposal of spent catalyst from the oxidizer. Pepperidge Farm will properly dispose of the spent catalyst in accordance with relevant regulations, in order to minimize impacts on the environment. No other environmental impacts occur due to the use of this device.

Economic Impacts

Capital and Annualized operating costs are taken from the recent BACT Analysis for the new line #10 oven at the facility. Total capital cost of the catalytic oxidizer is approximately $450,000. Calculations from the EPA Air Pollution Control Cost Manual (2000), Section 3, Chapter 2, were used to estimate the

annualized costs of operating the oxidizer. Total annual costs are calculated to be approximately $150,000. According to our emission calculations, the oxidizer would be capable of removing approximately 17.5 tons of VOC per year. The table below shows the cost calculation for the control equipment as depicted in the Best Available Technology (BACT) guidance document developed by Utah DAQ. As shown, the annualized cost for the control equipment would be approximately $8,336 per ton of VOC removed.

Cost Calculation for Control Equipment

A=	(B+C)/D
A=	**8336.14**
B=	PV{i / [1 - (1 + i)-n]}
B=	-3534.52
PV =	450000
i=	0.095
n=	12
C=	150000
D=	17.57

A = Annualized cost expressed in dollars per ton of pollutant removed.
B = Annualized equipment cost in $/yr = PV{i / [1 - (1 + i)-n]}
PV = Present day value of the equipment or the cost of the equipment today.
i = Interest rate at which the company can borrow money.
n = Number of years of the life of the equipment.

C = Annual operating cost is the sum of the cost for spare parts, power, labor, maintenance, etc., less the value for the amount of reclaimed product or by product recovered and used or sold

D = The amount of emission reduction due to the installation and operation of the pollution control equipment in tons/year.

This amount is higher than the DAQ potential annualized cost of $5,000 per ton of a pollutant. Therefore, Pepperidge Farm believes that a catalytic oxidizer is not economically feasible, and is not required by RACT for this source.

Line #5 Oven

Both the energy and environmental impacts of this control technology are assessed below in determining what is reasonably available control technology (RACT) for these sources.

Energy Impacts

Oxidizers at the facility would be fueled by natural gas. Propane is also used very rarely as a backup fuel. Using estimates from the BACT Analysis for the new Line 10 oxidizer, fuel usage will be approximately 2 MMCF/year. The costs for fuel to operate an oxidizer are included in the annual operating costs discussed in each source section. NOx and CO are the most prevalent pollutants, at 0.10 and 0.08 tons per year, respectively.

Environmental Impacts

Air Quality Impact Analysis
A catalytic oxidizer installed at Pepperidge Farm will have a destruction efficiency of 95%. Pre-control VOC potential to emit (PTE) is calculated to be 244.46 tons per year at maximum operation from the new process line. With the use of a catalytic oxidizer, potential to emit is decreased to 11 tons per year.

As noted above, this technology is capable of achieving control efficiencies that exceed 95% under certain operating conditions. However, BACT must be achievable on a consistent basis under normal operating conditions. Standard bakery operations include necessary process variations in order to produce quality products. Catalytic Oxidizers are adept at handling these process changes, but in order to provide the operational flexibility that bakeries need to achieve air pollution control compliance in addition to achieving necessary bakery operating performance, a required Destruction Efficiency of 95% is recommended.

Environmental Impacts Analysis
Pepperidge Farm has reviewed other environmental impacts from the use of a catalytic oxidizer. The only additional impacts would be the disposal of spent catalyst from the oxidizer. Pepperidge Farm will properly dispose of the spent catalyst in accordance with relevant regulations, in order to minimize impacts on the environment. No other environmental impacts occur due to the use of this device.

Economic Impacts

Capital and Annualized operating costs are taken from the recent BACT Analysis for the new line #10 oven at the facility. Total capital cost of the catalytic oxidizer is approximately $450,000. Calculations from the EPA Air Pollution Control Cost Manual (2000), Section 3, Chapter 2, were used to estimate the annualized costs of operating the oxidizer. Total annual costs are calculated to be approximately $150,000. According to our emission calculations, the oxidizer is removing approximately 233.46 tons of VOC per year. The table below shows the cost calculation for the control equipment as depicted in the Best Available Control Technology (BACT) guidance document developed by Utah DAQ. As shown, the annualized cost for the control equipment will be approximately $627.36 per ton of VOC removed.

Cost Calculation for Control Equipment

A=	(B+C)/D
A=	**627.36**
B=	PV{i / [1 - (1 + i)-n]}
B=	-3534.52
PV =	450000
i=	0.095
n=	12
C=	150000
D=	233.46

A = Annualized cost expressed in dollars per ton of pollutant removed.
B = Annualized equipment cost in $/yr = PV{i / [1 - (1 + i)-n]}
PV = Present day value of the equipment or the cost of the equipment today.
i = Interest rate at which the company can borrow money.
n = Number of years of the life of the equipment.

C = Annual operating cost is the sum of the cost for spare parts, power, labor, maintenance, etc., less the value for the amount of reclaimed product or by product recovered and used or sold

D = The amount of emission reduction due to the installation and operation of the pollution control equipment in tons/year.

This amount is lower than the DAQ potential annualized cost of $5,000 per ton of a pollutant. Therefore, Pepperidge Farm believes that a catalytic oxidizer is both economically feasible and technically feasible for this source, and why a catalytic oxidizer is currently used as RACT for this source.

Line #7 Oven

Both the energy and environmental impacts of this control technology are assessed below in determining what is reasonably available control technology (RACT) for these sources.

Energy Impacts

Oxidizers at the facility would be fueled by natural gas. Propane is also used very rarely as a backup fuel. Using estimates from the BACT Analysis for the new Line 10 oxidizer, fuel usage will be approximately 2 MMCF/year. The costs for fuel to operate an oxidizer are included in the annual operating costs discussed in each source section. NOx and CO are the most prevalent pollutants, at 0.10 and 0.08 tons per year, respectively.

Environmental Impacts

Air Quality Impact Analysis
A catalytic oxidizer installed at Pepperidge Farm will have a destruction efficiency of 95%. Pre-control VOC potential to emit (PTE) is calculated to be 35.68 tons per year at maximum operation from the new process line. With the use of a catalytic oxidizer, potential to emit is decreased to 1.61 tons per year.

As noted above, this technology is capable of achieving control efficiencies that exceed 95% under certain operating conditions. However, BACT must be achievable on a consistent basis under normal operating conditions. Standard bakery operations include necessary process variations in order to produce quality products. Catalytic Oxidizers are adept at handling these process changes, but in order to provide the operational flexibility that bakeries need to achieve air pollution control compliance in addition to achieving necessary bakery operating performance, a required Destruction Efficiency of 95% is recommended.

Environmental Impacts Analysis
Pepperidge Farm has reviewed other environmental impacts from the use of a catalytic oxidizer. The only additional impacts would be the disposal of spent catalyst from the oxidizer. Pepperidge Farm will properly dispose of the spent catalyst in accordance with relevant regulations, in order to minimize impacts on the environment. No other environmental impacts occur due to the use of this device.

Economic Impacts

Capital and Annualized operating costs are taken from the recent BACT Analysis for the new line #10 oven at the facility. Total capital cost of the catalytic oxidizer is approximately $450,000. Calculations from the EPA Air Pollution Control Cost Manual (2000), Section 3, Chapter 2, were used to estimate the annualized costs of operating the oxidizer. Total annual costs are calculated to be approximately $150,000. According to our emission calculations, the oxidizer would be capable of removing

approximately 34.8 tons of VOC per year. The table below shows the cost calculation for the control equipment as depicted in the Best Available Control Technology (BACT) guidance document developed by Utah DAQ. As shown, the annualized cost for the control equipment would be approximately $4,298 per ton of VOC removed.

Cost Calculation for Control Equipment

A=	(B+C)/D
A=	**8336.14**
B=	PV{i / [1 - (1 + i)-n]}
B=	-3534.52
PV =	450000
i=	0.095
n=	12
C=	150000
D=	17.57

A = Annualized cost expressed in dollars per ton of pollutant removed.
B = Annualized equipment cost in $/yr = PV{i / [1 - (1 + i)-n]}
PV = Present day value of the equipment or the cost of the equipment today.
i = Interest rate at which the company can borrow money.
n = Number of years of the life of the equipment.

C = Annual operating cost is the sum of the cost for spare parts, power, labor, maintenance, etc., less the value for the amount of reclaimed product or by product recovered and used or sold

D = The amount of emission reduction due to the installation and operation of the pollution control equipment in tons/year.

This amount is only slightly lower than the DAQ potential annualized cost of $5,000 per ton of a pollutant. As this source has been approved to operate without a control device, Pepperidge Farm believes it is not economically feasible or reasonable to use a catalytic oxidizer on this source.

Fugitives

Both the energy and environmental impacts of this control technology are assessed below in determining what is reasonably available control technology (RACT) for these sources.

Energy Impacts

Oxidizers at the facility would be fueled by natural gas. Propane is also used very rarely as a backup fuel. Using estimates from the BACT Analysis for the new Line 10 oxidizer, fuel usage will be approximately 2 MMCF/year. The costs for fuel to operate an oxidizer are included in the annual operating costs discussed in each source section. NOx and CO are the most prevalent pollutants, at 0.10 and 0.08 tons per year, respectively.

Environmental Impacts
Air Quality Impact Analysis

A catalytic oxidizer installed at Pepperidge Farm will have a destruction efficiency of 95%. Pre-control VOC potential to emit (PTE) is calculated to be 9.24 tons per year at maximum operation from the new process line. With the use of a catalytic oxidizer, potential to emit is decreased to 0.42 tons per year.

As noted above, this technology is capable of achieving control efficiencies that exceed 95% under certain operating conditions. However, BACT must be achievable on a consistent basis under normal operating conditions. Standard bakery operations include necessary process variations in order to produce quality products. Catalytic Oxidizers are adept at handling these process changes, but in order to provide the operational flexibility that bakeries need to achieve air pollution control compliance in addition to achieving necessary bakery operating performance, a required Destruction Efficiency of 95% is recommended.

Environmental Impacts Analysis
Pepperidge Farm has reviewed other environmental impacts from the use of a catalytic oxidizer. The only additional impacts would be the disposal of spent catalyst from the oxidizer. Pepperidge Farm will properly dispose of the spent catalyst in accordance with relevant regulations, in order to minimize impacts on the environment. No other environmental impacts occur due to the use of this device.

Economic Impacts

Capital and Annualized operating costs are taken from the recent BACT Analysis for the new line #10 oven at the facility. Total capital cost of the catalytic oxidizer is approximately $450,000. Calculations from the EPA Air Pollution Control Cost Manual (2000), Section 3, Chapter 2, were used to estimate the annualized costs of operating the oxidizer. Total annual costs are calculated to be approximately $150,000. According to our emission calculations, the oxidizer would be capable of removing approximately 8.82tons of VOC per year. The table below shows the cost calculation for the control equipment as depicted in the Best Available Control Technology (BACT) guidance document developed by Utah DAQ. As shown, the annualized cost for the control equipment would be approximately $16,597 per ton of VOC removed.

Cost Calculation for Control Equipment

A=	(B+C)/D
A=	**627.36**
B=	PV{i / [1 - (1 + i)-n]}
B=	-3534.52
PV =	450000
i=	0.095
n=	12
C=	150000
D=	233.46

A = Annualized cost expressed in dollars per ton of pollutant removed.
B = Annualized equipment cost in $/yr = PV{i / [1 - (1 + i)-n]}
PV = Present day value of the equipment or the cost of the equipment today.
i = Interest rate at which the company can borrow money.
n = Number of years of the life of the equipment.

C = Annual operating cost is the sum of the cost for spare parts, power, labor, maintenance, etc., less the value for the amount of reclaimed product or by product recovered and used or sold

D = The amount of emission reduction due to the installation and operation of the pollution control equipment in tons/year.

This amount is higher than the DAQ potential annualized cost of $5,000 per ton of a pollutant. Therefore, Pepperidge Farm believes that a catalytic oxidizer is not economically feasible, and is not required by RACT for this source.

Line #10 Oven

Both the energy and environmental impacts of this control technology are assessed below in determining what is reasonably available control technology (RACT) for these sources.

Energy Impacts

The oxidizer will be fueled by natural gas. Propane is also used very rarely as a backup fuel. The capacity of the burner is 1.4 MMBtu/hr but will be operating at minimum fire of 0.2 MMBtu/hr. If the oxidizer operates 8,760 hours per year, the fuel usage will be 2 MMCF per year. The costs for fuel to operate the oxidizer are included in the annual operating costs discussed below. Emissions from the oxidizer combustion are shown in Appendix C of the application package. NOx and CO are the most prevalent pollutants, at 0.10 and 0.08 tons per year, respectively.

Environmental Impacts

Air Quality Impact Analysis
The catalytic oxidizer installed by Pepperidge Farm will have a destruction efficiency of 95%. Pre-control VOC potential to emit (PTE) is calculated to be 362 tons per year at maximum operation from the new process line. With the use of a catalytic oxidizer, potential to emit is decreased to 20 tons per year.

As noted above, this technology is capable of achieving control efficiencies that exceed 95% under certain operating conditions. However, BACT must be achievable on a consistent basis under normal operating conditions. Standard bakery operations include necessary process variations in order to produce quality products. Catalytic Oxidizers are adept at handling these process changes, but in order to provide the operational flexibility that bakeries need to achieve air pollution control compliance in addition to achieving necessary bakery operating performance, a required Destruction Efficiency of 95% is recommended.

Environmental Impacts Analysis
Pepperidge Farm has reviewed other environmental impacts from the use of a catalytic oxidizer. The only additional impacts would be the disposal of spent catalyst from the oxidizer. Pepperidge Farm will properly dispose of the spent catalyst in accordance with relevant regulations, in order to minimize impacts on the environment. No other environmental impacts occur due to the use of this device.

Economic Impacts

Total capital cost of the catalytic oxidizer is approximately $450,000. The quote from the manufacturer is included in Appendix B. Calculations from the EPA Air Pollution Control Cost Manual (2000), Section 3, Chapter 2, were used to estimate the annualized costs of operating the oxidizer. Total annual costs are calculated to be approximately $150,000. According to our emission calculations, the oxidizer is

removing approximately 342 tons of VOC per year. The table below shows the cost calculation for the control equipment as depicted in the Best Available Control Technology (BACT) guidance document developed by Utah DAQ. As shown, the annualized cost for the control equipment will be approximately $430 per ton of VOC removed.

Cost Calculation for Control Equipment

A=	(B+C)/D
A=	**428.26**
B=	PV{i / [1 - (1 + i)-n]}
B=	-3534.52
PV =	450000
i=	0.095
n=	12
C=	150000
D=	342

A = Annualized cost expressed in dollars per ton of pollutant removed.
B = Annualized equipment cost in $/yr = PV{i / [1 - (1 + i)-n]}
PV = Present day value of the equipment or the cost of the equipment today.
i = Interest rate at which the company can borrow money.
n = Number of years of the life of the equipment.

C = Annual operating cost is the sum of the cost for spare parts, power, labor, maintenance, etc., less the value for the amount of reclaimed product or by product recovered and used or sold

D = The amount of emission reduction due to the installation and operation of the pollution control equipment in tons/year.

This amount is below the DAQ potential annualized cost of $5,000 per ton of a pollutant. Therefore, Pepperidge Farm believe that BACT for this facility is the use of a catalytic oxidizer, as it is both technically and economically feasible to control VOC emissions from the bakery oven. A catalytic oxidizer will be installed when the oven is installed.

Results of Analysis
The following was determined to represent RACT for this source:

Title and Description of Chosen Options

For the bakery ovens, RACT is demonstrated as a catalytic oxidizer for Line #5. For Line #3, Line #7, and Fugitive emissions, RACT is demonstrated without a control device.

For combustion emissions, RACT is not applicable. RACM is demonstrated by the use of natural gas as fuel and annual inspection and tuning, generally consistent with MACT and GACT proposed requirements for liquid and solid fossil fuel-burning sources.

Compliance Demonstration Methodology

Pepperidge Farm Richmond currently operates sources in compliance with RACT requirements. Pepperidge Farm will continue to comply with these requirements in their operations and incorporate good work practices and inspection/tuning for combustion sources to minimize pollution and conserve energy.

Off-Road Mobile Sources

UDAQ did not consider any SIP controls for off-road mobile sources beyond those already promulgated at the federal level. Nevertheless, emissions credit for these federal controls were taken indirectly because their effectiveness has been incorporated into the NONROAD model which UDAQ used to calculate emissions.

In order to assist the reader in understanding what control measures are included in the modeling, the following list is provided.

Federal Nonroad Regulations

EPA has adopted emission standards for all types of nonroad engines, equipment and vehicles operating on diesel or gasoline. Nonroad equipment is used in an extremely wide range of applications including:

a) diesel equipment such as boats, excavators, graders, off-highway tractors and trucks and pavers;

b) gasoline equipment such as ATVs, snowmobiles, non-road motorcycles ("dirt bikes") and other recreational equipment;

c) diesel or gasoline equipment such as agricultural equipment, airport ground support equipment, backhoes, compressors, forklifts, generator sets, lawn and garden equipment, loaders, personal watercraft and pumps.

Tier IV emission standards will phase in over calendar years 2008 - 2015, depending on type of equipment, fuel and engine displacement. These standards will decrease exhaust emissions by more than 90 percent compared to old equipment.

In addition, the introduction of ultra-low sulfur (ULS) diesel (15 ppm) for nonroad equipment will decrease SO2 emissions by more than 99% compared to emissions from old equipment running on non-road high sulfur diesel. All non-road diesel equipment must operate on ULS diesel by June 1, 2010 except for locomotives and certain large marine ships. Locomotives and such ships must operate on ULS diesel by June 1, 2012.

Nonroad Diesel Engine Regulations

Date of publication in the Federal Register is noted:

October 2008 Technical Amendments
FR 10-08-98 Control of Emissions from Nonroad Spark-Ignition Engines and Equipment

June 2008 Amendments

FR 06-30-98 Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines less than 30 Liters per Cylinder

Tier 4 Emission Standards
FR 06-29-2004 Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel

Tier 2 and Tier 3 Emission Standards
FR 10-23-1998 Control of Emissions of Air Pollution from Nonroad Diesel Engines

Tier 1 Emission Standards, and Determination of Significance for Nonroad Sources
FR 06-17-1994 Control of Air Pollution; Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression-Ignition Engines at or above 37 Kilowatts

Gasoline Engine Regulations

Final Rule: Control of Emissions from Nonroad Spark-Ignition Engines and Equipment
FR 10-08-2008 Control of Emissions from Nonroad Spark-Ignition Engines and Equipment

Final Emission Standards
FR 11-08-2002 Control of Emissions from Nonroad Large Spark-Ignition Engines and Recreational Engines (Marine and Land-Based)

Final Rule - Phase 2 Emission Standards for Non-handheld Engines
FR 03-30-1999 New Phase 2 Standards for Small Spark-Ignition Non-handheld Engines

Final Rule Phase I Small Engine Final Rule
FR 07-03-1995 Control of Air Pollution; Emission Standards for New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts

On-Road Mobile Sources

List of Control Measures Considered

Based upon input from stakeholders and internal research, UDAQ refined a list of potential control strategies that included the following measures:

1. Extending an I/M program to those non-attainment counties where such a program does not currently exist.
2. Reducing the Reid vapor pressure (RVP) of gasoline to control VOC emissions.
3. Implementing a bundle of voluntary control measures. EPA guidance allows up to 3 percent of the total reduction required to achieve attainment to come from voluntary and emerging mobile source strategies. Examples of such strategies include, but are not limited to:

- trip reduction programs
- alternative fuels
- diesel retrofits
- episode-triggered/inversion-specific measures (e.g., no drive on "red" days)
- public education and outreach

Quantification for Effectiveness Determination

To help determine which, if any, of the above programs should be included in the SIP, UDAQ conducted a series of MOVES model runs and related analysis.

I/M Program

Logan Nonattainment Area

UDAQ proposed that an I/M program be adopted in Cache County beginning in 2014. Applicable vehicles include light-duty cars and trucks up to 8,500 lbs Gross Vehicle Weight Rating (GVWR). Test procedures include "2500/Idle" for vehicles of model years 1968 - 1995, and "OBD II" for vehicles of model years 1996 and newer. Exempt vehicles include those of model years 1967 and older, and vehicles less than or equal to four years old. Test frequency is biennial on all applicable vehicles.

Cache Metropolitan Planning Organization (CMPO) modeled Cache County under "No I/M" and "I/M" scenarios using MOVES2010a. Results show the following:

Calendar Year	County	Scenario	PM2.5	CO	NOx	SO2	VOC
				TONS PER WINTER WEEKDAY			
2008	Cache	No I/M	0.4036	69.59	7.191	0.0789	5.676
2014	"	"	0.2991	54.39	5.063	0.0337	3.814
2008	"	With I/M	NOT MODELED				
2014	"	"	0.2991	50.74	4.824	0.0337	3.590
				PERCENT REDUCTIONS (WITH I/M)			
2014	Cache	With I/M	0.00%	6.71%	4.72%	0.00%	5.87%

A preliminary cost analysis revealed that such an emissions program would range in cost between approximately $6,000 and $8,000 per ton of emissions reduced. This is within the range of costs associated with other control measures under consideration for inclusion in the SIP. Furthermore, similar programs have been successfully operating in Utah, Salt Lake, Davis, and Weber counties and have proven to be both technologically feasible and cost effective.

Salt Lake Nonattainment Area

UDAQ also modeled the inclusion of the above I/M programs in both Box Elder and Tooele Counties within the Salt Lake nonattainment area. However, photochemistry model sensitivity runs revealed that the effect of these controls on PM2.5 concentrations at the controlling air monitor located at Hawthorne Elementary School (1675 South 600 East in Salt Lake City, Utah at an elevation of 1306 m or 4285 ft) was negligible.

Reduction in RVP

UDAQ used MOVES to model the effect of a 1.0 psi reduction in the RVP of winter gasoline on mobile source VOC emissions. This analysis revealed a 0.2-0.3 percent reduction in NOx emissions and a 0.3-0.5 percent reduction in VOC emissions (as a percentage of total inventory emissions from all source categories) – a non-trivial reduction. However, in working with the Utah petroleum suppliers (i.e., refiners and pipeline companies), UDAQ identified that the default fuel formulations available in MOVES were not representative of the wintertime fuel supplied to Northern Utah. In addition, consultation with industry representatives raised potential fuel supply and related cost-effectiveness issues for this strategy. As a result, UDAQ is continuing to evaluate the efficacy of RVP reduction as an emissions control strategy.

Voluntary and Emerging Measures Bundle

Voluntary controls include measures such as trip reduction, curtailing of operations/activities and driving on "yellow" and "red" air quality days, diesel retrofits and replacement of gasoline vehicles with alternate-fuel vehicles such as those running on CNG or electricity, and gasoline/electric hybrids.

EPA allows a total reduction of 3% across all criteria pollutants for the total package of voluntary control measures. The 3% applies to the difference between the sum of actual emissions of PM2.5, CO, NOx,

SO2 and VOC and the "attainment inventory" of these pollutants, i.e., the maximum amount of these emissions that will result in a demonstration of attainment through the CMAQ air dispersion model.

UDAQ has modeled some potential voluntary and emerging control measures (e.g., diesel retrofits and alternative fuel vehicle adoption), but the details of which measures could ultimately be adopted and how they would be implemented are not yet available. In addition, development of voluntary and emerging transportation control measures (TCMs) – those that aim to improve air quality by reducing vehicle use or changing traffic flow or congestion – is the responsibility (under Utah SIP Section XII) of the MPOs representing the three PM 2.5 nonattainment areas. To date, no list of TCMs has been received by UDAQ. For these reasons, the development of a voluntary and emerging mobile source control strategy bundle is still being evaluated by UDAQ.

Measures Included in the PM 2.5 SIP

Based upon the foregoing analysis, UDAQ has only included one on-road mobile source emission control strategy in the PM 2.5 SIP for the Cache nonattainment area. Specifically, UDAQ proposed that an I/M program be adopted in Cache County beginning in 2014. Applicable vehicles include light-duty cars and trucks up to 8,500 lbs Gross Vehicle Weight Rating (GVWR). Test procedures include "2500/Idle" for vehicles of model years 1968 - 1995, and "OBD II" for vehicles of model years 1996 and newer. Exempt vehicles include those of model years 1967 and older, and vehicles less than or equal to four years old. Test frequency is biennial on all applicable vehicles.

Appendix C. Idaho Documentation

- **Correction of Technical Support Document—Franklin County Emissions Inventory Data**
- **Woodstove Change Outs**
- **Agricultural Sources**
- **Reductions from Idaho Controls**
- **MOVES Documentation**
- **Road Dust Documentation**
- **Estimated Cost for a Franklin County Inspection and Maintenance Program**

This page intentionally left blank for correct double-sided printing.

Correction of Technical Support Document—Franklin County Emissions Inventory Data

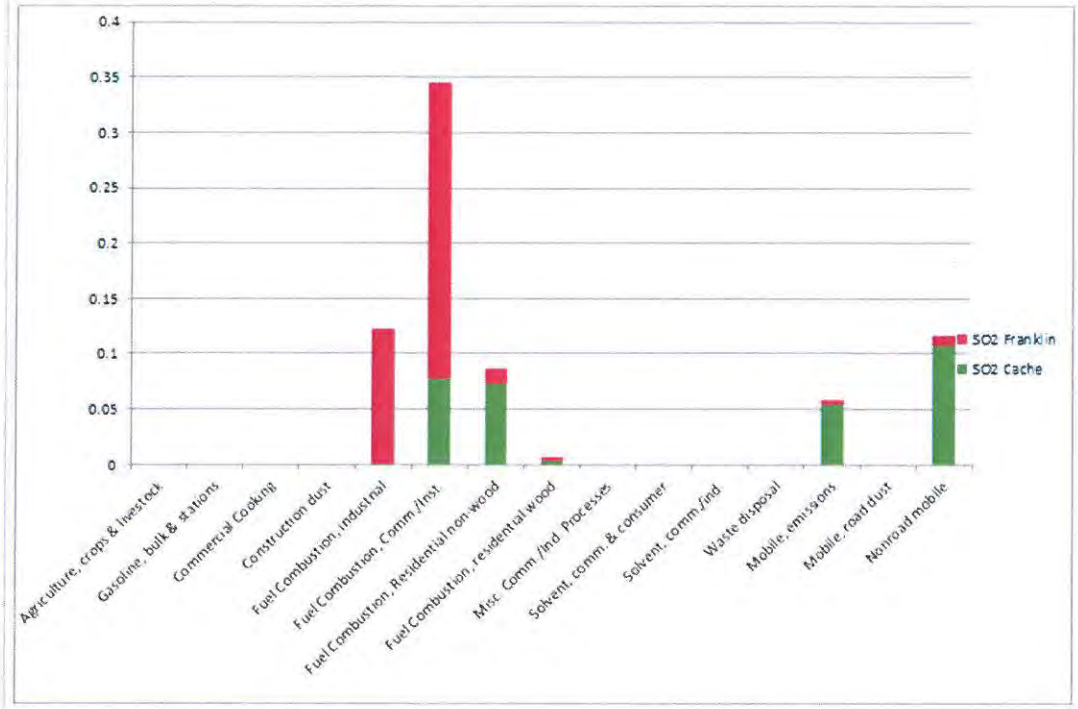
Correction of Technical Support Document Franklin County Emissions Inventory Data

The data below was gathered from Utah's Technical Support Document for the PM2.5 Attainment SIPs. Data from Episode 2 was used because it occurred in 2008 which is the base year. The only exception is the Area Source N0x data taken from episode 1 because the episode 2 link had SO2 data.

pollutant	county	Agriculture, crops & livestock	Gasoline, bulk & stations	Commercial Cooking	Construction dust	Fuel Combustion, industrial	Fuel Combustion, Comm./Inst.	Fuel Combustion, Residential non-wood	Fuel Combustion, residential wood
pm2.5	Cache	0.12	0	0.137	0.026	0	0.035	0.006	0.257
pm2.5	Franklin	0.008	0	0	0.014	0.006	0.01	0.001	0.1
Nox	Cache	0	0	0	0	0	0.475	0.633	0.026
Nox	Franklin	0	0	0	0	0.087	0.106	0.049	0.009
SO2	Cache	0	0	0	0	0	0.077	0.073	0.004
SO2	Franklin	0	0	0	0	0.122	0.268	0.014	0.002
VOC	Cache	1.315	0.669	0.02	0	0	0.024	0.039	0.469
VOC	Franklin	2.763	0	0	0	0.001	0.001	0.002	0.138
ammonia	Cache	5.117	0	0	0	0	0.003	0.138	0
ammonia	Franklin	4.65	0	0	0	0.002	0	0.008	0

Misc. Comm./Ind. Processes	Solvent, comm. & consumer	Solvent, comm./ind.	Waste disposal	Mobile, emissions	Mobile, road dust	Nonroad mobile	Point sources			
0.022	0	0	0.008	0.321	0.266	0.12	0.001	1.319		
0.001	0	0	0	0.028	0.596	0.035	0	0.799	2.118	pm2.5
0.001	0	0	0	6.666	0	1.738	0.012	9.551		
0.001	0	0	0	0.711	0	0.428	0	1.391	10.942	N0x
0	0	0	0	0.054	0	0.107	0	0.315		
0	0	0	0	0.004	0	0.009	0	0.419	0.734	SO2
0.062	0.953	2.495	0.076	5.179	0	1.763	0.412	13.476		
0	0.14	0.26	0.008	0.498	0	0.636	0	4.447	17.923	VOC
0.088	0.008	0	0.065	0.128	0	0	0	5.547		
0.008	0	0	0	0.008	0	0	0	4.676	10.223	NH3

After the data was gathered and condensed for use in summary charts in the SIP document, an obvious problem with the Idaho inventory showed up in the SO2 chart (see below).



An examination of the Idaho NEI data sheets showed that the amount of coal used by commercial/institutional sources was too large (225 vs the correct value of 40 from the EIA database). To correct the inventory numbers for amount of coal consumed in Commercial/Institutional coal boilers, the emissions rate reported in Utah's TSD for Franklin County were multiplied by 40/225.

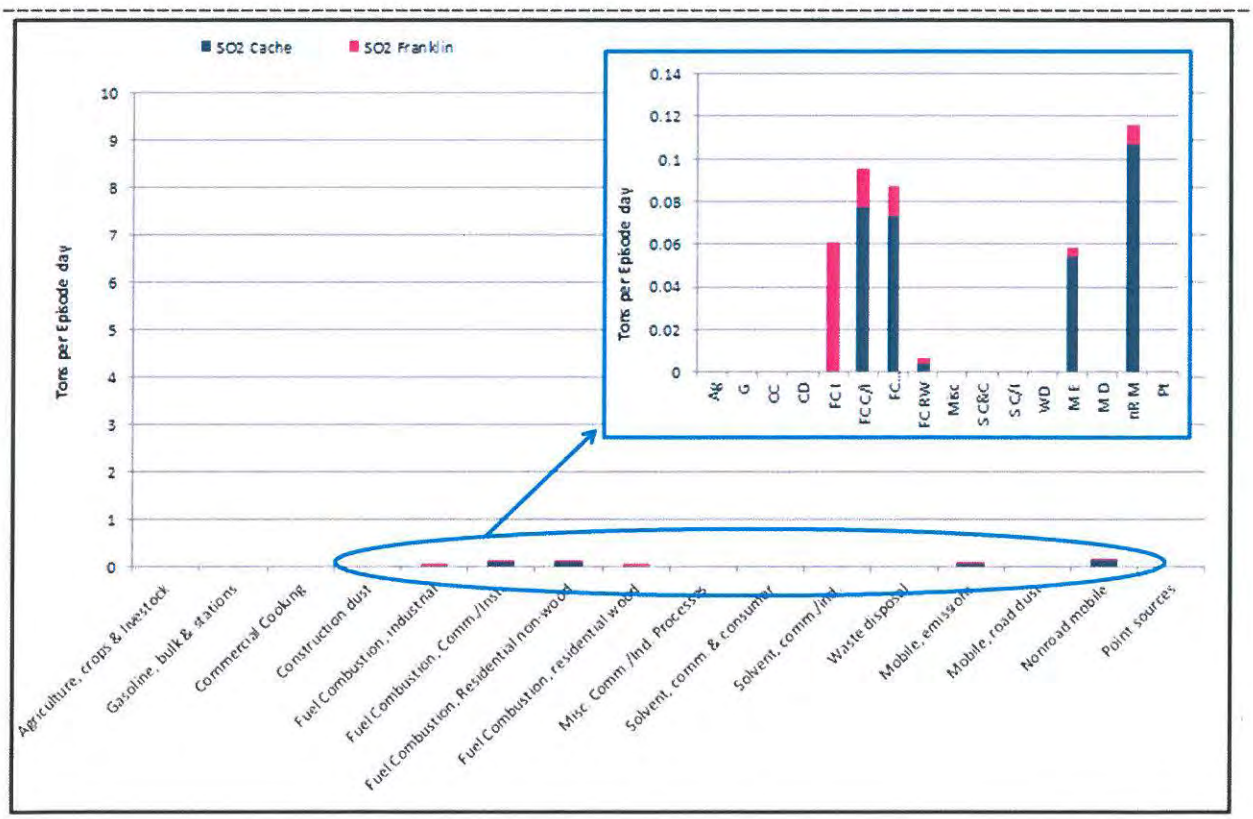
In addition, for both coal and distillate oil, DEQ made sulfur content assumptions that exceed the amount of sulfur allowed in those fuels per Idaho rules. Therefore, SO2 emissions of distillate oil were adjusted by a factor of 0.5 (1 percent was used, 0.5% allowed) and of coal were adjusted by a factor of 0.2 (5% used, 1% allowed).

The corrected entries are highlighted in red.

pollutant	county	Agriculture, crops & livestock	Gasoline, bulk & stations	Commercial Cooking	Construction dust	Fuel Combustion, industrial	Fuel Combustion, Comm./Inst.	Fuel Combustion, Residential non-wood	Fuel Combustion, residential wood
pm2.5	Cache	0.12	0	0.137	0.026	0	0.035	0.006	0.257
pm2.5	Franklin	0.008	0	0	0.014	0.006	0.004	0.001	0.1
Nox	Cache	0	0	0	0	0	0.475	0.633	0.026
Nox	Franklin	0	0	0	0	0.087	0.07	0.049	0.009
SO2	Cache	0	0	0	0	0	0.077	0.073	0.004
SO2	Franklin	0	0	0	0	0.061	0.018	0.014	0.002
VOC	Cache	1.315	0.669	0.02	0	0	0.024	0.039	0.469
VOC	Franklin	2.763	0	0	0	0.001	0.001	0.002	0.138
ammonia	Cache	5.117	0	0	0	0	0.003	0.138	0
ammonia	Franklin	4.65	0	0	0	0.002	0	0.008	0

Misc. Comm./Ind. Processes	Solvent, comm. & consumer	Solvent, comm./ind.	Waste disposal	Mobile, emissions	Mobile, road dust	Nonroad mobile	Point sources
0.022	0	0	0.008	0.321	0.266	0.12	0.001
0.001	0	0	0	0.028	0.596	0.035	0
0.001	0	0	0	6.666	0	1.738	0.012
0.001	0	0	0	0.711	0	0.428	0
0	0	0	0	0.054	0	0.107	0
0	0	0	0	0.004	0	0.009	0
0.062	0.953	2.495	0.076	5.179	0	1.763	0.412
0	0.14	0.26	0.008	0.498	0	0.636	0
0.088	0.008	0	0.065	0.128	0	0	0
0.008	0	0	0	0.008	0	0	0

The revised SO2 chart is shown below.



Woodstove Change Outs

Why replace an old, inefficient wood stove?

Reduce Your Taxes

The state of Idaho offers a tax deduction for replacing old, uncertified wood stoves manufactured before 1992 with new wood stoves certified by the U.S. Environmental Protection Agency (EPA), pellet stoves, or natural gas or propane heating units.

Save Money

EPA-certified wood stoves are more efficient at heating your home. An EPA-certified wood-burning stove that is sized and placed properly with a venting system that delivers adequate draft will reduce wood consumption, produce more usable heat, and reduce maintenance from inefficient fires.

Improve Air Quality and Protect Your Health

All wood stoves produce wood smoke, which contains both particles and gases. Breathing smoke is not healthy. Small particles – called particulates – can be inhaled deep into the respiratory system where they may cause serious health impacts. Both particulates and gases may contain cancer-causing materials.

EPA-certified wood stoves are cleaner burning. They emit 70 - 90% fewer particulates than conventional wood stoves, which helps protect against the adverse health impacts of breathing smoke.

Don't send your dollars up in smoke!

For More Information

Idaho Department of Environmental Quality
1410 N. Hilton
Boise, ID 83706
(208) 373-0502

Regional Offices

Boise Regional Office
1445 North Orchard
Boise, ID 83706
(208) 373-0550
toll-free: (888) 800-3480

Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Lewiston Regional Office
1118 F Street
Lewiston, ID 83501
(208) 799-4370
toll-free: (877) 541-3304

Twin Falls Regional Office
1363 Fillmore Street
Twin Falls, ID 83301
(208) 736-2190
toll-free: (800) 270-1663

Pocatello Regional Office
444 Hospital Way #300
Pocatello, ID 83201
(208) 236-6160
toll-free: (888) 655-6160

Idaho Falls Regional Office
900 N. Skyline, Suite B
Idaho Falls, ID 83402
(208) 528-2650
toll-free: (800) 232-4635

DEQ Web Site

Wood Stoves
www.deq.idaho.gov/air/prog_issues/burning/woodstoves.cfm

U.S. Environmental Protection Agency Web Site

Clean Burning Woodstoves and Fireplaces
www.epa.gov/woodstoves/

Printed on recycled paper. Updated September 2007. Costs associated with this publication are available from the Department of Environmental Quality in accordance with Section 60-202, Idaho Code.

Wood Stove Replacements and the Idaho Tax Deduction

Idaho Department of Environmental Quality
www.deq.idaho.gov

Who qualifies for the deduction?

The tax deduction is available to Idaho taxpayers who buy new wood stoves, pellet stoves, natural gas heating units, or propane heating units for their residences to replace old, uncertified wood stoves manufactured before 1992.

What conditions must be met?

The cost of a new natural gas or propane heating unit, pellet stove, or wood stove certified by the U.S. Environmental Protection Agency (EPA) may be deducted if:

- the stove or heating unit is for the buyer's residence;
- the stove or heating unit replaces an operable wood stove that does not meet EPA standards;
- the purchase and replacement occur within the same calendar year;
- proof of purchase is obtained; and
- the old wood stove is taken to a DEQ-approved drop-off site ***no later than 30 days from the date of purchase of the new appliance.***

How much is the tax deduction?

Forty percent of the total cost – purchase price plus professional installation – may be deducted in the year the wood stove or insert is replaced. During the next three years, 20% of the total cost may be deducted each year. The total annual deduction is limited to $5,000.

What is an EPA-certified wood stove?

EPA requires manufacturers to produce clean-burning wood stoves and establish limits on the amount of particulates (smoke) the new stoves can emit. An EPA-certified wood stove must have a permanent label indicating it meets EPA requirements.

Are fireplaces included?

No, the tax deduction applies only to the replacement of uncertified wood stoves. A common fireplace is not considered a wood stove.

However, wood-burning fireplace inserts can be considered wood stoves. Therefore, the tax deduction applies if an old fireplace insert is replaced with another meeting current EPA standards. The deduction also applies if a fireplace insert is removed and replaced with a certified wood stove or natural gas or propane heating unit.

How is proof of purchase obtained?

Proof of purchase is provided when you drop off your old stove at a DEQ-approved site. Notify the site attendant that you are participating in the tax deduction program and ask for a DEQ receipt. Fill out pertinent information and have the attendant sign the completed form. If the old wood stove is dropped off by the installer, the installer is responsible for returning the completed receipt to you.

To be eligible for the tax deduction, send the white copy of the receipt to DEQ and claim the deduction on your Idaho income tax form. Keep the yellow copy with your tax records.

Why does DEQ approve drop-off sites?

Idaho law requires DEQ to verify that old wood stoves are not reused. DEQ helps prevent reuse of old stoves by managing the drop-off sites. Operators of DEQ-approved drop-off sites must agree to destroy the old wood stoves they collect. The destroyed stoves are typically recycled for scrap.The fire-brick lining must be removed before drop-off.

Approved Wood Stove Drop-Off Sites

Boise	Pacific Recycling	208-375-2131
Burley	Pacific Recycling	208-678-2321
Clark Fork	Bonner Co. Clark Fork Transfer Station	208-266-0196
Coeur d'Alene	Kootenai Co. Transfer Station	208-446-1430
Colburn	Bonner Co. Colburn Transfer Site	208-263-0718
Coolin	Bonner Co. Dicken-sheet Transfer Site	208-443-3007
Donnelly	Valley Co. Landfill	208-634-7712
Idaho Falls	Pacific Recycling	208-529-4180
Lewiston	Pacific Recycling	208-743-2181
Moscow	Latah Sanitation	208-882-5724
Nampa	Pacific Recycling	208-466-1105
Oldtown	Bonner Co. Idaho Hill Transfer Site	208-437-2741
Pinehurst	North Idaho Recycling	208-784-6241
Pocatello	Pacific Recycling	208-233-7720
Riverdale	Franklin Co. Riverdale Landfill	208-852-2113
Sagle	Bonner Co. Dufort Transfer Site	208-265-0978
Salmon	Lemhi Co. Solid Waste	208-756-6441
Sandpoint	Pacific Recycling	208-263-2584
Twin Falls	Pacific Recycling	208-734-7440

Questions?

Contact
Idaho Tax Commission
(208) 334-7660
or your nearest
DEQ Regional Office
(contact information on reverse)

Woodstove Emissions Reductions Calculation Method and Results

Idaho estimated the reduction in emissions due to documented uncertified woodstove change-outs in Franklin County using EPA's Woodstove Calculator.

Specific information regarding the new combustor types was used to develop the calculator inputs.

EPA uses a default value of 3 cords or wood burned per year in areas with the same climate zone as Franklin County.

Idaho caluculated and average of 2.6 based on incomplete reporting in Idaho's Woodstove Tax Receipt database. This average supports using EPA's default value.

Idaho also used the defaults for wood density, efficiency of non-certified woodstoves, the efficiency of certified woodstoves, as well as the emissions factors for woodstoves.

Emissions factors from the MARAMA report, cited in the Calculator documentation, were used to calculated the emissions reduction benefits for changes to pellet stoves. The results are listed in the Tables below and documentation is provided in accompanying worksheets

Emissions avoided due to wood stove change-outs in Tons/yr						
Pollutant	**2006 uncert WS to cert WS or gas**	**2006 uncert WS to pellet**	**2009 uncert WS to cert WS or gas**	**2011 uncert WS to cert WS or gas**	**2011 uncert WS to pellet**	**Total**
CO	18.87	3.03	0.45	14.88	4.71	**41.94**
SO2	0.02	0	0	0.01	0	**0.03**
NOx	0.2	0	0	0.13	0.01	**0.34**
VOC	4.76	0.73	0.13	4.04	1.13	**10.79**
PM2.5-PRI	2.6	0.39	0.06	2.12	0.61	**5.78**
PM10-PRI	2.6	0.39	0.06	2.12	0.61	**5.78**

Utah adjusted woodstove emissions for winter season daily emissions by apportioning the emissions as follows:

Adjusted daily emissions in Tons/day						
month	**fraction**	**CO**	**SO2**	**NOx**	**VOC**	**PM2.5**
January	0.16	0.22	0.00	0.00	0.06	0.03
February	0.16	0.22	0.00	0.00	0.06	0.03
March	0.1	0.14	0.00	0.00	0.04	0.02
April	0.1	0.14	0.00	0.00	0.04	0.02
May	0.05	0.07	0.00	0.00	0.02	0.01
June	0	0.00	0.00	0.00	0.00	0.00
July	0	0.00	0.00	0.00	0.00	0.00
August	0	0.00	0.00	0.00	0.00	0.00
September	0.05	0.07	0.00	0.00	0.02	0.01
October	0.1	0.14	0.00	0.00	0.04	0.02
November	0.12	0.17	0.00	0.00	0.04	0.02
December	0.16	0.22	0.00	0.00	0.06	0.03

EPA calculator results for 2006 uncertified woodstove to pellet stove

Emissions factors for certified woodstoves were replaced with pellet stove factors from the MARAMA report.

	A	B	C
1	Parameters for Calculation of WS Changeout Benefit	Inputs	Input Description
2	Cords of Wood Burned per Woodstove =	3	See separate worksheet in this spreadsheet for EPA default values for burnrates
3	Wood density to convert cords to tons (tons oven dried wood/cord) =	1.02	use state average of wood density, based on oven dried wood. Densities available in this file in a separate worksheet.
4	Number of conventional stoves changed out =	9	
5	Woodstove % efficiency for conventional WS =	54	Compilation of Emission Factors, AP42, 5th edition
6	Woodstove % efficiency for certified WS =	80	Compilation of Emission Factors, AP42, 5th edition
7	Fraction assumed changed out to new Cert WS, remainder to non-wood burning heaters =	1	
8			

	A	B	C	D	E	F
9		NEI Pollutant Code	Emission factors (lb/ton)	Conv WS	Certified WS	Reference
10	Directions for use		CO	230.8	16	MARAMA report
11	Input in cell B2 the number of cord burned per woodstove		SO2	0.4	0.32	MARAMA report
12	input in cell B3 the wood density		NOX	2.8	3.8	MARAMA report
13	Input in cell B4 the number of conventional woodstoves being changed out		VOC	53	0.04	MARAMA report
14	Input in cell B7 the fraction of of new stoves that are EPA certified		PM2.5-PRI	30.6	3.06	MARAMA report
15	Emissions avoided displayed in box		PM10-PRI	30.6	3.06	MARAMA report
16		600	Dioxin teq	4.603E-09	7.34E-10	MARAMA report
17		106990	1,3-butadiene	0.4	0.18	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
18		40	16-PAH	0.64	0.3	MARAMA report
19		75	7-PAH	0.04	0.02	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
20		75070	Acetaldehyde	0.62	0.54	MARAMA report
21		107028	Acrolein	0.1	0.04	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
22		71432	Benzene	2.16	0.96	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
23		50000	Formaldehyde	1.46	0.98	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
24		CH4	Methane	64	28.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
25		91203	Napthalene	0.18	0.14	MARAMA report
26						
27						

Pellet Stove

	B	C
28	Emission Avoided (tons)	
29	Pollutant	Total Emissions Avoided
30	CO	3.03
31	SO2	0.00
32	NOX	0.00
33	VOC	0.73
34	PM2.5-PRI	0.39
35	PM10-PRI	0.39
36	Dioxin teq	0.000000000056
37	1,3-butadiene	0.0038
38	16-PAH	0.0060
39	7-PAH	0.0004
40	Acetaldehyde	0.0035
41	Acrolein	0.0010
42	Benzene	0.0208
43	Formaldehyde	0.0110
44	Methane	0.62
45	Napthalene	0.0012
46		
47	total HAPS =	0.048

EPA calculator results for 2006 uncertified woodstove to certified woodstove or gas

A16 fx

	A	B	C
1	Parameters for Calculation of WS Changeout Benefit	Inputs	Input Description
2	Cords of Wood Burned per Woodstove =	3	See separate worksheet in this spreadsheet for EPA default values for burnrates
3	Wood density to convert cords to tons (tons oven dried wood/cord) =	1.02	use state average of wood density, based on oven dried wood. Densities available in this file in a separate worksheet.
4	Number of conventional stoves changed out =	67	
5	Woodstove % efficiency for conventional WS =	54	Compilation of Emission Factors, AP42, 5th edition
6	Woodstove % efficiency for certified WS =	68	Compilation of Emission Factors, AP42, 5th edition
7	Fraction assumed changed out to new Cert WS, remainder to non-wood burning heaters =	0.55	
8			

	A	NEI Pollutant Code	Emission factors (lb/ton)	Conv WS	Certified WS	Reference
10	Directions for use		CO	230.8	107	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
11	Input in cell B2 the number of cord burned per woodstove		SO2	0.4	0.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
12	input in cell B3 the wood density		NOX	2.8	2	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
13	Input in cell B4 the number of conventional woodstoves being changed out		VOC	53	15	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
14	Input in cell B7 the fraction of of new stoves that are EPA certified		PM2.5-PRI	30.6	12	Conv Factor = AP-42; Certified EF = 060704 email from Jim Houck
15	Emissions avoided displayed in box		PM10-PRI	30.6	12	Conv Factor = AP-42; Certified EF = 060704 email from Jim Houck
16		600	Dioxin teq	4.603E-09	7.94E-10	MARAMA report
17		106990	1,3-butadiene	0.4	0.18	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
18		40	16-PAH	0.64	0.3	MARAMA report
19		75	7-PAH	0.04	0.02	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
20		75070	Acetaldehyde	0.62	0.54	MARAMA report
21		107028	Acrolein	0.1	0.04	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
22		71432	Benzene	2.16	0.96	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
23		50000	Formaldehyde	1.46	0.98	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
24		CH4	Methane	64	28.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
25		91203	Napthalene	0.18	0.14	MARAMA report

	Emission Avoided (tons)	
29	**Pollutant**	**Total Emissions Avoided**
30	CO	18.87
31	SO2	0.02
32	NOX	0.20
33	VOC	4.76
34	PM2.5-PRI	2.60
35	PM10-PRI	2.60
36	Dioxin teq	0.000000000436
37	1,3-butadiene	0.0329
38	16-PAH	0.0522
39	7-PAH	0.0032
40	Acetaldehyde	0.0394
41	Acrolein	0.0085
42	Benzene	0.1784
43	Formaldehyde	0.1058
44	Methane	5.29
45	Napthalene	0.0122
46		
47	total HAPS =	0.433

EPA calculator results for 2009 uncertified woodstove to certified woodstove or gas

	A	B	C
1	Parameters for Calculation of WS Changeout Benefit	Inputs	Input Description
2	Cords of Wood Burned per Woodstove =	3	See separate worksheet in this spreadsheet for EPA default values for burnrates
3	Wood density to convert cords to tons (tons oven dried wood/cord) =	1.02	use state average of wood density, based on oven dried wood. Densities available in this file in a separate worksheet.
4	Number of conventional stoves changed out =	2	
5	Woodstove % efficiency for conventional WS =	54	Compilation of Emission Factors, AP42, 5th edition
6	Woodstove % efficiency for certified WS =	68	Compilation of Emission Factors, AP42, 5th edition
7	Fraction assumed changed out to new Cert WS, remainder to non-wood burning heaters =	1	
8			

9	NEI Pollutant Code	Emission factors (lb/ton)	Conv WS	Certified WS	Reference
10		CO	230.8	107	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
11		SO2	0.4	0.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
12		NOX	2.8	2	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
13		VOC	53	15	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
14		PM2.5-PRI	30.6	12	Conv Factor = AP-42; Certified EF = 060704 email from Jim Houck
15		PM10-PRI	30.6	12	Conv Factor = AP-42; Certified EF = 060704 email from Jim Houck
16	600	Dioxin teq	4.603E-09	7.94E-10	MARAMA report
17	106990	1,3-butadiene	0.4	0.18	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
18	40	16-PAH	0.64	0.3	MARAMA report
19	75	7-PAH	0.04	0.02	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
20	75070	Acetaldehyde	0.62	0.54	MARAMA report
21	107028	Acrolein	0.1	0.04	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
22	71432	Benzene	2.16	0.96	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
23	50000	Formaldehyde	1.46	0.98	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
24	CH4	Methane	64	28.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
25	91203	Napthalene	0.18	0.14	MARAMA report

Directions for use
Input in cell B2 the number of cord burned per woodstove
input in cell B3 the wood density
Input in cell B4 the number of conventional woodstoves being changed out
Input in cell B7 the fraction of of new stoves that are EPA certified
Emissions avoided displayed in box

28	Emission Avoided (tons)	
29	Pollutant	Total Emissions Avoided
30	CO	0.45
31	SO2	0.00
32	NOX	0.00
33	VOC	0.13
34	PM2.5-PRI	0.06
35	PM10-PRI	0.06
36	Dioxin teq	0.000000000012
37	1,3-butadiene	0.0008
38	16-PAH	0.0012
39	7-PAH	0.0001
40	Acetaldehyde	0.0006
41	Acrolein	0.0002
42	Benzene	0.0043
43	Formaldehyde	0.0021
44	Methane	0.13
45	Napthalene	0.0002
46		
47	total HAPS =	0.009
48		

EPA calculator results for 2011 uncertified woodstove to pellet stove. Emissions Factors for criteria pollutants were modified from AP-42 woodstove factors to the MARMA report pellet stove factors

	A	B	C	D	E	F	G	H	I
1	Parameters for Calculation of WS Changeout Benefit	Inputs	Input Description						
2	Cords of Wood Burned per Woodstove =	3	See separate worksheet in this spreadsheet for EPA default values for burnrates						
3	Wood density to convert cords to tons (tons oven dried wood/cord) =	1.02	use state average of wood density, based on oven dried wood. Densities available in this file in a separate worksheet.						
4	Number of conventional stoves changed out =	14							
5	Woodstove % efficiency for conventional WS =	54	Compilation of Emission Factors, AP42, 5th edition						
6	Woodstove % efficiency for certified WS =	80	Compilation of Emission Factors, AP42, 5th edition						
7	Fraction assumed changed out to new Cert WS, remainder to non-wood burning heaters =	1							
8						Pellet Stove			
9		NEI Pollutant Code	Emission factors (lb/ton)	Conv WS	Certified WS	Reference			
10	Directions for use		CO	230.8	16	MARAMA report			
11	Input in cell B2 the number of cord burned per woodstove		SO2	0.4	0.32	MARAMA report			
12	input in cell B3 the wood density		NOX	2.8	3.8	MARAMA report			
13	Input in cell B4 the number of conventional woodstoves being changed out		VOC	53	0.04	MARAMA report			
14	Input in cell B7 the fraction of of new stoves that are EPA certified		PM2.5-PRI	30.6	3.06	MARAMA report			
15	Emissions avoided displayed in box		PM10-PRI	30.6	3.06	MARAMA report			
16		600	Dioxin teq	4.603E-09	7.94E-10	MARAMA report			
17		106990	1,3-butadiene	0.4	0.18	Section 1.10, Compilation of Emission Factors, AP42, 5th edition			
18		40	16-PAH	0.64	0.3	MARAMA report			
19		75	7-PAH	0.04	0.02	Section 1.10, Compilation of Emission Factors, AP42, 5th edition			
20		75070	Acetaldehyde	0.62	0.54	MARAMA report			
21		107028	Acrolein	0.1	0.04	Section 1.10, Compilation of Emission Factors, AP42, 5th edition			
22		71432	Benzene	2.16	0.96	Section 1.10, Compilation of Emission Factors, AP42, 5th edition			
23		50000	Formaldehyde	1.46	0.98	Section 1.10, Compilation of Emission Factors, AP42, 5th edition			
24		CH4	Methane	64	28.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition			
25		91203	Napthalene	0.18	0.14	MARAMA report			
26									
27									
28		Emission Avoided (tons)							
29		Pollutant	Total Emissions Avoided						
30		CO	4.71						
31		SO2	0.00						
32		NOX	0.01						
33		VOC	1.13						
34		PM2.5-PRI	0.61						
35		PM10-PRI	0.61						
36		Dioxin teq	0.000000000087						
37		1,3-butadiene	0.0060						
38		16-PAH	0.0094						
39		7-PAH	0.0006						
40		Acetaldehyde	0.0055						
41		Acrolein	0.0016						
42		Benzene	0.0324						
43		Formaldehyde	0.0171						
44		Methane	0.96						
45		Napthalene	0.0018						
46									
47		total HAPS =	0.074						

EPA calculator results for 2011 uncertified woodstove to certified woodstove or gas

	A	B	C
1	Parameters for Calculation of WS Changeout Benefit	Inputs	Input Description
2	Cords of Wood Burned per Woodstove =	3	See separate worksheet in this spreadsheet for EPA default values for burnrates
3	Wood density to convert cords to tons (tons oven dried wood/cord) =	1.02	use state average of wood density, based on oven dried wood. Densities available in this file in a separate worksheet.
4	Number of conventional stoves changed out =	62	
5	Woodstove % efficiency for conventional WS =	54	Compilation of Emission Factors, AP42, 5th edition
6	Woodstove % efficiency for certified WS =	68	Compilation of Emission Factors, AP42, 5th edition
7	Fraction assumed changed out to new Cert WS, remainder to non-wood burning heaters =	0.87	
8			

	A	B	C	D	E	F
9		NEI Pollutant Code	Emission factors (lb/ton)	Conv WS	Certified WS	Reference
10	Directions for use		CO	230.8	107	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
11	Input in cell B2 the number of cord burned per woodstove		SO2	0.4	0.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
12	input in cell B3 the wood density		NOX	2.8	2	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
13	Input in cell B4 the number of conventional woodstoves being changed out		VOC	53	15	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
14	Input in cell B7 the fraction of of new stoves that are EPA certified		PM2.5-PRI	30.6	12	Conv Factor = AP-42; Certified EF = 060704 email from Jim Houck
15	Emissions avoided displayed in box		PM10-PRI	30.6	12	Conv Factor = AP-42; Certified EF = 060704 email from Jim Houck
16		600	Dioxin teq	4.603E-09	7.94E-10	MARAMA report
17		106990	1,3-butadiene	0.4	0.18	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
18		40	16-PAH	0.64	0.3	MARAMA report
19		75	7-PAH	0.04	0.02	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
20		75070	Acetaldehyde	0.62	0.54	MARAMA report
21		107028	Acrolein	0.1	0.04	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
22		71432	Benzene	2.16	0.96	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
23		50000	Formaldehyde	1.46	0.98	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
24		CH4	Methane	64	28.4	Section 1.10, Compilation of Emission Factors, AP42, 5th edition
25		91203	Napthalene	0.18	0.14	MARAMA report
26						
27						

Emission Avoided (tons)

	Pollutant	Total Emissions Avoided
29	CO	14.88
30	SO2	0.01
31	NOX	0.13
32	VOC	4.04
33	PM2.5-PRI	2.12
34	PM10-PRI	2.12
35	Dioxin teq	0.000000000385
36	1,3-butadiene	0.0261
37	16-PAH	0.0410
38	7-PAH	0.0025
39	Acetaldehyde	0.0234
40	Acrolein	0.0069
41	Benzene	0.1420
42	Formaldehyde	0.0743
43	Methane	4.21
44	Napthalene	0.0079
45		
46		
47	total HAPS =	0.324
48		

Agricultural Sources

1 Agency and the Natural Resources Conservation
2 Service; and
3 (3) take advantage of new technologies to en-
4 hance efficiency and effectiveness of program deliv-
5 ery to producers.
6 (b) IMPLEMENTATION.—The Secretary shall make
7 available to the Farm Service Agency to carry out this
8 title $100,000,000.

9 TITLE II—CONSERVATION

10 Subtitle A—Conservation Reserve
11 Program

12 SEC. 2001. EXTENSION AND ENROLLMENT REQUIREMENTS
13 OF CONSERVATION RESERVE PROGRAM.

14 (a) EXTENSION.—Section 1231(a) of the Food Secu-
15 rity Act of 1985 (16 U.S.C. 3831(a)) is amended by strik-
16 ing "2012" and inserting "2017".
17 (b) ELIGIBLE LAND.—Section 1231(b) of the Food
18 Security Act of 1985 (16 U.S.C. 3831(b)) is amended—
19 (1) in paragraph (1)(B), by striking "the date
20 of enactment of the Food, Conservation, and Energy
21 Act of 2008" and inserting "the date of enactment
22 of the Agriculture Reform, Food, and Jobs Act of
23 2012";
24 (2) by striking paragraph (2) and redesignating
25 paragraph (3) as paragraph (2);

(3) by inserting before paragraph (4) the following:

"(3) grassland that—

"(A) contains forbs or shrubland (including improved rangeland and pastureland) for which grazing is the predominant use;

"(B) is located in an area historically dominated by grassland; and

"(C) could provide habitat for animal and plant populations of significant ecological value if the land is retained in its current use or restored to a natural condition;";

(4) in paragraph (4)(C), by striking "filterstrips devoted to trees or shrubs" and inserting "filterstrips and riparian buffers devoted to trees, shrubs, or grasses"; and

(5) by striking paragraph (5) and inserting the following:

"(5) the portion of land in a field not enrolled in the conservation reserve in a case in which—

"(A) more than 50 percent of the land in the field is enrolled as a buffer or filterstrip or more than 75 percent of the land in the field is enrolled in a practice other than as a buffer or filterstrip; and

1 "(B) the remainder of the field is—
2 "(i) infeasible to farm; and
3 "(ii) enrolled at regular rental rates.".
4 (c) PLANTING STATUS OF CERTAIN LAND.—Section
5 1231(c) of the Food Security Act of 1985 (16 U.S.C.
6 3831(c)) is amended by striking "if" and all that follows
7 through the period at the end and inserting "if, during
8 the crop year, the land was devoted to a conserving use.".
9 (d) ENROLLMENT.—Section 1231 of the Food Secu-
10 rity Act of 1985 (16 U.S.C. 3831) is amended by striking
11 subsection (d) and inserting the following:
12 "(d) ENROLLMENT.—
13 "(1) MAXIMUM ACREAGE ENROLLED.—The
14 Secretary may maintain in the conservation reserve
15 at any 1 time during—
16 "(A) fiscal year 2012, no more than
17 32,000,000 acres;
18 "(B) fiscal year 2013, no more than
19 30,000,000 acres;
20 "(C) fiscal year 2014, no more than
21 27,500,000 acres;
22 "(D) fiscal year 2015, no more than
23 26,500,000 acres;
24 "(E) fiscal year 2016, no more than
25 25,500,000 acres; and

1 "(F) fiscal year 2017, no more than
2 25,000,000 acres.
3 "(2) GRASSLAND.—
4 "(A) LIMITATION.—For purposes of apply-
5 ing the limitations in paragraph (1), no more
6 than 1,500,000 acres of the land described in
7 subsection (b)(3) may be enrolled in the pro-
8 gram at any 1 time during the 2013 through
9 2017 fiscal years.
10 "(B) PRIORITY.—In enrolling acres under
11 subparagraph (A), the Secretary may give pri-
12 ority to land with expiring conservation reserve
13 program contracts.
14 "(C) METHOD OF ENROLLMENT.—In en-
15 rolling acres under subparagraph (A), the Sec-
16 retary shall make the program available to own-
17 ers or operators of eligible land at least once
18 during each fiscal year.".
19 (e) DURATION OF CONTRACT.—Section 1231(e) of
20 the Food Security Act of 1985 (16 U.S.C. 3831(e)) is
21 amended by striking paragraphs (2) and (3) and inserting
22 the following:
23 "(2) SPECIAL RULE FOR CERTAIN LAND.—In
24 the case of land devoted to hardwood trees,
25 shelterbelts, windbreaks, or wildlife corridors under

1 a contract entered into under this subchapter, the
2 owner or operator of the land may, within the limita-
3 tions prescribed under this section, specify the dura-
4 tion of the contract.".

5 (f) CONSERVATION PRIORITY AREAS.—Section
6 1231(f) of the Food Security Act of 1985 (16 U.S.C.
7 3831(f)) is amended—

8 (1) in paragraph (1), by striking "watershed
9 areas of the Chesapeake Bay Region, the Great
10 Lakes Region, the Long Island Sound Region, and
11 other";

12 (2) in paragraph (2), by striking "WATER-
13 SHEDS.—Watersheds" and inserting "AREAS.—
14 Areas"; and

15 (3) in paragraph (3), by striking "a watershed's
16 designation—" and all that follows through the pe-
17 riod at the end and inserting "an area's designation
18 if the Secretary finds that the area no longer con-
19 tains actual and significant adverse water quality or
20 habitat impacts related to agricultural production
21 activities.".

22 **SEC. 2002. FARMABLE WETLAND PROGRAM.**

23 (a) EXTENSION.—Section 1231B(a)(1) of the Food
24 Security Act of 1985 (16 U.S.C. 3831b(a)(1)) is amend-
25 ed—

1 (1) by striking "2012" and inserting "2017";
2 and
3 (2) by striking "a program" and inserting "a
4 farmable wetland program".
5 (b) ELIGIBLE ACREAGE.—Section 1231B(b)(1)(B) of
6 the Food Security Act of 1985 (16 U.S.C.
7 3831b(b)(1)(B)) is amended by striking "flow from a row
8 crop agriculture drainage system" and inserting "surface
9 and subsurface flow from row crop agricultural produc-
10 tion".
11 (c) CLERICAL AMENDMENTS.—Section 1231B of the
12 Food Security Act of 1985 (16 U.S.C. 3831b) is amend-
13 ed—
14 (1) by striking the heading and inserting the
15 following:
16 **"SEC. 1231B. FARMABLE WETLAND PROGRAM.";**
17 and
18 (2) in subsection (f)(2), by striking "section
19 1234(c)(2)(B)" and inserting "section
20 1234(c)(2)(A)(ii)".
21 **SEC. 2003. DUTIES OF OWNERS AND OPERATORS.**
22 (a) LIMITATION ON HARVESTING, GRAZING OR COM-
23 MERCIAL USE OF FORAGE.—Section 1232(a)(8) of the
24 Food Security Act of 1985 (16 U.S.C. 3832(a)(8)) is
25 amended by striking "except that" and all that follows

1 through the semicolon at the end of the paragraph and
2 inserting "except as provided in section 1233(b);".
3 (b) CONSERVATION PLAN REQUIREMENTS.—Section
4 1232 of the Food Security Act of 1985 (16 U.S.C. 3832)
5 is amended by striking subsection (b) and inserting the
6 following:
7 "(b) CONSERVATION PLANS.—The plan referred to
8 in subsection (a)(1) shall set forth—
9 "(1) the conservation measures and practices to
10 be carried out by the owner or operator during the
11 term of the contract; and
12 "(2) the commercial use, if any, to be permitted
13 on the land during the term.".
14 (c) RENTAL PAYMENT REDUCTION.—Section 1232
15 of the Food Security Act of 1985 (16 U.S.C. 3832) is
16 amended by striking subsection (d).
17 **SEC. 2004. DUTIES OF THE SECRETARY.**
18 Section 1233 of the Food Security Act of 1985 (16
19 U.S.C. 3833) is amended to read as follows:
20 **"SEC. 1233. DUTIES OF THE SECRETARY.**
21 "(a) COST-SHARE AND RENTAL PAYMENTS.—In re-
22 turn for a contract entered into by an owner or operator,
23 the Secretary shall—
24 "(1) share the cost of carrying out the con-
25 servation measures and practices set forth in the

1 contract for which the Secretary determines that
2 cost sharing is appropriate and in the public inter-
3 est; and
4 "(2) for a period of years not in excess of the
5 term of the contract, pay an annual rental payment
6 in an amount necessary to compensate for—
7 "(A) the conversion of highly erodible crop-
8 land or other eligible land normally devoted to
9 the production of an agricultural commodity on
10 a farm or ranch to a less intensive use;
11 "(B) the retirement of any cropland base
12 and allotment history that the owner or oper-
13 ator agrees to retire permanently; and
14 "(C) the development and management of
15 grassland for multiple natural resource con-
16 servation benefits, including soil, water, air, and
17 wildlife.
18 "(b) SPECIFIED ACTIVITIES PERMITTED.—The Sec-
19 retary shall permit certain activities or commercial uses
20 of land that is subject to the contract if those activities
21 or uses are consistent with a plan approved by the Sec-
22 retary and include—
23 "(1) harvesting, grazing, or other commercial
24 use of the forage in response to drought, flooding,

1 or other emergency without any reduction in the
2 rental rate;
3 "(2) grazing by livestock of a beginning farmer
4 or rancher without any reduction in the rental rate,
5 if the grazing is—
6 "(A) consistent with the conservation of
7 soil, water quality, and wildlife habitat (includ-
8 ing habitat during the primary nesting season
9 for critical birds in the area); and
10 "(B) described in subparagraph (B) or (C)
11 of paragraph (3);
12 "(3) consistent with the conservation of soil,
13 water quality, and wildlife habitat (including habitat
14 during the primary nesting season for critical birds
15 in the area) and in exchange for a reduction of not
16 less than 25 percent in the annual rental rate for
17 the acres covered by the authorized activity—
18 "(A) managed harvesting and other com-
19 mercial use (including the managed harvesting
20 of biomass), except that in permitting those ac-
21 tivities the Secretary, in coordination with the
22 State technical committee—
23 "(i) shall develop appropriate vegeta-
24 tion management requirements; and

"(ii) shall identify periods during which the activities may be conducted, such that the frequency is at least once every 5 years but not more than once every 3 years;

"(B) prescribed grazing for the control of invasive species, which may be conducted annually;

"(C) routine grazing, except that in permitting routine grazing, the Secretary, in coordination with the State technical committee—

"(i) shall develop appropriate vegetation management requirements and stocking rates for the land that are suitable for continued routine grazing; and

"(ii) shall identify the periods during which routine grazing may be conducted, such that the frequency is not more than once every 2 years, taking into consideration regional differences such as—

"(I) climate, soil type, and natural resources;

"(II) the number of years that should be required between routine grazing activities; and

1 "(III) how often during a year in
2 which routine grazing is permitted
3 that routine grazing should be allowed
4 to occur; and
5 "(D) the installation of wind turbines and
6 associated access, except that in permitting the
7 installation of wind turbines, the Secretary shall
8 determine the number and location of wind tur-
9 bines that may be installed, taking into ac-
10 count—
11 "(i) the location, size, and other phys-
12 ical characteristics of the land;
13 "(ii) the extent to which the land con-
14 tains threatened or endangered wildlife and
15 wildlife habitat; and
16 "(iii) the purposes of the conservation
17 reserve program under this subchapter;
18 and
19 "(4) the intermittent and seasonal use of vege-
20 tative buffer practices incidental to agricultural pro-
21 duction on land adjacent to the buffer such that the
22 permitted use does not destroy the permanent vege-
23 tative cover.
24 "(c) AUTHORIZED ACTIVITIES ON GRASSLAND.—
25 Notwithstanding section 1232(a)(8), for eligible land de-

1 scribed in section 1231(b)(3), the Secretary shall permit
2 the following activities:

3 "(1) Common grazing practices, including
4 maintenance and necessary cultural practices, on the
5 land in a manner that is consistent with maintaining
6 the viability of grassland, forb, and shrub species ap-
7 propriate to that locality.

8 "(2) Haying, mowing, or harvesting for seed
9 production, subject to appropriate restrictions dur-
10 ing the primary nesting season for critical birds in
11 the area.

12 "(3) Fire presuppression, rehabilitation, and
13 construction of fire breaks.

14 "(4) Grazing-related activities, such as fencing
15 and livestock watering.

16 "(d) RESOURCE CONSERVING USE.—

17 "(1) IN GENERAL.—Beginning on the date that
18 is 1 year before the date of termination of a contract
19 under the program, the Secretary shall allow an
20 owner or operator to make conservation and land
21 improvements that facilitate maintaining protection
22 of highly erodible land after expiration of the con-
23 tract.

24 "(2) CONSERVATION PLAN.—The Secretary
25 shall require an owner or operator carrying out the

1 activities described in paragraph (1) to develop and
2 implement a conservation plan.
3 "(3) REENROLLMENT PROHIBITED.—Land al-
4 tered under paragraph (1) may not be reenrolled in
5 the conservation reserve program for 5 years.
6 "(4) PAYMENT.—The Secretary shall provide
7 an annual payment that is reduced in an amount
8 commensurate with any income or other compensa-
9 tion received as a result of the activities carried out
10 under paragraph (1).".

11 **SEC. 2005. PAYMENTS.**

12 (a) TREES, WINDBREAKS, SHELTERBELTS, AND
13 WILDLIFE CORRIDORS.—Section 1234(b)(3)(A) of the
14 Food Security Act of 1985 (16 U.S.C. 3834(b)(3)(A)) is
15 amended—
16 (1) in clause (i), by inserting "and" after the
17 semicolon;
18 (2) by striking clause (ii); and
19 (3) by redesignating clause (iii) as clause (ii).
20 (b) INCENTIVES.—Section 1234(b)(3)(B) of the Food
21 Security Act of 1985 (16 U.S.C. 3834(b)(3)(B)) is amend-
22 ed—
23 (1) in clause (i), by inserting ", practices to im-
24 prove the condition of resources on the land," after
25 "operator)"; and

1 (2) by adding at the end the following:

2 "(iii) INCENTIVES.—In making rental
3 payments to an owner or operator of land
4 described in subparagraph (A), the Sec-
5 retary may provide incentive payments suf-
6 ficient to encourage proper thinning and
7 practices to improve the condition of re-
8 sources on the land.".

9 (c) ANNUAL RENTAL PAYMENTS.—Section 1234(c)
10 of the Food Security Act of 1985 (16 U.S.C. 3834(c)) is
11 amended—

12 (1) in paragraph (1), by inserting "and other
13 eligible land" after "highly erodible cropland" both
14 places it appears;

15 (2) by striking paragraph (2) and inserting the
16 following:

17 "(2) METHODS OF DETERMINATION.—

18 "(A) IN GENERAL.—The amounts payable
19 to owners or operators in the form of rental
20 payments under contracts entered into under
21 this subchapter may be determined through—

22 "(i) the submission of bids for such
23 contracts by owners and operators in such
24 manner as the Secretary may prescribe; or

1 "(ii) such other means as the Sec-
2 retary determines are appropriate.
3 "(B) GRASSLAND.—In the case of eligible
4 land described in section 1231(b)(3), the Sec-
5 retary shall make annual payments in an
6 amount that is not more than 75 percent of the
7 grazing value of the land covered by the con-
8 tract."; and
9 (3) in paragraph (5)(A)—
10 (A) by striking "The Secretary" and in-
11 serting the following:
12 "(i) SURVEY.—The Secretary"; and
13 (B) by adding at the end the following:
14 "(ii) USE.—The Secretary may use
15 the survey of dryland cash rental rates de-
16 scribed in clause (i) as a factor in deter-
17 mining rental rates under this section as
18 the Secretary determines appropriate.".
19 (d) PAYMENT SCHEDULE.—Section 1234 of the Food
20 Security Act of 1985 (16 U.S.C. 3834) is amended by
21 striking subsection (d) and inserting the following:
22 "(d) PAYMENT SCHEDULE.—
23 "(1) IN GENERAL.—Except as otherwise pro-
24 vided in this section, payments under this sub-
25 chapter shall be made in cash in such amount and

on such time schedule as is agreed on and specified in the contract.

"(2) SOURCE.—Payments under this subchapter shall be made using the funds of the Commodity Credit Corporation.

"(3) ADVANCE PAYMENT.—Payments under this subchapter may be made in advance of determination of performance.".

(e) PAYMENT LIMITATION.—Section 1234(f) of the Food Security Act of 1985 (16 U.S.C. 3834(f)) is amended—

(1) in paragraph (1), by striking ", including rental payments made in the form of in-kind commodities,";

(2) by striking paragraph (3); and

(3) by redesignating paragraph (4) as paragraph (2).

SEC. 2006. CONTRACT REQUIREMENTS.

Section 1235(f) of the Food Security Act of 1985 (16 U.S.C. 3835(f)) is amended—

(1) in paragraph (1)—

(A) in the matter preceding subparagraph (A), by striking "DUTIES" and all that follows through "a beginning farmer" and inserting "TRANSITION TO COVERED FARMER OR RANCH-

1 ER.—In the case of a contract modification ap-
2 proved in order to facilitate the transfer of land
3 subject to a contract from a retired farmer or
4 rancher to a beginning farmer";
5 (B) in subparagraph (D), by striking "the
6 farmer or rancher" and inserting "the covered
7 farmer or rancher"; and
8 (C) in subparagraph (E), by striking "sec-
9 tion 1001A(b)(3)(B)" and inserting "section
10 1001"; and
11 (2) in paragraph (2), by striking "requirement
12 of section 1231(h)(4)(B)" and inserting "option pro-
13 vided under section 1234(c)(2)(A)(ii)".

14 **SEC. 2007. CONVERSION OF LAND SUBJECT TO CONTRACT**
15 **TO OTHER CONSERVING USES.**

16 Section 1235A of the Food Security Act of 1985 (16
17 U.S.C. 3835a) is repealed.

18 **SEC. 2008. EFFECTIVE DATE.**

19 (a) IN GENERAL.—The amendments made by this
20 title shall take effect on October 1, 2012, except, the
21 amendment made by section 2001(d), which shall take ef-
22 fect on the date of enactment of this Act.
23 (b) EFFECT ON EXISTING CONTRACTS.—
24 (1) IN GENERAL.—Except as provided in para-
25 graph (2), the amendments made by this title shall

not affect the validity or terms of any contract entered into by the Secretary of Agriculture under subchapter B of chapter 1 of subtitle D of title XII of the Food Security Act of 1985 (16 U.S.C. 3831 et seq.) before October 1, 2012, or any payments required to be made in connection with the contract.

(2) UPDATING OF EXISTING CONTRACTS.—The Secretary shall permit an owner or operator with a contract entered into under subchapter B of chapter 1 of subtitle D of title XII of the Food Security Act of 1985 (16 U.S.C. 3831 et seq.) before October 1, 2012, to update the contract to reflect the activities and uses of land under contract permitted under the terms and conditions of paragraphs (1) and (2) of section 1233(b) of that Act (as amended by section 2004).

Subtitle B—Conservation Stewardship Program

SEC. 2101. CONSERVATION STEWARDSHIP PROGRAM.

(a) REVISION OF CURRENT PROGRAM.—Subchapter B of chapter 2 of subtitle D of title XII of the Food Security Act of 1985 (16 U.S.C. 3838d et seq.) is amended to read as follows:

1 **"Subchapter B—Conservation Stewardship**
2 **Program**

3 **"SEC. 1238D. DEFINITIONS.**

4 "In this subchapter:

5 "(1) AGRICULTURAL OPERATION.—The term
6 'agricultural operation' means all eligible land,
7 whether or not contiguous, that is—

8 "(A) under the effective control of a pro-
9 ducer at the time the producer enters into a
10 contract under the program; and

11 "(B) operated with equipment, labor, man-
12 agement, and production or cultivation prac-
13 tices that are substantially separate from other
14 agricultural operations, as determined by the
15 Secretary.

16 "(2) CONSERVATION ACTIVITIES.—

17 "(A) IN GENERAL.—The term 'conserva-
18 tion activities' means conservation systems,
19 practices, or management measures.

20 "(B) INCLUSIONS.—The term 'conserva-
21 tion activities' includes—

22 "(i) structural measures, vegetative
23 measures, and land management measures,
24 including agriculture drainage manage-

1 ment systems, as determined by the Sec-
2 retary; and
3 "(ii) planning needed to address a pri-
4 ority resource concern.
5 "(3) CONSERVATION STEWARDSHIP PLAN.—
6 The term 'conservation stewardship plan' means a
7 plan that—
8 "(A) identifies and inventories priority re-
9 source concerns;
10 "(B) establishes benchmark data and con-
11 servation objectives;
12 "(C) describes conservation activities to be
13 implemented, managed, or improved; and
14 "(D) includes a schedule and evaluation
15 plan for the planning, installation, and manage-
16 ment of the new and existing conservation ac-
17 tivities.
18 "(4) ELIGIBLE LAND.—
19 "(A) IN GENERAL.—The term 'eligible
20 land' means—
21 "(i) private and tribal land on which
22 agricultural commodities, livestock, or for-
23 est-related products are produced; and
24 "(ii) land associated with the land de-
25 scribed in clause (i) on which priority re-

1 source concerns could be addressed
2 through a contract under the program.
3 "(B) INCLUSIONS.—The term 'eligible
4 land' includes—
5 "(i) cropland;
6 "(ii) grassland;
7 "(iii) rangeland;
8 "(iv) pastureland;
9 "(v) nonindustrial private forest land;
10 and
11 "(vi) other agricultural land (includ-
12 ing cropped woodland, marshes, and agri-
13 cultural land used for the production of
14 livestock), as determined by the Secretary.
15 "(5) PRIORITY RESOURCE CONCERN.—The
16 term 'priority resource concern' means a natural re-
17 source concern or problem, as determined by the
18 Secretary, that—
19 "(A) is identified at the national, State or
20 local level, as a priority for a particular area of
21 the State;
22 "(B) represents a significant concern in a
23 State or region; and

1 "(C) is likely to be addressed successfully
2 through the implementation of conservation ac-
3 tivities under this program.
4 "(6) PROGRAM.—The term 'program' means
5 the conservation stewardship program established by
6 this subchapter.
7 "(7) STEWARDSHIP THRESHOLD.—The term
8 'stewardship threshold' means the level of manage-
9 ment required, as determined by the Secretary, to
10 conserve and improve the quality and condition of a
11 natural resource.
12 **"SEC. 1238E. CONSERVATION STEWARDSHIP PROGRAM.**
13 "(a) ESTABLISHMENT AND PURPOSE.—During each
14 of fiscal years 2013 through 2017, the Secretary shall
15 carry out a conservation stewardship program to encour-
16 age producers to address priority resource concerns and
17 improve and conserve the quality and condition of natural
18 resources in a comprehensive manner—
19 "(1) by undertaking additional conservation ac-
20 tivities; and
21 "(2) by improving, maintaining, and managing
22 existing conservation activities.
23 "(b) EXCLUSIONS.—
24 "(1) LAND ENROLLED IN OTHER CONSERVA-
25 TION PROGRAMS.—Subject to paragraph (2), the fol-

1 lowing land (even if covered by the definition of eli-
2 gible land) is not eligible for enrollment in the pro-
3 gram:
4 "(A) Land enrolled in the conservation re-
5 serve program.
6 "(B) Land enrolled in the Agricultural
7 Conservation Easement Program in a wetland
8 easement.
9 "(C) Land enrolled in the conservation se-
10 curity program.
11 "(2) CONVERSION TO CROPLAND.—Eligible
12 land used for crop production after October 1, 2012,
13 that had not been planted, considered to be planted,
14 or devoted to crop production for at least 4 of the
15 6 years preceding that date shall not be the basis for
16 any payment under the program, unless the land
17 does not meet the requirement because—
18 "(A) the land had previously been enrolled
19 in the conservation reserve program;
20 "(B) the land has been maintained using
21 long-term crop rotation practices, as determined
22 by the Secretary; or
23 "(C) the land is incidental land needed for
24 efficient operation of the farm or ranch, as de-
25 termined by the Secretary.

1 **"SEC. 1238F. STEWARDSHIP CONTRACTS.**

2 "(a) SUBMISSION OF CONTRACT OFFERS.—To be eli-
3 gible to participate in the conservation stewardship pro-
4 gram, a producer shall submit a contract offer for the ag-
5 ricultural operation that—

6 "(1) demonstrates to the satisfaction of the
7 Secretary that the producer, at the time of the con-
8 tract offer, is meeting the stewardship threshold for
9 at least 2 priority resource concerns; and

10 "(2) would, at a minimum, meet or exceed the
11 stewardship threshold for at least 1 additional pri-
12 ority resource concern by the end of the stewardship
13 contract by—

14 "(A) installing and adopting additional
15 conservation activities; and

16 "(B) improving, maintaining, and man-
17 aging existing conservation activities on the ag-
18 ricultural operation in a manner that increases
19 or extends the conservation benefits in place at
20 the time the contract offer is accepted by the
21 Secretary.

22 "(b) EVALUATION OF CONTRACT OFFERS.—

23 "(1) RANKING OF APPLICATIONS.—In evalu-
24 ating contract offers the Secretary shall rank appli-
25 cations based on—

1 "(A) the level of conservation treatment on
2 all applicable priority resource concerns at the
3 time of application;
4 "(B) the degree to which the proposed con-
5 servation activities effectively increase conserva-
6 tion performance;
7 "(C) the number of applicable priority re-
8 source concerns proposed to be treated to meet
9 or exceed the stewardship threshold by the end
10 of the contract;
11 "(D) the extent to which other priority re-
12 source concerns will be addressed to meet or ex-
13 ceed the stewardship threshold by the end of
14 the contract period;
15 "(E) the extent to which the actual and
16 anticipated conservation benefits from the con-
17 tract are provided at the least cost relative to
18 other similarly beneficial contract offers; and
19 "(F) the extent to which priority resource
20 concerns will be addressed when transitioning
21 from the conservation reserve program to agri-
22 cultural production.
23 "(2) PROHIBITION.—The Secretary may not as-
24 sign a higher priority to any application because the

1 applicant is willing to accept a lower payment than
2 the applicant would otherwise be eligible to receive.
3 "(3) ADDITIONAL CRITERIA.—The Secretary
4 may develop and use such additional criteria that
5 the Secretary determines are necessary to ensure
6 that national, State, and local priority resource con-
7 cerns are effectively addressed.
8 "(c) ENTERING INTO CONTRACTS.—After a deter-
9 mination that a producer is eligible for the program under
10 subsection (a), and a determination that the contract offer
11 ranks sufficiently high under the evaluation criteria under
12 subsection (b), the Secretary shall enter into a conserva-
13 tion stewardship contract with the producer to enroll the
14 eligible land to be covered by the contract.
15 "(d) CONTRACT PROVISIONS.—
16 "(1) TERM.—A conservation stewardship con-
17 tract shall be for a term of 5 years.
18 "(2) REQUIRED PROVISIONS.—The conservation
19 stewardship contract of a producer shall—
20 "(A) state the amount of the payment the
21 Secretary agrees to make to the producer for
22 each year of the conservation stewardship con-
23 tract under section 1238G(d);
24 "(B) require the producer—

1 "(i) to implement a conservation stew-
2 ardship plan that describes the program
3 purposes to be achieved through 1 or more
4 conservation activities;
5 "(ii) to maintain and supply informa-
6 tion as required by the Secretary to deter-
7 mine compliance with the conservation
8 stewardship plan and any other require-
9 ments of the program; and
10 "(iii) not to conduct any activities on
11 the agricultural operation that would tend
12 to defeat the purposes of the program;
13 "(C) permit all economic uses of the eligi-
14 ble land that—
15 "(i) maintain the agricultural nature
16 of the land; and
17 "(ii) are consistent with the conserva-
18 tion purposes of the conservation steward-
19 ship contract;
20 "(D) include a provision to ensure that a
21 producer shall not be considered in violation of
22 the contract for failure to comply with the con-
23 tract due to circumstances beyond the control
24 of the producer, including a disaster or related
25 condition, as determined by the Secretary;

1 "(E) include provisions where upon the
2 violation of a term or condition of the contract
3 at any time the producer has control of the
4 land—
5 "(i) if the Secretary determines that
6 the violation warrants termination of the
7 contract—
8 "(I) to forfeit all rights to receive
9 payments under the contract; and
10 "(II) to refund all or a portion of
11 the payments received by the producer
12 under the contract, including any in-
13 terest on the payments, as determined
14 by the Secretary; or
15 "(ii) if the Secretary determines that
16 the violation does not warrant termination
17 of the contract, to refund or accept adjust-
18 ments to the payments provided to the pro-
19 ducer, as the Secretary determines to be
20 appropriate;
21 "(F) include provisions in accordance with
22 paragraphs (3) and (4) of this section; and
23 "(G) include any additional provisions the
24 Secretary determines are necessary to carry out
25 the program.

1 "(3) CHANGE OF INTEREST IN LAND SUBJECT
2 TO A CONTRACT.—
3 "(A) IN GENERAL.—At the time of appli-
4 cation, a producer shall have control of the eli-
5 gible land to be enrolled in the program. Except
6 as provided in subparagraph (B), a change in
7 the interest of a producer in eligible land cov-
8 ered by a contract under the program shall re-
9 sult in the termination of the contract with re-
10 gard to that land.
11 "(B) TRANSFER OF DUTIES AND
12 RIGHTS.—Subparagraph (A) shall not apply
13 if—
14 "(i) within a reasonable period of time
15 (as determined by the Secretary) after the
16 date of the change in the interest in all or
17 a portion of the land covered by a contract
18 under the program, the transferee of the
19 land provides written notice to the Sec-
20 retary that duties and rights under the
21 contract have been transferred to, and as-
22 sumed by, the transferee for the portion of
23 the land transferred;
24 "(ii) the transferee meets the eligi-
25 bility requirements of the program; and

"(iii) the Secretary approves the transfer of all duties and rights under the contract.

"(4) MODIFICATION AND TERMINATION OF CONTRACTS.—

"(A) VOLUNTARY MODIFICATION OR TERMINATION.—The Secretary may modify or terminate a contract with a producer if—

"(i) the producer agrees to the modification or termination; and

"(ii) the Secretary determines that the modification or termination is in the public interest.

"(B) INVOLUNTARY TERMINATION.—The Secretary may terminate a contract if the Secretary determines that the producer violated the contract.

"(5) REPAYMENT.—If a contract is terminated, the Secretary may, consistent with the purposes of the program—

"(A) allow the producer to retain payments already received under the contract; or

"(B) require repayment, in whole or in part, of payments received and assess liquidated damages.

1 "(e) CONTRACT RENEWAL.—At the end of the initial
2 5-year contract period, the Secretary may allow the pro-
3 ducer to renew the contract for 1 additional 5-year period
4 if the producer—
5 "(1) demonstrates compliance with the terms of
6 the existing contract;
7 "(2) agrees to adopt and continue to integrate
8 conservation activities across the entire agricultural
9 operation as determined by the Secretary; and
10 "(3) agrees, at a minimum, to meet or exceed
11 the stewardship threshold for at least 2 additional
12 priority resource concerns on the agricultural oper-
13 ation by the end of the contract period.
14 **"SEC. 1238G. DUTIES OF THE SECRETARY.**
15 "(a) IN GENERAL.—To achieve the conservation
16 goals of a contract under the conservation stewardship
17 program, the Secretary shall—
18 "(1) make the program available to eligible pro-
19 ducers on a continuous enrollment basis with 1 or
20 more ranking periods, 1 of which shall occur in the
21 first quarter of each fiscal year;
22 "(2) identify not less than 5 priority resource
23 concerns in a particular watershed or other appro-
24 priate region or area within a State; and

1 "(3) establish a science-based stewardship
2 threshold for each priority resource concern identi-
3 fied under subparagraph (2).
4 "(b) ALLOCATION TO STATES.—The Secretary shall
5 allocate acres to States for enrollment, based—
6 "(1) primarily on each State's proportion of eli-
7 gible land to the total acreage of eligible land in all
8 States; and
9 "(2) also on consideration of—
10 "(A) the extent and magnitude of the con-
11 servation needs associated with agricultural
12 production in each State;
13 "(B) the degree to which implementation
14 of the program in the State is, or will be, effec-
15 tive in helping producers address those needs;
16 and
17 "(C) other considerations to achieve equi-
18 table geographic distribution of funds, as deter-
19 mined by the Secretary.
20 "(c) ACREAGE ENROLLMENT LIMITATION.—During
21 the period beginning on October 1, 2012, and ending on
22 September 30, 2021, the Secretary shall, to the maximum
23 extent practicable—
24 "(1) enroll in the program an additional
25 10,348,000 acres for each fiscal year; and

1 "(2) manage the program to achieve a national
2 average rate of $18 per acre, which shall include the
3 costs of all financial assistance, technical assistance,
4 and any other expenses associated with enrollment
5 or participation in the program.
6 "(d) CONSERVATION STEWARDSHIP PAYMENTS.—
7 "(1) AVAILABILITY OF PAYMENTS.—The Sec-
8 retary shall provide annual payments under the pro-
9 gram to compensate the producer for—
10 "(A) installing and adopting additional
11 conservation activities; and
12 "(B) improving, maintaining, and man-
13 aging conservation activities in place at the op-
14 eration of the producer at the time the contract
15 offer is accepted by the Secretary.
16 "(2) PAYMENT AMOUNT.—The amount of the
17 conservation stewardship annual payment shall be
18 determined by the Secretary and based, to the max-
19 imum extent practicable, on the following factors:
20 "(A) Costs incurred by the producer asso-
21 ciated with planning, design, materials, installa-
22 tion, labor, management, maintenance, or train-
23 ing.
24 "(B) Income forgone by the producer.
25 "(C) Expected conservation benefits.

"(D) The extent to which priority resource concerns will be addressed through the installation and adoption of conservation activities on the agricultural operation.

"(E) The level of stewardship in place at the time of application and maintained over the term of the contract.

"(F) The degree to which the conservation activities will be integrated across the entire agricultural operation for all applicable priority resource concerns over the term of the contract.

"(G) Such other factors as determined by the Secretary.

"(3) EXCLUSIONS.—A payment to a producer under this subsection shall not be provided for—

"(A) the design, construction, or maintenance of animal waste storage or treatment facilities or associated waste transport or transfer devices for animal feeding operations; or

"(B) conservation activities for which there is no cost incurred or income forgone to the producer.

"(4) DELIVERY OF PAYMENTS.—In making stewardship payments, the Secretary shall, to the extent practicable—

1 "(A) prorate conservation performance
2 over the term of the contract so as to accommo-
3 date, to the extent practicable, producers earn-
4 ing equal annual stewardship payments in each
5 fiscal year; and
6 "(B) make stewardship payments as soon
7 as practicable after October 1 of each fiscal
8 year for activities carried out in the previous
9 fiscal year.
10 "(e) SUPPLEMENTAL PAYMENTS FOR RESOURCE-
11 CONSERVING CROP ROTATIONS.—
12 "(1) AVAILABILITY OF PAYMENTS.—The Sec-
13 retary shall provide additional payments to pro-
14 ducers that, in participating in the program, agree
15 to adopt resource-conserving crop rotations to
16 achieve beneficial crop rotations as appropriate for
17 the eligible land of the producers.
18 "(2) BENEFICIAL CROP ROTATIONS.—The Sec-
19 retary shall determine whether a resource-conserving
20 crop rotation is a beneficial crop rotation eligible for
21 additional payments under paragraph (1), based on
22 whether the resource-conserving crop rotation is de-
23 signed to provide natural resource conservation and
24 production benefits.

"(3) ELIGIBILITY.—To be eligible to receive a payment described in paragraph (1), a producer shall agree to adopt and maintain the resource-conserving crop rotations for the term of the contract.

"(4) RESOURCE-CONSERVING CROP ROTATION.—In this subsection, the term 'resource-conserving crop rotation' means a crop rotation that—

"(A) includes at least 1 resource conserving crop (as defined by the Secretary);

"(B) reduces erosion;

"(C) improves soil fertility and tilth;

"(D) interrupts pest cycles; and

"(E) in applicable areas, reduces depletion of soil moisture or otherwise reduces the need for irrigation.

"(f) PAYMENT LIMITATIONS.—A person or legal entity may not receive, directly or indirectly, payments under the program that, in the aggregate, exceed $200,000 under all contracts entered into during fiscal years 2013 through 2017, excluding funding arrangements with Indian tribes, regardless of the number of contracts entered into under the program by the person or legal entity.

"(g) SPECIALTY CROP AND ORGANIC PRODUCERS.—The Secretary shall ensure that outreach and technical assistance are available, and program specifications are ap-

1 propriate to enable specialty crop and organic producers
2 to participate in the program.
3 "(h) COORDINATION WITH ORGANIC CERTIFI-
4 CATION.—The Secretary shall establish a transparent
5 means by which producers may initiate organic certifi-
6 cation under the Organic Foods Production Act of 1990
7 (7 U.S.C. 6501 et seq.) while participating in a contract
8 under the program.
9 "(i) REGULATIONS.—The Secretary shall promulgate
10 regulations that—
11 "(1) prescribe such other rules as the Secretary
12 determines to be necessary to ensure a fair and rea-
13 sonable application of the limitations established
14 under subsection (f); and
15 "(2) otherwise enable the Secretary to carry out
16 the program.".
17 (b) EFFECTIVE DATE.—The amendment made by
18 this section shall take effect on October 1, 2012.
19 (c) EFFECT ON EXISTING CONTRACTS.—
20 (1) IN GENERAL.—The amendment made by
21 this section shall not affect the validity or terms of
22 any contract entered into by the Secretary of Agri-
23 culture under subchapter B of chapter 2 of subtitle
24 D of title XII of the Food Security Act of 1985 (16
25 U.S.C. 3838d et seq.) before October 1, 2012, or

1 any payments required to be made in connection
2 with the contract.
3 (2) CONSERVATION STEWARDSHIP PROGRAM.—
4 Funds made available under section 1241(a)(4) of
5 the Food Security Act of 1985 (16 U.S.C.
6 3841(a)(4)) (as amended by section 2601(a)) may
7 be used to administer and make payments to pro-
8 gram participants enrolled into contracts during any
9 of fiscal years 2009 through 2012.

10 Subtitle C—Environmental Quality
11 Incentives Program

12 **SEC. 2201. PURPOSES.**

13 Section 1240 of the Food Security Act of 1985 (16
14 U.S.C. 3839aa) is amended—
15 (1) in paragraph (3)—
16 (A) in subparagraph (A), by striking
17 "and" at the end;
18 (B) by redesignating subparagraph (B) as
19 subparagraph (C) and, in such subparagraph,
20 by inserting "and" after the semicolon; and
21 (C) by inserting after subparagraph (A)
22 the following:
23 "(B) develop and improve wildlife habitat;
24 and";

1 (2) in paragraph (4), by striking "; and" and
2 inserting a period; and
3 (3) by striking paragraph (5).

4 **SEC. 2202. DEFINITIONS.**

5 Section 1240A of the Food Security Act of 1985 (16
6 U.S.C. 3839aa–1) is amended—
7 (1) by striking paragraph (2) and redesignating
8 paragraphs (3) through (6) as paragraphs (2)
9 through (5), respectively; and
10 (2) in paragraph (2) (as so redesignated), by
11 inserting "established under the Organic Foods Pro-
12 duction Act of 1990 (7 U.S.C. 6501 et seq.)" after
13 "national organic program".

14 **SEC. 2203. ESTABLISHMENT AND ADMINISTRATION.**

15 Section 1240B of the Food Security Act of 1985 (16
16 U.S.C. 3839aa–2) is amended—
17 (1) in subsection (a), by striking "2014" and
18 inserting "2017";
19 (2) in subsection (b), by striking paragraph (2)
20 and inserting the following:
21 "(2) TERM.—A contract under the program
22 shall have a term that does not exceed 10 years.";
23 (3) in subsection (d)—

(A) in paragraph (3), by striking subparagraphs (A) through (G) and inserting the following:

"(A) soil health;

"(B) water quality and quantity improvement;

"(C) nutrient management;

"(D) pest management;

"(E) air quality improvement;

"(F) wildlife habitat development, including pollinator habitat;

"(G) invasive species management; or

"(H) other resource issues of regional or national significance, as determined by the Secretary."; and

(B) in paragraph (4)—

(i) in subparagraph (A) in the matter preceding clause (i), by inserting ", veteran farmer or rancher (as defined in section 2501(e) of the Food, Agriculture, Conservation, and Trade Act of 1990 (7 U.S.C. 2279(e))),'' before "or a beginning farmer or rancher"; and

(ii) by striking subparagraph (B) and inserting the following:

1 "(B) ADVANCE PAYMENTS.—

2 "(i) IN GENERAL.—Not more than 30
3 percent of the amount determined under
4 subparagraph (A) may be provided in ad-
5 vance for the purpose of purchasing mate-
6 rials or contracting.

7 "(ii) RETURN OF FUNDS.—If funds
8 provided in advance are not expended dur-
9 ing the 90-day period beginning on the
10 date of receipt of the funds, the funds shall
11 be returned within a reasonable time
12 frame, as determined by the Secretary.";

13 (4) by striking subsection (f) and inserting the
14 following:

15 "(f) ALLOCATION OF FUNDING.—

16 "(1) LIVESTOCK.—For each of fiscal years
17 2013 through 2017, at least 60 percent of the funds
18 made available for payments under the program
19 shall be targeted at practices relating to livestock
20 production.

21 "(2) WILDLIFE HABITAT.—For each of fiscal
22 years 2013 through 2017, at least 5 percent of the
23 funds made available for payments under the pro-
24 gram shall be targeted at practices benefitting wild-
25 life habitat under subsection (g).''; and

(5) by striking subsection (g) and inserting the following:

"(g) WILDLIFE HABITAT INCENTIVE PRACTICE.—The Secretary shall provide payments under the program for conservation practices that support the restoration, development, and improvement of wildlife habitat on eligible land, including—

"(1) upland wildlife habitat;

"(2) wetland wildlife habitat;

"(3) habitat for threatened and endangered species;

"(4) fish habitat;

"(5) habitat on pivot corners and other irregular areas of a field; and

"(6) other types of wildlife habitat, as determined by the Secretary.".

SEC. 2204. EVALUATION OF APPLICATIONS.

Section 1240C(b) of the Food Security Act of 1985 (16 U.S.C. 3839aa–3(b)) is amended—

(1) in paragraph (1), by striking "environmental" and inserting "conservation"; and

(2) in paragraph (3), by striking "purpose of the environmental quality incentives program specified in section 1240(1)" and inserting "purposes of the program".

1 **SEC. 2205. DUTIES OF PRODUCERS.**

2 Section 1240D(2) of the Food Security Act of 1985
3 (16 U.S.C. 3839aa–4(2)) is amended by striking "farm,
4 ranch, or forest" and inserting "enrolled".

5 **SEC. 2206. LIMITATION ON PAYMENTS.**

6 Section 1240G of the Food Security Act of 1985 (16
7 U.S.C. 3839aa–7) is amended—

8 (1) in subsection (a)—

9 (A) by striking "by the person or entity
10 during any six-year period," and inserting
11 "during fiscal years 2013 through 2017"; and

12 (B) by striking "federally recognized" and
13 all that follows through the period and inserting
14 "Indian tribes under section 1244(l)."; and

15 (2) in subsection (b)(2), by striking "any six-
16 year period" and inserting "fiscal years 2013
17 through 2017".

18 **SEC. 2207. CONSERVATION INNOVATION GRANTS AND PAY-**
19 **MENTS.**

20 Section 1240H of the Food Security Act of 1985 (16
21 U.S.C. 3839aa–8) is amended by striking subsection (b)
22 and inserting the following:

23 "(b) REPORTING.—Not later than December 31,
24 2013, and every 2 years thereafter, the Secretary shall
25 submit to the Committee on Agriculture, Nutrition, and
26 Forestry of the Senate and the Committee on Agriculture

of the House of Representatives a report on the status of projects funded under this section, including—

"(1) funding awarded;

"(2) project results; and

"(3) incorporation of project findings, such as new technology and innovative approaches, into the conservation efforts implemented by the Secretary.".

SEC. 2208. EFFECTIVE DATE.

(a) IN GENERAL.—The amendments made by this title shall take effect on October 1, 2012.

(b) EFFECT ON EXISTING CONTRACTS.—The amendments made by this title shall not affect the validity or terms of any contract entered into by the Secretary of Agriculture under chapter 4 of subtitle D of title XII of the Food Security Act of 1985 (16 U.S.C. 3839aa et seq.) before October 1, 2012, or any payments required to be made in connection with the contract.

Subtitle D—Agricultural Conservation Easement Program

SEC. 2301. AGRICULTURAL CONSERVATION EASEMENT PROGRAM.

(a) ESTABLISHMENT.—Title XII of the Food Security Act of 1985 is amended by adding at the end the following:

"Subtitle H—Agricultural Conservation Easement Program

"SEC. 1265. ESTABLISHMENT AND PURPOSES.

"(a) ESTABLISHMENT.—The Secretary shall establish an Agricultural Conservation Easement Program for the conservation of eligible land and natural resources through easements or other interests in land.

"(b) PURPOSES.—The purposes of the program are to—

"(1) combine the purposes and coordinate the functions of the wetlands reserve program established under section 1237, the grassland reserve program established under section 1238N, and the farmland protection program established under section 1238I;

"(2) restore, protect, and enhance wetland on eligible land;

"(3) protect the agricultural use, viability, and related conservation values of eligible land by limiting nonagricultural uses of that land; and

"(4) protect grazing uses and related conservation values by restoring and conserving eligible land.

"SEC. 1265A. DEFINITIONS.

"In this subtitle:

"(1) AGRICULTURAL LAND EASEMENT.—The term 'agricultural land easement' means an easement or other interest in eligible land that—

"(A) is conveyed for the purposes of protecting natural resources and the agricultural nature of the land, and of promoting agricultural viability for future generations; and

"(B) permits the landowner the right to continue agricultural production and related uses subject to an agricultural land easement plan.

"(2) ELIGIBLE ENTITY.—The term 'eligible entity' means—

"(A) an agency of State or local government or an Indian tribe (including farmland protection board or land resource council established under State law); or

"(B) an organization that is—

"(i) organized for, and at all times since the formation of the organization has been operated principally for, 1 or more of the conservation purposes specified in clause (i), (ii), (iii), or (iv) of section 170(h)(4)(A) of the Internal Revenue Code of 1986;

1 "(ii) an organization described in sec-
2 tion 501(c)(3) of that Code that is exempt
3 from taxation under section 501(a) of that
4 Code; or
5 "(iii) described in—
6 "(I) paragraph (1) or (2) of sec-
7 tion 509(a) of that Code; or
8 "(II) section 509(a)(3) of that
9 Code and is controlled by an organiza-
10 tion described in section 509(a)(2) of
11 that Code.
12 "(3) ELIGIBLE LAND.—The term 'eligible land'
13 means private or tribal land that is—
14 "(A) in the case of an agricultural land
15 easement, agricultural land, including land on a
16 farm or ranch—
17 "(i) that is subject to a pending offer
18 for purchase from an eligible entity;
19 "(ii) that—
20 "(I) has prime, unique, or other
21 productive soil;
22 "(II) contains historical or ar-
23 chaeological resources; or
24 "(III) the protection of which will
25 further a State or local policy con-

1 sistent with the purposes of the pro-
2 gram; and
3 "(iii) that is—
4 "(I) cropland;
5 "(II) rangeland;
6 "(III) grassland or land that con-
7 tains forbs, or shrubland for which
8 grazing is the predominant use;
9 "(IV) pastureland; or
10 "(V) nonindustrial private forest
11 land that contributes to the economic
12 viability of an offered parcel or serves
13 as a buffer to protect such land from
14 development;
15 "(B) in the case of a wetland easement, a
16 wetland or related area, including—
17 "(i) farmed or converted wetland, to-
18 gether with the adjacent land that is func-
19 tionally dependent on that land if the Sec-
20 retary determines it—
21 "(I) is likely to be successfully
22 restored in a cost effective manner;
23 and
24 "(II) will maximize the wildlife
25 benefits and wetland functions and

1 values as determined by the Secretary
2 in consultation with the Secretary of
3 the Interior at the local level;
4 "(ii) cropland or grassland that was
5 used for agricultural production prior to
6 flooding from the natural overflow of a
7 closed basin lake or pothole, as determined
8 by the Secretary, together (where prac-
9 ticable) with the adjacent land that is
10 functionally dependent on the cropland or
11 grassland;
12 "(iii) farmed wetland and adjoining
13 land that—
14 "(I) is enrolled in the conserva-
15 tion reserve program;
16 "(II) has the highest wetland
17 functions and values; and
18 "(III) is likely to return to pro-
19 duction after the land leaves the con-
20 servation reserve program;
21 "(iv) riparian areas that link wetland
22 that is protected by easements or some
23 other device that achieves the same pur-
24 pose as an easement; or

"(v) other wetland of an owner that would not otherwise be eligible if the Secretary determines that the inclusion of such wetland in such easement would significantly add to the functional value of the easement; and

"(C) in the case of both an agricultural land easement or wetland easement, other land that is incidental to eligible land if the Secretary determines that it is necessary for the efficient administration of the easements under this program.

"(4) PROGRAM.—The term 'program' means the Agricultural Conservation Easement Program established by this subtitle.

"(5) WETLAND EASEMENT.—The term 'wetland easement' means a reserved interest in eligible land that—

"(A) is defined and delineated in a deed; and

"(B) stipulates—

"(i) the rights, title, and interests in land conveyed to the Secretary; and

"(ii) the rights, title, and interests in land that are reserved to the landowner.

1 **"SEC. 1265B. AGRICULTURAL LAND EASEMENTS.**

2 "(a) AVAILABILITY OF ASSISTANCE.—The Secretary
3 shall facilitate and provide funding for—

4 "(1) the purchase of agricultural land ease-
5 ments and other interests in eligible land; and

6 "(2) technical assistance to provide for the con-
7 servation of natural resources pursuant to an agri-
8 cultural land easement plan.

9 "(b) COST-SHARE ASSISTANCE.—

10 "(1) IN GENERAL.—The Secretary shall provide
11 cost-share assistance to eligible entities for pur-
12 chasing agricultural land easements to protect the
13 agricultural use, including grazing, and related con-
14 servation values of eligible land.

15 "(2) SCOPE OF ASSISTANCE AVAILABLE.—

16 "(A) FEDERAL SHARE.—Subject to sub-
17 paragraph (C), an agreement described in para-
18 graph (4) shall provide for a Federal share de-
19 termined by the Secretary of an amount not to
20 exceed 50 percent of the fair market value of
21 the agricultural land easement or other interest
22 in land, as determined by the Secretary using—

23 "(i) the Uniform Standards of Profes-
24 sional Appraisal Practices;

25 "(ii) an area-wide market analysis or
26 survey; or

1 "(iii) another industry approved meth-
2 od.
3 "(B) NON-FEDERAL SHARE.—
4 "(i) IN GENERAL.—Subject to sub-
5 paragraph (C), under the agreement, the
6 eligible entity shall provide a share that is
7 at least equivalent to that provided by the
8 Secretary.
9 "(ii) SOURCE OF CONTRIBUTION.—An
10 eligible entity may include as part of its
11 share a charitable donation or qualified
12 conservation contribution (as defined by
13 section 170(h) of the Internal Revenue
14 Code of 1986) from the private landowner
15 if the eligible entity contributes its own
16 cash resources in an amount that is at
17 least 50 percent of the amount contributed
18 by the Secretary.
19 "(C) WAIVER AUTHORITY.—In the case of
20 grassland of special environmental significance,
21 as determined by the Secretary, the Secretary
22 may provide up to 75 percent of the fair market
23 value of the agricultural land easement.
24 "(3) EVALUATION AND RANKING OF APPLICA-
25 TIONS.—

1 "(A) CRITERIA.—The Secretary shall es-
2 tablish evaluation and ranking criteria to maxi-
3 mize the benefit of Federal investment under
4 the program.
5 "(B) CONSIDERATIONS.—In establishing
6 the criteria, the Secretary shall emphasize sup-
7 port for—
8 "(i) protecting agricultural uses and
9 related conservation values of the land; and
10 "(ii) maximizing the protection of con-
11 tiguous acres devoted to agricultural use.
12 "(C) BIDDING DOWN.—If the Secretary
13 determines that 2 or more applications for cost-
14 share assistance are comparable in achieving
15 the purpose of the program, the Secretary shall
16 not assign a higher priority to any of those ap-
17 plications solely on the basis of lesser cost to
18 the program.
19 "(4) AGREEMENTS WITH ELIGIBLE ENTITIES.—
20 "(A) IN GENERAL.—The Secretary shall
21 enter into agreements with eligible entities to
22 stipulate the terms and conditions under which
23 the eligible entity is permitted to use cost-share
24 assistance provided under this section.

1 "(B) LENGTH OF AGREEMENTS.—An
2 agreement shall be for a term that is—
3 "(i) in the case of an eligible entity
4 certified under the process described in
5 paragraph (5), a minimum of 5 years; and
6 "(ii) for all other eligible entities, at
7 least 3, but not more than 5 years.
8 "(C) MINIMUM TERMS AND CONDITIONS.—
9 An eligible entity shall be authorized to use its
10 own terms and conditions for agricultural land
11 easements so long as the Secretary determines
12 such terms and conditions—
13 "(i) are consistent with the purposes
14 of the program;
15 "(ii) are permanent or for the max-
16 imum duration allowed under applicable
17 State law;
18 "(iii) permit effective enforcement of
19 the conservation purposes of such ease-
20 ments, including appropriate restrictions
21 depending on the purposes for which the
22 easement is acquired;
23 "(iv) include a right of enforcement
24 for the Secretary;

"(v) subject the land purchased to an agricultural land easement plan that—

"(I) describes the activities which promote the long-term viability of the land to meet the purposes for which the easement was acquired;

"(II) requires the management of grassland according to a grassland management plan; and

"(III) includes a conservation plan, where appropriate, and requires, at the option of the Secretary, the conversion of highly erodible cropland to less intensive uses; and

"(vi) include a limit on the impervious surfaces to be allowed that is consistent with the agricultural activities to be conducted.

"(D) SUBSTITUTION OF QUALIFIED PROJECTS.—An agreement shall allow, upon mutual agreement of the parties, substitution of qualified projects that are identified at the time of the proposed substitution.

1 "(E) EFFECT OF VIOLATION.—If a viola-
2 tion occurs of a term or condition of an agree-
3 ment under this subsection—
4 "(i) the agreement may be termi-
5 nated; and
6 "(ii) the Secretary may require the el-
7 igible entity to refund all or part of any
8 payments received by the entity under the
9 program, with interest on the payments as
10 determined appropriate by the Secretary.
11 "(5) CERTIFICATION OF ELIGIBLE ENTITIES.—
12 "(A) CERTIFICATION PROCESS.—The Sec-
13 retary shall establish a process under which the
14 Secretary may—
15 "(i) directly certify eligible entities
16 that meet established criteria;
17 "(ii) enter into long-term agreements
18 with certified eligible entities; and
19 "(iii) accept proposals for cost-share
20 assistance for the purchase of agricultural
21 land easements throughout the duration of
22 such agreements.
23 "(B) CERTIFICATION CRITERIA.—In order
24 to be certified, an eligible entity shall dem-
25 onstrate to the Secretary that the entity will

1 maintain, at a minimum, for the duration of the
2 agreement—
3 "(i) a plan for administering ease-
4 ments that is consistent with the purpose
5 of this subtitle;
6 "(ii) the capacity and resources to
7 monitor and enforce agricultural land ease-
8 ments; and
9 "(iii) policies and procedures to en-
10 sure—
11 "(I) the long-term integrity of
12 agricultural land easements on eligible
13 land;
14 "(II) timely completion of acqui-
15 sitions of easements; and
16 "(III) timely and complete eval-
17 uation and reporting to the Secretary
18 on the use of funds provided under
19 the program.
20 "(C) REVIEW AND REVISION.—
21 "(i) REVIEW.—The Secretary shall
22 conduct a review of eligible entities cer-
23 tified under subparagraph (A) every 3
24 years to ensure that such entities are

1 meeting the criteria established under sub-
2 paragraph (B).
3 "(ii) REVOCATION.—If the Secretary
4 finds that the certified entity no longer
5 meets the criteria established under sub-
6 paragraph (B), the Secretary may—
7 "(I) allow the certified entity a
8 specified period of time, at a min-
9 imum 180 days, in which to take such
10 actions as may be necessary to meet
11 the criteria; and
12 "(II) revoke the certification of
13 the entity, if after the specified period
14 of time, the certified entity does not
15 meet such criteria.
16 "(c) TECHNICAL ASSISTANCE.—The Secretary may
17 provide technical assistance, if requested, to assist in—
18 "(1) compliance with the terms and conditions
19 of easements; and
20 "(2) implementation of an agricultural land
21 easement plan.
22 **"SEC. 1265C. WETLAND EASEMENTS.**
23 "(a) AVAILABILITY OF ASSISTANCE.—The Secretary
24 shall provide assistance to owners of eligible land to re-
25 store, protect, and enhance wetland through—

1 "(1) easements and related wetland easement
2 plans; and
3 "(2) technical assistance.
4 "(b) EASEMENTS.—
5 "(1) METHOD OF ENROLLMENT.—The Sec-
6 retary shall enroll eligible land through the use of—
7 "(A) 30-year easements;
8 "(B) permanent easements;
9 "(C) easements for the maximum duration
10 allowed under applicable State laws; or
11 "(D) as an option for Indian tribes only,
12 30-year contracts.
13 "(2) LIMITATIONS.—
14 "(A) INELIGIBLE LAND.—The Secretary
15 may not acquire easements on—
16 "(i) land established to trees under
17 the conservation reserve program, except in
18 cases where the Secretary determines it
19 would further the purposes of the program;
20 and
21 "(ii) farmed wetland or converted wet-
22 land where the conversion was not com-
23 menced prior to December 23, 1985.
24 "(B) CHANGES IN OWNERSHIP.—No ease-
25 ment shall be created on land that has changed

1 ownership during the preceding 24-month pe-
2 riod unless—
3 "(i) the new ownership was acquired
4 by will or succession as a result of the
5 death of the previous owner;
6 "(ii)(I) the ownership change occurred
7 because of foreclosure on the land; and
8 "(II) immediately before the fore-
9 closure, the owner of the land exercises a
10 right of redemption from the mortgage
11 holder in accordance with State law; or
12 "(iii) the Secretary determines that
13 the land was acquired under circumstances
14 that give adequate assurances that such
15 land was not acquired for the purposes of
16 placing it in the program.
17 "(3) EVALUATION AND RANKING OF OFFERS.—
18 "(A) CRITERIA.—The Secretary shall es-
19 tablish evaluation and ranking criteria to maxi-
20 mize the benefit of Federal investment under
21 the program.
22 "(B) CONSIDERATIONS.—When evaluating
23 offers from landowners, the Secretary may con-
24 sider—

1 "(i) the conservation benefits of ob-
2 taining an easement or 30-year contract,
3 including the potential environmental bene-
4 fits if the land was removed from agricul-
5 tural production;
6 "(ii) the cost-effectiveness of each
7 easement or 30-year contract, so as to
8 maximize the environmental benefits per
9 dollar expended;
10 "(iii) whether the landowner or an-
11 other person is offering to contribute fi-
12 nancially to the cost of the easement or
13 30-year contract to leverage Federal funds;
14 and
15 "(iv) such other factors as the Sec-
16 retary determines are necessary to carry
17 out the purposes of the program.
18 "(C) PRIORITY.—The Secretary shall place
19 priority on acquiring easements based on the
20 value of the easement for protecting and en-
21 hancing habitat for migratory birds and other
22 wildlife.
23 "(4) AGREEMENT.—To be eligible to place eligi-
24 ble land into the program through a wetland ease-

1 ment, the owner of such land shall enter into an
2 agreement with the Secretary to—
3 "(A) grant an easement on such land to
4 the Secretary;
5 "(B) authorize the implementation of a
6 wetland easement plan;
7 "(C) create and record an appropriate
8 deed restriction in accordance with applicable
9 State law to reflect the easement agreed to;
10 "(D) provide a written statement of con-
11 sent to such easement signed by those holding
12 a security interest in the land;
13 "(E) comply with the terms and conditions
14 of the easement and any related agreements;
15 and
16 "(F) permanently retire any existing crop-
17 land base and allotment history for the land on
18 which the easement has been obtained.
19 "(5) TERMS AND CONDITIONS OF EASEMENT.—
20 "(A) IN GENERAL.—A wetland easement
21 shall include terms and conditions that—
22 "(i) permit—
23 "(I) repairs, improvements, and
24 inspections on the land that are nec-

1 essary to maintain existing public
2 drainage systems; and
3 "(II) owners to control public ac-
4 cess on the easement areas while iden-
5 tifying access routes to be used for
6 restoration activities and management
7 and easement monitoring;
8 "(ii) prohibit—
9 "(I) the alteration of wildlife
10 habitat and other natural features of
11 such land, unless specifically author-
12 ized by the Secretary;
13 "(II) the spraying of such land
14 with chemicals or the mowing of such
15 land, except where such spraying or
16 mowing is authorized by the Secretary
17 or is necessary—
18 "(aa) to comply with Fed-
19 eral or State noxious weed con-
20 trol laws;
21 "(bb) to comply with a Fed-
22 eral or State emergency pest
23 treatment program; or
24 "(cc) to meet habitat needs
25 of specific wildlife species;

"(III) any activities to be carried out on the owner's or successor's land that is immediately adjacent to, and functionally related to, the land that is subject to the easement if such activities will alter, degrade, or otherwise diminish the functional value of the eligible land; and

"(IV) the adoption of any other practice that would tend to defeat the purposes of the program, as determined by the Secretary;

"(iii) provide for the efficient and effective establishment of wetland functions and values; and

"(iv) include such additional provisions as the Secretary determines are desirable to carry out the program or facilitate the practical administration thereof.

"(B) VIOLATION.—On the violation of the terms or conditions of the easement, the easement shall remain in force and the Secretary may require the owner to refund all or part of any payments received by the owner under the

1 program, together with interest thereon as de-
2 termined appropriate by the Secretary.
3 "(C) COMPATIBLE USES.—Land subject to
4 a wetland easement may be used for compatible
5 economic uses, including such activities as
6 hunting and fishing, managed timber harvest,
7 or periodic haying or grazing, if such use is spe-
8 cifically permitted by the wetland easement plan
9 and is consistent with the long-term protection
10 and enhancement of the wetland resources for
11 which the easement was established.
12 "(D) RESERVATION OF GRAZING
13 RIGHTS.—The Secretary may include in the
14 terms and conditions of an easement a provi-
15 sion under which the owner reserves grazing
16 rights if—
17 "(i) the Secretary determines that the
18 reservation and use of the grazing rights—
19 "(I) is compatible with the land
20 subject to the easement;
21 "(II) is consistent with the his-
22 torical natural uses of the land and
23 long-term protection and enhancement
24 goals for which the easement was es-
25 tablished; and

"(III) complies with the wetland easement plan; and

"(ii) the agreement provides for a commensurate reduction in the easement payment to account for the grazing value, as determined by the Secretary.

"(E) APPLICATION.—The relevant provisions of this paragraph shall also apply to a 30-year contract.

"(6) COMPENSATION.—

"(A) DETERMINATION.—

"(i) IN GENERAL.—The Secretary shall pay as compensation for a permanent easement acquired an amount necessary to encourage enrollment in the program based on the lowest of—

"(I) the fair market value of the land, as determined by the Secretary, using the Uniform Standards of Professional Appraisal Practices or an area-wide market analysis or survey;

"(II) the amount corresponding to a geographical cap, as determined by the Secretary in regulations; or

1 "(III) the offer made by the
2 landowner.
3 "(ii) OTHER.—Compensation for a
4 30-year contract or 30-year easement shall
5 be not less than 50 percent, but not more
6 than 75 percent, of the compensation that
7 would be paid for a permanent easement.
8 "(B) FORM OF PAYMENT.—Compensation
9 shall be provided by the Secretary in the form
10 of a cash payment, in an amount determined
11 under subparagraph (A).
12 "(C) PAYMENT SCHEDULE.—
13 "(i) EASEMENTS VALUED AT LESS
14 THAN $500,000.—For easements valued at
15 $500,000 or less, the Secretary may pro-
16 vide easement payments in not more than
17 10 annual payments.
18 "(ii) EASEMENTS VALUED AT MORE
19 THAN $500,000.—For easements valued at
20 more than $500,000, the Secretary may
21 provide easement payments in at least 5,
22 but not more than 10 annual payments,
23 except that, if the Secretary determines it
24 would further the purposes of the program,

1 the Secretary may make a lump sum pay-
2 ment for such an easement.
3 "(c) EASEMENT RESTORATION.—
4 "(1) IN GENERAL.—The Secretary shall provide
5 financial assistance to carry out the establishment of
6 conservation measures and practices and protect
7 wetland functions and values, including necessary
8 maintenance activities, as set forth in a wetland
9 easement plan.
10 "(2) PAYMENTS.—The Secretary shall—
11 "(A) in the case of a permanent easement,
12 pay an amount that is not less than 75 percent,
13 but not more than 100 percent, of the eligible
14 costs; and
15 "(B) in the case of a 30-year contract or
16 30-year easement, pay an amount that is not
17 less than 50 percent, but not more than 75 per-
18 cent, of the eligible costs.
19 "(d) TECHNICAL ASSISTANCE.—
20 "(1) IN GENERAL.—The Secretary shall assist
21 owners in complying with the terms and conditions
22 of easements and 30-year contracts.
23 "(2) CONTRACTS OR AGREEMENTS.—The Sec-
24 retary may enter into 1 or more contracts with pri-
25 vate entities or agreements with a State, non-govern-

1 mental organization, or Indian tribe to carry out
2 necessary restoration, enhancement or maintenance
3 of an easement if the Secretary determines that the
4 contract or agreement will advance the purposes of
5 the program.

6 "(e) WETLAND ENHANCEMENT OPTION.—The Sec-
7 retary may enter into 1 or more agreements with a State
8 (including a political subdivision or agency of a State),
9 nongovernmental organization, or Indian tribe to carry out
10 a special wetland enhancement option that the Secretary
11 determines would advance the purposes of the program.

12 "(f) ADMINISTRATION.—

13 "(1) WETLAND EASEMENT PLAN.—The Sec-
14 retary shall develop a wetland easement plan for eli-
15 gible land subject to a wetland easement, which will
16 include the practices and activities necessary to re-
17 store, protect, enhance, and maintain the enrolled
18 land.

19 "(2) DELEGATION OF EASEMENT ADMINISTRA-
20 TION.—

21 "(A) IN GENERAL.—The Secretary may
22 delegate any of the easement management,
23 monitoring, and enforcement responsibilities of
24 the Secretary to other Federal or State agencies
25 that have the appropriate authority, expertise

1 and resources necessary to carry out such dele-
2 gated responsibilities or to other conservation
3 organizations if the Secretary determines the
4 organization has similar expertise and re-
5 sources.

6 "(B) LIMITATION.—The Secretary shall
7 not delegate any of the monitoring or enforce-
8 ment responsibilities under the program to con-
9 servation organizations.

10 "(3) PAYMENTS.—

11 "(A) TIMING OF PAYMENTS.—The Sec-
12 retary shall provide payment for obligations in-
13 curred by the Secretary under this section—

14 "(i) with respect to any easement res-
15 toration obligation as soon as possible after
16 the obligation is incurred; and

17 "(ii) with respect to any annual ease-
18 ment payment obligation incurred by the
19 Secretary as soon as possible after October
20 1 of each calendar year.

21 "(B) PAYMENTS TO OTHERS.—If an owner
22 who is entitled to a payment dies, becomes in-
23 competent, is otherwise unable to receive such
24 payment, or is succeeded by another person or
25 entity who renders or completes the required

1 performance, the Secretary shall make such
2 payment, in accordance with regulations pre-
3 scribed by the Secretary and without regard to
4 any other provision of law, in such manner as
5 the Secretary determines is fair and reasonable
6 in light of all of the circumstances.

7 **"SEC. 1265D. ADMINISTRATION.**

8 "(a) INELIGIBLE LAND.—The Secretary may not ac-
9 quire an easement under the program on—

10 "(1) land owned by an agency of the United
11 States, other than land held in trust for Indian
12 tribes;

13 "(2) land owned in fee title by a State, includ-
14 ing an agency or a subdivision of a State, or a unit
15 of local government;

16 "(3) land subject to an easement or deed re-
17 striction which, as determined by the Secretary, pro-
18 vides similar protection as would be provided by en-
19 rollment in the program; and

20 "(4) land where the purposes of the program
21 would be undermined due to on-site or off-site condi-
22 tions, such as risk of hazardous substances, pro-
23 posed or existing rights of way, infrastructure devel-
24 opment, or adjacent land uses.

1 "(b) PRIORITY.—In evaluating applications under the
2 program, the Secretary may give priority to land that is
3 currently enrolled in the conservation reserve program in
4 a contract that is set to expire within 1 year and—
5 "(1) in the case of an agricultural land ease-
6 ment, is grassland that would benefit from protec-
7 tion under a long-term easement; and
8 "(2) in the case of a wetland easement, is a
9 wetland or related area with the highest functions
10 and values and is likely to return to production after
11 the land leaves the conservation reserve program.
12 "(c) SUBORDINATION, EXCHANGE, MODIFICATION,
13 AND TERMINATION.—
14 "(1) IN GENERAL.—The Secretary may subor-
15 dinate, exchange, terminate, or modify any interest
16 in land, or portion of such interest, administered by
17 the Secretary, either directly or on behalf of the
18 Commodity Credit Corporation under the program
19 when the Secretary determines that—
20 "(A) it is in the Federal Government's in-
21 terest to subordinate, exchange, modify or ter-
22 minate the interest in land;
23 "(B) the subordination, exchange, modi-
24 fication, or termination action—

1 "(i) will address a compelling public
2 need for which there is no practicable al-
3 ternative, or
4 "(ii) such action will further the prac-
5 tical administration of the program; and
6 "(C) the subordination, exchange, modi-
7 fication, or termination action will result in
8 comparable conservation value and equivalent
9 or greater economic value to the United States.
10 "(2) CONSULTATION.—The Secretary shall
11 work with the current owner, and eligible entity if
12 applicable, to address any subordination, exchange,
13 termination, or modification of the interest, or por-
14 tion of such interest in land.
15 "(3) NOTICE.—At least 90 days before taking
16 any termination action described in paragraph (1),
17 the Secretary shall provide written notice of such ac-
18 tion to the Committee on Agriculture of the House
19 of Representatives and the Committee on Agri-
20 culture, Nutrition, and Forestry of the Senate.
21 "(d) LAND ENROLLED IN OTHER PROGRAMS.—
22 "(1) CONSERVATION RESERVE PROGRAM.—The
23 Secretary may terminate or modify an existing con-
24 tract entered into under section 1231(a) if eligible

land that is subject to such contract is transferred into the program.

"(2) OTHER.—Land enrolled in the wetlands reserve program, grassland reserve program, or farmland protection program shall be considered enrolled in this program.

"(e) ALLOCATION OF FUNDS FOR AGRICULTURAL LAND EASEMENTS.—Of the funds made available under section 1241 to carry out the program for a fiscal year, the Secretary shall, to the extent practicable, use no less than 40 percent for agricultural land easements.".

(b) COMPLIANCE WITH CERTAIN REQUIREMENTS.—Before an eligible entity or owner of eligible land may receive assistance under subtitle H of title XII of the Food Security Act of 1985, the eligible entity or person shall agree, during the crop year for which the assistance is provided and in exchange for the assistance—

(1) to comply with applicable conservation requirements under subtitle B of title XII of that Act (16 U.S.C. 3811 et seq.); and

(2) to comply with applicable wetland protection requirements under subtitle C of title XII of that Act (16 U.S.C. 3821 et seq.).

(c) CROSS REFERENCE.—Section 1244 of the Food Security Act of 1985 (16 U.S.C. 3844) is amended—

1 (1) in subsection (c)—

2 (A) in paragraph (1)—

3 (i) by inserting "and" at the end of

4 subparagraph (A);

5 (ii) by striking "and" at the end of

6 subparagraph (B); and

7 (iii) by striking subparagraph (C);

8 (B) by redesignating paragraph (2) as

9 paragraph (3); and

10 (C) by inserting after paragraph (1) the

11 following:

12 "(2) the Agricultural Conservation Easement

13 Program established under subtitle H; and"; and

14 (2) in subsection (f)—

15 (A) in paragraph (1)—

16 (i) in subparagraph (A), by striking

17 "programs administered under subchapters

18 B and C of chapter 1 of subtitle D" and

19 inserting "conservation reserve program

20 established under subchapter B of chapter

21 1 of subtitle D and the Agricultural Con-

22 servation Easement Program under sub-

23 title H using wetland easements under sec-

24 tion 1265C"; and

(ii) in subparagraph (B), by striking "subchapter C of chapter 1 of subtitle D" and inserting "the Agricultural Conservation Easement Program under subtitle H using wetland easements under section 1265C"; and

(B) in paragraph (4), by striking "subchapter C" and inserting "subchapter B".

(d) EFFECTIVE DATE.—The amendments made by this section shall take effect on October 1, 2012.

Subtitle E—Regional Conservation Partnership Program

SEC. 2401. REGIONAL CONSERVATION PARTNERSHIP PROGRAM.

(a) IN GENERAL.—Title XII of the Food Security Act of 1985 is amended by inserting after subtitle H (as added by section 2301) the following:

"Subtitle I—Regional Conservation Partnership Program

"SEC. 1271. ESTABLISHMENT AND PURPOSES.

"(a) ESTABLISHMENT.—The Secretary shall establish a Regional Conservation Partnership Program to implement eligible activities through—

"(1) partnership agreements with eligible partners; and

1 "(2) contracts with producers.

2 "(b) PURPOSES.—The purposes of the program

3 are—

4 "(1) to combine the purposes and coordinate

5 the functions of—

6 "(A) the agricultural water enhancement

7 program established under section 1240I;

8 "(B) the Chesapeake Bay watershed pro-

9 gram established under section 1240Q;

10 "(C) the cooperative conservation partner-

11 ship initiative established under section 1243;

12 and

13 "(D) the Great Lakes basin program for

14 soil erosion and sediment control established

15 under section 1240P;.

16 "(2) to further the conservation, restoration,

17 and sustainable use of soil, water, wildlife, and re-

18 lated natural resources on a regional or watershed

19 scale; and

20 "(3) to encourage partners to cooperate with

21 producers in—

22 "(A) meeting or avoiding the need for na-

23 tional, State, and local natural resource regu-

24 latory requirements related to production; and

"(B) implementing projects that will result in the installation and maintenance of eligible activities that affect multiple agricultural or nonindustrial private forest operations on a local, regional, State, or multi-State basis.

"SEC. 1271A. DEFINITIONS.

"In this subtitle:

"(1) COVERED PROGRAMS.—The term 'covered programs' means—

"(A) the agricultural conservation easement program;

"(B) the environmental quality incentives program; and

"(C) the conservation stewardship program.

"(2) ELIGIBLE ACTIVITY.—The term 'eligible activity' means any of the following conservation activities when delivered through a covered program:

"(A) Water quality restoration or enhancement projects, including nutrient management and sediment reduction.

"(B) Water quantity conservation, restoration, or enhancement projects relating to surface water and groundwater resources, including—

1 "(i) the conversion of irrigated crop-
2 land to the production of less water-inten-
3 sive agricultural commodities or dryland
4 farming; and
5 "(ii) irrigation system improvement
6 and irrigation efficiency enhancement.
7 "(C) Drought mitigation.
8 "(D) Flood prevention.
9 "(E) Water retention.
10 "(F) Habitat conservation, restoration,
11 and enhancement.
12 "(G) Erosion control.
13 "(H) Other related activities that the Sec-
14 retary determines will help achieve conservation
15 benefits.
16 "(3) ELIGIBLE PARTNER.—The term 'eligible
17 partner' means any of the following:
18 "(A) An agricultural or silvicultural pro-
19 ducer association or other group of producers.
20 "(B) A State or unit of local government.
21 "(C) An Indian tribe.
22 "(D) A farmer cooperative.
23 "(E) An institution of higher education.
24 "(F) An organization with an established
25 history of working cooperatively with producers

1 on agricultural land, as determined by the Sec-
2 retary, to address—
3 "(i) local conservation priorities re-
4 lated to agricultural production, wildlife
5 habitat development, and nonindustrial pri-
6 vate forest land management; or
7 "(ii) critical watershed-scale soil ero-
8 sion, water quality, sediment reduction, or
9 other natural resource concerns.
10 "(4) PARTNERSHIP AGREEMENT.—The term
11 'partnership agreement' means an agreement be-
12 tween the Secretary and an eligible partner.
13 "(5) PROGRAM.—The term 'program' means
14 the Regional Conservation Partnership Program es-
15 tablished by this subtitle.

16 **"SEC. 1271B. REGIONAL CONSERVATION PARTNERSHIPS.**

17 "(a) PARTNERSHIP AGREEMENTS AUTHORIZED.—
18 The Secretary may enter into a partnership agreement
19 with an eligible partner to implement a project that will
20 assist producers with installing and maintaining an eligi-
21 ble activity.
22 "(b) LENGTH.—A partnership agreement shall be for
23 a period not to exceed 5 years, except that the Secretary
24 may extend the agreement 1 time for up to 12 months

1 when an extension is necessary to meet the objectives of
2 the program.
3 "(c) DUTIES OF PARTNERS.—
4 "(1) IN GENERAL.—Under a partnership agree-
5 ment, the eligible partner shall—
6 "(A) define the scope of a project, includ-
7 ing—
8 "(i) the eligible activities to be imple-
9 mented;
10 "(ii) the potential agricultural or non-
11 industrial private forest operations af-
12 fected;
13 "(iii) the local, State, multi-State or
14 other geographic area covered; and
15 "(iv) the planning, outreach, imple-
16 mentation and assessment to be conducted;
17 "(B) conduct outreach and education to
18 producers for potential participation in the
19 project;
20 "(C) at the request of a producer, act on
21 behalf of a producer participating in the project
22 in applying for assistance under section 1271C;
23 "(D) leverage financial or technical assist-
24 ance provided by the Secretary with additional
25 funds to help achieve the project objectives;

"(E) conduct an assessment of the project's effects; and

"(F) at the conclusion of the project, report to the Secretary on its results and funds leveraged.

"(2) CONTRIBUTION.—A partner shall provide a significant portion of the overall costs of the scope of the project as determined by the Secretary.

"(d) APPLICATIONS.—

"(1) COMPETITIVE PROCESS.—The Secretary shall conduct a competitive process to select applications for partnership agreements and may assess and rank applications with similar conservation purposes as a group.

"(2) CRITERIA USED.—In carrying out the process described in paragraph (1), the Secretary shall make public the criteria used in evaluating applications.

"(3) CONTENT.—An application to the Secretary shall include a description of—

"(A) the scope of the project as described in subsection (c)(1)(A);

"(B) the plan for monitoring, evaluating, and reporting on progress made towards achieving the project's objectives;

1 "(C) the program resources requested for
2 the project, including the covered programs to
3 be used and estimated funding needed from the
4 Secretary;
5 "(D) the partners collaborating to achieve
6 project objectives, including their roles, respon-
7 sibilities, capabilities, and financial contribu-
8 tion; and
9 "(E) any other elements the Secretary con-
10 siders necessary to adequately evaluate and
11 competitively select applications for funding
12 under the program.
13 "(4) PRIORITY TO CERTAIN APPLICATIONS.—
14 The Secretary may give a higher priority to applica-
15 tions that—
16 "(A) have a high percentage of producers
17 in the area to be covered by the agreement;
18 "(B) assist producers in meeting or avoid-
19 ing the need for a natural resource regulatory
20 requirement;
21 "(C) significantly leverage non-Federal fi-
22 nancial and technical resources and coordinate
23 with other local, State, regional, or national ef-
24 forts;

"(D) deliver high percentages of applied conservation to address conservation priorities or local, State, regional, or national conservation initiatives;

"(E) provide innovation in conservation methods and delivery, including outcome-based performance measures and methods; or

"(F) meet other factors that are important for achieving the purposes of the program, as determined by the Secretary.

"SEC. 1271C. ASSISTANCE TO PRODUCERS.

"(a) IN GENERAL.—The Secretary shall enter into contracts to provide financial and technical assistance to—

"(1) producers participating in a project with an eligible partner as described in section 1271B; or

"(2) producers that fit within the scope of a project described in section 1271B or a critical conservation area designated pursuant to section 1271F, but who are seeking to implement an eligible activity independent of a partner.

"(b) TERMS AND CONDITIONS.—

"(1) CONSISTENCY WITH PROGRAM RULES.—Except as provided in paragraph (2), the Secretary shall ensure that the terms and conditions of a con-

1 tract under this section are consistent with the ap-
2 plicable rules of the covered programs to be used as
3 part of the project, as described in the application
4 under section 1271B(d)(3)(C).

5 "(2) ADJUSTMENTS.—Except for statutory pro-
6 gram requirements governing appeals, payment limi-
7 tations, and conservation compliance, the Secretary
8 may adjust the discretionary program rules of a cov-
9 ered program—

10 "(A) to provide a simplified application
11 and evaluation process; and

12 "(B) to better reflect unique local cir-
13 cumstances and purposes if the Secretary deter-
14 mines such adjustments are necessary to
15 achieve the purposes of the program.

16 "(3) ALTERNATIVE FUNDING ARRANGE-
17 MENTS.—

18 "(A) IN GENERAL.—For the purposes of
19 providing assistance for land described in sub-
20 section (a) and section 1271F, the Secretary
21 may enter into alternative funding arrange-
22 ments with a multistate water resource agency
23 or authority if—

24 "(i) the Secretary determines that the
25 goals and objectives of the program will be

1 met by the alternative funding arrange-
2 ments;
3 "(ii) the agency or authority certifies
4 that the limitations established under this
5 section on agreements with individual pro-
6 ducers will not be exceeded; and
7 "(iii) all participating producers meet
8 applicable payment eligibility provisions.
9 "(B) CONDITIONS.—As a condition on re-
10 ceipt of funding under subparagraph (A), the
11 multistate water resource agency or authority
12 shall agree—
13 "(i) to submit an annual independent
14 audit to the Secretary that describes the
15 use of funds under this paragraph;
16 "(ii) to provide any data necessary for
17 the Secretary to issue a report on the use
18 of funds under this paragraph; and
19 "(iii) not to use any funds for admin-
20 istration or contracting with another enti-
21 ty.
22 "(C) LIMITATION.—The Secretary may
23 enter into not more than 10 alternative funding
24 arrangements under this paragraph.
25 "(c) PAYMENTS.—

1 "(1) IN GENERAL.—In accordance with statu-
2 tory requirements of the covered programs involved,
3 the Secretary may make payments to a producer in
4 an amount determined by the Secretary to be nec-
5 essary to achieve the purposes of the program.
6 "(2) PAYMENTS TO PRODUCERS IN STATES
7 WITH WATER QUANTITY CONCERNS.—The Secretary
8 may provide payments to producers participating in
9 a project that addresses water quantity concerns for
10 a period of 5 years in an amount sufficient to en-
11 courage conversion from irrigated farming to
12 dryland farming.
13 "(3) WAIVER AUTHORITY.—To assist in the im-
14 plementation of the program, the Secretary may
15 waive the applicability of the limitation in section
16 1001D(b)(2) of this Act for participating producers
17 if the Secretary determines that the waiver is nec-
18 essary to fulfill the objectives of the program.
19 **"SEC. 1271D. FUNDING.**
20 "(a) AVAILABILITY OF FUNDS.—The Secretary shall
21 use $100,000,000 of the funds of the Commodity Credit
22 Corporation for each of fiscal years 2013 through 2017
23 to carry out the program established under this subtitle.

1 "(b) DURATION OF AVAILABILITY.—Funds made
2 available under subsection (a) shall remain available until
3 expended.
4 "(c) ADDITIONAL FUNDING AND ACRES.—
5 "(1) IN GENERAL.—In addition to the funds
6 made available under subsection (a), the Secretary
7 shall reserve 6 percent of the funds and acres made
8 available for a covered program for each of fiscal
9 years 2013 through 2017 in order to ensure addi-
10 tional resources are available to carry out this pro-
11 gram.
12 "(2) UNUSED FUNDS AND ACRES.—Any funds
13 or acres reserved under paragraph (1) for a fiscal
14 year from a covered program that are not obligated
15 under this program by April 1 of that fiscal year
16 shall be returned for use under the covered program.
17 "(d) ALLOCATION OF FUNDING.—Of the funds and
18 acres made available for the program under subsections
19 (a) and (c), the Secretary shall allocate—
20 "(1) 25 percent of the funds and acres to
21 projects based on a State competitive process admin-
22 istered by the State conservationist, with the advice
23 of the State technical committee;

1 "(2) 50 percent of the funds and acres to
2 projects based on a national competitive process to
3 be established by the Secretary; and
4 "(3) 25 percent of the funds and acres to
5 projects for the critical conservation areas des-
6 ignated in section 1271F.
7 "(e) LIMITATION ON ADMINISTRATIVE EXPENSES.—
8 None of the funds made available under the program may
9 be used to pay for the administrative expenses of partners.
10 **"SEC. 1271E. ADMINISTRATION.**
11 "(a) DISCLOSURE.—In addition to the criteria used
12 in evaluating applications as described in section
13 1271B(d)(2), the Secretary shall make publicly available
14 information on projects selected through the competitive
15 process described in section 1271B(d)(1).
16 "(b) REPORTING.—Not later than December 31,
17 2013, and for every 2 years thereafter, the Secretary shall
18 submit to the Committee on Agriculture of the House of
19 Representatives and the Committee on Agriculture, Nutri-
20 tion, and Forestry of the Senate a report on the status
21 of projects funded under the program, including—
22 "(1) the number and types of partners and pro-
23 ducers participating in the partnership agreements
24 selected;

"(2) the number of producers receiving assistance;

"(3) total funding committed to projects, including Federal and non-Federal resources; and

"(4) a description of how the funds under section 1271C(b)(3) are being administered, including—

"(A) any oversight mechanisms that the Secretary has implemented;

"(B) the process through which the Secretary is resolving appeals by program participants; and

"(C) the means by which the Secretary is tracking adherence to any applicable provisions for payment eligibility.

"SEC. 1271F. CRITICAL CONSERVATION AREAS.

"(a) IN GENERAL.—When administering the funding described in section 1271D(d)(3), the Secretary shall select applications for partnership agreements and producer contracts within designated critical conservation areas.

"(b) CRITICAL CONSERVATION AREA DESIGNATIONS.—In designating geographical areas as critical conservation areas under this section, the Secretary may give priority to not more than 8 areas based on the degree to which an area—

1 "(1) includes multiple States with significant
2 agricultural production;
3 "(2) is covered by an existing regional, State,
4 binational, or multistate agreement or plan that has
5 established objectives, goals and work plans and is
6 adopted by a Federal, State, or regional authority;
7 "(3) has water quality concerns, including con-
8 cerns for reducing erosion, promoting sediment con-
9 trol, and addressing nutrient management activities
10 affecting large bodies of water of regional, national,
11 or international significance;
12 "(4) has water quantity concerns, including—
13 "(A) concerns for groundwater, surface
14 water, aquifer, or other water sources; or
15 "(B) a need to promote water retention
16 and flood prevention; or
17 "(5) will be subject to regulatory requirements
18 that could reduce the economic scope of agricultural
19 operations within the area.
20 "(c) ADMINISTRATION.—
21 "(1) IN GENERAL.—Except as provided in para-
22 graph (2), the Secretary shall administer any part-
23 nership agreement or producer contract under this
24 section in a manner that is consistent with the terms
25 of the program.

"(2) RELATIONSHIP TO EXISTING ACTIVITY.—The Secretary shall, to the maximum extent practicable, ensure that eligible activities carried out in critical conservation areas designated under this section complement and are consistent with other Federal and State programs and water quality and quantity strategies.".

(b) EFFECTIVE DATE.—The amendment made by this section shall take effect on October 1, 2012.

Subtitle F—Other Conservation Programs

SEC. 2501. CONSERVATION OF PRIVATE GRAZING LAND.

Section 1240M(e) of the Food Security Act of 1985 (16 U.S.C. 3839bb(e)) is amended inserting "and $30,000,000 for each of fiscal years 2013 through 2017" before the period at the end.

SEC. 2502. GRASSROOTS SOURCE WATER PROTECTION PROGRAM.

Section 1240O(b) of the Food Security Act of 1985 (16 U.S.C. 3839bb–2(b)) is amended by inserting "and $15,000,000 for each of fiscal years 2013 through 2017" before the period at the end.

1 **SEC. 2503. VOLUNTARY PUBLIC ACCESS AND HABITAT IN-**
2 **CENTIVE PROGRAM.**

3 (a) FUNDING.—Section 1240R(f) of the Food Secu-
4 rity Act of 1985 (16 U.S.C. 3839bb–5(f)) is amended by
5 inserting "and $40,000,000 for the period of fiscal years
6 2013 through 2017" before the period at the end .

7 (b) REPORT ON PROGRAM EFFECTIVENESS.—Not
8 later than 2 years after the date of enactment of this Act,
9 the Secretary of Agriculture shall submit to the Com-
10 mittee on Agriculture of the House of Representatives and
11 the Committee on Agriculture, Nutrition, and Forestry of
12 the Senate a report evaluating the effectiveness of the vol-
13 untary public access and habitat incentive program estab-
14 lished by section 1240R of the Food Security Act of 1985
15 (16 U.S.C. 3839bb–5), including—

16 (1) identifying cooperating agencies;

17 (2) identifying the number of land holdings and
18 total acres enrolled by State;

19 (3) evaluating the extent of improved access on
20 eligible land, improved wildlife habitat, and related
21 economic benefits; and

22 (4) any other relevant information and data re-
23 lating to the program that would be helpful to such
24 Committees.

25 (c) EFFECTIVE DATE.—The amendment made by
26 this section shall take effect on October 1, 2012.

1 **SEC. 2504. AGRICULTURE CONSERVATION EXPERIENCED**
2 **SERVICES PROGRAM.**

3 (a) FUNDING.—Section 1252 of the Food Security
4 Act of 1985 (16 U.S.C. 3851) is amended by striking sub-
5 section (c) and inserting the following:

6 "(c) FUNDING.—

7 "(1) IN GENERAL.—The Secretary may carry
8 out the ACES program using funds made available
9 to carry out each program under this title.

10 "(2) EXCLUSION.—Funds made available to
11 carry out the conservation reserve program may not
12 be used to carry out the ACES program.".

13 (b) EFFECTIVE DATE.—The amendment made by
14 this section shall take effect on October 1, 2012.

15 **SEC. 2505. SMALL WATERSHED REHABILITATION PRO-**
16 **GRAM.**

17 Section 14(h)(2)(E) of the Watershed Protection and
18 Flood Prevention Act (16 U.S.C. 1012(h)(2)(E)) is
19 amended by striking "2012" and inserting "2017".

20 **SEC. 2506. TERMINAL LAKES ASSISTANCE.**

21 Section 2507 of the Food, Security, and Rural Invest-
22 ment Act of 2002 (43 U.S.C. 2211 note; Public Law 107–
23 171) is amended to read as follows:

24 **"SEC. 2507. TERMINAL LAKES ASSISTANCE.**

25 "(a) DEFINITIONS.—In this section:

1 "(1) ELIGIBLE LAND.—The term 'eligible land'
2 means privately owned agricultural land (including
3 land in which a State has a property interest as a
4 result of state water law)—
5 "(A) that a landowner voluntarily agrees to
6 sell to a State; and
7 "(B) which—
8 "(i)(I) is ineligible for enrollment as a
9 wetland easement established under the
10 Agricultural Conservation Easement Pro-
11 gram under subtitle H of the Food Secu-
12 rity Act of 1985;
13 "(II) is flooded to—
14 "(aa) an average depth of at
15 least 6.5 feet; or
16 "(bb) a level below which the
17 State determines the management of
18 the water level is beyond the control
19 of the State or landowner; or
20 "(III) is inaccessible for agricultural
21 use due to the flooding of adjoining prop-
22 erty (such as islands of agricultural land
23 created by flooding);

"(ii) is located within a watershed with water rights available for lease or purchase; and

"(iii) has been used during at least 5 of the immediately preceding 30 years—

"(I) to produce crops or hay; or

"(II) as livestock pasture or grazing.

"(2) PROGRAM.—The term 'program' means the voluntary land purchase program established under this section.

"(3) TERMINAL LAKE.—The term 'terminal lake' means a lake and its associated riparian and watershed resources that is—

"(A) considered flooded because there is no natural outlet for water accumulating in the lake or the associated riparian area such that the watershed and surrounding land is consistently flooded; or

"(B) considered terminal because it has no natural outlet and is at risk due to a history of consistent Federal assistance to address critical resource conditions, including insufficient water available to meet the needs of the lake, general uses, and water rights.

1 "(b) ASSISTANCE.—The Secretary shall—

2 "(1) provide grants under subsection (c) for the
3 purchase of eligible land impacted by a terminal lake
4 described in subsection (a)(3)(A); and

5 "(2) provide funds to the Secretary of the Inte-
6 rior pursuant to subsection (e)(2) with assistance in
7 accordance with subsection (d) for terminal lakes de-
8 scribed in subsection (a)(3)(B).

9 "(c) LAND PURCHASE GRANTS.—

10 "(1) IN GENERAL.—Using funds provided
11 under subsection (e)(1), the Secretary shall make
12 available land purchase grants to States for the pur-
13 chase of eligible land in accordance with this sub-
14 section.

15 "(2) IMPLEMENTATION.—

16 "(A) AMOUNT.—A land purchase grant
17 shall be in an amount not to exceed the lesser
18 of—

19 "(i) 50 percent of the total purchase
20 price per acre of the eligible land; or

21 "(ii)(I) in the case of eligible land
22 that was used to produce crops or hay,
23 $400 per acre; and

"(II) in the case of eligible land that was pasture or grazing land, $200 per acre.

"(B) DETERMINATION OF PURCHASE PRICE.—A State purchasing eligible land with a land purchase grant shall ensure, to the maximum extent practicable, that the purchase price of such land reflects the value, if any, of other encumbrances on the eligible land to be purchased, including easements and mineral rights.

"(C) COST-SHARE REQUIRED.—To be eligible to receive a land purchase grant, a State shall provide matching non-Federal funds in an amount equal to 50 percent of the amount described in subparagraph (A), including additional non-Federal funds.

"(D) CONDITIONS.—To receive a land purchase grant, a State shall agree—

"(i) to ensure that any eligible land purchased is—

"(I) conveyed in fee simple to the State; and

"(II) free from mortgages or other liens at the time title is transferred;

"(ii) to maintain ownership of the eligible land in perpetuity;

"(iii) to pay (from funds other than grant dollars awarded) any costs associated with the purchase of eligible land under this section, including surveys and legal fees; and

"(iv) to keep eligible land in a conserving use, as defined by the Secretary.

"(E) LOSS OF FEDERAL BENEFITS.—Eligible land purchased with a grant under this section shall lose eligibility for any benefits under other Federal programs, including—

"(i) benefits under title XII of the Food Security Act of 1985 (16 U.S.C. 3801 et seq.);

"(ii) benefits under the Federal Crop Insurance Act (7 U.S.C. 1501 et seq.); and

"(iii) covered benefits described in section 1001D(b) of the Food Security Act of 1985 (7 U.S.C. 1308–3a).

1 "(F) PROHIBITION.—Any Federal rights
2 or benefits associated with eligible land prior to
3 purchase by a State may not be transferred to
4 any other land or person in anticipation of or
5 as a result of such purchase.
6 "(d) WATER ASSISTANCE.—
7 "(1) IN GENERAL.—The Secretary of the Inte-
8 rior, acting through the Commissioner of Reclama-
9 tion, may use the funds described in subsection
10 (c)(2) to administer and provide financial assistance
11 to carry out this subsection to provide water and as-
12 sistance to a terminal lake described in subsection
13 (a)(3)(B) through willing sellers or willing partici-
14 pants only—
15 "(A) to lease water;
16 "(B) to purchase land, water appurtenant
17 to the land, and related interests; and
18 "(C) to carry out research, support and
19 conservation activities for associated fish, wild-
20 life, plant, and habitat resources."
21 "(2) EXCLUSIONS.—The Secretary of the Inte-
22 rior may not use this subsection to deliver assistance
23 to the Great Salt Lake in Utah, lakes that are con-
24 sidered dry lakes, or other lakes that do not meet

1 the purposes of this section, as determined by the
2 Secretary of the Interior.
3 "(3) TRANSITIONAL PROVISION.—
4 "(A) IN GENERAL.—Notwithstanding any
5 other provision of this section, any funds made
6 available before the date of enactment of the
7 Agriculture Reform, Food, and Jobs Act of
8 2012 under a provision of law described in sub-
9 paragraph (B) shall remain available using the
10 provisions of law (including regulations) in ef-
11 fect on the day before the date of enactment of
12 that Act.
13 "(B) DESCRIBED LAWS.—The provisions
14 of law described in this section are—
15 "(i) section 2507 of the Farm Secu-
16 rity and Rural Investment Act of 2002 (43
17 U.S.C. 2211 note; Public Law 107–171)
18 (as in effect on the day before the date of
19 enactment of the Agriculture Reform,
20 Food, and Jobs Act of 2012);
21 "(ii) section 207 of the Energy and
22 Water Development Appropriations Act,
23 2003 (Public Law 108–7; 117 Stat. 146);
24 "(iii) section 208 of the Energy and
25 Water Development Appropriations Act,

2006 (Public Law 109–103; 119 Stat. 2268, 123 Stat. 2856); and

"(iv) section 208 of the Energy and Water Development and Related Agencies Appropriations Act, 2010 (Public Law 111–85; 123 Stat. 2858, 123 Stat. 2967, 125 Stat. 867).

"(e) FUNDING.—

"(1) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Secretary to carry out subsection (c) $25,000,000, to remain available until expended.

"(2) COMMODITY CREDIT CORPORATION.—As soon as practicable after the date of enactment of the Agriculture Reform, Food, and Jobs Act of 2012, the Secretary shall transfer to the Bureau of Reclamation Water and Related Resources Account $150,000,000 from the funds of the Commodity Credit Corporation to carry out subsection (d), to remain available until expended.".

Subtitle G—Funding and Administration

SEC. 2601. FUNDING.

(a) IN GENERAL.—Section 1241 of the Food Security Act of 1985 (16 U.S.C. 3841) is amended by striking subsection (a) and inserting the following:

"(a) ANNUAL FUNDING.—For each of fiscal years 2013 through 2017, the Secretary shall use the funds, facilities, and authorities of the Commodity Credit Corporation to carry out the following programs under this title (including the provision of technical assistance):

"(1) The conservation reserve program under subchapter B of chapter 1 of subtitle D, including, to the maximum extent practicable—

"(A) $10,000,000 for the period of fiscal years 2013 through 2017 to provide payments under paragraph (3) of section 1234(b) in connection with thinning activities conducted on land described in subparagraph (B)(iii) of that paragraph; and

"(B) $50,000,000 for the period of fiscal years 2013 through 2017 to carry out section 1235(f) to facilitate the transfer of land subject to contracts from retired or retiring owners and

1 operators to beginning farmers or ranchers and
2 socially disadvantaged farmers or ranchers.
3 "(2) The Agricultural Conservation Easement
4 Program under subtitle H using to the maximum ex-
5 tent practicable—
6 "(A) $450,000,000 for fiscal year 2013;
7 "(B) $475,000,000 for fiscal year 2014;
8 "(C) $500,000,000 for fiscal year 2015;
9 "(D) $525,000,000 for fiscal year 2016;
10 and
11 "(E) $250,000,000 for fiscal year 2017.
12 "(3) The conservation security program under
13 subchapter A of chapter 2 of subtitle D, using such
14 sums as are necessary to administer contracts en-
15 tered into before September 30, 2008.
16 "(4) The conservation stewardship program
17 under subchapter B of chapter 2 of subtitle D.
18 "(5) The environmental quality incentives pro-
19 gram under chapter 4 of subtitle D, using, to the
20 maximum extent practicable—
21 "(A) $1,500,000,000 for fiscal year 2013;
22 "(B) $1,600,000,000 for fiscal year 2014;
23 and
24 "(C) $1,650,000,000 for each of fiscal
25 years 2015 through 2017.".

1 (b) GUARANTEED AVAILABILITY OF FUNDS.—Sec-
2 tion 1241 of the Food Security Act of 1985 (16 U.S.C.
3 3841) is amended—
4 (1) by redesignating subsections (b) through (h)
5 as subsections (c) through (i), respectively; and
6 (2) by inserting after subsection (a) the fol-
7 lowing:
8 "(b) AVAILABILITY OF FUNDS.—Amounts made
9 available by subsection (a) shall be used by the Secretary
10 to carry out the programs specified in such subsection for
11 fiscal years 2013 through 2017 and shall remain available
12 until expended. Amounts made available for the programs
13 specified in such subsection during a fiscal year through
14 modifications, cancellations, terminations, and other re-
15 lated administrative actions and not obligated in that fis-
16 cal year shall remain available for obligation during subse-
17 quent fiscal years, but shall reduce the amount of addi-
18 tional funds made available in the subsequent fiscal year
19 by an amount equal to the amount remaining unobli-
20 gated.".
21 (c) EFFECTIVE DATE.—The amendments made by
22 this section shall take effect on October 1, 2012.
23 **SEC. 2602. TECHNICAL ASSISTANCE.**
24 Section 1241 of the Food Security Act of 1985 (16
25 U.S.C. 3841) is amended by striking subsection (c) (as

1 redesignated by section 2601(b)(1)) and inserting the fol-
2 lowing:

3 "(c) TECHNICAL ASSISTANCE.—

4 "(1) AVAILABILITY OF FUNDS.—Commodity
5 Credit Corporation funds made available for a fiscal
6 year for each of the programs specified in subsection
7 (a)—

8 "(A) shall be available for the provision of
9 technical assistance for the programs for which
10 funds are made available as necessary to imple-
11 ment the programs effectively; and

12 "(B) shall not be available for the provi-
13 sion of technical assistance for conservation
14 programs specified in subsection (a) other than
15 the program for which the funds were made
16 available.

17 "(2) REPORT.—Not later than December 31,
18 2012, the Secretary shall submit (and update as
19 necessary in subsequent years) to the Committee on
20 Agriculture of the House of Representatives and the
21 Committee on Agriculture, Nutrition, and Forestry
22 of the Senate a report—

23 "(A) detailing the amount of technical as-
24 sistance funds requested and apportioned in

1 each program specified in subsection (a) during
2 the preceding fiscal year; and
3 "(B) any other data relating to this provi-
4 sion that would be helpful to such Commit-
5 tees.".

6 **SEC. 2603. REGIONAL EQUITY.**

7 Section 1241 of the Food Security Act of 1985 (16
8 U.S.C. 3841) is amended by striking subsection (e) (as
9 redesignated by section 2601(b)(1)) and inserting the fol-
10 lowing:

11 "(e) REGIONAL EQUITY.—
12 "(1) EQUITABLE DISTRIBUTION.—When deter-
13 mining funding allocations each fiscal year, the Sec-
14 retary shall, after considering available funding and
15 program demand in each State, provide a distribu-
16 tion of funds for conservation programs under sub-
17 title D (excluding the conservation reserve program
18 under subchapter B of chapter 1), subtitle H (ex-
19 cluding wetland easements under section 1265C),
20 and subtitle I to ensure equitable program participa-
21 tion proportional to historical funding allocations
22 and usage by all States.
23 "(2) MINIMUM PERCENTAGE.—In determining
24 the specific funding allocations under paragraph (1),
25 the Secretary shall—

"(A) ensure that during the first quarter of each fiscal year each State has the opportunity to establish that the State can use an aggregate allocation amount of at least 0.6 percent of the funds made available for those conservation programs; and

"(B) for each State that can so establish, provide an aggregate amount of at least 0.6 percent of the funds made available for those conservation programs.".

SEC. 2604. RESERVATION OF FUNDS TO PROVIDE ASSISTANCE TO CERTAIN FARMERS OR RANCHERS FOR CONSERVATION ACCESS.

Subsection (h) of section 1241 of the Food Security Act of 1985 (16 U.S.C. 3841) (as redesignated by section 2601(b)(1)) is amended—

(1) in paragraph (1) by striking "2012" and inserting "2017"; and

(2) by adding at the end the following:

"(4) PREFERENCE.—In providing assistance under paragraph (1), the Secretary shall give preference to a veteran farmer or rancher (as defined in section 2501(e) of the Food, Agriculture, Conservation, and Trade Act of 1990 (7 U.S.C. 2279(e)))

1 that qualifies under subparagraph (A) or (B) of
2 paragraph (1).".

3 **SEC. 2605. ANNUAL REPORT ON PROGRAM ENROLLMENTS**
4 **AND ASSISTANCE.**

5 Subsection (i) of section 1241 of the Food Security
6 Act of 1985 (16 U.S.C. 3841) (as redesignated by section
7 2601(b)(1)) is amended—

8 (1) in paragraph (1), by striking "wetlands re-
9 serve program" and inserting "agricultural conserva-
10 tion easement program";

11 (2) by striking paragraphs (2) and (3) and re-
12 designating paragraphs (4), (5), and (6) as para-
13 graphs (2), (3), and (4), respectively;

14 (3) in paragraph (3) (as so redesignated)—

15 (A) by striking "agricultural water en-
16 hancement program" and inserting "regional
17 conservation partnership program"; and

18 (B) by striking "section 1240I(g)" and in-
19 serting "section 1271C(c)(3)"; and

20 (4) by adding at the end the following:

21 "(5) Payments made under the conservation
22 stewardship program.

23 "(6) Waivers granted by the Secretary under
24 section 1265B(b)(2)(C).".

1 **SEC. 2606. ADMINISTRATIVE REQUIREMENTS FOR CON-**
2 **SERVATION PROGRAMS.**

3 Section 1244 of the Food Security Act of 1985 (16
4 U.S.C. 3844) is amended—

5 (1) in subsection (a)(2), by adding at the end
6 the following:

7 "(E) Veteran farmers or ranchers (as de-
8 fined in section 2501(c) of the Food, Agri-
9 culture, Conservation, and Trade Act of 1990
10 (7 U.S.C. 2279(e))).";

11 (2) in subsection (d), by inserting ", H, and I"
12 before the period at the end;

13 (3) in subsection (f)—

14 (A) in paragraph (1)(B), by striking
15 "country" and inserting "county"; and

16 (B) in paragraph (3), by striking "sub-
17 section (c)(2)(B) or (f)(4)" and inserting "sub-
18 section (c)(2)(A)(ii) or (f)(2)";

19 (4) by striking subsection (i) and inserting the
20 following:

21 "(i) CONSERVATION APPLICATION PROCESS.—

22 "(1) INITIAL APPLICATION.—

23 "(A) IN GENERAL.—Not later than 1 year
24 after the date of enactment of this subsection,
25 the Secretary shall establish a single, simplified
26 application for eligible entities to use in initially

1 requesting assistance under any conservation
2 program administered by the Secretary (re-
3 ferred to in this subsection as the 'initial appli-
4 cation').

5 "(B) REQUIREMENTS.—To the maximum
6 extent practicable, the Secretary shall ensure
7 that—

8 "(i) a conservation program applicant
9 is not required to provide information that
10 is duplicative of information or resources
11 already available to the Secretary for that
12 applicant and the specific operation of the
13 applicant; and

14 "(ii) the initial application process is
15 streamlined to minimize complexity and re-
16 dundancy.

17 "(2) REVIEW OF APPLICATION PROCESS.—

18 "(A) IN GENERAL.—Not later than 1 year
19 after the date of enactment of this subsection,
20 the Secretary shall review the application proc-
21 ess for each conservation program administered
22 by the Secretary, including the forms and proc-
23 esses used to receive assistance requests from
24 eligible program participants.

1 "(B) REQUIREMENTS.—In carrying out
2 the review, the Secretary shall determine what
3 information the participant is required to sub-
4 mit during the application process, including—
5 "(i) identification information for the
6 applicant;
7 "(ii) identification and location infor-
8 mation for the land parcel or tract of con-
9 cern;
10 "(iii) a general statement of the need
11 or resource concern of the applicant for the
12 land parcel or tract; and
13 "(iv) the minimum amount of other
14 information the Secretary considers to be
15 essential for the applicant to provide per-
16 sonally.
17 "(3) REVISION AND STREAMLINE.—
18 "(A) IN GENERAL.—Not later than 1 year
19 after the date of enactment of this subsection,
20 the Secretary shall carry out a revision of the
21 application forms and processes for each con-
22 servation program administered by the Sec-
23 retary to enable use of information technology
24 to incorporate appropriate data and information
25 concerning the conservation needs and solutions

1 appropriate for the land area identified by the
2 applicant.
3 "(B) GOAL.—The goal of the revision shall
4 be to streamline the application process to mini-
5 mize the burden placed on applicants.
6 "(4) CONSERVATION PROGRAM APPLICATION.—
7 "(A) IN GENERAL.—Once the needs of an
8 applicant have been adequately assessed by the
9 Secretary, or a third party provider under sec-
10 tion 1242, based on the initial application, in
11 order to determine the 1 or more programs
12 under this title that best match the needs of the
13 applicant, with the approval of the applicant,
14 the Secretary may convert the initial application
15 into the specific application for assistance for
16 the relevant conservation program.
17 "(B) SECRETARIAL BURDEN.—To the
18 maximum extent practicable, the Secretary
19 shall—
20 "(i) complete the specific application
21 for conservation program assistance for
22 each applicant; and
23 "(ii) request only that specific further
24 information from the applicant that is not
25 already available to the Secretary.

"(5) IMPLEMENTATION AND NOTIFICATION.—Not later than 1 year after the date of enactment of this subsection, the Secretary shall submit to the Committee on Agriculture of the House of Representatives and the Committee on Agriculture, Nutrition, and Forestry of the Senate written notification that the Secretary has fulfilled the requirements of this subsection."; and

(5) by adding at the end the following:

"(j) IMPROVED ADMINISTRATIVE EFFICIENCY AND EFFECTIVENESS.—In administrating a conservation program under this title, the Secretary shall, to the maximum extent practicable—

"(1) seek to reduce administrative burdens and costs to producers by streamlining conservation planning and program resources; and

"(2) take advantage of new technologies to enhance efficiency and effectiveness.

"(k) RELATION TO OTHER PAYMENTS.—Any payment received by an owner or operator under this title, including an easement payment or rental payment, shall be in addition to, and not affect, the total amount of payments that the owner or operator is otherwise eligible to receive under any of the following:

"(1) This Act.

1 "(2) The Agricultural Act of 1949 (7 U.S.C.
2 1421 et seq.).
3 "(3) The Agriculture Reform, Food, and Jobs
4 Act of 2012.
5 "(4) Any law that succeeds a law specified in
6 paragraph (1), (2), or (3).
7 "(l) FUNDING FOR INDIAN TRIBES.—In carrying out
8 the conservation stewardship program under subchapter
9 B of chapter 2 of subtitle D and the environmental quality
10 incentives program under chapter 4 of subtitle D, the Sec-
11 retary may enter into alternative funding arrangements
12 with Indian tribes if the Secretary determines that the
13 goals and objectives of the programs will be met by such
14 arrangements, and that statutory limitations regarding
15 contracts with individual producers will not be exceeded
16 by any Tribal member.".

17 **SEC. 2607. RULEMAKING AUTHORITY.**

18 Subtitle E of title XII of the Food Security Act of
19 1985 (16 U.S.C. 3841 et seq.) is amended by adding at
20 the end the following:

21 **"SEC. 1246. REGULATIONS.**

22 "(a) IN GENERAL.—The Secretary shall promulgate
23 such regulations as are necessary to implement programs
24 under this title, including such regulations as the Sec-
25 retary determines to be necessary to ensure a fair and rea-

1 sonable application of the limitations established under
2 section 1244(f).

3 "(b) RULEMAKING PROCEDURE.—The promulgation
4 of regulations and administration of programs under this
5 title—

6 "(1) shall be carried out without regard to—

7 "(A) the Statement of Policy of the Sec-
8 retary effective July 24, 1971 (36 Fed. Reg.
9 13804), relating to notices of proposed rule-
10 making and public participation in rulemaking;
11 and

12 "(B) chapter 35 of title 44, United States
13 Code (commonly known as the Paperwork Re-
14 duction Act); and

15 "(2) shall be made as an interim rule effective
16 on publication with an opportunity for notice and
17 comment.

18 "(c) CONGRESSIONAL REVIEW OF AGENCY RULE-
19 MAKING.—In promulgating regulations under this section,
20 the Secretary shall use the authority provided under sec-
21 tion 808 of title 5, United States Code.".

22 **SEC. 2608. STANDARDS FOR STATE TECHNICAL COMMIT-**
23 **TEES.**

24 Section 1261(b) of the Food Security Act of 1985
25 (16 U.S.C. 3861(b)) is amended by striking "Not later

1 than 180 days after the date of enactment of the Food,
2 Conservation, and Energy Act of 2008, the Secretary shall
3 develop" and inserting "The Secretary shall review and
4 update as necessary".

5 Subtitle H—Repeal of Superseded 6 Program Authorities and Transitional Provisions 7

**8 SEC. 2701. COMPREHENSIVE CONSERVATION ENHANCE-
9 MENT PROGRAM.**

10 Section 1230 of the Food Security Act of 1985 (16
11 U.S.C. 3830) is repealed.

**12 SEC. 2702. EMERGENCY FORESTRY CONSERVATION RE-
13 SERVE PROGRAM.**

14 (a) REPEAL.—Section 1231A of the Food Security
15 Act of 1985 (16 U.S.C. 3831a) is repealed.

16 (b) TRANSITIONAL PROVISIONS.—

17 (1) EFFECT ON EXISTING CONTRACTS.—The
18 amendment made by this section shall not affect the
19 validity or terms of any contract entered into by the
20 Secretary of Agriculture under section 1231A of the
21 Food Security Act of 1985 (16 U.S.C. 3831a) before
22 October 1, 2012, or any payments required to be
23 made in connection with the contract.

24 (2) FUNDING.—The Secretary may use funds
25 made available to carry out the conservation reserve

1 program under subchapter B of chapter 1 of subtitle
2 D of title XII of the Food Security Act of 1985 (16
3 U.S.C. 3831 et seq.) to continue to carry out con-
4 tracts referred to in paragraph (1) using the provi-
5 sions of law and regulation applicable to such con-
6 tracts as in existence on September 30, 2012.
7 (c) EFFECTIVE DATE.—The amendment made by
8 this section shall take effect on October 1, 2012.
9 **SEC. 2703. WETLANDS RESERVE PROGRAM.**
10 (a) REPEAL.—Subchapter C of chapter 1 of subtitle
11 D of title XII of the Food Security Act of 1985 (16 U.S.C.
12 3837 et seq.) is repealed.
13 (b) TRANSITIONAL PROVISIONS.—
14 (1) EFFECT ON EXISTING CONTRACTS AND
15 EASEMENTS.—The amendment made by this section
16 shall not affect the validity or terms of any contract
17 or easement entered into by the Secretary of Agri-
18 culture under subchapter C of chapter 1 of subtitle
19 D of title XII of the Food Security Act of 1985 (16
20 U.S.C. 3837 et seq.) before October 1, 2012, or any
21 payments required to be made in connection with the
22 contract or easement.
23 (2) FUNDING.—
24 (A) USE OF PRIOR YEAR FUNDS.—Not-
25 withstanding the repeal of subchapter C of

1 chapter 1 of subtitle D of title XII of the Food
2 Security Act of 1985 (16 U.S.C. 3837 et seq.),
3 any funds made available from the Commodity
4 Credit Corporation to carry out the wetlands
5 reserve program under that subchapter for fis-
6 cal years 2009 through 2012 shall be made
7 available to carry out contracts or easements
8 referred to in paragraph (1) that were entered
9 into prior to October 1, 2012 (including the
10 provision of technical assistance), provided that
11 no such contract or easement is modified so as
12 to increase the amount of the payment received.
13 (B) OTHER.—The Secretary may use
14 funds made available to carry out the agricul-
15 tural conservation easement program under
16 subtitle H of title XII of the Food Security Act
17 of 1985, as added by section 2301 of this Act,
18 to continue to carry out contracts and ease-
19 ments referred to in paragraph (1) using the
20 provisions of law and regulation applicable to
21 such contracts and easements as in existence on
22 September 30, 2012.
23 (c) EFFECTIVE DATE.—The amendment made by
24 this section shall take effect on October 1, 2012.

1 **SEC. 2704. FARMLAND PROTECTION PROGRAM AND FARM**
2 **VIABILITY PROGRAM.**

3 (a) REPEAL.—Subchapter C of chapter 2 of subtitle
4 D of title XII of the Food Security Act of 1985 (16 U.S.C.
5 3838h et seq.) is repealed.

6 (b) TRANSITIONAL PROVISIONS.—

7 (1) EFFECT ON EXISTING AGREEMENTS AND
8 EASEMENTS.—The amendment made by this section
9 shall not affect the validity or terms of any agree-
10 ment or easement entered into by the Secretary of
11 Agriculture under subchapter C of chapter 2 of sub-
12 title D of title XII of the Food Security Act of 1985
13 (16 U.S.C. 3838h et seq.) before October 1, 2012,
14 or any payments required to be made in connection
15 with the agreement or easement.

16 (2) FUNDING.—

17 (A) USE OF PRIOR YEAR FUNDS.—Not-
18 withstanding the repeal of subchapter C of
19 chapter 2 of subtitle D of title XII of the Food
20 Security Act of 1985 (16 U.S.C. 3838h et seq.),
21 any funds made available from the Commodity
22 Credit Corporation to carry out the farmland
23 protection program under that subchapter for
24 fiscal years 2009 through 2012 shall be made
25 available to carry out agreements and ease-
26 ments referred to in paragraph (1) that were

1 entered into prior to October 1, 2012 (including
2 the provision of technical assistance).
3 (B) OTHER.—On exhaustion of funds
4 made available under subparagraph (A), the
5 Secretary may use funds made available to
6 carry out the agricultural conservation ease-
7 ment program under subtitle H of title XII of
8 the Food Security Act of 1985, as added by
9 section 2301 of this Act, to continue to carry
10 out agreements and easements referred to in
11 paragraph (1) using the provisions of law and
12 regulation applicable to such agreements and
13 easement as in existence on September 30,
14 2012.
15 (c) EFFECTIVE DATE.—The amendment made by
16 this section shall take effect on October 1, 2012.
17 **SEC. 2705. GRASSLAND RESERVE PROGRAM.**
18 (a) REPEAL.—Subchapter D of chapter 2 of subtitle
19 D of title XII of the Food Security Act of 1985 (16 U.S.C.
20 3838n et seq.) is repealed.
21 (b) TRANSITIONAL PROVISIONS.—
22 (1) EFFECT ON EXISTING CONTRACTS, AGREE-
23 MENTS, AND EASEMENTS.—The amendment made
24 by this section shall not affect the validity or terms
25 of any contract, agreement, or easement entered into

by the Secretary of Agriculture under subchapter D of chapter 2 of subtitle D of title XII of the Food Security Act of 1985 (16 U.S.C. 3838n et seq.) before October 1, 2012, or any payments required to be made in connection with the contract, agreement, or easement.

(2) FUNDING.—

(A) USE OF PRIOR YEAR FUNDS.—Notwithstanding the repeal of subchapter D of chapter 2 of subtitle D of title XII of the Food Security Act of 1985 (16 U.S.C. 3838n et seq.), any funds made available from the Commodity Credit Corporation to carry out the grassland reserve program under that subchapter for fiscal years 2009 through 2012 shall be made available to carry out contracts, agreements, or easements referred to in paragraph (1) that were entered into prior to October 1, 2012 (including the provision of technical assistance), provided that no such contract, agreement, or easement is modified so as to increase the amount of the payment received.

(B) OTHER.—The Secretary may use funds made available to carry out the agricultural conservation easement program under

1 subtitle H of title XII of the Food Security Act
2 of 1985, as added by section 2301 of this Act,
3 to continue to carry out contracts, agreements,
4 and easements referred to in paragraph (1)
5 using the provisions of law and regulation appli-
6 cable to such contracts, agreements, and ease-
7 ments as in existence on September 30, 2012.
8 (c) EFFECTIVE DATE.—The amendment made by
9 this section shall take effect on October 1, 2012.

10 **SEC. 2706. AGRICULTURAL WATER ENHANCEMENT PRO-**
11 **GRAM.**

12 (a) REPEAL.—Section 1240I of the Food Security
13 Act of 1985 (16 U.S.C. 3839aa–9) is repealed.
14 (b) TRANSITIONAL PROVISIONS.—
15 (1) EFFECT ON EXISTING CONTRACTS AND
16 AGREEMENTS.—The amendment made by this sec-
17 tion shall not affect the validity or terms of any con-
18 tract or agreement entered into by the Secretary of
19 Agriculture under section 1240I of the Food Secu-
20 rity Act of 1985 (16 U.S.C. 3839aa–9) before Octo-
21 ber 1, 2012, or any payments required to be made
22 in connection with the contract or agreement.
23 (2) FUNDING.—
24 (A) USE OF PRIOR YEAR FUNDS.—Not-
25 withstanding the repeal of section 1240I of the

1 Food Security Act of 1985 (16 U.S.C. 3839aa–
2 9), any funds made available from the Com-
3 modity Credit Corporation to carry out the ag-
4 ricultural water enhancement program under
5 that section for fiscal years 2009 through 2012
6 shall be made available to carry out contracts
7 and agreements referred to in paragraph (1)
8 that were entered into prior to October 1, 2012
9 (including the provision of technical assistance).
10 (B) OTHER.—On exhaustion of funds
11 made available under subparagraph (A), the
12 Secretary may use funds made available to
13 carry out the regional conservation partnerships
14 program under subtitle I of title XII of the
15 Food Security Act of 1985, as added by section
16 2401 of this Act, to continue to carry out con-
17 tracts and agreements referred to in paragraph
18 (1) using the provisions of law and regulation
19 applicable to such contracts and agreements as
20 in existence on September 30, 2012.
21 (c) EFFECTIVE DATE.—The amendment made by
22 this section shall take effect on October 1, 2012.
23 **SEC. 2707. WILDLIFE HABITAT INCENTIVE PROGRAM.**
24 (a) REPEAL.—Section 1240N of the Food Security
25 Act of 1985 (16 U.S.C. 3839bb–1) is repealed.

1 (b) TRANSITIONAL PROVISIONS.—

2 (1) EFFECT ON EXISTING CONTRACTS.—The
3 amendment made by this section shall not affect the
4 validity or terms of any contract entered into by the
5 Secretary of Agriculture under section 1240N of the
6 Food Security Act of 1985 (16 U.S.C. 3839bb–1)
7 before October 1, 2012, or any payments required to
8 be made in connection with the contract.

9 (2) FUNDING.—

10 (A) USE OF PRIOR YEAR FUNDS.—Not-
11 withstanding the repeal of section 1240N of the
12 Food Security Act of 1985 (16 U.S.C. 3839bb–
13 1), any funds made available from the Com-
14 modity Credit Corporation to carry out the
15 wildlife habitat incentive program under that
16 section for fiscal years 2009 through 2012 shall
17 be made available to carry out contracts re-
18 ferred to in paragraph (1) which were entered
19 into prior to October 1, 2012 (including the
20 provision of technical assistance).

21 (B) OTHER.—On exhaustion of funds
22 made available under subparagraph (A), the
23 Secretary may use funds made available to
24 carry out the environmental quality incentives
25 program under chapter 4 of subtitle D of title

1 XII of the Food Security Act of 1985 (16
2 U.S.C. 3839aa et seq.) to continue to carry out
3 contracts referred to in paragraph (1) using the
4 provisions of law and regulation applicable to
5 such contracts as in existence on September 30,
6 2012.

7 (c) EFFECTIVE DATE.—The amendment made by
8 this section shall take effect on October 1, 2012.

9 **SEC. 2708. GREAT LAKES BASIN PROGRAM.**

10 (a) REPEAL.—Section 1240P of the Food Security
11 Act of 1985 (16 U.S.C. 3839bb–3) is repealed.

12 (b) EFFECTIVE DATE.—The amendment made by
13 this section shall take effect on October 1, 2012.

14 **SEC. 2709. CHESAPEAKE BAY WATERSHED PROGRAM.**

15 (a) REPEAL.—Section 1240Q of the Food Security
16 Act of 1985 (16 U.S.C. 3839bb–4) is repealed.

17 (b) TRANSITIONAL PROVISIONS.—

18 (1) EFFECT ON EXISTING CONTRACTS, AGREE-
19 MENTS, AND EASEMENTS.—The amendment made
20 by this section shall not affect the validity or terms
21 of any contract, agreement, or easement entered into
22 by the Secretary of Agriculture under section 1240Q
23 of the Food Security Act of 1985 (16 U.S.C.
24 3839bb–4) before October 1, 2012, or any payments

1 required to be made in connection with the contract,
2 agreement, or easement.
3 (2) FUNDING.—
4 (A) USE OF PRIOR YEAR FUNDS.—Not-
5 withstanding the repeal of section 1240Q of the
6 Food Security Act of 1985 (16 U.S.C. 3839bb–
7 4), any funds made available from the Com-
8 modity Credit Corporation to carry out the
9 Chesapeake Bay watershed program under that
10 section for fiscal years 2009 through 2012 shall
11 be made available to carry out contracts, agree-
12 ments, and easements referred to in paragraph
13 (1) that were entered into prior to October 1,
14 2012 (including the provision of technical as-
15 sistance).
16 (B) OTHER.—The Secretary may use
17 funds made available to carry out the regional
18 conservation partnerships program under sub-
19 title I of title XII of the Food Security Act of
20 1985, as added by section 2401 of this Act, to
21 continue to carry out contracts, agreements,
22 and easements referred to in paragraph (1)
23 using the provisions of law and regulation appli-
24 cable to such contracts, agreements, and ease-
25 ments as in existence on September 30, 2012.

1 (c) EFFECTIVE DATE.—The amendment made by
2 this section shall take effect on October 1, 2012.

3 **SEC. 2710. COOPERATIVE CONSERVATION PARTNERSHIP**
4 **INITIATIVE.**

5 (a) REPEAL.—Section 1243 of the Food Security Act
6 of 1985 (16 U.S.C. 3843) is repealed.

7 (b) TRANSITIONAL PROVISIONS.—

8 (1) EFFECT ON EXISTING CONTRACTS AND
9 AGREEMENTS.—The amendment made by this sec-
10 tion shall not affect the validity or terms of any con-
11 tract or agreement entered into by the Secretary of
12 Agriculture under section 1243 of the Food Security
13 Act of 1985 (16 U.S.C. 3843) before October 1,
14 2012, or any payments required to be made in con-
15 nection with the contract or agreement.

16 (2) FUNDING.—

17 (A) USE OF PRIOR YEAR FUNDS.—Not-
18 withstanding the repeal of section 1243 of the
19 Food Security Act of 1985 (16 U.S.C. 3843),
20 any funds made available from the Commodity
21 Credit Corporation to carry out the cooperative
22 conservation partnership initiative under that
23 section for fiscal years 2009 through 2012 shall
24 be made available to carry out contracts and
25 agreements referred to in paragraph (1) that

1 were entered into prior to October 1, 2012 (in-
2 cluding the provision of technical assistance).
3 (B) OTHER.—On exhaustion of funds
4 made available under subparagraph (A), the
5 Secretary may use funds made available to
6 carry out the regional conservation partnerships
7 program under subtitle I of title XII of the
8 Food Security Act of 1985, as added by section
9 2401 of this Act, to continue to carry out con-
10 tracts and agreements referred to in paragraph
11 (1) using the provisions of law and regulation
12 applicable to such contracts and agreements as
13 in existence on September 30, 2012.
14 (c) EFFECTIVE DATE.—The amendment made by
15 this section shall take effect on October 1, 2012.

16 **SEC. 2711. ENVIRONMENTAL EASEMENT PROGRAM.**

17 Chapter 3 of subtitle D of title XII of the Food Secu-
18 rity Act of 1985 (16 U.S.C. 3839 et seq.) is repealed.

19 **SEC. 2712. TECHNICAL AMENDMENTS.**

20 (a) Section 1201(a) of the Food Security Act of 1985
21 (16 U.S.C. 3801(a)) is amended in the matter preceding
22 paragraph (1) by striking "E" and inserting "I".
23 (b) Section 1211(a) of the Food Security Act of 1985
24 (16 U.S.C. 3811(a)) is amended by striking "predomi-
25 nate" each place it appears and inserting "predominant".

1 (c) Section 1242(i) of the Food Security Act of
2 1985(16 U.S.C. 3842(i)) is amended in the subsection
3 heading by striking "SPECIALITY" and inserting "SPE-
4 CIALTY".

5 TITLE III—TRADE

6 Subtitle A—Food for Peace Act

7 SEC. 3001. SET-ASIDE FOR SUPPORT FOR ORGANIZATIONS 8 THROUGH WHICH NONEMERGENCY ASSIST- 9 ANCE IS PROVIDED.

10 Effective October 1, 2012, section 202(e)(1) of the
11 Food for Peace Act (7 U.S.C. 1722(e)(1)) is amended—
12 (1) in the matter preceding subparagraph (A),
13 by striking "13 percent" and inserting "15 per-
14 cent"; and
15 (2) in subparagraph (A), by striking "new" and
16 inserting "and enhancing".

17 SEC. 3002. FOOD AID QUALITY.

18 Section 202(h) of the Food for Peace Act (7 U.S.C.
19 1722(h)) is amended—
20 (1) by striking paragraph (1) and inserting the
21 following:
22 "(1) IN GENERAL.—The Administrator shall
23 use funds made available for fiscal year 2013 and
24 subsequent fiscal years to carry out this title—

DEPARTMENT OF AGRICULTURE

Commodity Credit Corporation

7 CFR Part 1410

RIN 0560–AH80

Conservation Reserve Program

AGENCY: Commodity Credit Corporation, USDA.

ACTION: Interim rule.

SUMMARY: The Commodity Credit Corporation (CCC) is amending the Conservation Reserve Program (CRP) regulations to implement provisions of the Food, Conservation, and Energy Act of 2008 (the 2008 Farm Bill). The 2008 Farm Bill generally extends the existing CRP through 2012 with some changes in eligibility requirements. The changes in this rule include adding alfalfa to the definition of agricultural commodity for the purposes of determining cropping history, adding incentives for limited resource farmers and Indian tribes, adding pollinator habitat incentives, adding a provision allowing preference for local residents in accepting competitive offers, adding an additional waiver provision to exclude certain acreage for CRP county acreage maximums, and clarifying the limited harvesting and grazing activities that may be allowed on CRP land. The purpose of CRP is to cost-effectively assist producers in conserving and improving soil, water, wildlife, and other natural resources by converting environmentally-sensitive acreage from the production of agricultural commodities to a long-term vegetative cover and to address issues raised by State, regional and national conservation initiatives.

DATES: *Effective Date:* This rule is effective July 28, 2010.

Comment Date: We will consider comments that we receive by September 27, 2010.

ADDRESSES: We invite you to submit comments on this interim rule. In your comment, include the volume, date, and page number of this issue of the **Federal Register**. You may submit comments by any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov.* Follow the online instructions for submitting comments.
- *Mail:* Director, Conservation and Environmental Programs Division (CEPD), USDA FSA CEPD, Mail Stop 0513, 1400 Independence Ave, SW., Washington, DC 20250–0513.
- *Hand Delivery or Courier:* Deliver comments to the above address.

Comments may be inspected at the mail address listed above between 8:00 a.m. and 4:30 p.m., Monday through Friday, except holidays. A copy of this interim rule is available through the U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) home page at *http://www.fsa.usda.gov/.*

FOR FURTHER INFORMATION CONTACT: Beverly J. Preston, CRP Program Manager, USDA FSA CEPD, Mail Stop 0513, 1400 Independence Ave, SW., Washington, DC 20250–0513 at, 1400 Independence Avenue, SW., Washington, DC 20250–0513; telephone: (202) 720–9563; e-mail: *beverly.preston@wdc.usda.gov.* Persons with disabilities who require alternative means for communication (Braille, large print, audiotape, etc.) should contact the USDA Target Center at 202–720–2600 (voice and TDD).

SUPPLEMENTARY INFORMATION:

Background

This rule amends CRP regulations in 7 CFR part 1410 to implement certain changes to CRP as required by the 2008 Farm Bill (Pub. L. 110–246). This is the third of three interim rules that CCC has published to implement 2008 Farm Bill changes to CRP. On June 29, 2009, (74 FR 30907–30912) CCC published an interim rule to implement CRP provisions in the 2008 Farm Bill regarding farmable wetlands, thinning of trees to improve the condition of resources, income and payment limitations, and address issues raised by State, regional, and National conservation initiatives.

On May 14, 2010, (75 FR 27165–69) CCC published an interim rule to implement provisions in the 2008 Farm Bill regarding transition incentives for CRP participants with expiring contracts to sell or lease the land to a beginning or socially disadvantaged farmer or rancher.

This interim rule implements the remaining 2008 Farm Bill CRP provisions, which include updating cropping history requirements, adding an additional waiver provision as an exclusion to exceed the 25 percent of the county cropland CRP acreage maximum, adding an acceptability-of-offer provision to allow local resident preference, and clarifying permissive uses of CRP land. It also adds provisions for pollinator habitat incentives and incentives for limited resource farmers and ranchers and Indian tribes. This rule also updates dates and makes minor plain language improvements. This interim rule is effective on publication, but is subject to modification after the consideration of comments. After the comment period closes, CCC expects to publish a final rule that will discuss the comments and implement any amendments determined to be justified based on a review of the comments.

CRP participants enroll land under contracts for 10 to 15 years in exchange for annual rental payments and financial assistance to install certain conservation practices and to maintain approved vegetative, tree, or other appropriate covers. A wide range of conservation practices may be enrolled under CRP including, for example, introduced and native grasses and legumes, hardwood trees, wildlife habitat, grass waterways, filter strips, riparian buffers, wetlands, rare and declining habitat, upland bird habitat, longleaf pine, and duck nesting habitat. The basic structure and nature of CRP remains the same.

Definitions

This rule amends § 1410.2, "Definitions," to add a definition for "pollinator." The 2008 Farm Bill allows the Secretary to add the development of pollinator habitat and practices to encourage native and managed pollinators to any of the USDA conservation programs. The 2008 Farm Bill does not define "native or managed pollinator." This rule adds a definition of "pollinator" to mean "an insect or other animal that carries pollen from one flower to another." Other animals would include birds and bats.

Consistent with section 2105 of the 2008 Farm Bill, this rule also adds alfalfa, other multi-year grasses, and legumes grown in rotation to the definition of "agricultural commodity." This will permit, for example, land with alfalfa grown under a long-term rotation with another agricultural commodity to meet the cropping history requirement for eligible land.

This rule adds definitions for "limited resource farmer or rancher" and "Indian tribe" that are consistent with the definitions used for other USDA programs and with the 2008 Farm Bill. The 2008 Farm Bill gives the term "Indian tribe" the definition given under section 4(e) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b(e)). In implementing the Indian Self-Determination and Education Assistance Act, the Department of the Interior, Bureau of Indian Affairs, and the Department of Health and Human Services, Indian Health Service, established the definition of "Indian tribe" in 25 CFR 900.6. This rule adds that definition to 7 CFR 1410.2. The definition of "limited resource farmer or

rancher" in this rule is consistent with the definition that applies under the regulations for the Environmental Quality Incentives Program (EQIP) at 7 CFR 1466.3. These definitions are needed because this rule adds authority to provide additional incentives for enrollment of Indian tribes and limited resource farmers and ranchers.

This rule amends the definitions for "conserving use" and "considered planted" to update the period of time—to the period 2002 through 2007—that is considered for land use history. This change is consistent with other updates to the cropping history requirement for eligible land, as described below, required by the 2008 Farm Bill.

Maximum County Acreage

This rule amends § 1410.4, "Maximum County Acreage," to add an additional waiver provision as an exclusion of certain acreage enrolled under CRP. Under the current regulations, the amount of cropland that may be enrolled under CRP and the Wetlands Reserve Program, as specified in § 1410.4, may not exceed 25 percent of a county's total cropland unless CCC waives this cap. To implement a waiver, CCC must determine that enrolling additional land would not adversely affect the local economy of the county and that operators in the county are having difficulties complying with conservation plans implemented under 7 CFR part 12. The existing waiver provisions are not changed with this rule. This rule adds an additional waiver provision specifying that CCC may exclude high-priority continuous signup acreage, including acreage in the Conservation Reserve Enhancement Program (CREP), Farmable Wetlands Program (FWP), or State Acreage for Wildlife Enhancement (SAFE) Program, from the 25 percent cropland limitation, if the county government agrees. The 2008 Farm Bill specifies that the Secretary may implement the waiver to exclude for high-priority acreage; it does not require CCC to do so.

Under CRP, eligible land may be enrolled competitively during publicly announced general signups. An environmental benefits index (EBI) to optimize costs and benefits is used for competitive enrollment. When an offer is made, FSA collects data for a number of factors for each piece of ground offered into CRP. Each offer is assigned a point score based on its relative environmental factors and competes with all other offers. Offer acceptability is determined based on the ranking results. Generally, FSA has used these EBI factors to assess the environmental benefits for the land offered:

- Wildlife habitat benefits;
- Water quality benefits from reduced erosion, runoff, and leaching;
- On-farm benefits from reduced erosion;
- Benefits that will likely endure beyond the contract period;
- Air quality benefits from reduced wind erosion; and
- Cost.

Land may also be enrolled non-competitively on a continuous basis if the land meets certain criteria. That is not changing with this rule. Non-competitive continuous enrollment is available for certain high-priority practices including, but not limited to, filter strips, wetlands, buffers, grass waterways, land enrolled under CREP, FWP, and for certain initiatives such as wetland restoration, longleaf pine restoration, quail habitat, and SAFE. This rule amends the regulations to allow the special high-priority land including acreage in CREP, FWP, or SAFE Program to be excluded from the 25 percent maximum county acreage limit if the county government agrees.

Eligible Land

As provided for in the existing CRP regulations in § 1401.6, "Eligible Land," eligible land for CRP must be cropland with a history of production of tillable crops or marginal pastureland. The purpose of this eligibility requirement, which is not changing with this rule, is to ensure CRP is used to convert environmentally-sensitive land to a long-term environmentally-beneficial cover crop.

As provided in the 2008 Farm Bill, this rule amends § 1410.6, "Eligible Land," to change the dates of the cropping history required for certain cropland to be eligible. In the current regulation, eligible cropland must have been planted or considered planted for four of the six years during the period of 1996 through 2001. This rule amends that section to modify the cropping history dates to the four of the six years during 2002 through 2007. This rule also updates this section to refer to CCC rather than the Deputy Administrator to reflect more consistently that the program is a CCC program. References to the dates for expiring Water Bank Program contracts are removed from the eligibility requirements for marginal pastureland because all such contracts have already expired.

Acceptability of Offers

This rule amends § 1410.31, "Acceptability of Offers," to add the 2008 Farm Bill specified "local preference" as a factor in offer acceptability. This means that CCC may preferentially accept offers from residents of the county or a contiguous county where the land is offered for enrollment, provided that offer has at least equal expected benefits to offers from non-resident landowners. Section 2110 of the 2008 Farm Bill requires the Secretary to give preference to such offers.

Permissive Uses of CRP Land

The CRP regulations limit the uses of CRP land to a list of uses specified in § 1410.63 "Permissive Uses." The intent is to ensure that CRP land is not used for activities that would tend to defeat the conservation purposes of the program. Permissive uses must be consistent with the conservation of soil, water quality and wildlife habitat, including habitat during nesting season for birds in the area. To achieve this goal, section 2108 of the 2008 Farm Bill clarifies the specific restrictions on managed harvesting, grazing, other commercial uses of forage on CRP land, and installation of wind turbines. Therefore, § 1410.63 is amended to implement the specific permissive uses, and permissive use restrictions, as specified in the 2008 Farm Bill. The amendments to permissive uses are as follows:

- Provisions for managed harvesting and grazing uses are revised and clarified, as specified in the 2008 Farm Bill. Specific types of harvesting and grazing are allowed, in exchange for a payment reduction as determined by CCC. The provision for "haying" is removed, but haying is understood to be a type of harvesting. Managed harvesting provisions are expanded to include uses in addition to biomass harvest, in exchange for a payment reduction as determined by CCC. The specific requirement for harvesting biomass not more than once every three years is removed, but CCC will continue to require that biomass harvesting and any other harvesting not defeat the conservation purposes of the contract. Appropriate vegetation management requirements for the land will apply including the timing, frequency, and duration that is consistent with the purposes of CRP. Managed harvesting will be conducted according to an approved CRP conservation plan.
- Routine grazing, in exchange for a payment reduction, is added as a permissive use, as specified in the 2008 Farm Bill. Appropriate vegetation management requirements and stocking rates for the land will apply, as appropriate, consistent with the Natural Resources Conservation Service (NRCS) Field Office Technical Guide (FOTG) grazing standards that are suitable for

continued routine grazing. The allowed frequency and timing of routine grazing will take into account regional differences that are consistent with the purposes of CRP according to an approved CRP conservation plan. The provision for managed grazing that is incidental to the gleaning of crop residue is removed, but this practice is understood to be a type of routine grazing.

- Prescribed grazing to control invasive species, in exchange for a payment reduction, is added as a permissive use, as specified in the 2008 Farm Bill. Appropriate vegetation management requirements and stocking rates for the land will apply. The allowed frequency of prescribed grazing will take into account regional differences that are consistent with the purposes of CRP according to an approved CRP conservation plan. Invasive species such as kudzu and leafy spurge will be targeted.
- Harvesting, grazing, or other commercial use of forage allowed in response to a drought or other emergency, is added as a permissive use in exchange for a payment reduction. Emergency haying and grazing has been allowed in the past, in response to droughts and other emergencies, but was not specified as a permitted use in the CFR.
- Wind turbine installation provisions are revised; the 2008 Farm Bill requires a payment reduction for this use.

The following permissive use provisions in § 1410.63 remain unchanged:

- The general provision that the permissive uses in this section may be allowed, but are not automatically allowed, is unchanged.
- Commercial shooting preserve use provisions are unchanged.
- Spot grazing use provisions are unchanged.
- Forestry maintenance use provisions are unchanged.
- Sale of carbon, water quality, or other environmental credits provisions are unchanged.

As noted above, in § 1410.63, there is the general provision that the permissive uses may be allowed, but are not automatically allowed. All of the permissive uses in § 1410.63 require approval by CCC, which also means that they may not be approved for use in a particular region or for a specific CRP contract. CCC will exercise the discretionary authority provided in section 2108 of the 2008 Farm Bill to determine which activities will be approved for specific CRP contracts.

As noted above, the 2008 Farm Bill requires a payment reduction for the permissive use for wind turbine installation. All of the permissive uses except commercial shooting preserves and sale of carbon, water quality, or other environmental credits will, as in the past, require a payment reduction as determined by CCC. The reduction for the installation of wind turbines is new. The 2008 Farm Bill requires the payment reduction, but gives CCC discretionary authority as to the amount of the reduction.

Incentives for Native and Managed Pollinator Habitat, Limited Resource Farmers and Ranchers, and Indian Tribes

Section 2708 of the 2008 Farm Bill allows, but does not require, the Secretary to add provisions to encourage the development of habitat for, and use of conservation practices to benefit, native and managed pollinators. Accordingly, this rule adds a new paragraph to § 1410.62 "Miscellaneous," to add a provision that will allow approval of practices to encourage the development of habitat for, and use of conservation practices to benefit, native and managed pollinators. FSA, working with NRCS and State technical committees, will develop and define conservation practice standards that provide habitats for pollinators. The requirements in those practices for acreage and other characteristics of habitat will take into account appropriate habitat needs relevant to specific geographical areas and species.

Section 2708 of the 2008 Farm Bill also allows the Secretary to provide special incentives for certain categories of participants, including Indian tribes and limited resource farmers and ranchers. This rule therefore amends § 1410.62, "Miscellaneous," to add incentives for Indian tribes and for limited resource farmers and ranchers. Implementation of the incentives will be coordinated with other USDA programs that provide assistance, including CRP technical assistance, to these farmers and ranchers. Implementation will be subject to funding availability and acreage limits that apply to CRP as a whole.

Notice and Comment

CCC is not required by 5 U.S.C. 553 or any other provision of law to publish a notice of proposed rulemaking with respect to the subject matter of this rule. CCC is authorized by section 2904 of the 2008 Farm Bill to issue an interim rule effective on publication with an opportunity for comment.

Executive Order 12866

This rule has been determined to be economically significant and was reviewed by the Office of Management and Budget (OMB) under Executive Order 12866. A Cost Benefit Analysis is summarized below and is available from the contact information listed above.

Cost Benefit Analysis

The changes to CRP in this rule are expected to cost about $6.7 million per year over ten years (2011–2020). This is a net cost that reflects roughly $77 million in additional CRP payments to participants over the next ten years for additional land enrolled through the county maximum acreage waivers to exclude certain acreage and revised cropping history requirements and payments for pollinator habitat practices, minus roughly $10 million in reduced payments for the revised permissive uses. The benefits to participants will be the net additional $6.7 million per year over the next ten years. There are expected to be additional non-quantifiable environmental benefits from the waivers to exclude that will allow more environmentally sensitive acres to be enrolled through continuous signup, from additional highly erodible land enrollment that could result from making land in long-term hay rotations eligible, and from the incentives for pollinator habitat.

The other provisions in this rule, such as local preference, are expected to have little to no cost. These provisions will largely substitute one CRP participant for another, or one practice for another, leading in a shift in costs and benefits to different participants and practices, but little net cost or benefit for CRP as a whole.

Regulatory Flexibility Act

It has been determined that the Regulatory Flexibility Act is not applicable to this interim rule because CCC is not required by 5 U.S.C. 553 or any other provision of law to publish a notice of proposed rulemaking for this rule. CCC is authorized by section 2904 of the 2008 Farm Bill to issue an interim rule effective on publication with an opportunity for comment.

Environmental Evaluation

In 2003, FSA, on behalf of CCC, finalized a Programmatic Environmental Impact Statement (PEIS) for the reauthorization of the CRP in Title II of the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) and published a Record of Decision (ROD). Consistent with provisions in 40 CFR 1508.28, in order to focus primarily on

the issues relevant to this specific rule and not duplicate material found in the 2003 EIS, FSA tiered a Programmatic Environmental Assessment (PEA) on select provisions of the 2008 Farm Bill for CRP to the 2003 PEIS; tiering is appropriate when the sequence of analysis is lesser in scope than the initial programmatic statement.

The PEA incorporated by reference general discussions and analysis from the 2003 PEIS to assess potential environmental impacts associated with implementation of only those non-discretionary provisions identified in this rule for CRP consistent with the 2008 Farm Bill. The Final PEA and Finding of No Significant Impact (FONSI) on select provisions of the 2008 Farm Bill for CRP was published in the **Federal Register** on December 16, 2008 (73 FR 76331–76332) for public review and comment. The proposed changes analyzed in the PEA were separate and distinct from the proposals for discretionary changes examined in the 2010 Final Supplemental Environmental Impact Statement (Final SEIS). For those 2008 Farm Bill changes not examined in the PEA where discretion was exercised, FSA published a Final SEIS to the 2003 Programmatic Environmental Impact Statement (PEIS) on CRP on February 19, 2010, (75 FR 7438–7440) for public comment and review.

On behalf of the Commodity Credit Corporation, FSA prepared a Final Supplemental Environmental Impact Statement (SEIS) for CRP and the Notice of Availability (NOA) was published in the **Federal Register** (FR) on June 18, 2010 (75 FR 34737–34738). Based on a thorough evaluation of the resource areas affected by CRP, a detailed analysis of the Alternatives, and a comprehensive review of public comments, FSA has issued a Record of Decision (ROD). This decision was made after comparing overall environmental impacts and other relevant information with regard to the reasonable alternatives considered in the Final SEIS. The ROD can be found on FSA's Web site: *http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecrc&topic=nep-cd.*

Executive Order 12372

This program is not subject to Executive Order 12372, which requires consultation with State and local officials. See the notice related to 7 CFR part 3015, subpart V, published in the **Federal Register** on June 24, 1983 (48 FR 29115).

Executive Order 12988

This rule has been reviewed under Executive Order 12988, Civil Justice Reform. This final rule is not retroactive and does not preempt State or local laws, regulations, or policies unless they represent an irreconcilable conflict with this rule. Before any judicial action may be brought regarding provisions of this rule, the administrative appeal provisions of 7 CFR parts 11, 624, and 780 must be exhausted.

Executive Order 13132

The policies contained in this rule do not have any substantial direct effect on States, on the relationship between the Federal government and the States, or on the distribution of power and responsibilities among the various levels of government. Nor does this rule impose substantial direct compliance costs on State and local governments. Therefore, consultation with the States is not required.

Executive Order 13175

The policies contained in this rule do not have tribal implications that preempt tribal law.

USDA will undertake, within 6 months after this rule becomes effective, a series of regulation Tribal consultation sessions to gain input by Tribal officials concerning the impact of this rule on Tribal governments, communities, and individuals. These sessions will establish a baseline of consultation for future actions, should any become necessary, regarding this rule. Reports from these sessions for consultation will be made part of the USDA annual reporting on Tribal Consultation and Collaboration. USDA will respond in a timely and meaningful manner to all Tribal government requests for consultation concerning this rule and will provide additional venues, such as webinars and teleconferences, to periodically host collaborative conversations with Tribal leaders and their representatives concerning ways to improve this rule in Indian country.

Unfunded Mandates

This rule contains no Federal mandates under the regulatory provisions of Title II of the Unfunded Mandate Reform Act of 1995 (UMRA, Pub. L. 104–4) for State, local, or tribal governments, or the private sector. In addition, CCC is not required to publish a notice of proposed rulemaking for this rule. Therefore, this rule is not subject to the requirements of sections 202 and 205 of UMRA.

Small Business Regulatory Enforcement Fairness Act of 1996

This rule has been determined to be Major under the Small Business Regulatory Enforcement Fairness Act of 1996, (Pub. L. 104–121) (SBREFA). SBREFA normally requires that an agency delay the effective date of a major rule for 60 days from the date of publication to allow for Congressional review. Section 808 of SBREFA allows an agency to make a major regulation effective immediately if the agency finds there is good cause to do so. Section 2904(c) provides that the authority in Section 808 of SBREFA will be used in implementing the 2008 Farm bill changes to the CRP. Consistent with section 2904(c) of the 2008 Farm Bill, FSA finds that it would be contrary to the public interest to delay implementation of this rule because it would significantly delay implementation of the program changes required by the 2008 Farm Bill by impeding the conduct of future general signups without having these additional changes to the program regulations in place. Therefore, this rule is effective on the date of its publication in the **Federal Register**.

Federal Domestic Assistance Program

The title and number of the Federal Domestic Assistance Program in the Catalog of Federal Domestic Assistance to which this rule applies is the Conservation Reserve Program—10.069.

Paperwork Reduction Act

The regulations in this rule are exempt from the requirements of the Paperwork Reduction Act (44 U.S.C. Chapter 35), as specified in section 2904 of the 2008 Farm Bill, which provides that these regulations be promulgated and the programs administered without regard to the Paperwork Reduction Act.

E-Government Act Compliance

CCC is committed to complying with the E-Government Act, to promote the use of the Internet and other information technologies to provide increased opportunities for citizen access to Government information and services, and for other purposes.

List of Subjects in 7 CFR Part 1410

Administrative practice and procedure, Agriculture, Environmental protection, Grant programs—Agriculture, Natural resources, Reporting and recordkeeping requirements, Soil conservation, Technical assistance, Water resources, Wildlife.

■ For the reasons explained above, this rule amends 7 CFR part 1410 as follows:

PART 1410—CONSERVATION RESERVE PROGRAM

■ 1. The authority citation for 7 CFR part 1410 continues to read as follows:

Authority: 15 U.S.C. 714b and 714c; 16 U.S.C. 3801–3847.

■ 2. Amend § 1410.2 as follows:

■ a. Revise the definition in paragraph (b) for "Agricultural commodity" to read as set forth below;

■ b. Add definitions in paragraph (b), in alphabetical order, for "Indian tribe," "Limited resource farmer or rancher," and "Pollinator" to read as set forth below;

■ c. Amend the definition of "Conserving use" by removing the words "1996 through 2001" each time they appear and adding, in their place, the words "2002 through 2007"; and

■ d. Amend the definition of "Considered planted" by removing the words "or will expire during calendar year 2000, 2001, or 2002".

§ 1410.2 Definitions.

* * * * *

(b) * * *

Agricultural commodity means:

(1) Any crop planted and produced by annual tilling of the soil or on an annual basis by one-trip planters,

(2) Sugarcane planted or produced in a State, or

(3) Alfalfa and other multi-year grasses and legumes grown in a rotation practice as approved by CCC.

* * * * *

Indian tribe means any Indian tribe, band, nation, or other organized group, or community, including pueblos, rancherias, colonies and any Alaska Native Village, or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1601–1629h), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

* * * * *

Limited resource farmer or rancher means:

(1) A person with direct or indirect gross farm sales of not more than $155,200 in each of the previous two calendar years preceding the year of enrollment (adjusted for inflation using Prices Paid by Farmer Index as compiled by the USDA National Agricultural Statistics Service), and

(2) A total household income at or below the national poverty level for a family of four, or less than 50 percent of county median household income in each of the previous two years (to be determined annually using U.S. Department of Commerce data).

* * * * *

Pollinator means an insect or other animal that carries pollen from one flower to another.

* * * * *

■ 3. Revise § 1410.4(b) to read as follows:

§ 1410.4 Maximum county acreage.

* * * * *

(b) The restrictions in paragraph (a) of this section may be waived by CCC as follows:

(1) If CCC determines that such action would not adversely affect the local economy of the county and that operators in the county are having difficulties complying with conservation plans implemented under part 12 of this title; or

(2) Cropland in a county enrolled under continuous signup provisions as specified in § 1410.30 or § 1410.50 may be excluded from the restrictions in paragraph (a) of this section, as determined by CCC, provided that the county government concurs.

* * * * *

§ 1410.6 [Amended]

■ 4. Amend § 1410.6 as follows:

■ a. In paragraphs (a)(1), (a)(2) introductory text, (a)(2)(i)(B), (a)(2)(i)(C), (a)(2)(ii) introductory text, (a)(2)(ii))B), (a)(3), (b)(1) introductory text, (b)(2)(iii), (b)(6), (b)(7), (b)(11), (b)(12), (c) introductory text and (c)(3), remove the words "the Deputy Administrator" each time they appear and add, in their place, the word "CCC",

■ b. In paragraph (a)(1), remove the words "1996 through 2001" and add, in their place, the words "2002 through 2007",

■ c. Remove paragraph (a)(2)(i),

■ d. Redesignate paragraph (a)(2)(ii) as paragraph (a)(2)(i) and reserve paragraph (a)(2)(ii), and

■ e. In newly redesignated paragraph (a)(2)(i), introductory text, second sentence, add the word "by" before the word "CCC".

■ 5. Amend § 1410.31 to redesignate paragraph (c) as paragraph (d) and to add new paragraph (c) to read as follows:

§ 1410.31 Acceptability of offers.

* * * * *

(c) Notwithstanding paragraph (b) of this section, when all other appropriate factors are equivalent, CCC may give preference to offers from residents of the county or contiguous county where the offered land is located.

* * * * *

■ 6. Amend § 1410.62 as follows:

■ a. In paragraph (g), remove the words "beginning and socially disadvantaged" and add, in their place, the words "Indian tribes and beginning, limited resource, and socially disadvantaged" and

■ b. Add paragraph (h) to read as follows:

§ 1410.62 Miscellaneous.

* * * * *

(h) As determined by CCC, consistent with the purposes of CRP, the development of habitat for, and use of conservation practices for, native and managed pollinators may be authorized.

■ 7. Amend § 1410.63 by revising paragraph (c) to read as follows:

§ 1410.63 Permissive uses.

* * * * *

(c) The following activities may be permitted, as determined by CCC, on CRP enrolled land insofar as they are consistent with the conservation purposes of the program including timing, frequency, and duration as provided in an approved CRP conservation plan that identifies appropriate vegetative management requirements:

(1) Managed harvesting, including harvest of biomass, but only in exchange for a payment reduction as determined by CCC and in accordance with harvest frequency and timing of harvesting activities outside the official nesting and broodrearing season only as identified in an approved CRP conservation plan;

(2) Routine grazing, but only in exchange for a payment reduction as determined by CCC and in accordance with appropriate vegetative management requirements and stocking rates for the land, grazing frequency, and grazing periods outside the official nesting and broodrearing season only as identified in an approved CRP conservation plan;

(3) Prescribed grazing to control invasive species, but only in exchange for a payment reduction as determined by CCC and in accordance with appropriate vegetative management requirements and stocking rates for the land, grazing frequency, and grazing periods outside the official nesting and broodrearing season only as identified in an approved CRP conservation plan;

(4) Harvesting, grazing, or other commercial use of the forage on the land in response to a drought or other emergency, but only in exchange for a payment reduction as determined by CCC;

(5) Wind turbines on CRP land installed in numbers and locations as determined appropriate by CCC

considering the location, size, and other physical characteristics of the land, the extent to which the land contains wildlife and wildlife habitat, and the purposes of CRP, but only in exchange for a payment reduction as determined by CCC;

(6) Spot grazing, if necessary for control of weed infestation, and not to exceed a 30-day period according to an approved conservation plan, but only in exchange for a payment reduction as determined by CCC;

(7) Forestry maintenance such as pruning, thinning, and timber stand improvement on lands converted to forestry use, but only in accordance with a conservation plan, and only in exchange for a payment reduction as determined by CCC; and

(8) The sale of carbon, water quality, or other environmental credits, as determined appropriate by CCC.

Signed at Washington, DC, on July 21, 2010.

Jonathan W. Coppess,

Executive Vice President, Commodity Credit Corporation.

[FR Doc. 2010–18473 Filed 7–27–10; 8:45 am]

BILLING CODE 3410–05–P

NUCLEAR REGULATORY COMMISSION

10 CFR Part 110

[NRC–2008–0567]

RIN 3150–AI16

Export and Import of Nuclear Equipment and Material; Updates and Clarifications

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The United States Nuclear Regulatory Commission (NRC) is amending its regulations that govern the export and import of nuclear equipment and material. This rule allows International Atomic Energy Agency Code of Conduct on the Safety and Security of Radioactive Sources Category 1 and 2 quantities of radioactive materials to be imported under a general license. This rule also revises the definition of "radioactive waste" and removes the definition of "incidental radioactive material." In addition, this rule updates, clarifies, and corrects several provisions.

DATES: The rule is effective on August 27, 2010.

ADDRESSES: You can access publicly available documents related to this document using the following methods:

Federal e-Rulemaking Portal: Go to *http://www.regulations.gov* and search for documents filed under Docket ID [NRC–2008–0567]. Address questions about NRC dockets to Ms. Carol Gallagher at 301–492–3668; e-mail *Carol.Gallagher@nrc.gov.*

NRC's Public Document Room (PDR): The public may examine and have copied for a fee publicly available documents at the NRC's PDR, Room O1 F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland.

NRC's Agencywide Documents Access and Management System (ADAMS): Publicly available documents created or received at the NRC are available electronically at the NRC's electronic Reading Room at *http://www.nrc.gov/reading-rm/adams.html.* From this page, the public can gain entry into ADAMS, which provides text and image files of NRC's public documents. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's PDR reference staff at 1–800–397–4209, 301–415–4737, or by e-mail to *pdr.resource@nrc.gov.*

FOR FURTHER INFORMATION CONTACT: Brooke G. Smith, Senior International Policy Analyst, Office of International Programs, U.S. Nuclear Regulatory Commission, MS–O4E21, Washington, DC 20555–0001; telephone: (301) 415–2347; e-mail: *brooke.smith@nrc.gov,* or Jill Shepherd, Licensing Officer, Office of International Programs, U.S. Nuclear Regulatory Commission, MS–O4E21, Washington, DC 20555–0001; telephone: (301) 415–3635; email: *jill.shepherd@nrc.gov.*

SUPPLEMENTARY INFORMATION:

I. Background
II. Analysis of Public Comments on Proposed Rule
III. Section-by-Section Analysis

I. Background

On June 23, 2009, the NRC published a proposed rule that requested comments on the proposed changes to 10 CFR part 110, Export and Import of Nuclear Equipment and Material (74 FR 29614). This final rule updates, clarifies, and corrects several provisions in 10 CFR part 110 to improve NRC's regulatory framework for the export and import of nuclear equipment, material, and radioactive waste. It also clarifies and corrects the regulations addressing the general license for the export of byproduct material. In addition, changes are made to the regulations governing the export and import of International Atomic Energy Agency (IAEA) Code of Conduct on the Safety and Security of Radioactive Sources Category 1 and Category 2 quantities of radioactive materials listed in appendix P to 10 CFR part 110 and the definition of "radioactive waste" in 10 CFR part 110. A discussion of the most significant changes follows.

A. Category 1 and 2 Quantities of Radioactive Material Listed in Appendix P to 10 CFR Part 110

The NRC reevaluated the need for a specific license for the import of Category 1 and 2 quantities of radioactive material to a U.S.-licensed user in light of enhancements made to the NRC's domestic regulatory framework. As a result, the NRC is amending 10 CFR part 110 to allow imports of Category 1 and 2 quantities of materials listed in Appendix P under a general license.

After the attacks of September 11, 2001, the Commission determined that certain licensed material should be subject to enhanced security requirements and safeguarded during transport, and that individuals with unescorted access to risk-significant quantities of radioactive material should be subject to background investigations. The results of vulnerability assessments performed by the NRC were used in the development of security enhancement orders that were issued to licensees using a graded approach based on the relative risk and quantity of material possessed by the licensee. (70 FR 72128; December 1, 2005) These security orders specifically address the security of byproduct material possessed in quantities greater than, or equal to, Category 1 and 2 quantities. The orders provide for enhanced security measures for such things as license verification before transfer, intrusion detection and response, access control, and coordination with local law enforcement authorities. The orders also contain requirements for the licensee to determine the trustworthiness and reliability of individuals permitted unescorted access to risk-significant radioactive materials. The determination involves a background investigation of the individual.

With the passage of the Energy Policy Act of 2005 giving the NRC new fingerprinting authority, the Commission determined that individuals with access to Category 1 and 2 quantities of radioactive material warrant fingerprinting and FBI criminal history records checks.

By the end of 2007, the NRC had issued orders to all NRC licensees that possessed Category 1 or 2 quantities of radioactive material (72 FR 70901; December 13, 2007) to require fingerprinting and FBI criminal history

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

SURFACE ROUGHENING

(Ac.)

CODE 609

DEFINITION

Performing tillage operations that create random roughness of the soil surface

PURPOSE

- Reduce wind erosion
- Reduce dust emissions into the air
- Protect plants from abrasion by wind-blown particles.

CONDITIONS WHERE PRACTICE APPLIES

On soils that have a surface layer suitable for clod formation and have a high potential for wind erosion due to lack of surface cover. This practice should not be used as a primary erosion control practice.

This practice applies on soils whose surface layer has a wind erodibility factor (I) value of 104 or less (see the National Agronomy Manual, Exhibit 502-2).

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

Tillage operations done for this purpose will produce random roughness (RR) values (inches) large enough to achieve a 25% reduction in the potential erosion rate (soil "I" value), **OR** reduce wind erosion during the management period by 25% as determined by the most current wind erosion technology.

The random roughness (K_{rr}) value used to estimate wind erosion shall be determined from Table 1. Random roughness (K_{rr}) shall be equal to or less than 0.75. The shaded area shows the RR – "I" factor combinations that meet the 25% reduction criterion.

Table 1. K_{rr} from Random Roughness (RR) and "I" Factor Values[1]

RR (in)	I = 104	I = 86	I ≤ 56
0.2"	1.0	1.0	1.0
0.4"	0.95	0.86	0.70
0.6"	0.88	0.76	0.51
0.8"	0.82	0.68	0.40
1.0"	0.78	0.62	0.34
1.2"	0.74	0.57	0.30
1.4"	0.72	0.54	0.27
1.6"	0.69	0.51	0.24

[1]Note-I factor values >134 have a K_{rr} = 1.0, & the I of 134 soil will not reach a 25% reduction at any RR.

Random Roughness (RR) values shall be estimated from the field operation table for random roughness [see the National Agronomy Manual Part 502, Exhibit 502-7], or estimated using the roughness pictures in Agriculture Handbook 703 Appendix C, pages 339 to 347.

Criteria to Protect Plants from Abrasion by Wind Blown Soil Particles

Tillage operations for this purpose will produce random roughness sufficient to reduce or eliminate surface creep (roller phase) and saltation during crop emergence and early crop development.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the Field Office Technical Guide.

Roughness created shall reduce the soil loss for the first growth period after planting the crop to the soil loss listed in National Agronomy Manual Table 502-4,

CONSIDERATIONS

This practice should be used when a well-planned and properly applied wind erosion control system fails for reasons beyond the control of the producer. These situations may exist when a low residue-producing crop is harvested too late in a growing season to produce sufficient residue cover, or when the planned erosion control system fails to control erosion during a high wind event.

Wide spacing of chisel points or skip chiseling (alternate chiseled/non-chiseled strips) for the first operation may permit salvaging part of a growing crop of small grain and leave undisturbed soil for later operations, if needed.

Spacing and depth of chisel operation are important to obtain uniform distribution of clods on the surface. Close spacing at shallow depths generally pulverizes the soil, and does not produce enough random roughness to decrease the soil-blowing potential.

Proper tillage equipment matched to the crop being grown and soil is important. In general, chisels or narrow sweeps may reduce potential soil blowing on loamy or fine textured soils. Roughening the soil surface with a lister/bedder or wide shovels on chisel shanks is more effective on soils whose surface layer has a wind erodibility factor (I) value of 104 and 86.

Emergency tillage (surface roughening) can be done on soil that has an "I" factor greater than 104 using deep tillage, when soil moisture is adequate to create a stable aggregate (clod) and when finer soil material can be brought to the surface.

Perform the initial tillage operation as soon as erosion starts, or as soon as it is evident that the existing cover or surface roughness is inadequate to control erosion below an acceptable level.

Begin surface roughening operations on the windward (up wind) edge of the field.

Ridging associated with the tillage is very important to controlling wind erosion. Tillage that creates ridging is done perpendicular to the direction of damaging wind. See conservation practice standard Cross Wind Ridges 588 for criteria to use ridging.

Surface crusts generally reduce soil erodibility. However, certain smooth, crusted soils with loose grains (sand size particles) on the soil surface may cause crusts to abrade rapidly. These soils include loamy fine sands and sandy loams that have significant portions of sand on the surface when crusted. They also include certain calcareous loams, silt loams, and silty clay loams that tend to form sand sized aggregates in the surface when crusted.

PLANS AND SPECIFICATIONS

Plans and specifications for establishment of this practice shall be prepared for each field or treatment unit according to the conditions and criteria in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

This practice will be performed as soon as possible when there is inadequate cover to protect the soil from potential wind erosion events or when a crusted soil condition occurs as sensitive crop is emerging and inadequate crop residues are present.

REFERENCES

USDA, Natural Resources Conservation Service, National Agronomy Manual, 3rd. Ed., October 2002. Part 502 Wind Erosion.

Reductions from Idaho Controls

Emissions Sources Affected by Burn Cessation Ordinances

Source	PM2.5	N0x	VOC	NH3	SO2
fireplace: general	0.016	0.002	0.013	0.000	0.000
woodstove: fireplace inserts, non-EPA certified	0.029	0.003	0.050	0.000	0.000
woodstove: freestanding, non-EPA certified	0.035	0.003	0.063	0.000	0.000
Furnace: indoor, wood fired, non-EPA certified	0.005	0.000	0.002	0.000	0.000
Hydronic heater, outdoor	0.001	0.000	0.000	0.000	0.000
Firelog	0.004	0.001	0.005	0.000	0.000
waste disposal, open-burning	0.000	0.000	0.005	0.000	0.000
subtotal	**0.090**	**0.009**	**0.138**	**0.000**	**0.000**
less emissions reductions due to woodstove change-outs	0.030	0.000	0.060	0.000	0.000
total	0.060	0.009	0.078	0.000	0.000

In order to estimate the emissions that would be "turned off" when the AQI reaches or is forecasted to reach 75, Idaho used the 2008 emissions data (in tons per episode day) from units or activities affected by the ordinances. The emissions reductions due to woodstove change-outs were subtracted from the 2008 inventory numbers to arrive at the estimated daily amount of emissions that would cease to be added once a burn ban has been called.

Documentation of source of data for calculating emissions from units affected by the woodstove/open-burning ordinances

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - County - Sector - SCC - Temporal Profile Codes

Tons/Average Episode Day

NA-Area	State	County	Sector	SCC	SCC Level Two	SCC Level Three	SCC Level Four
Logan, UT-ID	Idaho	Franklin	Agriculture - Crops & Livestock Dust	2801600000	Agriculture Production - Crops	Country Grain Elevators	Total
	Idaho	Franklin	Agriculture - Livestock Waste	2805002000	Agriculture Production - Livestock	Beef cattle production composite	Not Elsewhere Classified
	Idaho	Franklin	Agriculture - Livestock Waste	2805015000	Agriculture Production - Livestock	Dairy cattle composite	Not Elsewhere Classified
	Idaho	Franklin	Agriculture - Livestock Waste	2805025000	Agriculture Production - Livestock	Swine production composite	Not Elsewhere Classified (see also 28-05-039, -047,
	Idaho	Franklin	Agriculture - Livestock Waste	2805030000	Agriculture Production - Livestock	Poultry Waste Emissions	Not Elsewhere Classified (see also 28-05-007, -008,
	Idaho	Franklin	Agriculture - Livestock Waste	2805035000	Agriculture Production - Livestock	Horses and Ponies Waste Emissions	Not Elsewhere Classified
	Idaho	Franklin	Agriculture - Livestock Waste	2805040000	Agriculture Production - Livestock	Sheep and Lambs Waste Emissions	Total
	Idaho	Franklin	Agriculture - Livestock Waste	2805045000	Agriculture Production - Livestock	Goats Waste Emissions	Not Elsewhere Classified
	Idaho	Franklin	Dust - Construction Dust	2311010000	Construction: SIC 15 - 17	Residential	Total
	Idaho	Franklin	Dust - Construction Dust	2311020000	Construction: SIC 15 - 17	Industrial/Commercial/Institutional	Total
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Biomass	2103008000	Commercial/Institutional	Wood	Total: All Boiler Types
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Coal	2103002000	Commercial/Institutional	Bituminous/Subbituminous Coal	Total: All Boiler Types
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Natural Gas	2103006000	Commercial/Institutional	Natural Gas	Total: Boilers and IC Engines
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Oil	2103004000	Commercial/Institutional	Distillate Oil	Total: Boilers and IC Engines
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Other	2103007000	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Total: All Combustor Types
	Idaho	Franklin	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	2102006000	Industrial	Natural Gas	Total: Boilers and IC Engines
	Idaho	Franklin	Fuel Comb - Industrial Boilers, ICEs - Oil	2102004000	Industrial	Distillate Oil	Total: Boilers and IC Engines
	Idaho	Franklin	Fuel Comb - Industrial Boilers, ICEs - Other	2102007000	Industrial	Liquified Petroleum Gas (LPG)	Total: All Boiler Types
	Idaho	Franklin	Fuel Comb - Residential - Natural Gas	2104006010	Residential	Natural Gas	Residential Furnaces
	Idaho	Franklin	Fuel Comb - Residential - Oil	2104004000	Residential	Distillate Oil	Total: All Combustor Types
	Idaho	Franklin	Fuel Comb - Residential - Other	2104002000	Residential	Bituminous/Subbituminous Coal	Total: All Combustor Types
	Idaho	Franklin	Fuel Comb - Residential - Other	2104007000	Residential	Liquified Petroleum Gas (LPG)	Total: All Combustor Types
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008100	Residential	Wood	Fireplace: general
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008210	Residential	Wood	Woodstove: fireplace inserts; non-EPA certified
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008220	Residential	Wood	Woodstove: fireplace inserts; EPA certified; non-cat
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008230	Residential	Wood	Woodstove: fireplace inserts; EPA certified; catalytic
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008310	Residential	Wood	Woodstove: freestanding, non-EPA certified
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008320	Residential	Wood	Woodstove: freestanding, EPA certified, non-catalyt
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008330	Residential	Wood	Woodstove: freestanding, EPA certified, catalytic
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008400	Residential	Wood	Woodstove: pellet-fired, general (freestanding or FP
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008510	Residential	Wood	Furnace: indoor, cordwood-fired, non-EPA certified
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008610	Residential	Wood	Hydronic heater: outdoor
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104009000	Residential	Firelog	Total: All Combustor Types
	Idaho	Franklin	Gas Stations	2501060052	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Splash Filling
	Idaho	Franklin	Gas Stations	2501060101	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 2: Displacement Loss/Uncontrolled

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - County - Sector - SCC - Temporal Profile Codes

Tons/Average Episode Day

NA-Area	State	County	Sector	SCC	Temporal Profile Code	ProfileName	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	Agriculture - Crops & Livestock Dust	2501600000	21	all year	0.008	0.000	0.000	0.000	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805002000	21	all year	0.000	0.000	2.147	2.147	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805010000	21	all year	0.000	0.000	0.065	2.226	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805025000	21	all year	0.000	0.000	0.002	0.021	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805030000	21	all year	0.000	0.000	0.548	0.151	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805035000	21	all year	0.000	0.000	0.000	0.091	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805040000	21	all year	0.000	0.000	0.000	0.010	0.000	0.000
	Idaho	Franklin	Agriculture - Livestock Waste	2805045000	21	all year	0.000	0.000	0.000	0.004	0.000	0.000
	Idaho	Franklin	Dust - Construction Dust	2311010000	29	construction	0.001	0.000	0.000	0.000	0.000	0.000
	Idaho	Franklin	Dust - Construction Dust	2311020000	21	all year	0.013	0.000	0.000	0.000	0.000	0.000
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Biomass	2103008000	469	all year, winter emphasis	0.000	0.000	0.000	0.000	0.000	0.000
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Coal	2103002000	469	all year, winter emphasis	0.007	0.044	0.000	0.000	0.251	0.363
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Natural Gas	2103006000	469	all year, winter emphasis	0.002	0.056	0.001	0.000	0.000	0.017
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Oil	2103004000	469	all year, winter emphasis	0.001	0.005	0.000	0.000	0.017	0.001
	Idaho	Franklin	Fuel Comb - Comm/Institutional - Other	2103007000	469	all year, winter emphasis	0.000	0.001	0.000	0.000	0.000	0.000
	Idaho	Franklin	Fuel Comb - Industrial Boilers, ICEs - Natural Gas	2102006000	469	all year, winter emphasis	0.001	0.045	0.001	0.001	0.000	0.014
	Idaho	Franklin	Fuel Comb - Industrial Boilers, ICEs - Oil	2102004000	469	all year, winter emphasis	0.005	0.040	0.000	0.001	0.122	0.004
	Idaho	Franklin	Fuel Comb - Industrial Boilers, ICEs - Other	2102007000	469	all year, winter emphasis	0.000	0.002	0.000	0.000	0.000	0.001
	Idaho	Franklin	Fuel Comb - Residential - Natural Gas	2104006010	485	winter emphasis, no summer	0.000	0.038	0.002	0.005	0.000	0.016
	Idaho	Franklin	Fuel Comb - Residential - Oil	2104004000	485	winter emphasis, no summer	0.000	0.003	0.000	0.000	0.013	0.001
	Idaho	Franklin	Fuel Comb - Residential - Other	2104002000	485	winter emphasis, no summer	0.000	0.000	0.000	0.000	0.001	0.005
	Idaho	Franklin	Fuel Comb - Residential - Other	2104007000	485	winter emphasis, no summer	0.001	0.005	0.000	0.000	0.000	0.001
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008100	485	winter emphasis, no summer	0.016	0.002	0.013	0.000	0.000	0.086
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008210	485	winter emphasis, no summer	0.029	0.003	0.050	0.000	0.000	0.217
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008220	485	winter emphasis, no summer	0.003	0.000	0.002	0.000	0.000	0.019
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008230	485	winter emphasis, no summer	0.001	0.000	0.001	0.000	0.000	0.005
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008310	485	winter emphasis, no summer	0.035	0.003	0.063	0.000	0.000	0.273
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008320	485	winter emphasis, no summer	0.003	0.000	0.002	0.000	0.000	0.025
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008330	485	winter emphasis, no summer	0.001	0.000	0.001	0.000	0.000	0.006
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008400	485	winter emphasis, no summer	0.001	0.000	0.000	0.000	0.000	0.004
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008510	485	winter emphasis, no summer	0.005	0.000	0.002	0.000	0.000	0.032
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104008610	485	winter emphasis, no summer	0.001	0.000	0.000	0.000	0.000	0.007
	Idaho	Franklin	Fuel Comb - Residential - Wood	2104009000	485	winter emphasis, no summer	0.004	0.001	0.005	0.000	0.000	0.016
	Idaho	Franklin	Gas Stations	2501060052	21	all year	0.000	0.000	0.000	0.000	0.000	0.000

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - County - Sector - SCC - Temporal Profile Codes

Tons/Average Episode Day

NA-Area	State	County	Sector	SCC	SCC Level Two	SCC Level Three	SCC Level Four
Logan, UT-ID	Idaho	Franklin	Solvent - Graphic Arts	2425010000	Graphic Arts	Lithography	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401005000	Surface Coating	Auto Refinishing: SIC 7532	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401015000	Surface Coating	Factory Finished Wood: SIC 2426 thru 242	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401020000	Surface Coating	Wood Furniture: SIC 25	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401035000	Surface Coating	Plastic Products: SIC 308	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401050000	Surface Coating	Miscellaneous Finished Metals: SIC 34 - (341	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401055000	Surface Coating	Machinery and Equipment: SIC 35	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401090000	Surface Coating	Miscellaneous Manufacturing	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401100000	Surface Coating	Industrial Maintenance Coatings	Total: All Solvent Types
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401200000	Surface Coating	Other Special Purpose Coatings	Total: All Solvent Types
	Idaho	Franklin	Waste Disposal	2610000100	Open Burning	All Categories	Yard Waste - Leaf Species Unspecified
	Idaho	Franklin	Waste Disposal	2620030000	Landfills	Municipal	Total
	Idaho	Franklin	Waste Disposal	2630020000	Wastewater Treatment	Public Owned	Total: Processed
	Utah	Cache	Agriculture - Livestock Waste	2805020000	Agriculture Production - Livestock	Cattle and Calves Waste Emissions	Total: (see also 28-05-001, -002, -003)

Modeling Domain
Temporally and Spatially Adjusted
Episode 2: 2/14/2008 - 2/18/2008 (5 days)
Area Emissions by Non-Attainment Area - County - Sector - SCC - Temporal Profile Codes

Tons/Average Episode Day

NA-Area	State	County	Sector	SCC	Temporal Profile Code	ProfileName	PM2.5	NOX	VOC	NH3	SO2	CO
Logan, UT-ID	Idaho	Franklin	Solvent - Graphic Arts	2425010000	21	all year	0.000	0.000	0.002	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401005000	21	all year	0.000	0.000	0.007	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401015000	21	all year	0.000	0.000	0.001	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401020000	21	all year	0.000	0.000	0.011	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401035000	21	all year	0.000	0.000	0.010	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401050000	21	all year	0.000	0.000	0.010	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401055000	21	all year	0.000	0.000	0.004	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401090000	21	all year	0.000	0.000	0.010	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401100000	21	all year	0.000	0.000	0.013	0.000	0.000	0.000
	Idaho	Franklin	Solvent - Industrial Surface Coating & Solvent Use	2401200000	21	all year	0.000	0.000	0.013	0.000	0.000	0.000
	Idaho	Franklin	Waste Disposal	2610000100	21	all year	0.000	0.000	0.005	0.000	0.000	0.019
	Idaho	Franklin	Waste Disposal	2620030000	21	all year	0.000	0.000	0.000	0.000	0.000	0.001
	Idaho	Franklin	Waste Disposal	2630020000	21	all year	0.000	0.000	0.003	0.000	0.000	0.000
	Utah	Cache	Agriculture - Livestock Waste	2805020000	21	all year	0.012	0.000	1.087	4.289	0.000	0.000
	Utah	Cache	Agriculture - Livestock Waste	2805025000	21	all year	0.000	0.000	0.043	0.094	0.000	0.000

Road Dust Documentation

Technical Support Document

Development of episodic, base- and future-year paved road dust emission inventory for the Idaho portion of the Cache Valley $PM_{2.5}$ SIP

Technical Services Division

Idaho Department of Environmental Quality

October 2012

Table of Contents

1 Summary 3

2 Introduction 3

3 Idaho Portion of Modeling Domain, Target Counties, and Target Dates 3

4 Methodology 6

4.1 Vehicle Miles Traveled 7

4.2 Precipitation data 7

4.3 Average Vehicle Weight 7

4.4 Silt Loading 8

4.4.1 ADT Category VMT Weighted Silt Loading Parameters 8

4.4.2 Days When Anti-skid Material was Applied 10

5 Episodic Paved Road Dust Emission Estimates 11

6 Base- and Future Year Emissions and Emission Reductions 12

6.1 Base- and Future-Year Emissions Estimates 12

6.2 Emission Reduction Estimates 12

7 Quality Control and Quality Assurance 13

8 References 14

Appendix A: Vehicle Miles Traveled 15

Appendix B: P (number of hours with at least 0.01 inches daily precipitation) 16

Appendix C: Average Vehicle Weight (Short Tons) 17

Appendix D: Final Silt Loading (g/m^2) 18

Appendix E: PM_{10} Emission Factors (g/VMT) 19

Appendix F: $PM_{2.5}$ Emission Factors (g/VMT) 20

Appendix G: PM_{10} Emission Estimates (tons/day) 21

Appendix H: $PM_{2.5}$ Emission Estimates (tons/day) 22

1 Summary

In support of the Cache Valley, Utah/Idaho $PM_{2.5}$ SIP attainment demonstration, episodic road dust emissions were computed for eleven Idaho Counties for each of the 86 days included in Utah Division of Air Quality's four photochemical modeling periods from 2007 through 2010. The Paved Roads AP-42 road dust emission estimation methodology revised in January 2011 was followed rigorously (USEPA, 2011). Local wintertime sanding practices were identified along with snow days which trigger application of antiskid material (sand). Enhanced silt loadings recommended in the AP-42 section were used for specified days after each sanding event.

The development of episodic emissions for UDAQ's photochemical modeling episodes are described in Sections 4 and 5. Following the model evaluation phase, IDEQ used the same methodology to develop base-year and future year road dust emissions for typical winter weekday and weekend day conditions. Finally, emission reductions were computed to represent the reductions in sand usage in Franklin County resulting from use of a 4-to-1 sand-to-salt mix, and liquid brine on days when it is not too cold. The base-year (2008) and future-year (2014 and 2019) emissions, and emission reduction estimates are described in Section 6.

2 Introduction

This report details the methodology used to develop the episodic, base-year and future-year paved road dust emission inventory for the Idaho portion of the modeling domain to be used in the Cache Valley $PM_{2.5}$ SIP attainment demonstration. This emission inventory was compiled by the Idaho Department of Environmental Quality (IDEQ) with data and information from the Idaho Transportation Department (ITD), Bannock Planning Organization (BPO), Franklin County Road Department, and Pocatello City Road Department. These estimates will be reviewed through Idaho's interagency consultation process.

The state of Idaho used the January 2011 version of the AP-42 Road Dust emission factor methodology (USEPA, 2011) to calculate paved road dust emissions for each episode day and each county in the Idaho portion of the modeling domain. The episodic emissions computed using this method are required for the model evaluation and attainment demonstration, rather than annualized emissions, so that day-to-day variation in precipitation and road silt loadings can be accounted for in the photochemical modeling step. The methods used and local inputs for Idaho counties are described in this document.

3 Idaho Portion of Modeling Domain, Target Counties, and Target Dates

This project is specific for the Cache Valley $PM_{2.5}$ SIP. The counties included in this project are within the Idaho portion of the Cache Valley $PM_{2.5}$ SIP modeling domain. The emission inventory is an episodic, day to day inventory in the four episode periods to be modeled by the Utah Division of Air Quality (UDAQ). The Idaho portion of the modeling domain is shown in *Figure 1* along with the National Weather Service (NWS) airports which provided precipitation data. The target counties and target dates are shown in *Table 1* and *Table 2*, respectively.

There are 86 model days in the four UDAQ model episodes shown in *Table 2*. Days in which snow occurs in one or more counties are indicated with an asterisk (*) because snow triggers application of antiskid material (sand) on the roadways and fresh sanding temporarily increases the silt loading on the roads for 1 to 7 days, depending on how much traffic each roadway experiences. Highly trafficked roads lose the "additive silt loading" within one day or less, while the fresh silt on local roadways does not decay to winter baseline levels until after about seven days. In addition to snow/sanding days, the stagnation days in Cache Valley are indicated by boxes around each day in which the 24-hour $PM_{2.5}$ concentration exceeded 35μg/m^3 in Logan. The sanding days and stagnation days are indicated in *Table 2* to highlight the fact that most stagnation days occur at least a few days after any fresh snow/sanding events. The temporary additive silt loadings play a diminished role on the days when $PM_{2.5}$ concentrations are above 35 μg/m^3, the National Ambient Air Quality Level. The "ubiquitous winter baseline" silt loadings, on the other hand, are applicable throughout the winter resulting in one to four times more emissions than an area that does not utilize sand as an antiskid material, depending on the level of traffic.

Figure 1 Idaho Portion of Modeling Domain and Precipitation Sites

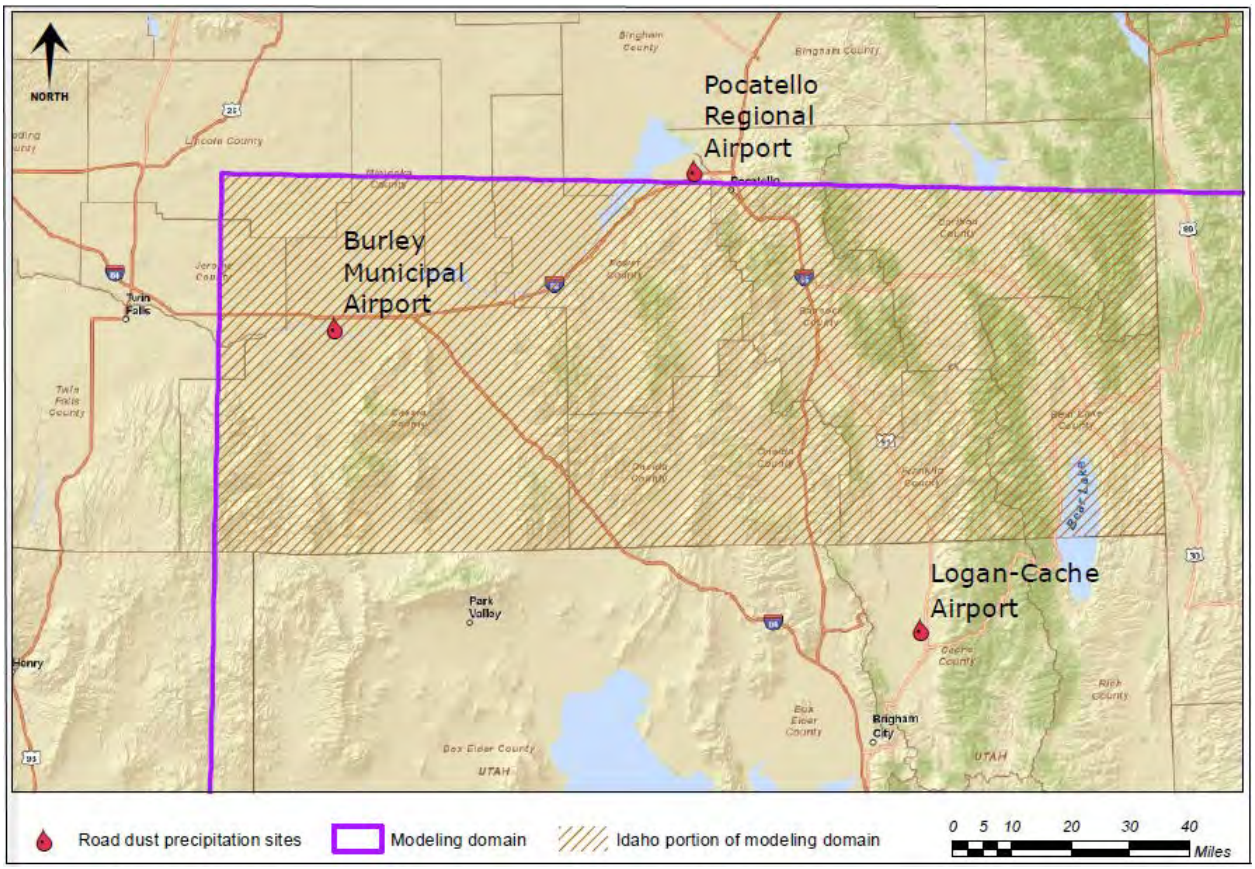


Table 1 Target Counties

County ID	County Name
16005	Bannock County
16007	Bear Lake County
16013	Blaine County
16029	Caribou County
16031	Cassia County
16041	Franklin County
16053	Jerome County
16063	Lincoln County
16067	Minidoka County
16071	Oneida County
16077	Power County

Table 2 Target Dates

Episode 1	Episode 2	Episode 3	Episode 4	
1/11/2007*	2/13/2008*	1/8/2009	12/7/2009*	12/31/2009
1/12/2007	2/14/2008	1/9/2009	12/8/2009*	1/1/2010
1/13/2007	2/15/2008	1/10/2009	12/9/2009	1/2/2010
1/14/2007	2/16/2008	1/11/2009	12/10/2009	1/3/2010
1/15/2007	2/17/2008	1/12/2009	12/11/2009	1/4/2010
1/16/2007	2/18/2008	1/13/2009	12/12/2009	1/5/2010
1/17/2007	2/19/2008	1/14/2009	12/13/2009*	1/6/2010
1/18/2007		1/15/2009	12/14/2009	1/7/2010
1/19/2007		1/16/2009	12/15/2009	1/8/2010
1/20/2007*		1/17/2009	12/16/2009	1/9/2010
1/21/2007		1/18/2009	12/17/2009	1/10/2010
		1/19/2009	12/18/2009	1/11/2010
		1/20/2009	12/19/2009	1/12/2010
		1/21/2009	12/20/2009	1/13/2010
		1/22/2009	12/21/2009	1/14/2010
		1/23/2009*	12/22/2009	1/15/2010
		1/24/2009*	12/23/2009	1/16/2010
		1/25/2009*	12/24/2009	1/17/2010
		1/26/2009	12/25/2009	1/18/2010
		1/27/2009	12/26/2009	1/19/2010
			12/27/2009	1/20/2010
			12/28/2009	1/21/2010
			12/29/2009	1/22/2010*
			12/30/2009	1/23/2010

* indicates snow & antiskid application in one or more counties.

Boxed days indicate Cache Valley stagnation days with 24-hr $PM_{2.5}$ > 35 μg/m^3

4 Methodology

Paved road dust emissions were computed on a daily basis using equation 3 from the January 2011 version of AP-42, Section 13.2.1 (USEPA, 2011). This form of the equation accounts for precipitation that occurs during each of the episode days modeled.

$$E_{ext} = [\ k\ (sL)^{0.91} \times (W)^{1.02}\ ]\ (1 - 1.2P/N)$$

where

E_{ext} = PM_{10} or $PM_{2.5}$ emission factor in the same units as k,
K = particle size multiplier (1.0 for PM_{10} [g/VMT], 0.25 for $PM_{2.5}$ [g/VMT]),
sL = road surface silt loading (grams per square meter) (g/m^2),
W = average weight (tons) of the vehicles traveling the road,
P = number of hours with at least 0.254 mm (0.01 in.) of precipitation during the averaging period (daily), and
N = number of hours in the averaging period (24 for daily).

The emissions for each county and each roadway type is the product of the emission factor and the vehicle miles traveled on each roadway type and in each county.

Therefore, for each roadway type, each county and each day in the modeling period, vehicle miles traveled (VMT), road surface silt loading, average weight of the vehicles traveling the road, and the number of hours with at least 0.254 mm (0.01 in) of precipitation must be determined. The following sections will discuss these inputs in detail. Note, road dust categories are computed only for local roads, arterials and freeways, however, VMT are available for the Highway Performance Monitoring System (HPMS) roadway types (FHWA, 2011). *Table 3* shows the roadway type definitions and the relationship between the road dust roadways and HPMS roadway types.

Table 3 Roadway Type Definition in Road Dust Calculation

Road Type for Road Dust	Road Type for Road Dust	HPMS Road Type ID	HPMS RoadType
11	Rural Interstate	11	Rural Interstate
13	Rural Arterial	13	Rural Principal Arterial
		15	Rural Minor Arterial
		17	Rural Major Collector
		19	Rural Minor Collector
21	Rural Local	21	Rural Local
23	Urban Interstate	23	Urban Interstate
		25	Urban Freeway/Expressway
27	Urban Arterial	27	Urban Principal Arterial
		29	Urban Minor Arterial
		31	Urban Collector
33	Urban Local	33	Urban Local

4.1 Vehicle Miles Traveled

To generate an on road mobile emission for each day in the modeling period and each county in the Idaho portion of modeling domain, daily averaged vehicle miles traveled (VMT) are required. The VMT generated during the MOVES2010a mobile source emission project for each day and each of these counties were used for this purpose. Please see details in *Appendix A: Vehicle Miles Traveled.*

4.2 Precipitation data

Precipitation data was obtained from the Mesowest product "Precipitation Monitor" (MesoWest, 2011). Due to the poor quality of the data found in some Mesowest networks a representative site is not available for every county. Thus, three National Weather Service sites were used to represent the eleven counties in the domain, based on proximity. It is recognized that mountainous counties may receive more snow than what is indicated by these lower elevation stations, however, most of the VMT occurs in the populated areas near these airports so this is a reasonable approach. *Table 4* shows the mapping between precipitation monitor sites and counties. If the precipitation data are missing for a specific hour, we assume no rain for that hour. Please see detail in *Appendix B*, where the P values for all the modeling days and counties are listed.

Table 4 Representative Precipitation Monitor Sites

Precipitation Monitor Site	County ID	County Name
KBYI Burley, Idaho Airport	16013	Blaine County
	16031	Cassia County
	16053	Jerome County
	16063	Lincoln County
	16067	Minidoka County
KLGU Logan, Utah Airport	16007	Bear Lake County
	16041	Franklin County
	16071	Oneida County
KPIH Pocatello, Idaho Airport	16005	Bannock County
	16029	Caribou County
	16077	Power County

4.3 Average Vehicle Weight

Permanent Automated Traffic Recorder (ATR) data from the eleven counties was provided by ITD and combined with more detailed, statewide vehicle classification data to determine the vehicle type fractions traveling on each roadway type in the modeling domain (Idaho Transportation Department, 2010). The average vehicle weight for each vehicle type was obtained from the MOVES2010a default database (USEPA, 2010) as shown in *Table 5*. The VMT-weighted vehicle weights for each roadway type, each county and each day are listed in *Appendix C*.

Table 5 Average Vehicle Weight by Vehicle Type

SourceType ID	HPMS Vtype ID	SourceType Name	Source Mass (Metric Tons)
11	10	Motorcycle	0.285
21	20	Passenger Car	1.4788
31	30	Passenger Truck	1.86686
32	30	Light Commercial Truck	2.05979
41	40	Intercity Bus	19.5937
42	40	Transit Bus	16.556
43	40	School Bus	9.06989
51	50	Refuse Truck	20.6845
52	50	Single Unit Short-haul Truck	7.64159
53	50	Single Unit Long-haul Truck	6.25047
54	50	Motor Home	6.73483
61	60	Combination Short-haul Truck	29.3275
62	60	Combination Long-haul Truck	31.4038

4.4 Silt Loading

Because there are no existing measured silt loading data available for eastern Idaho, the default silt loadings recommended in AP-42 (2011) were used. After consulting with ITD and local road departments in Franklin and Bannock Counties, it was determined that sand is still used as anti-skid material although its use is being reduced gradually. One to two inches of snow fall were assumed to trigger an application of anti-skid material, based on the ranges estimated by ITD, District 5 and local road departments. In order to be conservative, ubiquitous winter baseline factors were used and one inch snow fall was used as the trigger for adding the "initial peak additive contribution" of silt due to application of antiskid abrasive (see *Table 6*). The following section will discuss the VMT-weighted silt loading parameters, determining the days when the anti-skid material is applied, and the decay period for the silt loading additive contribution. The final silt loading for each day and each county is shown for example days of weekday/weekend with/without snow are in the *Appendix D* partial listing below. The complete silt loadings for all episodic days are in a separate document, *Appendix D: Final Silt Loading*.

4.4.1 ADT Category VMT Weighted Silt Loading Parameters

In the AP-42 (2011), default silt loading factors are given by the Average Daily Traffic (ADT) category, as shown in *Table 6*, excerpted from AP-42 (2011).

Table 6 AP-42 Ubiquitous Silt Loading Default Values with Hot Spot Contributions from Anti-Skid Abrasives (g/m^2) (USEPA, 2011)

ADT Category	< 500	500-5,000	5,000-10,000	> 10,000
Ubiquitous Baseline g/m^2	0.6	0.2	0.06	0.03 0.015 limited access
Ubiquitous Winter Baseline Multiplier during months with frozen precipitation	X4	X3	X2	X1
Initial peak additive contribution from application of antiskid abrasive (g/m^2)	2	2	2	2
Days to return to baseline conditions (assume linear decay)	7	3	1	0.5

All local roads were assumed to have less than 500 ADT, while all limited access roads (i.e. interstates) were assumed to be over 10,000 ADT. However, arterials include a small percentage of roadways having less than 500 ADT and greater than 10,000 ADT, with larger fractions in both the 500 – 5000 ADT and 5,000 – 10,000 ADT categories. In order to apply AP-42 ADT-based factors to the arterials category, the link-level, average daily traffic (ADT) database for the area was used to compute the VMT fraction for each AP-42 ADT category within the rural and urban arterial roadway types. *Table 7* shows the resulting VMT-weighted silt loading parameters for road dust roadway categories used in this project.

Table 7 VMT-Weighted Silt Loading Parameters

Roadway Type	Rural Interstate	Rural Local	Urban Interstate	Urban Local	Rural Arterial	Urban Arterial
Ubiquitous Winter Baseline (g/m2)	0.015	2.4	0.015	2.4	0.4839	0.0670
Initial peak additive contribution from application of antiskid abrasive (g/m2)	2	2	2	2	2	2
Days to return to baseline conditions (assume linear decay)	0.5	7	0.5	7	2.425	0.6816

4.4.2 Days When Anti-skid Material was Applied

In the modeling domain, only Pocatello Airport has high quality snowfall data (National Weather Service, 2011). Therefore, the method used to determine the days when anti-skid material was applied is as follows: for a specific county and day, anti-skid material was assumed to be applied if Pocatello Airport had one inch of snow and the number of hours with at least 0.01 inches of precipitation for that specific county and day is greater than zero. The days when anti-skid material was applied are indicated in *Table 8* with a "1". On these days, an initial peak additive silt loading in *Table 7* is added to the ubiquitous winter baseline silt loading. The additive silt loading contributions are assumed to decay linearly from the peak value based on the VMT-weighted days to return to baseline conditions shown in the last row of *Table 7*. Days without snow are not listed in *Table 8*.

Table 8 Days When Anti-Skid Material was Applied

Date	Bannock	Bear Lake	Blaine	Caribou	Cassia	Franklin	Jerome	Lincoln	Minidoka	Oneida	Power
1/11/2007		1	1		1	1	1	1	1	1	
1/20/2007	1			1							1
2/13/2008	1	1		1		1				1	1
1/23/2009	1	1		1		1				1	1
1/24/2009	1	1	1	1	1	1	1	1	1	1	1
1/25/2009	1	1	1	1	1	1	1	1	1	1	1
12/7/2009	1		1	1	1		1	1	1		1
12/8/2009	1			1							1
12/13/2009	1	1	1	1	1	1	1	1	1	1	1
1/22/2010	1	1	1	1	1	1	1	1	1	1	1

5 Episodic Paved Road Dust Emission Estimates

Once the silt loading, average vehicle weight, precipitation and VMT were determined, the emission factors were calculated using the AP-42 (2011) method and the final emission estimates were generated. *Table 9* and *Table 10* show PM_{10} and $PM_{2.5}$ average episode daily emission estimates for each county. The variation between the different episodes is primarily caused by snowfall days and how many times the anti-skid material was applied. Additional variation between counties results from the county VMT, the VMT roadway type distributions, and how many times the anti-skid material was applied in each county. The detailed PM_{10} and $PM_{2.5}$ emission estimates for episode example days including weekend/weekday and with/without snow are provided for each county in the Idaho portion of the modeling domain are in *Appendices E – H*.

Appendix E: PM10 Emission Factors (g/VMT),

Appendix F: PM2.5 Emission Factors (g/VMT),

Appendix G: PM10 Emission Estimates (tons/day),

Appendix H: PM2.5 Emission Estimates (tons/day).

Table 9 PM_{10} Average Episode Daily Emission (tons/day)

County Name	Episode 1	Episode 2	Episode 3	Episode 4
Bannock County	5.676	8.095	5.727	6.759
Bear Lake County	2.098	2.419	1.836	1.850
Blaine County	6.067	4.713	4.887	5.706
Caribou County	1.520	2.003	1.468	1.761
Cassia County	3.172	1.853	2.349	2.649
Franklin County	2.077	2.386	1.795	1.875
Jerome County	4.306	2.513	3.212	3.581
Lincoln County	2.038	1.552	1.627	1.880
Minidoka County	2.636	1.811	2.002	2.303
Oneida County	1.154	1.304	1.031	0.776
Power County	1.230	1.811	1.247	1.460

Table 10 $PM_{2.5}$ Average Episode Daily Emission (tons/day)

County Name	Episode 1	Episode 2	Episode 3	Episode 4
Bannock County	1.419	2.024	1.432	1.690
Bear Lake County	0.525	0.605	0.459	0.462
Blaine County	1.517	1.178	1.222	1.427
Caribou County	0.380	0.501	0.367	0.440
Cassia County	0.793	0.463	0.587	0.662
Franklin County	0.519	0.596	0.449	0.469
Jerome County	1.077	0.628	0.803	0.895
Lincoln County	0.510	0.388	0.407	0.470
Minidoka County	0.659	0.453	0.501	0.576
Oneida County	0.289	0.326	0.258	0.194
Power County	0.308	0.453	0.312	0.365

6 Base- and Future Year Emissions and Emission Reductions

6.1 Base- and Future-Year Emissions Estimates

Base and future-year road dust emissions were developed using the same January 2011 EPA methodology described in Section 4. Base-year emissions were estimated for typical weekend and weekday scenarios during the 2007 – 2008 winter conditions (since weekday VMT are greater than weekend, emission reductions and the motor vehicle emission budgets are based on weekday emissions.) Future year emissions were scaled up from the base year emissions estimates using future year VMT estimates obtained from the MOVES modeling, which used growth factors derived from MOVES national default VMT Idaho counties in 2008, 2014 and 2019 (Department of Environmental Quality, 2012). Episodic precipitation data for 2007-2008 were used to represent precipitation, however only one snow event occurred so silt loadings were based on the VMT-weighted *ubiquitous winter* baseline values shown in Table 7 and transient *additive* silt loadings were not applied. Base- and future-year daily emissions are summarized in Table 11.

Table 11 PM2.5 Base- and Future-Year Winter Daily Emission (tons/day)

County Name	2008		2014		2019	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
Bannock County	1.17	0.72	1.22	0.75	1.34	0.82
Bear Lake County	0.42	0.28	0.44	0.29	0.48	0.32
Blaine County	1.21	0.75	1.26	0.79	1.38	0.86
Caribou County	0.36	0.24	0.38	0.24	0.41	0.27
Cassia County	0.48	0.29	0.50	0.31	0.54	0.33
Franklin County	0.45	0.28	0.47	0.29	0.52	0.32
Jerome County	0.65	0.43	0.68	0.44	0.74	0.48
Lincoln County	0.41	0.26	0.43	0.27	0.47	0.30
Minidoka County	0.47	0.29	0.49	0.30	0.53	0.33
Oneida County	0.13	0.08	0.13	0.08	0.14	0.09
Power County	0.22	0.14	0.23	0.14	0.25	0.16

6.2 Emission Reduction Estimates

Paved road dust emission estimates are dependent on the silt loading and silt loading increases during the winter season when sand is used as an anti-skid treatment on icy and snowy roads. For areas in which 100% sand is used for anti-skid treatment, the *Ubiquitous Winter Baseline* silt loadings are assumed and a temporary *additive* silt loading contribution is added for a number of days after each snow event before the newly generated silt has been blown or washed off the roadway. In areas in which only salt is used for anti-skid treatment, no increase in road silt occurs and the non-winter *Ubiquitous Baseline* silt loadings are assumed, similar to summer conditions (Table 6). When sand is partially replaced by salt, the silt loading and the resulting emissions are reduced in proportion to the reduction in the amount of sand used.

The Franklin County Road and Bridge Department has signed a Memorandum of Agreement (Appendix A) committing to achieving a 4-to-1 sand-to-salt ratio by 2014. In addition, the Department has implemented application of liquid salt (brine) prior to storms in which the temperature is forecast to be above 22 degrees F. When they can use brine prior to a storm, the amount of anti-skid sand used is further reduced by 50% on average. Meteorological records indicate that 80% of the storms during the winter of 2010-2011 were associated with temperatures above 22 degrees F. Thus, the brine application along with the 4-to-1 sand-to-salt mixture together results in an overall average sand usage in the controlled operation equivalent to 70.6% of the sand used in the uncontrolled operation. The modeled road dust emissions for the base year and future years, and the future year emission reductions are shown in Table 12.

Table 12 Paved Road Dust Emission Reductions based on Franklin County winter weekday emissions, tons per day

Year	Uncontrolled (100% Sand) $PM_{2.5}$	$PM_{2.5}$ Reduction*	Controlled* Road Dust $PM_{2.5}$
2008	0.45		
2014	0.47	0.10	0.37
2019	0.52	0.11	0.41

*Paved road dust reduction based on 4-to-1 sand-to-salt ratio for anti-skid treatment and liquid brine application.

7 Quality Control and Quality Assurance

In order to ensure the highest quality emission estimates, a number of different QA/QC steps were implemented during the development of the paved road dust source emissions inventory. These are outlined below:

- The emission estimation key parameters, such as silt loading, were based on input from road departments in the District pertaining to anti-skid application practices..
- All the input data, such as precipitation, average vehicle weight, silt loading, and vehicle miles traveled, were checked by the data generator and reviewed by QA/QC staff for accuracy and reasonableness. In this process, the quality of the precipitation data from some Mesowest stations, such as citizen-observer stations, was questioned, investigated, and found to be in error. Eventually, the precipitation data used in the final calculation was reduced to several high quality precipitation monitoring sites in order to avoid the poor quality stations.
- All the calculation steps through to the final emission estimates were verified by QA/QC staff through manual calculation of sample data.

8 References

Code of Federal Regulations (2011). Official Release of the January 2011 AP-42 Method for Estimating Re-Entrained Road Dust From Paved Roads, USEPA. **40 CFR Parts 51 and 93:** 6328-6330.

Department of Environmental Quality (2012), Development of the base- and future-year mobile source emission inventory for the Idaho portion of the Cache Valley $PM_{2.5}$ SIP

Desert Research Institute (2002). Treasure Valley Road Dust Study Final Report, IDEQ.

FHWA. (2011). "Highway Performance Monitoring System (HPMS)." from http://www.fhwa.dot.gov/policy/ohpi/hpms/index.cfm.

Idaho Transportation Department (2010). Automatic Traffic Recorder (ATR) Data, State of Idaho.

MesoWest. (2011). "Archived precipitation data." Retrieved 2011, from http://mesowest.utah.edu/cgi-bin/droman/precip_monitor.cgi?state=ID&rawsflag=3.

National Weather Service. (2011). "Archived Daily Climate Report." Retrieved 2011, from http://www.nws.noaa.gov/climate/index.php?wfo=pih.

USEPA (1997). Fugitive Particulate Matter Emissions, USEPA.

USEPA (2010). MOVES2010 Highway Vehicle Population and Activity Data, USEPA.

USEPA (2011). AP-42: Compilation of air pollutant emission factors, Office of Air Quality Planning and Standards, Office of Air and Radiation. **Volume 1: Stationary point and area sources**.

Appendix A: Vehicle Miles Traveled

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix A* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	166,463	113,667	234,297	93,202	44,425	76,962	125,371	104,595	72,222	12,247	34,405
	Rural Interstate	422,155	0	0	0	347,692	0	491,696	0	134,446	234,363	252,833
	Rural Local	126,262	86,240	177,764	70,698	97,171	99,779	124,851	79,341	93,640	26,785	44,601
	Urban Arterial	518,464	0	0	0	128,712	0	26,407	0	114,467	0	0
	Urban Interstate	198,117	0	0	0	0	0	0	0	35,670	0	0
	Urban Local	208,866	2,821	148,912	3,402	22,914	4,720	8,092	0	20,376	0	4,679
2/17/2008 Total		1,640,327	202,727	560,974	167,302	640,914	181,461	776,418	183,936	470,821	273,395	336,518
Weekday Without Snow (2/18/2008)	Rural Arterial	203,220	131,925	287,991	110,521	55,422	95,773	149,169	126,465	90,056	15,290	42,753
	Rural Interstate	461,253	0	0	0	379,912	0	538,269	0	146,738	256,565	276,668
	Rural Local	154,142	100,092	218,502	83,835	121,225	124,169	148,550	95,931	116,762	33,439	55,423
	Urban Arterial	805,015	0	0	0	197,927	0	41,910	0	176,321	0	0
	Urban Interstate	250,115	0	0	0	0	0	0	0	44,995	0	0
	Urban Local	324,304	4,477	224,610	5,398	35,237	7,491	12,843	0	31,387	0	7,426
2/18/2008 Total		2,198,051	236,494	731,103	199,754	789,722	227,433	890,741	222,396	606,260	305,294	382,270
Weekend With Snow (12/13/2009)	Rural Arterial	145,423	95,465	209,603	80,224	41,658	68,898	110,291	94,035	64,725	11,697	30,810
	Rural Interstate	413,195	0	0	0	336,397	0	479,911	0	128,983	232,742	241,332
	Rural Local	110,303	72,430	159,029	60,853	91,119	89,324	109,833	71,331	83,919	25,582	39,941
	Urban Arterial	471,590	0	0	0	118,401	0	26,133	0	104,150	0	0
	Urban Interstate	167,033	0	0	0	0	0	0	0	33,879	0	0
	Urban Local	189,982	2,681	153,408	3,260	21,079	4,603	8,008	0	18,540	0	4,681
12/13/2009 Total		1,497,526	170,575	522,040	144,336	608,654	162,825	734,176	165,365	434,195	270,022	316,765
Weekday With Snow (1/22/2010)	Rural Arterial	174,470	115,407	253,356	97,067	49,325	83,508	129,168	113,797	77,513	13,552	35,945
	Rural Interstate	423,995	0	0	0	341,028	0	484,206	0	132,113	231,618	241,640
	Rural Local	132,335	87,561	192,224	73,629	107,888	108,267	128,633	86,321	100,499	29,639	46,597
	Urban Arterial	712,268	0	0	0	174,386	0	39,226	0	155,363	0	0
	Urban Interstate	204,183	0	0	0	0	0	0	0	41,260	0	0
	Urban Local	286,941	4,163	225,941	5,051	31,046	7,099	12,021	0	27,656	0	6,967
1/22/2010 Total		1,934,193	207,131	671,521	175,746	703,673	198,874	793,254	200,118	534,404	274,808	331,149

Appendix B: P (number of hours with at least 0.01 inches daily precipitation)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix B* document.

Date	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	0	0	0	0	0	0	0	0	0	0	0
Weekday Without Snow (2/18/2008)	0	0	0	0	0	0	0	0	0	0	0
Weekend With Snow (12/13/2009)	5	1	8	5	8	1	8	8	8	1	5
Weekday With Snow (1/22/2010)	6	1	4	6	4	1	4	4	4	1	6

Appendix C: Average Vehicle Weight (Short Tons)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix C* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	6.156	6.155	6.155	6.156	4.178	4.178	6.774	6.156	4.178	4.178	4.178
	Rural Interstate	9.248				9.248		9.248		9.248	9.248	9.248
	Rural Local	4.178	4.178	4.178	4.178	4.178	4.178	4.178	4.178	4.178	4.178	4.178
	Urban Arterial	2.829				2.738		2.487		2.738		
	Urban Interstate	5.341								5.341		
	Urban Local	2.359	2.359	2.359	2.359	2.359	2.359	2.359		2.359		2.359
Weekday Without Snow (2/18/2008)	Rural Arterial	6.601	6.601	6.601	6.601	4.929	4.929	7.124	6.601	4.929	4.929	4.929
	Rural Interstate	11.831				11.831		11.831		11.831	11.831	11.831
	Rural Local	4.929	4.929	4.929	4.929	4.929	4.929	4.929	4.929	4.929	4.929	4.929
	Urban Arterial	2.829				2.738		2.487		2.738		
	Urban Interstate	6.924								6.924		
	Urban Local	2.359	2.359	2.359	2.359	2.359	2.359	2.359		2.359		2.359
Weekend With Snow (12/13/2009)	Rural Arterial	6.168	6.168	6.168	6.168	4.190	4.190	6.787	6.168	4.190	4.190	4.190
	Rural Interstate	9.264				9.264		9.264		9.264	9.264	9.264
	Rural Local	4.190	4.190	4.190	4.190	4.190	4.190	4.190	4.190	4.190	4.190	4.190
	Urban Arterial	2.828				2.737		2.487		2.737		
	Urban Interstate	5.349								5.349		
	Urban Local	2.358	2.358	2.358	2.358	2.358	2.358	2.358		2.358		2.358
Weekday With Snow (1/22/2010)	Rural Arterial	6.596	6.596	6.596	6.596	4.924	4.924	7.119	6.596	4.924	4.924	4.924
	Rural Interstate	11.822				11.822		11.822		11.822	11.822	11.822
	Rural Local	4.924	4.924	4.924	4.924	4.924	4.924	4.924	4.924	4.924	4.924	4.924
	Urban Arterial	2.828				2.737		2.486		2.737		
	Urban Interstate	6.922								6.922		
	Urban Local	2.358	2.358	2.358	2.358	2.358	2.358	2.358		2.358		2.358

Appendix D: Final Silt Loading (g/m^2)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix D* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484
	Rural Interstate	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	Rural Local	3.257	3.257	2.400	3.257	2.400	3.257	2.400	2.400	2.400	3.257	3.257
	Urban Arterial	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067
	Urban Interstate	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	Urban Local	3.257	3.257	2.400	3.257	2.400	3.257	2.400	2.400	2.400	3.257	3.257
Weekday Without Snow (2/18/2008)	Rural Arterial	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484	0.484
	Rural Interstate	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	Rural Local	2.971	2.971	2.400	2.971	2.400	2.971	2.400	2.400	2.400	2.971	2.971
	Urban Arterial	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067
	Urban Interstate	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	Urban Local	2.971	2.971	2.400	2.971	2.400	2.971	2.400	2.400	2.400	2.971	2.971
Weekend With Snow (12/13/2009)	Rural Arterial	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484
	Rural Interstate	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015
	Rural Local	5.257	4.400	4.686	5.257	4.686	4.400	4.686	4.686	4.686	4.400	5.257
	Urban Arterial	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067
	Urban Interstate	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015
	Urban Local	5.257	4.400	4.686	5.257	4.686	4.400	4.686	4.686	4.686	4.400	5.257
Weekday With Snow (1/22/2010)	Rural Arterial	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484	2.484
	Rural Interstate	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015
	Rural Local	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400
	Urban Arterial	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067
	Urban Interstate	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015
	Urban Local	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400	4.400

Appendix E: PM_{10} Emission Factors (g/VMT)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix E* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	3.297	3.297	3.297	3.297	2.221	2.221	3.636	3.297	2.221	2.221	2.221
	Rural Interstate	0.212				0.212		0.212		0.212	0.212	0.212
	Rural Local	12.592	12.592	9.537	12.592	9.537	12.592	9.537	9.537	9.537	12.592	12.592
	Urban Arterial	0.247				0.239		0.216		0.239		
	Urban Interstate	0.121								0.121		
	Urban Local	7.027	7.027	5.322	7.027	5.322	7.027	5.322		5.322		7.027
Weekday Without Snow (2/18/2008)	Rural Arterial	3.541	3.541	3.541	3.541	2.629	2.629	3.827	3.541	2.629	2.629	2.629
	Rural Interstate	0.272				0.272		0.272		0.272	0.272	0.272
	Rural Local	13.709	13.709	11.287	13.709	11.287	13.709	11.287	11.287	11.287	13.709	13.709
	Urban Arterial	0.247				0.239		0.216		0.239		
	Urban Interstate	0.158								0.158		
	Urban Local	6.464	6.464	5.322	6.464	5.322	6.464	5.322		5.322		6.464
Weekend With Snow (12/13/2009)	Rural Arterial	10.980	13.906	8.783	10.980	5.921	9.375	9.683	8.784	5.921	9.375	7.402
	Rural Interstate	13.743				10.995		10.995		10.995	17.408	13.743
	Rural Local	14.643	15.775	10.550	14.643	10.550	15.775	10.550	10.550	10.550	15.775	14.643
	Urban Arterial	4.193				3.245		2.942		3.245		
	Urban Interstate	7.849								6.279		
	Urban Local	8.147	8.776	5.870	8.147	5.870	8.776	5.870		5.870		8.147
Weekday With Snow (1/22/2010)	Rural Arterial	10.974	14.892	12.541	10.974	9.308	11.053	13.557	12.541	9.308	11.053	8.144
	Rural Interstate	16.449				18.798		18.798		18.798	22.323	16.449
	Rural Local	13.704	18.598	15.661	13.704	15.661	18.598	15.661	15.661	15.661	18.598	13.704
	Urban Arterial	3.913				4.326		3.922		4.326		
	Urban Interstate	9.528								10.889		
	Urban Local	6.466	8.775	7.389	6.466	7.389	8.775	7.389		7.389		6.466

Appendix F: $PM_{2.5}$ Emission Factors (g/VMT)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix F* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	0.824	0.824	0.824	0.824	0.555	0.555	0.909	0.824	0.555	0.555	0.555
	Rural Interstate	0.053				0.053		0.053		0.053	0.053	0.053
	Rural Local	3.148	3.148	2.384	3.148	2.384	3.148	2.384	2.384	2.384	3.148	3.148
	Urban Arterial	0.062				0.060		0.054		0.060		
	Urban Interstate	0.030								0.030		
	Urban Local	1.757	1.757	1.331	1.757	1.331	1.757	1.331		1.331		1.757
Weekday Without Snow (2/18/2008)	Rural Arterial	0.885	0.885	0.885	0.885	0.657	0.657	0.957	0.885	0.657	0.657	0.657
	Rural Interstate	0.068				0.068		0.068		0.068	0.068	0.068
	Rural Local	3.427	3.427	2.822	3.427	2.822	3.427	2.822	2.822	2.822	3.427	3.427
	Urban Arterial	0.062				0.060		0.054		0.060		
	Urban Interstate	0.039								0.039		
	Urban Local	1.616	1.616	1.331	1.616	1.331	1.616	1.331		1.331		1.616
Weekend With Snow (12/13/2009)	Rural Arterial	2.745	3.477	2.196	2.745	1.480	2.344	2.421	2.196	1.480	2.344	1.850
	Rural Interstate	3.436				2.749		2.749		2.749	4.352	3.436
	Rural Local	3.661	3.944	2.637	3.661	2.637	3.944	2.637	2.637	2.637	3.944	3.661
	Urban Arterial	1.048				0.811		0.736		0.811		
	Urban Interstate	1.962								1.570		
	Urban Local	2.037	2.194	1.467	2.037	1.467	2.194	1.467		1.467		2.037
Weekday With Snow (1/22/2010)	Rural Arterial	2.743	3.723	3.135	2.743	2.327	2.763	3.389	3.135	2.327	2.763	2.036
	Rural Interstate	4.112				4.700		4.700		4.700	5.581	4.112
	Rural Local	3.426	4.649	3.915	3.426	3.915	4.649	3.915	3.915	3.915	4.649	3.426
	Urban Arterial	0.978				1.081		0.981		1.081		
	Urban Interstate	2.382								2.722		
	Urban Local	1.616	2.194	1.847	1.616	1.847	2.194	1.847		1.847		1.616

Appendix G: PM_{10} Emission Estimates (tons/day)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix G* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	0.605	0.413	0.852	0.339	0.109	0.188	0.502	0.380	0.177	0.030	0.084
	Rural Interstate	0.098				0.081		0.115		0.031	0.055	0.059
	Rural Local	1.753	1.197	1.869	0.981	1.022	1.385	1.313	0.834	0.984	0.372	0.619
	Urban Arterial	0.141				0.034		0.006		0.030		
	Urban Interstate	0.026								0.005		
	Urban Local	1.618	0.022	0.874	0.026	0.134	0.037	0.047		0.120		0.036
2/17/2008 Total		4.241	1.632	3.594	1.346	1.380	1.610	1.983	1.214	1.347	0.456	0.799
Weekday Without Snow (2/18/2008)	Rural Arterial	0.793	0.515	1.124	0.431	0.161	0.277	0.629	0.494	0.261	0.044	0.124
	Rural Interstate	0.138				0.114		0.161		0.044	0.077	0.083
	Rural Local	2.329	1.513	2.719	1.267	1.508	1.876	1.848	1.194	1.453	0.505	0.838
	Urban Arterial	0.219				0.052		0.010		0.046		
	Urban Interstate	0.043								0.008		
	Urban Local	2.311	0.032	1.318	0.038	0.207	0.053	0.075		0.184		0.053
2/18/2008 Total		5.834	2.059	5.160	1.737	2.042	2.207	2.724	1.687	1.996	0.627	1.097
Weekend With Snow (12/13/2009)	Rural Arterial	1.760	1.463	2.029	0.971	0.272	0.712	1.177	0.910	0.422	0.121	0.251
	Rural Interstate	6.260				4.077		5.816		1.563	4.466	3.656
	Rural Local	1.780	1.259	1.849	0.982	1.060	1.553	1.277	0.830	0.976	0.445	0.645
	Urban Arterial	2.180				0.423		0.085		0.373		
	Urban Interstate	1.445								0.234		
	Urban Local	1.706	0.026	0.993	0.029	0.136	0.045	0.052		0.120		0.042
12/13/2009 Total		15.131	2.749	4.871	1.982	5.968	2.310	8.407	1.740	3.689	5.032	4.594
Weekday With Snow (1/22/2010)	Rural Arterial	2.111	1.894	3.502	1.174	0.506	1.017	1.930	1.573	0.795	0.165	0.323
	Rural Interstate	7.688				7.067		10.034		2.738	5.699	4.381
	Rural Local	1.999	1.795	3.318	1.112	1.863	2.220	2.221	1.490	1.735	0.608	0.704
	Urban Arterial	3.072				0.831		0.170		0.741		
	Urban Interstate	2.144								0.495		
	Urban Local	2.045	0.040	1.840	0.036	0.253	0.069	0.098		0.225		0.050
1/22/2010Total		19.059	3.730	8.661	2.322	10.520	3.306	14.452	3.063	6.729	6.472	5.458

Appendix H: $PM_{2.5}$ Emission Estimates (tons/day)

The example days of weekday/weekend with/without snow are listed below. The complete episodic days are in a separate *Appendix H* document.

Date	Roadway Type	Bannock County	Bear Lake County	Blaine County	Caribou County	Cassia County	Franklin County	Jerome County	Lincoln County	Minidoka County	Oneida County	Power County
Weekend Without Snow (2/17/2008)	Rural Arterial	0.151	0.103	0.213	0.085	0.027	0.047	0.126	0.095	0.044	0.007	0.021
	Rural Interstate	0.025				0.020		0.029		0.008	0.014	0.015
	Rural Local	0.438	0.299	0.467	0.245	0.255	0.346	0.328	0.209	0.246	0.093	0.155
	Urban Arterial	0.035				0.008		0.002		0.008		
	Urban Interstate	0.007								0.001		
	Urban Local	0.404	0.005	0.218	0.007	0.034	0.009	0.012		0.030		0.009
2/17/2008 Total		1.060	0.408	0.898	0.337	0.345	0.402	0.496	0.304	0.337	0.114	0.200
Weekday Without Snow (2/18/2008)	Rural Arterial	0.198	0.129	0.281	0.108	0.040	0.069	0.157	0.123	0.065	0.011	0.031
	Rural Interstate	0.035				0.028		0.040		0.011	0.019	0.021
	Rural Local	0.582	0.378	0.680	0.317	0.377	0.469	0.462	0.298	0.363	0.126	0.209
	Urban Arterial	0.055				0.013		0.002		0.012		
	Urban Interstate	0.011								0.002		
	Urban Local	0.578	0.008	0.329	0.010	0.052	0.013	0.019		0.046		0.013
2/18/2008 Total		1.459	0.515	1.290	0.434	0.510	0.552	0.681	0.422	0.499	0.157	0.274
Weekend With Snow (12/13/2009)	Rural Arterial	0.440	0.366	0.507	0.243	0.068	0.178	0.294	0.228	0.106	0.030	0.063
	Rural Interstate	1.565				1.019		1.454		0.391	1.117	0.914
	Rural Local	0.445	0.315	0.462	0.246	0.265	0.388	0.319	0.207	0.244	0.111	0.161
	Urban Arterial	0.545				0.106		0.021		0.093		
	Urban Interstate	0.361								0.059		
	Urban Local	0.427	0.006	0.248	0.007	0.034	0.011	0.013		0.030		0.011
12/13/2009 Total		3.783	0.687	1.218	0.496	1.492	0.577	2.102	0.435	0.922	1.258	1.149
Weekday With Snow (1/22/2010)	Rural Arterial	0.528	0.474	0.876	0.294	0.127	0.254	0.483	0.393	0.199	0.041	0.081
	Rural Interstate	1.922				1.767		2.508		0.684	1.425	1.095
	Rural Local	0.500	0.449	0.830	0.278	0.466	0.555	0.555	0.373	0.434	0.152	0.176
	Urban Arterial	0.768				0.208		0.042		0.185		
	Urban Interstate	0.536								0.124		
	Urban Local	0.511	0.010	0.460	0.009	0.063	0.017	0.024		0.056		0.012
1/22/2010 Total		4.765	0.932	2.165	0.581	2.630	0.826	3.613	0.766	1.682	1.618	1.364

MOVES Documentation

Development of the mobile source emission inventory for the Idaho portion of the Cache Valley $PM_{2.5}$ SIP

Technical Services Division

Idaho Department of Environmental Quality

October 2012

Table of Contents

1 Introduction 4

2 Methodology: Development of the MOVES2010 Input Database 4

2.1 Meteorology 6

2.2 Vehicle Hours Traveled (VHT) Related Inputs 7

2.2.1 Ramp Fractions 7

2.2.2 Average Speed 7

2.3 Vehicle Miles Traveled (VMT) Related Inputs 9

2.3.1 Annual VMT 9

2.3.1.1 Roadway Type Growth Factors for 2009 and 2010 10

2.3.2 Roadway Type, Monthly, Daily, and Hourly VMT 10

2.4 Inspection and Maintenance Programs 11

2.5 Source Related Inputs 11

2.5.1 Age Distribution 11

2.5.2 Source Type Population 13

2.6 Fuel Related Inputs 13

2.6.1 Alternative Vehicle Fuels and Technology (AVFT) 13

2.6.2 Fuel Supply 13

2.6.3 Fuel Formulation 14

2.7 On-road Retrofits 14

3 Results 14

4 Quality Control and Quality Assurance 14

References 16

Appendix A. 17

List of Figures and Table

Figure 1. MOVES input files and groups 5
Figure 2. Meteorology and precipitation sites 6
Table 1. MOVES road type descriptions 7
Table 2. MOVES source type descriptions 7
Table 3. MOVES speed bins 8
Equation 1. BPR method 8
Table 4. Free-flow speed look-up table 9
Table 5. Roadway type VMT growth factors 10
Table 6. ITD vehicle registration age fractions for 2007 through 2009 12
Table 7. Crosswalk between MOBILE6.2 vehicle types and age distribution data source combinations 12
Table 8. E10 market share 14
Figure 3. IDEQ MOVES emissions results compared to UDAQ MOVES emissions results. 15
Table A1. MOBILE6.2 vehicle type descriptions 17
Table A2. Unaltered ITD registration age data for 2007 – 2009 17

1 Introduction

Idaho's Franklin County $PM_{2.5}$ State Implementation Plan (SIP) is being completed in parallel to Utah's Cache County $PM_{2.5}$ SIP. The $PM_{2.5}$ nonattainment area occupies land in both states with approximately 90% of the people and vehicles located in Cache County Utah. As a result, Utah Division of Air Quality (UDAQ) took the lead on much of joint attainment demonstration, including the photochemical modeling and modeled attainment test, while each state gathered emissions inventory data from the 2008 National Emissions Inventory (NEI) and performed separate on-road mobile modeling to update the 2008 NEI using newer methods now required by EPA for SIPs and conformity. The updated modeling included on-road mobile vehicle emissions and paved road dust episodic modeling used for the model evaluation phase of the project and base-year and future-year modeling used for the attainment demonstration. This document describes Idaho's on-road mobile modeling efforts. Paved road dust modeling is described in a parallel report.

The Motor Vehicle Emissions Simulator (MOVES2010a)(USEPA, 2011) is the EPA-designated model for on-road mobile emission inventory development for $PM_{2.5}$ State Implementation Plans (SIP) and for Federal Highway Administration (FHWA) transportation conformity determinations. The on-road mobile source emission inventory (EI) was compiled with MOVES according to the *Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity* (USEPA, 2010). The EI for the Idaho counties in the modeling domain was compiled by the Idaho Department of Environmental Quality (IDEQ) with input from the Idaho Transportation Department (ITD), Bannock Transportation Planning Organization (BTPO), Cache Metropolitan Planning Organization (CMPO), U.S. Environmental Protection Agency (EPA), the Federal Highway Administration (FHWA,) and the Utah Department of Air Quality (UDAQ).

The state of Idaho used the standard unmodified MOVES model core database with four roadway classifications. Inventories for the SIP were compiled representing model evaluation episodes and both base and future year scenarios for eleven Idaho counties within the SIP modeling domain. The methodologies for episodic, base- and future-year MOVES modeling is described in this document.

2 Methodology: Development of the MOVES2010 Input Database

MOVES2010a is developed to work in conjunction with MySQL database management software. To operate the MOVES2010a model at the county-level as required by EPA for SIP-level emission inventories, development of an input database for each specific combination of inputs is necessary. The following is a discussion of the assumptions, research, and calculations that were involved in developing the MOVES2010a input databases.

Figure 1 describes the required MOVES inputs, grouped by common data source. For example, VMT related inputs such as road type distribution and month, day and hour temporal profiles require a compilation of vehicle miles traveled within the modeling domain.

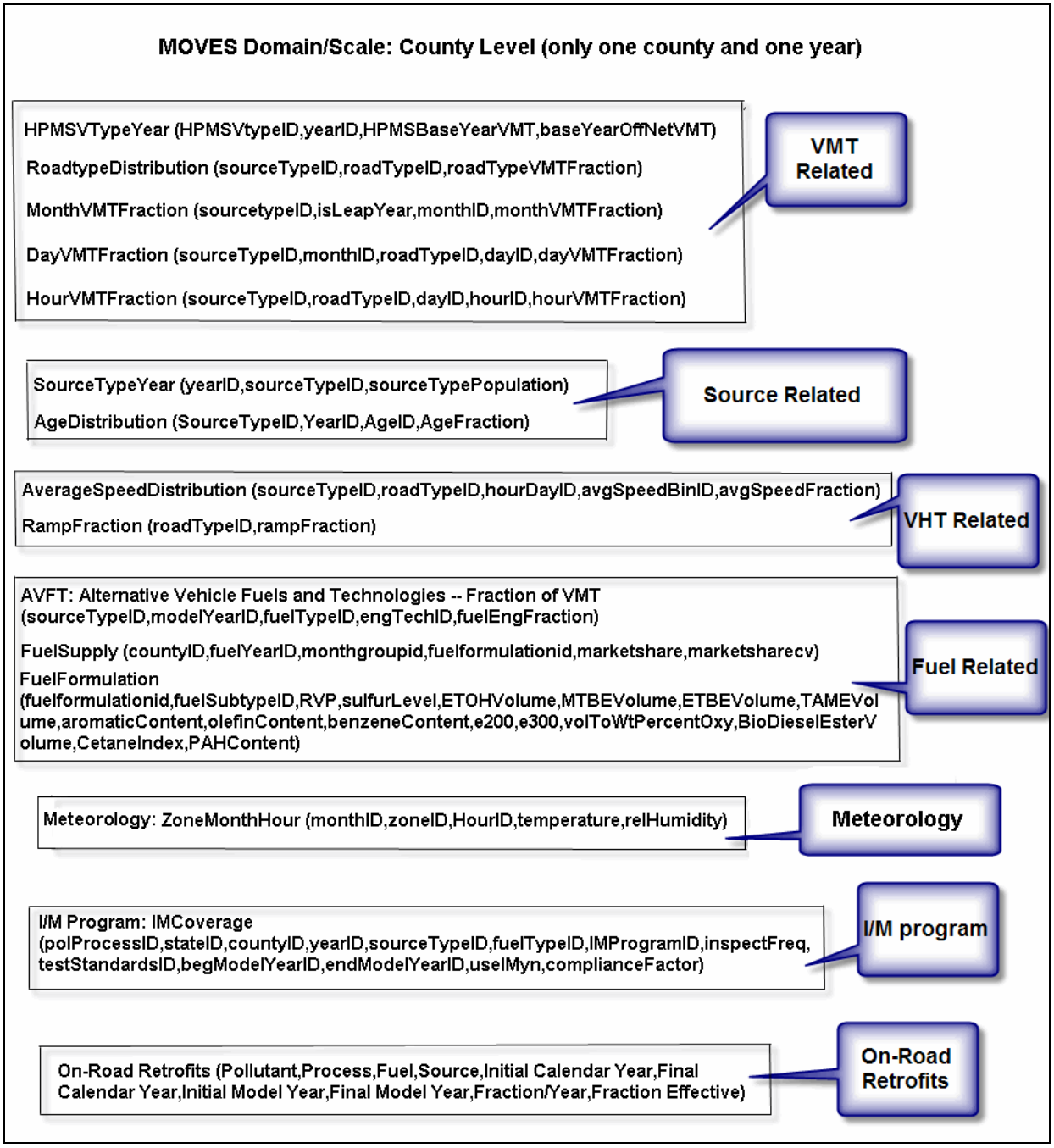


Figure 1. MOVES input files and groups

Input files were prepared for each category, using a combination of local data and national defaults. The methodology section discusses the creation of each input in turn. The input filename under discussion is given after each section heading for clarification.

2.1 Meteorology

Required MOVES input file: ZoneMonthHour(monthID, zoneID, hourID, temperature, relHumidity)

The meteorology inputs provide the average hourly temperature and relative humidity for each county in the domain. During the episodic evaluation phase, each episode was modeled using hourly temperature and relative humidity data by county for each episode day from a representative weather station for each county (*Figure 2*).

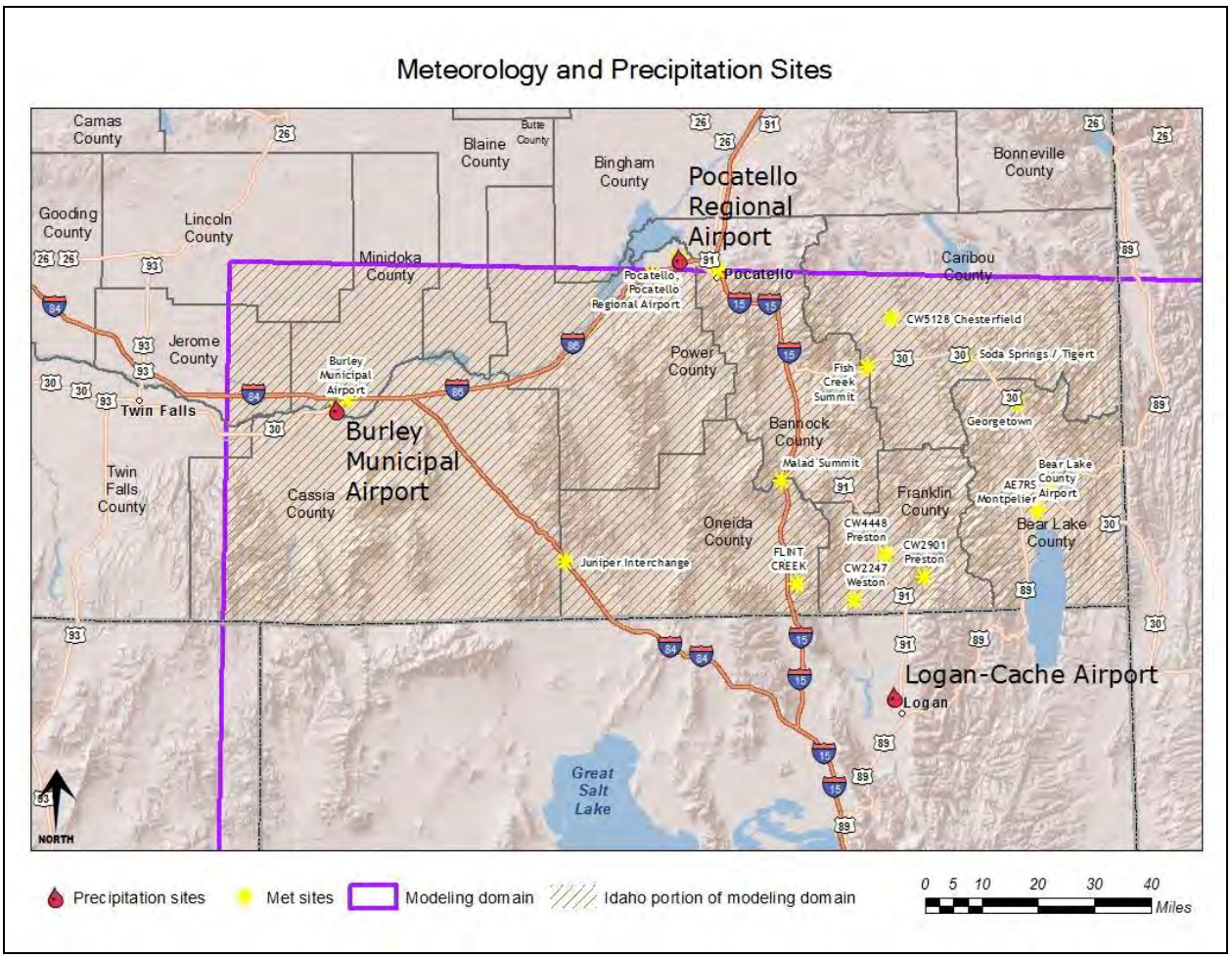


Figure 2. Meteorology and precipitation sites

In the event that a representative station provided an incomplete data set, data sets from one to three other nearby stations were used to gap-fill the original data set. After gap-filling the originally selected data set, if there were still isolated missing observations not more than three hours long, linear interpolation was used to estimate data values for temperature and relative humidity.

For base and future year model runs, averaged hourly temperature and relative humidity data were used from the 2007 episode spanning January 1, 2007 through January 21, 2007.

2.2 Vehicle Hours Traveled (VHT) Related Inputs

VHT inputs describe the fraction of time spent on specific roadway types such as freeway ramps versus other interstate segments and the average speed distributions, or fractions spent at specific speeds by vehicles. MOVES road types and source types (vehicles) related to many of the MOVES input categories are defined in *Tables 1* and 2.

MOVES Road Type	
roadTypeID	*roadDesc*
1	Off-Network
2	Rural Restricted Access
3	Rural Unrestricted Access
4	Urban Restricted Access
5	Urban Unrestricted Access

Table 1. MOVES road type descriptions

MOVES Source Type	Description
11	Motorcycle
21	Passenger Car
31	Passenger Truck
32	Light Commercial Truck
41	Intercity Bus
42	Transit Bus
43	School Bus
51	Refuse Truck
52	Single Unit Short-haul Truck
53	Single Unit Long-haul Truck
54	Motor Home
61	Combination Short-haul Truck
62	Combination Long-haul Truck

Table 2. MOVES source type descriptions

2.2.1 Ramp Fractions

RampFraction(roadTypeID, rampFraction)

Ramp fraction defines the portion of roadways that contain entrance and exit ramps for restricted access roadways. Ramp fractions for rural freeways were set to 1% in order to maintain consistency with UDAQ data inputs for rural areas during the episodic evaluation phase as well as base and future year runs. The MOVES 8% default ramp fraction was used for the small portion of urban interstate in Pocatello, Bannock County (USEPA, 2010).

2.2.2 Average Speed

AverageSpeedDistribution(sourceTypeID, YearID, AgeID, AgeFraction)

The average speed distribution allocates the different source types (vehicles) to fourteen speed bins ranging from 0 to >65 mph (*Table 3*). This input can indicate levels of congestion on roadways.

avgSpeedBinID	avgBinSpeed	avgSpeedBinDesc
1	2.5	speed < 2.5mph
2	5	2.5mph <= speed < 7.5mph
3	10	7.5mph <= speed < 12.5mph
4	15	12.5mph <= speed < 17.5mph
5	20	17.5mph <= speed <22.5mph
6	25	22.5mph <= speed < 27.5mph
7	30	27.5mph <= speed < 32.5mph
8	35	32.5mph <= speed < 37.5mph
9	40	37.5mph <= speed < 42.5mph
10	45	42.5mph <= speed < 47.5mph
11	50	47.5mph <= speed < 52.5mph
12	55	52.5mph <= speed < 57.5mph
13	60	57.5mph <= speed < 62.5mph
14	65	62.5mph <= speed < 67.5mph
15	70	67.5mph <= speed < 72.5mph
16	75	72.5mph <= speed

Table 3. MOVES speed bins

The average speed distribution was based on the ITD link-level data and on the ATR-based temporal profiles. The updated BPR method for average speed estimates was used, as recommended by EPA for rural areas where travel demand models are unavailable (USEPA, 1999).

The average speed on a roadway is primarily a function of the volume of traffic per lane, and the capacity of that lane. The recommended method for determining average speed for MOVES inputs is the modified BPR (Bureau of Public Roads) curve method (ICF Consulting, 2004). The BPR relationship is

$$s = \frac{s_f}{1 + a(v/c)^b},$$

Equation 1. BPR method

where
s = predicted average speed
s_f = free-flow speed
v= volume
c = practical capacity
a = 0.05 for urban arterials; 0.20 for all other facilities
b = 10 (ICF Consulting 2004).

Volume (v) was calculated for each hour by multiplying annual average daily traffic counts for the ITD segments with hourly temporal profiles for specific roadway types averaged from ATR data. Practical capacity (c) and free-flow speed (s_f) were obtained from look-up tables provided in (ICF Consulting, 2004). Capacity was based on an assumption of 1750 counts per lane for interstates and 550 counts per

lane for all other facility types. Free-flow speeds used for specific roadway types are shown in *Table 4* (Transportation Research Board, 1997).

	Free-flow speeds (MPH)		
	Interstate	Arterial	Collector
Urban	55	45	-
Rural	65	55	50

Table 4. Free-flow speed look-up table

Average speeds for each segment were estimated for each hour for both winter weekdays and winter weekend days. These values were then aggregated by roadway type to produce the average speed distributions representative of the roadways throughout the domain.

The average speed distribution developed for use during the episodic evaluation phase was also used in base- and future-year modeling runs.

2.3 Vehicle Miles Traveled (VMT) Related Inputs

VMT inputs describe the distance traveled on different roadways by the various source types (vehicles). This dataset was developed from link-level traffic counts provided by ITD, from ATR-based temporal profiles, from statewide annual totals obtained from HPMS, and in some cases, from MOVES default distributions.

2.3.1 Annual VMT

HPMSVTypeYear(HPMSVtypeID, yearID, HPMSBaseYearVMT, baseYearOffNetVMT)

The data used to generate the annual VMT includes HPMS statewide total annual VMT by FHWA roadway type, ITD statewide link-level annual average daily traffic data (AADT), MOVES default statewide county-level annual VMT by MOVES roadway type, and ITD ATR data. Since the data quality of the ITD statewide link-level AADT is not good enough for the rural major collector, rural minor collector, rural local, urban minor arterial, urban collector, or urban local road types, the method used to develop the annual VMT is as follows:

- For 2007 and 2008
    - For rural interstate, rural principal arterial, rural minor arterial, urban interstate, and urban principal arterial
        - Calculate ITD statewide county-level annual VMT using ITD statewide link-level AADT data.
        - Use ITD statewide county-level annual VMT as surrogate to split HPMS statewide total annual VMT to produce county-level annual VMT.
    - For rural major collector, rural minor collector, rural local, urban minor arterial, urban collector, and urban local
        - Run MOVES at national scale to generate default statewide county-level annual VMT by MOVES roadway type.
        - Use MOVES default statewide county-level annual VMT as surrogate to split HPMS statewide total annual VMT to produce county-level annual VMT.
- For 2009 and 2010

- Use ITD ATR data to generate growth factor for 2009 and 2010 annual VMT as described in section 2.3.1.1.
- Grow 2007 data to 2009 and 2010 using the generated growth factor.

2.3.1.1 Roadway Type Growth Factors for 2009 and 2010

Since the HPMS traffic activity data are not available for the years 2009 and 2010, the annual VMT for each MOVES roadway classification was grown from the 2007 roadway type VMT distribution using published monthly average traffic count volumes from the network of Automatic Traffic Recorders (ATRs). ATR monthly average counts for the month of January for the years 2007 through 2010 were used to best represent the period of most severe $PM_{2.5}$ stagnation events in the Cache Valley. The change in average counts (growth factors) relative to January 2007 was aggregated by MOVES roadway type, as shown in *Table 5*.

Growth Factors for January Relative to January 2007				
YEAR	Rural Arterials	Rural Interstates	Urban Interstates	Urban Arterials & Collectors
# ATRs	6	7	3	4
2007	1.0000	1.0000	1.0000	1.0000
2008	0.9717	0.9575	0.9457	1.0028
2009	0.9964	0.9780	0.9761	1.0396
2010	0.9677	0.9721	0.9763	1.0212

Table 5. Roadway type VMT growth factors

For future year runs, annual VMT was estimated by applying the annual VMT growth rate between 2008, 2014 and 2019 in the MOVES default database to local 2008 VMT.

2.3.2 Roadway Type, Monthly, Daily, and Hourly VMT

RoadTypeDistribution(sourceTypeID, roadTypeID, roadTypeVMTFraction)
MonthVMTFraction(sourceTypeID, isLeapYear, monthID, monthVMTFraction)
DayVMTFraction(sourceTypeID, monthID, roadTypeID, dayID, dayVMTFraction)
HourVMTFraction(sourceTypeID, roadTypeID, dayID, hourID, hourVMTFraction)

The road type distribution describes the fleet miles driven on the roadways within the domain. The temporal distribution profiles split out the VMT activity by source type into month, day and hour temporal profiles. The road type distribution and temporal profiles were derived from ATR data and annual FHWA roadway type VMT. ATR data contains hourly vehicle counts for each length bin. Crosswalks from ATR length bins to MOVES vehicle types and from FHWA roadway type to MOVES roadway types were developed. For each ATR site, data for a complete year was processed to assure temporal profiles are not biased by seasonal variations. Hourly, weekday/weekend, and monthly statistics were calculated for each vehicle type. Finally, ATR sites were grouped based on MOVES roadway types and each site was weighted the same in the final temporal profiles.

Future year monthly VMT fractions were converted from leap year input format to non-leap year format. Day and hour VMT fractions used for the episodes and 2008 base-year were also used for 2014 and 2019 future years.

2.4 Inspection and Maintenance Programs

IMCoverage(polProcessID, stateID, countyID, yearID, sourceTypeID, fuelTypeID, IMProgramID, inspectFreq, testStandardsID, begModelYearID, endModelYearID, useIMyn, complianceFactor)

Inspection and Maintenance (I/M) programs require registered vehicles to undergo periodic emissions tests. None of the Idaho counties included in the modeling domain have current or planned IM programs. Therefore, all counties were modeled with no IM programs specified in the MOVES input database during the episodic evaluation, base year and future year model runs.

2.5 Source Related Inputs

The source types describe and group the vehicles in the domain. The fleet mix type and age distributions are key components of mobile emissions.

2.5.1 Age Distribution

AgeDistribution(sourceTypeID, yearID, ageID, ageFraction)

The age distribution inputs provide an age profile for each vehicle source type in the fleet. Two separate age distributions were developed for input into the MOVES model using three primary sources of data: the 2005 Sierra Research Fleet Mix Study Report (Sierra Research, 2006), ITD vehicle registration age data, and the MOVES national default database age distribution. A rural county age distribution and an urban age distribution were developed for MOBILE6.2 vehicle types. The urban distribution was used to model Power and Bannock counties. The rural county distribution was used for modeling the remaining nine counties. Two different age distribution inputs were developed for input into the MOVES model because the Sierra Study created age distributions for several metropolitan areas in Idaho in addition to a rural age distribution for all the remaining counties within the state. Pocatello was one of the metropolitan areas for which the Sierra Study provided a specific age distribution.

Age distribution inputs were developed for MOBILE6.2 model vehicle types in order to facilitate conversion of data into the MOVES vehicle types via an EPA converter spreadsheet program (USEPA, 2010). Since the Sierra Study developed a light duty fleet age distribution for MOBILE6.2 vehicle types LDV, LDT1, LDT2, LDT3, LDT4, HDV2B, and HDV3 DEQ developed the MOBILE6.2 age distributions and converted them to MOVES age distributions via the EPA converter program. A description of the MOBILE6.2 vehicle types is included in *Appendix A*.

For heavy duty MOBILE6.2 vehicle types HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS, HDBT, and motorcycles, the MOVES national default database age distributions were used to reflect the fact that the majority of heavy duty vehicles traveling through the modeling domain are not in fact registered within the counties included in the modeling domain and therefore are better represented by the most recent national default age distributions.

For rural and urban counties, age distribution inputs for passenger vehicles including MOBILE6.2 vehicle types LDV, LDT1, and LDT2 were adjusted using passenger vehicle registration data from ITD for 2007

- 2009. *Table 6* shows the ITD registration data converted into fractions based on the vehicle registration populations. The original ITD registration age data is contained in *Appendix A*. Since the ITD registration data is grouped into two-year bins (e.g., 0-2 years old, 3-4 years old, etc.), a direct application of the ITD age distribution to the single year format required by the MOBILE6.2 model was impossible. For this reason, a scaling factor was calculated using the Sierra Study age distribution fractions for each MOBILE6.2 vehicle class to apportion the ITD registration age distribution to each of the light duty MOBILE6.2 vehicle classes LDV, LDT1, and LDT2.

Since the ITD registration data was applicable only to MOBILE6.2 vehicle classes LDV, LDT1, and LDT2, and the 2005 Sierra Research age distribution extended only to vehicle types LDT3, LDT4, HDV2B, and HDV3, these local data sources could not be used to provide information on the remainder of the heavy duty vehicle classes and motorcycles. Thus, MOVES model national default age distributions were used for the remaining MOBILE6.2 vehicle types HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS, HDBT, and motorcycles. *Table 7* shows the MOBILE6.2 vehicle classes and the data sources used to develop the age distributions for each vehicle type.

IDAHO TRANSPORTATION DEPARTMENT PASSENGER CAR REGISTRATIONS BY AGE GROUP							
REGISTRATION YEAR	AGE IN YEARS	0-2	3-4	5-6	7-8	> 8	TOTAL
2007	Fraction	0.1633	0.0992	0.1048	0.1058	0.5270	1.0000
2008	Fraction	0.1449	0.1026	0.1036	0.1067	0.5421	1.0000
2009	Fraction	0.1174	0.1045	0.1049	0.1045	0.5688	1.0000

Table 6. ITD vehicle registration age fractions for 2007 through 2009

MOBILE6.2 Vehicle Type	Age Distribution Input Source
LDV	2005 Sierra Report scaled using ITD registration data for 2007-2009
LDT1	2005 Sierra Report scaled using ITD registration data for 2007-2009
LDT2	2005 Sierra Report scaled using ITD registration data for 2007-2009
LDT3	2005 Sierra Report unscaled values
LDT4	2005 Sierra Report unscaled values
HDV2B	2005 Sierra Report unscaled values
HDV3	2005 Sierra Report unscaled values
HDV4	MOVES national default distribution
HDV5	MOVES national default distribution
HDV6	MOVES national default distribution
HDV7	MOVES national default distribution
HDV8a	MOVES national default distribution
HDV8b	MOVES national default distribution
HDBS	MOVES national default distribution
HDBT	MOVES national default distribution
Motorcycle	MOVES national default distribution

Table 7. Crosswalk between MOBILE6.2 vehicle types and age distribution data source combinations

Future year age distributions were developed using this methodology and the 2010 ITD vehicle age data since it was the newest data available at the time the model was run.

2.5.2 Source Type Population

SourceTypeYear(yearID, sourceTypeID, sourceTypePopulation)

The source type population input describes the types and numbers of vehicles that make up the fleet. Two sources of data were used to develop the source type population inputs: ITD registration data and MOVES national default population data.

ITD registration data is presented in three categories: passenger cars, trucks, and miscellaneous motor vehicles. ITD defines passenger cars in their registration data as non-commercial vehicles 8,000 lbs. gross vehicle weight (GVW) and under. Thus, the vast majority of sport utility vehicles (SUVs) on the road would also be classified as passenger cars by ITD. The ITD trucks registration designation applies to all vehicles with GVW over 8000 lbs., which would primarily include short-haul delivery trucks registered locally. Long-haul, heavy duty tractor-trailer truck populations are typically not complete in state motor vehicle registration databases, because many those types of trucks are typically registered out of state. Thus, default source type populations were used for MOVES vehicle types 11, 41, 42, 43, 51, 52, 53, 54, 61, and 62. For the remaining MOVES vehicle types 21, 31, and 32, ITD registration data were allocated to each of the vehicle types using the MOVES default fractions as the basis for splitting the ITD registration data into the three source types. *Table 2* shows descriptions of each MOVES source type.

For base year model runs, the source type population used for the 2008 episode was used. For future years, the MOVES default growth rate was assumed and applied to 2008 source type populations to estimate 2014 and 2019 source type populations.

2.6 Fuel Related Inputs

2.6.1 Alternative Vehicle Fuels and Technology (AVFT)

AVFT(sourceTypeID, modelYearID, fuelTypeID, engTechID, fuelEngFraction)

None of the Idaho counties in the modeling domain use compressed natural gas (CNG) as a fuel source for transit buses, therefore AVFT input files were constructed by converting CNG fraction in the default input file to diesel. This input was consistent with the Cache County, Utah inputs.

2.6.2 Fuel Supply

FuelSupply(countyID, fuelYearID, monthGroupID, fuelFormulationID, marketShare, marketShareCV)

With the exception of E10, MOVES national default fuel supplies were used as inputs for each county and date combination within the modeling domain and episode time frames. MOVES national default fuel formulations were judged to be reasonable based on local knowledge except for the E10 market share. These values were updated with information provided by fuel suppliers (*Table 8*). MOVES defaults were used in future year model runs.

E10 Market Share for Idaho [approximate]	
Year	**Market Share**
2007	Default
2008	0.68
2009	0.86
2010	0.90

Table 8. E10 market share

2.6.3 Fuel Formulation

FuelFormulation(fuelFormulationID, fuelSubtypeID, RVP, sulfurLevel, ETOHVolume, MTBEVolume, ETBEVolume, TAMEVolume, aromaticContent, olefinContent, benzeneContent, e200, e300, volToWtPercentOxy, bioDieselEsterVolume, cetaneIndex, PAHContent)

No local data sources were available for the fuel formulation input, so national defaults were used for this category during the episodic evaluation phase, base year, and future year model runs.

2.7 On-road Retrofits

On-roadRetrofits(pollutant, process, fuel, source, initialCalendarYear, finalCalendarYear, initialModelYear, finalModelYear, fractionYear, fractionEffective)

None of the Idaho counties in the modeling domain use on-road retrofits. Therefore, all counties were modeled with no on-road retrofits specified in the MOVES input database.

3 Results

Episodic, base- and future year on-road emissions estimates were provided in electronic format to UDAQ and are summarized in their Technical Support Document included as an appendix to this SIP package.

4 Quality Control and Quality Assurance

Quality control was achieved by a quality assurance review of each set of inputs by a team member not directly involved with development of the input. In general, each input was checked for internal consistency, compared with national defaults, and assessed for reasonableness in comparison to fleet and traffic statistics that DEQ has seen in other parts of the state.

Examination of the MOVES emissions outputs produced with the inputs described in this report reveal that the results are acceptable. *Figure 3* shows a plot of the NO_x emissions outputs produced by IDEQ for the Idaho counties in the modeling domain along with the NO_x emissions outputs produced by UDAQ for the Utah counties in the domain. The correlation between NO_x emissions and VMT is similar for counties in both states, even though the MOVES inputs where developed using independent methods and the MOVES modeling was conducted on different systems. This result gives us confidence that the MOVES modeling is correct and the DEQ estimates for Idaho counties are consistent with the UDAQ results for Utah counties.

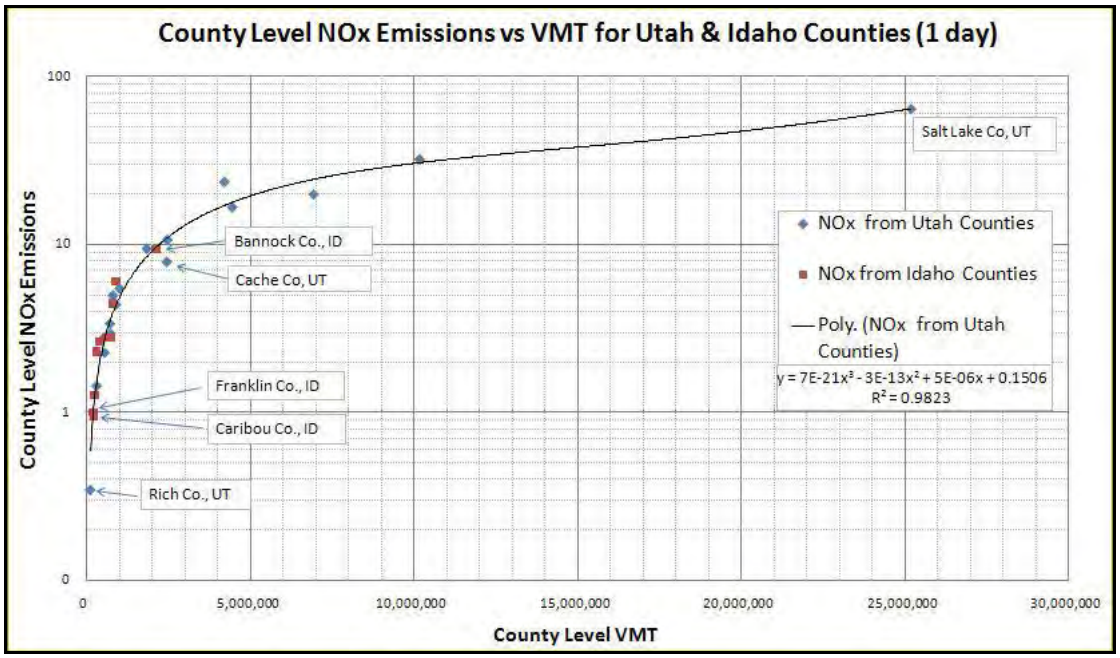


Figure 3. IDEQ MOVES emissions results compared to UDAQ MOVES emissions results.

References

FHWA. (2011). "Highway Performance Monitoring System (HPMS)." from **http://www.fhwa.dot.gov/policy/ohpi/hpms/index.cfm**.

ICF Consulting (2004). Sample Methodologies for Regional Emissions Analysis in Small Urban and Rural Areas, Federal Highway Administration, US Department of Transportation: 108.

Sierra Research (2006). Development of Fleet Characteristics Data for the Idaho On-Road Motor Vehicle Fleet. SR2006-01-01: 131.

Transportation Research Board (1997). Planning Techniques to Estimate Speeds and Service Volumes for Planning Applications. NCHRP Report 387.

USEPA (1999). Guidance for the Development of Facility Type VMT and Speed Distributions (DRAFT), Assessment and Modeling Division, Office of Mobile Sources. EPA420-P-99-004: 53.

USEPA. (2010). "RegistrationDistributionConverter Veh16, Tools for MOVES (Motor Vehicle Emission Simulator)." Retrieved Dec. 2010, from **http://www.epa.gov/oms/models/moves/tools.htm**.

USEPA (2010). Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity, Transportation and Regional Programs Division, Office of Transportation and Air Quality, USEPA. EPA-420-B-10-023: 47.

USEPA. (2011). "MOVES (Motor Vehicle Emission Simulator)." from **http://www.epa.gov/otaq/models/moves/index.htm**.

Appendix A.

Vehicle Type	Abbreviation	Description
1	LDV	Light-Duty Vehicles (Passenger Cars)
2	LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
3	LDT2	Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
4	LDT3	Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)
5	LDT4	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, greater than 5,751 lbs. ALVW)
6	HDV2b	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)
7	HDV3	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)
8	HDV4	Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)
9	HDV5	Class 5 Heavy-Duty Vehicles (16,001-19,500 lbs. GVWR)
10	HDV6	Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)
11	HDV7	Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)
12	HDV8a	Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)
13	HDV8b	Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)
14	HDBS	School Buses
15	HDBT	Transit Buses
16	MC	Motorcycles

Table A1. MOBILE6.2 vehicle type descriptions

IDAHO TRANSPORTATION DEPARTMENT PASSENGER CAR REGISTRATIONS BY VEHICLE AGE GROUPS							
REGISTRATION YEAR	**AGE IN YEARS**	**0-2**	**3-4**	**5-6**	**7-8**	**> 8**	**TOTAL**
2007	UNIT	205,802	125,020	132,084	133,331	664,389	1,260,626
	PERCENT	16.3%	9.9%	10.5%	10.6%	52.7%	100.0%
2008	UNIT	183,887	130,259	131,500	135,420	688,022	1,269,088
	PERCENT	14.5%	10.3%	10.4%	10.7%	54.2%	100.0%
2009*	UNIT	143,191	127,437	127,945	127,536	693,961	1,220,070
	PERCENT	11.7%	10.4%	10.5%	10.5%	56.9%	100.0%
*Model Years		2011 - 2007	2006, 2005	2004, 2003	2002, 2001	2000 and older	Total

Table A2. Unaltered ITD registration age data for 2007 – 2009

Estimated Cost for a Franklin County Inspection and Maintenance Program

Estimated Cost for a Franklin County Inspection and Maintenance Program

The Canyon County, Idaho Inspection and Maintenance (I/M) program is the basis for this back-of-the-envelope estimate. Every I/M program has a certain amount of fixed costs regardless of the number of vehicles to be tested. For Canyon County the major costs are:

DEQ:	1 full time employee
Contractor:	3 full time employees Office space, computer equipment, and software
Shops:	Testing equipment Staff time

The Canyon County program yields about $450,000 per year and is losing money. Even if it were possible to run a Franklin County Program at 2/3 that cost, by no means a certain prospect, the annual estimated cost would be approximately $300,000.

An I/M program would be expected to reduce NOx emissions by 4.6% based on UDAQ MOVES modeling. Franklin County NOx emissions from mobile sources in 2008 were 0.88 tons/day. A 4.6% reduction in emissions would be 0.04 tons/day or 15 tons /year. Therefore, the estimated cost per ton of NOx reduced would be at least $20,000/ton.

According to the 2011 NEI MOVES input files Idaho has compiled using ITD DMV registration data for Franklin County, there are the following numbers of vehicles registered:

Vehicle Type	2011 Registered Population in Franklin County
Passenger Cars	5498
Passenger Trucks	7506
Light Commercial Trucks	219
Total	13223

Of the 13,223 vehicles in those three classes, 35.2% of them are ineligible for IM testing due to age (either 5 years old/newer or 30 years old/older). That leaves approximately 8574 vehicles that would be subject to a theoretical IM program in Franklin County. If, consistent with Canyon County, vehicles are tested every 2 years, the number of vehicles expected to be tested per year would be about 4300. The cost per vehicle would then be about $70 every 2 years.

By either measure, cost per ton reduced or cost per vehicle, Idaho deems the cost unreasonable both on its face and in the context of the Franklin County emissions inventory.

Appendix D. Modeling—Utah Department of Air Quality

- **Modeling Protocol**
- **Photochemical Modeling**
- **SMOKE Model**
- **MATS TSD**
- **Meteorological Monitoring**

This page intentionally left blank for correct double-sided printing.

Modeling Protocol

$PM_{2.5}$ State Implementation Plan

Modeling Protocol

Prepared by:

Utah Division of Air Quality
195 North 1950 West
Salt Lake City, Utah 84116

Final – Version 2.2

TABLE OF CONTENTS

1. OVERVIEW OF MODELING AND ANALYSIS PROJECT 4

1.1 Management Structure 4

1.2 Technical Committees and Participating Organizations 4

1.3 Schedule for Completion of Attainment Demonstration 4

1.4 Description of Conceptual Model 5
1.4.1 Conceptual Model Introduction 5
1.4.2 $PM_{2.5}$ Meteorology 7
1.4.3 $PM_{2.5}$ Components 8
1.4.4 $PM_{2.5}$ Precursor Emissions 9
1.4.5 $PM_{2.5}$ Spatial Patterns 12
1.4.6 $PM_{2.5}$ Chemistry 12
1.4.7 $PM_{2.5}$ Concentration Trends 14
1.4.8 $PM_{2.5}$ Modeling Experience 14

2. MODEL AND MODELING INPUTS 15

2.1 Air Quality, Meteorology, Emissions Model Selection Rationale 15

2.2 Modeling Domain & Resolution 17

2.3 Attainment Test Geographic Area 18

2.4 Initial and Boundary Conditions 19

2.5 Episode Selection 19
2.5.1 Introduction 19
2.5.2 Non-Attainment Area Meteorological Conditions 20
2.5.3 Non-Attainment Area Episode Selection 20
2.5.4 Episode Selection Criteria 20
2.5.5 Selected Episodes 25
2.5.6 Summary 31

2.6 Modeling Setup 32

2.7 Emissions Inputs 32
2.7.1 Introduction 32
2.7.2 Idaho and Wyoming Inventory 34
2.7.3 Spatial Surrogates used for Distributing Emissions 35
2.7.4 Method to Create Partial-County Emission Inventories 38
2.7.5 Temporal Processing 39
2.7.6 Inputs for Base and Future Year Episodes 42
2.7.7 Inventory Quality Assurance 43

2.8 Model Input Quality Assurance Methods 43

3. MODEL PERFORMANCE EVALUATION 43

3.1 Ambient air quality database 43

3.2 Evaluation Procedures 44
3.2.1 Identify a Window of Model Grid Cells 44
3.2.2 Identify a Window Statistic to Compare With Monitor 47
3.2.3 Performance Metrics and Tests 47

3.3 Diagnostic Testing 48

3.4 Modeled Attainment Test Using the Modeled Attainment Test Software (MATS) 49
3.4.1 Future Year Modeling 50
3.4.2 Unmonitored Area Analysis Outside of MATS 50

4. SUPPLEMENTAL ANALYSES 51

4.1 Additional Analyses to Corroborate Modeled Attainment Test 52

4.2 Weight of Evidence Determination 53

4.3 Large Point Source Incremental Modeling 54

5. PROCEDURAL REQUIREMENTS 54

5.1 Plan for Archiving Technical Data 54

5.2 List of Deliverables 55

6. REFERENCES 56

1. Overview of Modeling and Analysis Project

1.1 Management Structure

The draft development of this document is being led by the Technical Analysis Group of the Utah Division of Air Quality (UDAQ). A committee has been formed to make decisions about the technical methods that will be used for this study. The members of this group represent the following agencies:

- State of Utah
- State of Idaho
- EPA Region 8
- EPA Region 10

Through a series of periodic telephone conference calls all of the technical proposals and decisions regarding the methods used in this study will be discussed and agreed to by the members of this committee. When the substantive elements of this document are agreed to by all of the committee members the protocol will be considered to be in its final draft form.

1.2 Technical Committees and Participating Organizations

Modeling: The UDAQ modeling team performs meteorological, chemistry, and emissions modeling for the $PM_{2.5}$ SIP. The team interfaces with EPA Region 8 and 10 as well as the State of Idaho.

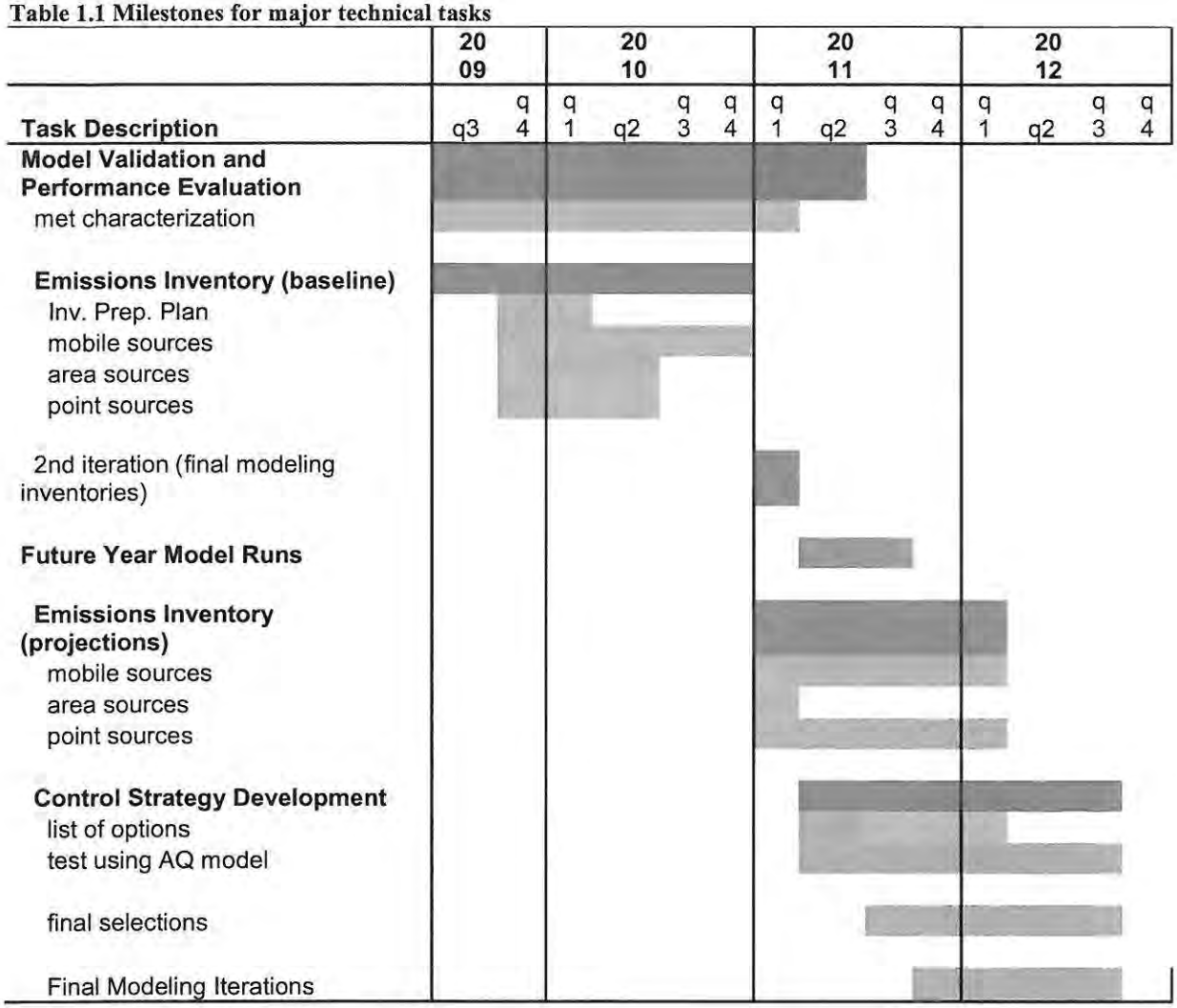
Emissions Inventory: The UDAQ emissions inventory group collects inventories. The group produces episodic inventories for SIP modeling, projects inventories to future years, and develops the Inventory Preparation Plan. The inventory group interfaces with EPA Region 8, EPA Region 10, and coordinates with the State of Idaho.

Mobile Sub-Committee: UDAQ in conjunction with the Metropolitan Planning Organizations of the Wasatch Front and Cache Valley work together to implement the new EPA MOVES mobile emissions model and to create episodic emissions inventories for SIP modeling. The sub-committee interfaces with EPA Region 8, EPA Region 10, and coordinates with the State of Idaho.

1.3 Schedule for Completion of Attainment Demonstration

Table 1.1 shows the general time line for completion of the major modeling milestones in developing the base case and future year modeling episodes.

Table 1.1 Milestones for major technical tasks



1.4 Description of Conceptual Model

1.4.1 Conceptual Model Introduction

In 2009, EPA designated 3 regions in northern Utah as $PM_{2.5}$ non-attainment areas due to high 24-hour average $PM_{2.5}$ concentrations that occur during winter-time stagnation episodes in Utah valleys. The "Wasatch Front" is included in the Salt Lake City and Utah County non-attainment areas. Parts of Cache County, Utah and Franklin County Idaho are included in the Logan non-attainment area (see Figure 1.1). Traditionally, the term Wasatch Front has been used to describe the most densely populated area of the state. This is comprised of four counties that lie on a north-south axis along the west slope of the Wasatch mountain range and includes Weber, Davis, Salt Lake, and Utah counties. Portions of Tooele and Box Elder counties are also included in EPA's designation of the Salt Lake City non-attainment area. The meteorological conditions and chemical processes that lead to elevated winter-time $PM_{2.5}$ in Utah occur in very few locations in

the United States. The combination of the following factors make Utah's $PM_{2.5}$ problem both unique and difficult to model:

1) Mountainous topography.
2) High density of urban emissions sources.
3) Ridge dominated weather in SW United States.
4) $PM_{2.5}$ dominated by secondary chemistry.
5) High density of agricultural ammonia emissions sources near the urban area.

The situation that Utah faces is unique to the United States and presents significant meteorological and chemistry modeling challenges.

In addition to stagnation related 24-hour average exceedences, Utah experiences $PM_{2.5}$ exceedances caused by occasional high wind events during the spring and fall. As of August, 2010, UDAQ and EPA have not yet determined the most appropriate method to analyze these events in the context of the modeled attainment test. Language in the Clean Air Act seems to require the inclusion of PM concentrations measured during dust storms in the calculation of the design values for the model attainment test. If dust storm $PM_{2.5}$ data is included in the calculation of the design values it will increase the design value at several locations. The use of CMAQ with a modeled attainment test will be specifically tied to a winter inversion period. Photochemical grid models such as CMAQ perform poorly for wind blown dust events, so alternate modeling approaches would be required to evaluate the dust component for high wind events when wind blown dust is the primary component of $PM_{2.5}$.

When these issues are resolved, this protocol will be updated with an addendum to incorporate the technical approach to be used to assess wind-blown dust events for the Utah $PM_{2.5}$ SIP.

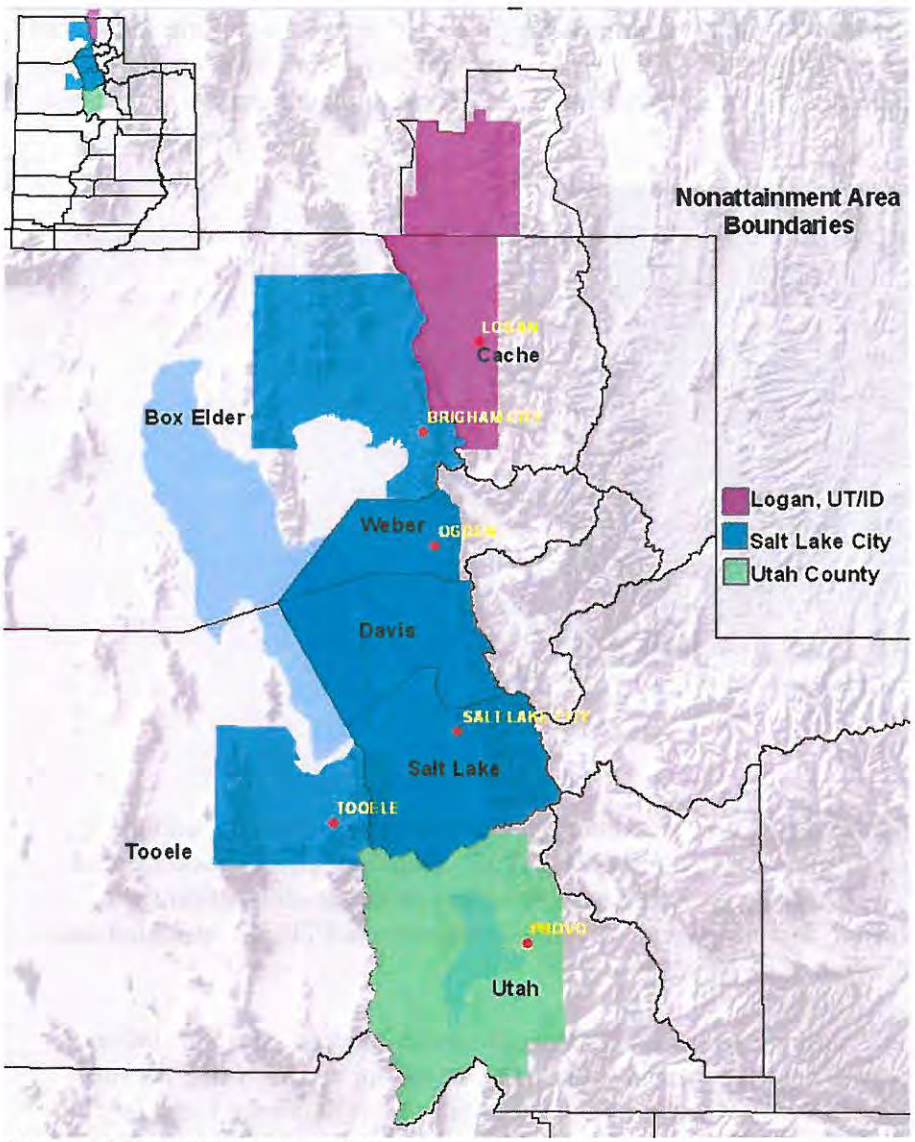


Figure 1.1 Utah $PM_{2.5}$ non-attainment areas

1.4.2 $PM_{2.5}$ Meteorology

While Utah's problem is unique the conceptual picture of the conditions that lead to elevated $PM_{2.5}$ is simple (Malek 2006). Utah's non-attainment areas sit in valley/basin bottoms which are known as Utah Lake Basin, Great Salt Lake Basin, and the Bear River Basin. During the winter-time, periodic ridges of high pressure park themselves over the Intermountain region and bring clear skies and quiescent weather. The presence of snow cover and weak insolation quickly allow temperature inversions to develop in basin bottoms. Without significant synoptic scale forcing mechanisms these nascent temperature inversions are not scoured out and stable cold pools can develop and strengthen as a result of the heat deficit present in the basin (Whiteman 1999) (Figure 1.2).

Emission sources within the stable cold pool provide the precursor emissions to form secondary $PM_{2.5}$ which accounts for over 75% of the total $PM_{2.5}$. Regional $PM_{2.5}$ represents only a fraction of the total $PM_{2.5}$ because transport winds are essentially non-existent in the regions dominated by the ridge.

Figure 1.2 Cold pool in Bear River (Cache) Valley

1.4.3 $PM_{2.5}$ Components

Utah's winter-time cold pool $PM_{2.5}$ in all 3 non-attainment areas is dominated by secondarily formed particulate. All winter-time cold pool speciated $PM_{2.5}$ data that UDAQ has collected supports this statement. The $PM_{2.5}$ is dominated by ammonium nitrate at all locations and includes significant portions of organic carbon. Table 1.2 summarizes UDAQ's speciated data that has been collected during the last 10 years.

The first 3 rows of Table 1.2 contain speciation statistics from the 3 longer term Speciation Network (STN) sites located along the Wasatch Front. The Bountiful and Lindon STN sites collect data on a 1 in 6 day schedule while the Hawthorne site collects data on a 1 in 3 day schedule. The statistics for these 3 STN sites reflects only days when the 24-hour average PM2.5 was >= 35 ug/m3. The fourth row of Table 1.2 provides data from a newly installed STN site in Logan. The statistics for this site reflect the 4 highest PM2.5 24-hour average concentrations that have been collected to date.

Rows 5, 6, and 7 of Table 1.2 show speciated data sets that were collected in the Cache Valley, including Logan, during the winter of 2004. These special study data sets from TEOM speciation, Mini_Vol speciation (Martin 2006), and real-time mass spectrometer speciation (Silva 2007) corroborate the newly acquired data from the Logan STN site and create a robust speciated data set for Logan and the Cache Valley.

Station	County	Monitor & Analysis Type	Year	Number Samples	Median PM2.5 ug/m3	Median PM1.0 ug/m3	% Ammonium Nitrate	% Ammonium Sulphate	% Organic Carbon	% Elemental Carbon
Bountiful	Davis	STN	Nov 2001+	18	44	NA	65%	7%	16%	3%
Hawthorne (Salt Lake City)	Salt Lake	STN	Feb 2000+	62	44	NA	56%	6%	21%	4%
Lindon	Utah	STN	Jun 2001+	22	50	NA	62%	3%	15%	2%
Logan	Cache	STN	Feb 2010+	4	28	NA	56%	3%	14%	4%
Logan	Cache	FRM	Jan-Feb 2004	20	92	NA	64%	6%	13%	1%
Cache Valley Rural*	Cache	Mini-Vol	Jan 2004	12	105	NA	65%	6%	NA	NA
Logan (USU)	Cache	Mass Spectrometer	Jan-Mar 2004	Continuous	NA	Up to 120	60-80%	~6%	15-20%	1-3%

*Hyrum, Newton, Preston, Amalga, Cornish, Franklin, Mendon, Richmond, Smithfield, USU

Table 1.2 Average $PM_{2.5}$ 24-hour average speciation for 2000-2009

Speciation profiles obtained from each location and each instrument are consistent with each other in that ammonium nitrate dominates the PM2.5 speciation. Furthermore, the data shows that speciation in the Cache Valley is similar to that along the Wasatch Front. The somewhat lower percentage of ammonium nitrate obtained from the Logan STN is likely the result of lower total PM2.5 concentrations. Only 1 of the 4 speciated observations was above the NAAQS, therefore, the median 24-hour PM2.5 concentration was only 28.4 ug/m3. A statistical analysis of Wasatch Front speciated data shows that the percentage of ammonium nitrate increases as total PM2.5 concentrations increase. The Logan finding is consistent with this Wasatch Front analysis.

The take away message is that $PM_{2.5}$ in Utah's non-attainment areas are dominated by ammonium nitrate and organic carbon. The data indicates that ammonium nitrate accounts for greater than half of observed $PM_{2.5}$ and can exceed 80% of the total $PM_{2.5}$ during the very highest $PM_{2.5}$ episodes. Organic carbon accounts for 15-20% of total PM2.5.

1.4.4 $PM_{2.5}$ Precursor Emissions

Emission inventories continue to be calculated, as they have in the past, using the most current models and emission factors. Mobile emissions will be calculated using the most recent EPA mobile model called MOVES.

As mentioned later in Section 1.5.2, violations of the NAAQS occur most often during stagnant, winter-time inversions and involve the production of secondary aerosols. Figures 1.3 and 1.4 show emission inventories for the non-attainment counties of the Wasatch Front and Cache County during a typical winter day. Pollutants shown are those most commonly involved in the formation of secondary particulates as well as the inventory of primary $PM_{2.5}$. Figure 1.5 is a view of just Salt Lake County and shows a further breakout of some of the major contributing categories to each of these pollutants.

Other than normal growth in population and commercial activity there are no significant changes in the nature of pollutants coming into the airshed over the past five to ten years.

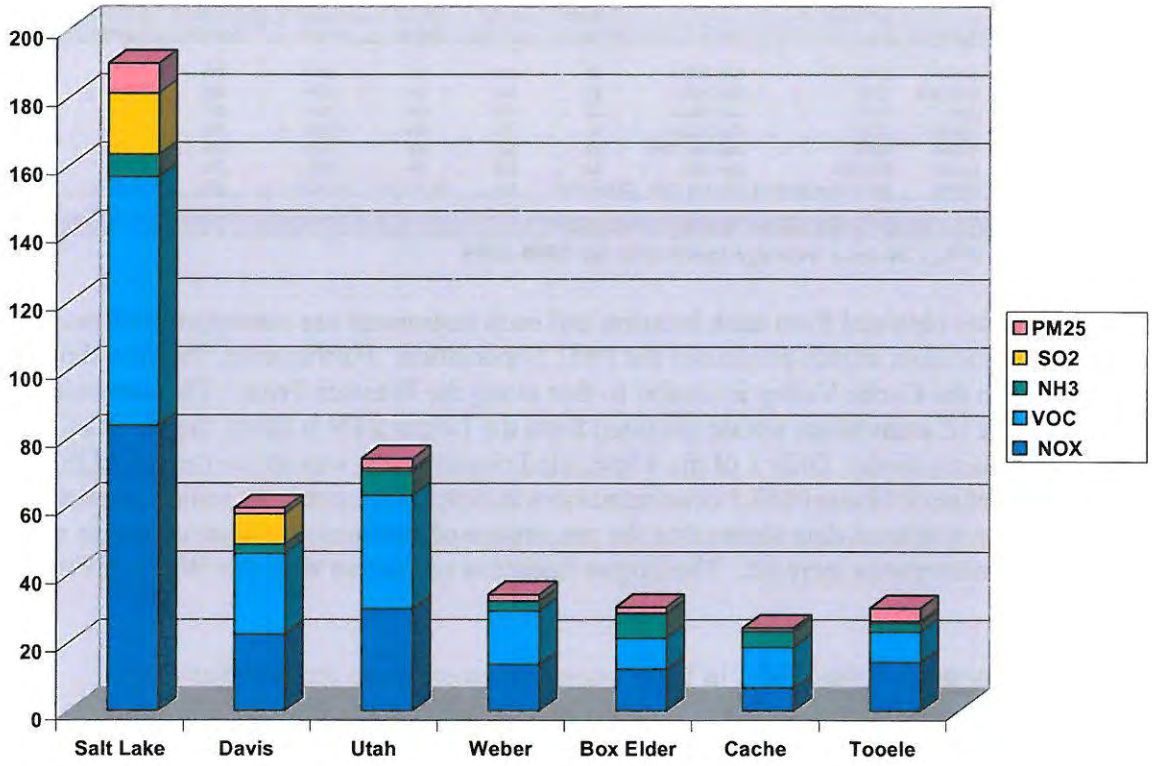


Figure 1.3 Sum of all emissions in tons/day for February 2008

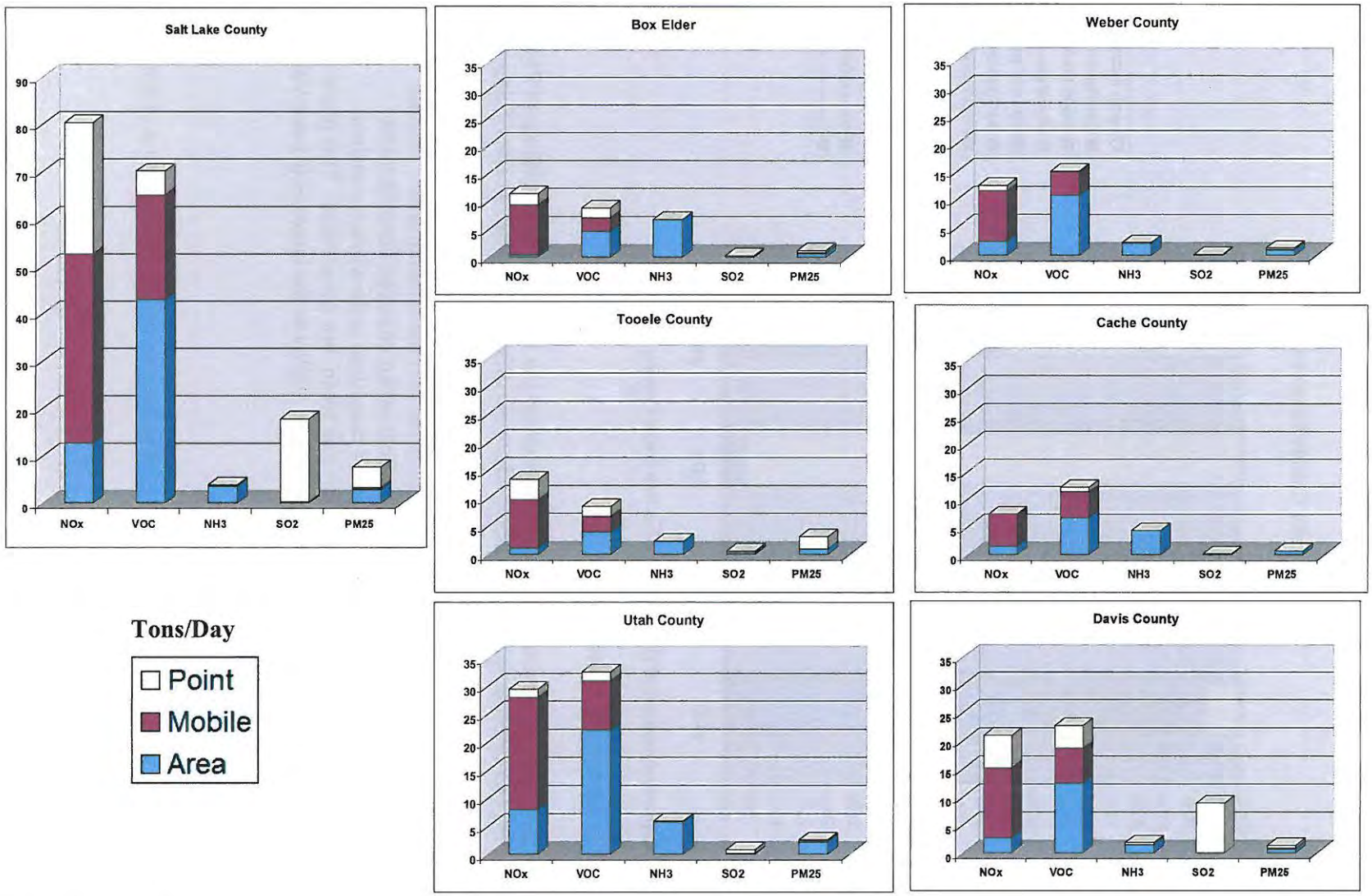


Figure 1.4 County emissions by type for February 2008

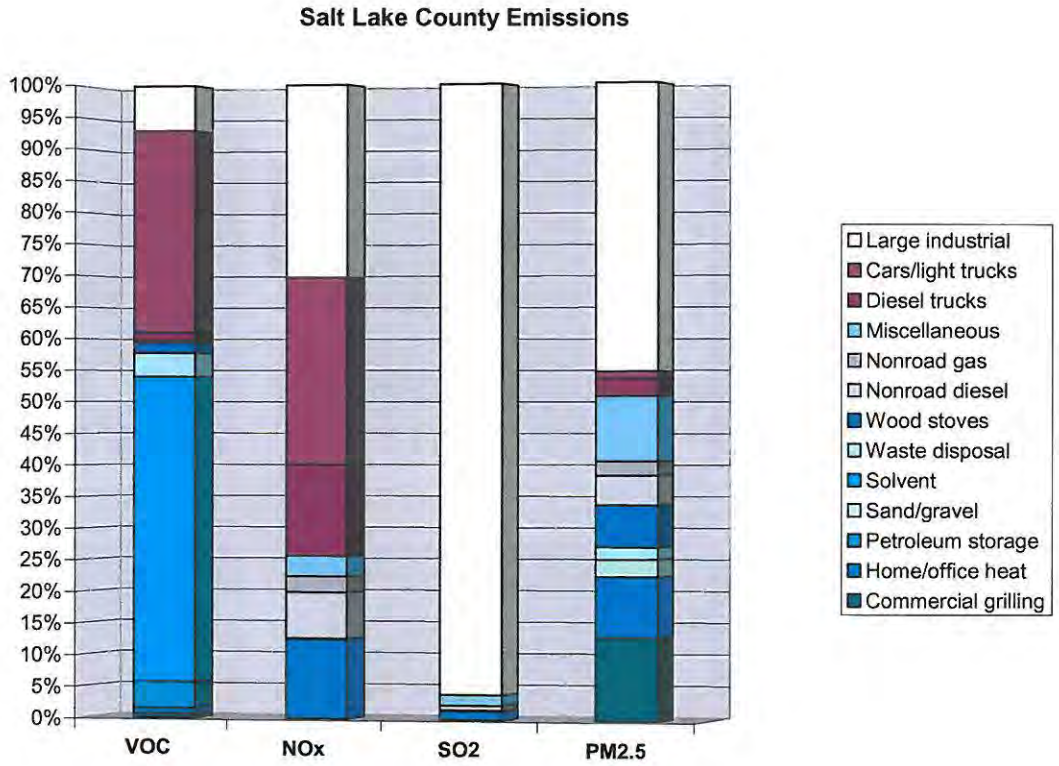


Figure 1.5 Major components of the inventory for Salt Lake County

1.4.5 $PM_{2.5}$ Spatial Patterns

The basin cold pools are regional in scale and dominate the formation and build-up of $PM_{2.5}$ at all of Utah's $PM_{2.5}$ monitoring locations. Localized terrain driven mesoscale weather features impact $PM_{2.5}$ concentration dynamics from location to location, however, these features are very hard to identify and model. The Utah Division of Air Quality has not measured sharp 24 hour average $PM_{2.5}$ concentration gradients anywhere in the non-attainments areas. Instead, concentrations gradually tail off as the distance from urban emission cores increase. Occasionally, sharp gradients do exist on a sub-24 hour time scale when a transient meteorological feature scours or partially scours one basin, but not another. This phenomenon has been observed when comparing the smaller Cache Valley to the larger Salt Lake Valley.

1.4.6 $PM_{2.5}$ Chemistry

The key questions with regards to Utah's $PM_{2.5}$ chemistry relates to the formation of ammonium nitrate are as follows:

1) Is the atmosphere ammonia (NH_3) limited?
2) Is it nitric acid (HNO_3) limited?

3) What is the primary pathway for HNO_3 formation?

Question 1:

At almost all times NH_3 is in excess from Cache County south to Salt Lake County. Figure 1.6 below illustrates excess NH_3 at Hawthorne during a January 2009 cold pool episode that led to hourly $PM_{2.5}$ concentrations in excess of 100 ug/m^3. NH_3 is present at all times. In the Cache Valley, investigations by Dr. Randy Martin from Utah State University show that NH_3 is almost never limited during the winter (see Figures 1.6 and 1.7, and Martin, 2006).

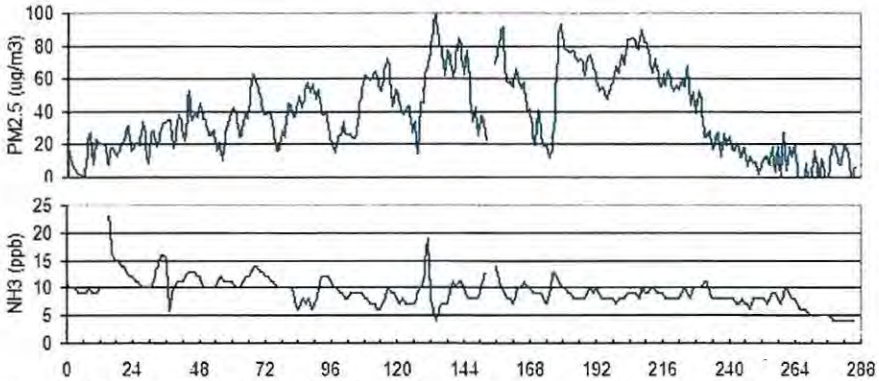


Figure 1.6 Hourly $PM_{2.5}$ and NH_3 at Hawthorne during January 2009

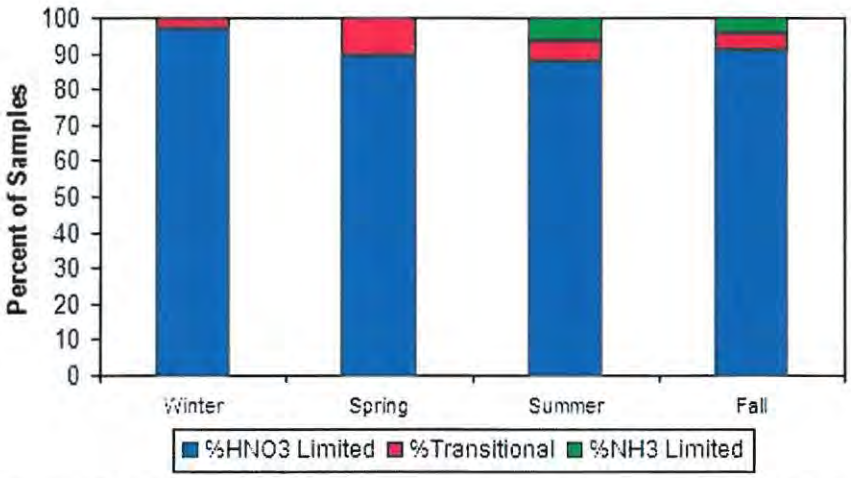


Figure 1.7 Percent of Logan, UT aerosol samples that are either limited by either HNO3- or NH3- (from Martin, 2006).

Questions 2 & 3:

Because ambient NH_3 data shows that NH_3 is almost always in excess and NO_x is plentiful, both the Wasatch Front and the Cache Valley are limited with respect to HNO_3 formation. HNO_3 is the direct precursor to the formation of ammonium nitrate. We do not know for certain what times of the day the atmosphere is HNO_3 limited nor do we know what the dominant pathway is to HNO_3, however, our hypothesis is that the daytime pathway is dominant. During winter-time cold pool events, clear skies, snow covered ground, and high elevation terrain can lead to

increased actinic flux, increased photolysis rates, and increased OH production. Increased OH production could lead to higher rates of HNO3 production when NO2 and OH react.

UDAQ will test model sensitivity to increased albedo due to snow cover in CMAQ's calculation of photolysis rates. Using typical albedo values for various land use types and snow age UDAQ will select representative albedo values for our simulations. Further sensitivity tests could also incorporate testing of enhanced actinic flux caused reflection from high albedo steep terrain that form valley walls in the Cache Valley and along the Wasatch Front.

Data collected during a UDAQ commissioned study support this hypothesis of increased daytime HNO3 production. The study was conducted by the Brigham Young University Chemistry Department during a 2 month winter period in 2009 (Kuprov, 2010). The study was punctuated with short periods of instrument malfunction that leaves some uncertainty with respect to the conclusions of whether or not HNO_3 formation is greatest at night or during the day.

UDAQ has purchased a URG-9000 instrument and will attempt to verify the 2009 results during the winter of 2010-2011. We believe that analysis of the monitoring data will provide the most robust data set from which to the dominant HNO3 formation pathway. The monitoring data can be used to confirm if CMAQ model chemistry is capturing the appropriate HNO3 formation mechanisms.

1.4.7 $PM_{2.5}$ Concentration Trends

Identifying trends in $PM_{2.5}$ concentrations is difficult due to the nature of the conditions that lead to the formation of stable cold pools. Figure 1.8 shows the 98th percentile value at Hawthorne for the last 9 years. The graph has no trend and is essentially a commentary on a particular winter's weather pattern. Depending on the year, some winters have more periods dominated by semi-permanent ridges. Other winters feature more progressive synoptic flow that limits the duration (and strength) of ridge dominated weather.

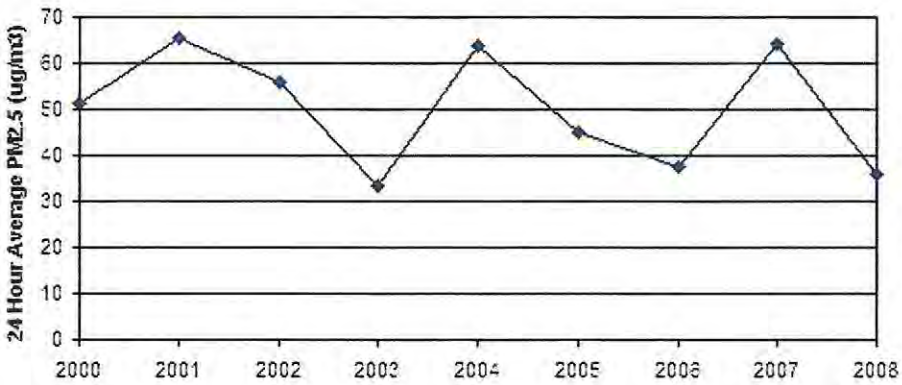


Figure 1.8 Hawthorne 98th percentile $PM_{2.5}$ concentration

1.4.8 $PM_{2.5}$ Modeling Experience

The DAQ modeling team has 8 years of $PM_{2.5}$ grid-based modeling experience. In all modeling cases, we have encountered significant challenges in accurately simulating the cold pools because of the highly variable mesoscale meteorology and chemistry that occurs in Northern Utah's valleys/basins. The lack of synoptic scale forcing produces mesoscale meteorology that is largely terrain driven. Model resolution and data assimilation are not capable of capturing all of the mesoscale features. As a result, our modeling results show that containing the pollutants within the cold pool is a severe weakness of the model.

Our experience consists of the following modeling projects and strategies:

1999: MM5 with UAM-AERO.
2002: Diagnostic Wind Model using all MESOWEST observation stations with UAM-AERO.
2002: Diagnostic Wind Model using selected MESOWEST observation stations with UAM-AERO.
2003: Diagnostic Wind Model using an idealized bi-modal wind field with UAM-AERO.
2007: NCAR RT-FDDA (Real Time Four Dimensional Data Assimilation) MM5 with CMAQ.
2008: NCAR 30 member Ensemble-RT-FDDA (MM5 & WRF) with CMAQ.
2009: WRF with CMAQ.
2010: WRF with CMAQ.

2. Model and Modeling Inputs

2.1 Air Quality, Meteorology, Emissions Model Selection Rationale

Meteorological Model

DAQ has taken 3 approaches to developing meteorological fields for input to CMAQ. The first two approaches involve a partnership that we have formed with the Department of Army Dugway Proving Ground Meteorology Division for meteorological modeling services using NCAR's state of the Science MM5 & WRF modeling systems. In the third approach, DAQ developed in-house WRF customization capabilities.

1) NCAR produced a single MM5 Real Time Four Dimensional Data Assimilation (RT-FDDA) methodology to generate meteorological fields for the January 2007 episode.

2) NCAR ran their Ensemble Real-Time Four Dimensional Data Assimilation (E-RTFDDA) model for our second episode during February 2008. The ensemble system consists of 30 members including 15 MM5 based members and 15 WRF based members. Each ensemble member included unique physics or initialization options. Table 2.1 provides a summary of physics schemes used in the 30 ensemble members.

Physics	WRF	MM5
Cumulus	Kain-Fritsch Betts-Miller-Janic Grell-Devenyi	Kain-Fritsch Grell Betts-Miller-Janic Fritsch-Chappell Kuo
Microphysics	Kessler Lin et al. WSM5 WSM6 Thompson et al. Ferrier	Hsie Dudhia Ice Reisner 1 Reisner 2 Goddard Schwartz
Long-Wave Radiation	RRTM CAM GFDL	RRTM CCM2
Short-Wave Radiation	Dudhia Goddard CAM GFDL	Dudhia CCM2
PBL	YKU Meller-Yamada-Janic RUC GFS	MRF Blackadar Meller-Yamada-Janic Gyano-Seaman
Other	No horizontal diffusion	No horizontal diffusion

Table 2.1 Ensemble member physics combinations

3) DAQ has developed the in-house capability to run WRF. The base case WRF simulation is configured using a 4km horizontal resolution with 40 vertical layers. UDAQ plans to conduct experimental WRF runs using customized physics options, code modifications, landuse parameter changes, initialization variations, FDDA variations, and increased vertical resolution.

These 3 approaches to developing meteorological fields in support of SIP chemistry modeling represent a new level of sophistication. With our three approaches, we attempt to identify numerous model configuration options that the literature has shown to be effective in stable conditions and/or complex terrain in order to develop accurate or conceptually representative meteorological fields for CMAQ.

Air Quality Model

CMAQ was selected because it is the open source atmospheric chemistry model co-sponsored by EPA and NOAA. We are currently using CMAQ version 4.6 and will upgrade to either version 4.7 or the 2010 release for model performance evaluation.

Emissions Model

The emissions processing model used in conjunction with CMAQ is the Sparse Matrix Operator Kernel Emissions Modeling System (SMOKE version 2.6). Modeling staff at UDAQ have extensive experience with this model and have been using it on a regular basis since 2001. The

emissions processing model takes the annual, county-wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model.

2.2 Modeling Domain & Resolution

DAQ selected our high resolution modeling domain to cover all of northern Utah including the portion of southern Idaho extending north of Franklin County and west to the Nevada border (Figure 2.1). This domain was selected to ensure that all of the major emissions sources that have the potential to impact the non-attainment areas were included.

MM5, WRF, and CMAQ are configured using a 4km x 4km horizontal resolution domain. Vertical resolution in MM5 and WRF ranges between 36 and 40 layers as a base case with additional experimentations planned using increased vertical resolution in the lower atmosphere. CMAQ is run using 15 vertical layers with experimentations utilizing all MM5 and WRF layers.

In early simulations of the CMAQ model UDAQ tested a 1.3 km horizontal resolution but found no improvement in chemistry performance. This result confirms other complex terrain horizontal resolution studies conducted by numerous researchers (eg., Roebber 2001, Mass 2001, Hoadley 2004, Zhong 2003, Kain 2008, Zhong, 2005) and a locally conducted study by the University of Utah (Hart, 2005).

Increased horizontal resolution would be more likely to provide increased wind field complexity in the mountains where increased terrain details (i.e. ridges, mountain tops, etc) could effect wind predictions in those elevated areas. The Cache Valley $PM_{2.5}$ problem is confined to the very lowest terrain along the Valley bottom where increased horizontal resolution will not resolve additional terrain details. Furthermore, Randy Martin's $PM_{2.5}$ saturation studies have shown that $PM_{2.5}$ concentrations demonstrate a high level of homogeneity along the Valley bottom (Martin, 2006). The homogeneity suggests that adding detail and complexity to the emissions or meteorological fields should not be a high priority issue.

In 2010, UDAQ will explore running WRF with increased vertical resolution in the 2009 and 2009-2010 episodes. Increased vertical resolution in the lower atmosphere is likely more relevant to simulations of atmospheric stability than would be moving to extremely fine horizontal resolution over flat valley bottoms where the $PM_{2.5}$ is trapped.

Figure 2.1 Northern Utah and Idaho modeling domain

2.3 Attainment Test Geographic Area

UDAQ proposes to select an area that encompasses all of the non-attainment areas in northern Utah and southern Idaho and use the grid cells within that area to apply the modeled attainment test (Figure 2.2).

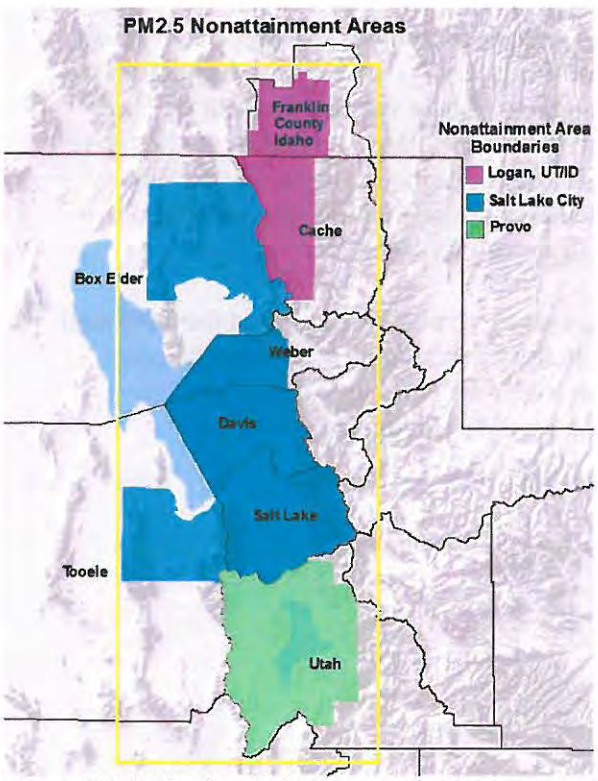


Figure 2.2 Grid cells within the geographic area to be used for the modeled attainment test

2.4 Initial and Boundary Conditions

The ridge dominated synoptic meteorology during $PM_{2.5}$ cold pool episodes features weak transport winds and near calm surface winds. As a result, transport of $PM_{2.5}$ and precursors from the rural regions at the domain periphery is very small. In addition, most of the observed Wasatch Front and Cache Valley $PM_{2.5}$ is formed in-situ (and trapped) via fresh locally derived emission sources and secondary chemistry. In essence, Utah's cold pools represent an isolated system that is controlled only by locally derived emissions, meteorology, and chemistry.

We begin each of our CMAQ model simulations prior to the start of $PM_{2.5}$ build-up. The very small initial concentrations of diurnally produced gaseous concentrations have little consequence to the ultimate build-up of $PM_{2.5}$. DAQ has configured CMAQ to use EPA default profiles for background chemistry concentrations and will consider using a model spin-up approach. UDAQ will supplement the default profiles by using rural values taken from bordering National Park air quality monitoring stations for chemistry initialization.

2.5 Episode Selection

2.5.1 Introduction

The meteorological conditions and chemical processes that lead to elevated PM in Utah occur in very few locations in the United States. The mountain-valley physiography of Northern Utah allows long lasting (up to 2 weeks) stable cold pools to form in valley bottoms. Within the cold pool, extreme atmospheric stability with weak mixing and advection can lead to the build-up of $PM_{2.5}$ concentrations. The uniqueness of our situation creates several significant $PM_{2.5}$ meteorological modeling and atmospheric chemistry modeling challenges that need to be considered during episode selection. The process by which we select $PM_{2.5}$ SIP episodes and design the SIP modeling protocol will be based on experience gained over several years combined with the criteria outlined in the EPA modeling guidance.

The first challenge involves the meteorological modeling of the mesoscale cold pool phenomena that forms along the Wasatch Mountain valleys. Meteorological models have a very difficult time replicating the extreme vertical temperature gradient and vertical and spatial extent of cold pools. In addition, subtle variations in meso to synoptic scale meteorology can have a significant impact on the degree of atmospheric stability and chemistry concentrations. The replication of extreme atmospheric stability and weak near-surface wind field will be the greatest challenge of model development.

Second, gaseous and particulate chemistry modeling is handicapped by an incomplete understanding of the complex chemical processes that operate in cold sub-freezing conditions typical of Utah's winter cold pools. For example, no data exists for the sub-freezing heterogeneous reaction probability for N_2O_5. A second example comes from recent data published by researchers at Utah State University and University of California at Riverside (Malloy 2009). They found a new significant pathway for the formation of secondary organic aerosols. The pathway may have particular significance in rural areas similar to the Cache

Valley where agricultural animal operations may produce high concentrations of amines. This new pathway is absent from existing chemistry models.

Third, the Federal Reference Method (FRM) for collecting $PM_{2.5}$ measurements is inadequate for our cold temperature, secondary particulate dominated air. Ammonium nitrate (NH_4NO_3) accounts for over 50% of our measured $PM_{2.5}$ mass. NH_4NO_3 can rapidly volatilize off of FRM filters and result in "missing mass" when speciated.

2.5.2 Non-Attainment Area Meteorological Conditions

With the exception of wind blown desert dust events, wild land fires, and holiday related fireworks, elevated $PM_{2.5}$ in Utah occurs when stagnant cold pools develop during the winter season. The synoptic conditions that lead to the formation of cold pools along the Wasatch Front and in the Cache Valley are identical: synoptic scale ridging, subsidence, light winds, snow cover (often), and cool to cold surface temperatures.

While the general synoptic scale meteorological characteristics are identical between these two areas there are important differences related to topography. The Cache Valley is a closed basin with no significant outlets. The Salt Lake Valley has an outlet to the north and is connected to the larger Great Basin. Utah Valley is essentially closed but has numerous complicating terrain features. The northern Wasatch Front is open to the west, north, and south. The degree of basin "openness" may allow for varying amounts of advection of pollutants and corresponding changes in pollutant concentrations and build-up rates. For example, Cache Valley topographical features lead to faster forming, more intense, and more persistent cold pools relative to the Wasatch Front. Because of these differences, the Wasatch Front and Cache Valley are designated as separate attainment areas, however, they will be modeled together within the same modeling domain.

2.5.3 Non-Attainment Area Episode Selection

Episodes for CMAQ modeling will be selected such that observed elevated $PM_{2.5}$ concentrations occur simultaneously along the Wasatch Front and in the Cache Valley. The meteorological similarity between the two basins will allow us to model the same episodes for both non-attainment areas.

2.5.4 Episode Selection Criteria

According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze" the selection of SIP episodes for modeling should consider the following 4 criteria:

1. Select episodes that represent a variety of meteorological conditions that lead to elevated $PM_{2.5}$.

2. Select episodes during which observed concentrations are close to the baseline design value.

3. Select episode that have extensive air quality data bases.

4. Select enough episodes such that the model attainment test is based on multiple days at each monitor violating NAAQS.

The following section will describe how Utah will use each of the criteria to choose episodes that will provide the best opportunity for meeting model performance criteria.

1. Select episodes that represent a variety of meteorological conditions that lead to elevated $PM_{2.5}$.

Stagnant cold pools are the only meteorological conditions that produce elevated $PM_{2.5}$ during the winter in Utah's non-attainment areas. The synoptic meteorological conditions that lead to cold pool formation are essentially identical from one episode to another in that stagnant cold pools develop when synoptic scale ridging dominates the region. Variations in temperature, humidity, cloud cover, snow cover, wind speed, stability, emissions, and episode length may produce greater (or lesser) exceedences, but these variations are generally not resolvable by numerical weather models.

Based on our modeling experience, medium length (5 to 10 days) episodes that have a smooth steady build-up of $PM_{2.5}$ concentrations are appropriate for a general analysis of winter inversion episodes. Long episodes (>10 days) tend to have excessive concentration variability produced by subtle meteorological features. An example would be a subtle 700 mb feature that moves through the northern portion of the state. Often, these features pass without notice, but they can provide enough destabilization to briefly stir the surface layer and significantly reduce $PM_{2.5}$ concentrations before rebuilding again. This type of subtle feature will not be captured in the model and will result in poor model $PM_{2.5}$ performance.

Occasionally, a winter season will feature long periods (weeks) when synoptic conditions are dominated by a semi-permanent ridge of high pressure. During these periods, inversion and cold pool conditions persist, but are punctuated by periodic mixing events. A long simulation of this kind of weather pattern can address issues relating to transport and partial mix-outs. Furthermore, a long simulation during which $PM_{2.5}$ builds, and mixes multiple times could prove useful in understanding model strengths and weaknesses.

At this juncture, this modeling protocol will not address 24-hour $PM_{2.5}$ NAAQS exceedences that occasionally occur during the warmer seasons due to high wind events, wild land fires, and holiday related fireworks. Additional discussions with EPA will be required before a decision can be made on how to address this special issue. UDAQ will include a modeling protocol supplement when a decision is made on how to treat these types of exceptional events.

2. Select episodes during which observed concentrations are close to the baseline design value.

Based on our modeling experience it seems appropriate to give more weight to the behavior and characteristics of the episode during periods when the statistical calculation of the 24 hour average $PM_{2.5}$ is over the baseline design value. The model system will perform best when the episode is of medium length and it has a smooth steady build-up. In this case, day one of the episode will feature very low $PM_{2.5}$ concentrations and then build to higher levels on each successive day. The build-up will continue until some meteorological feature either cleans the $PM_{2.5}$ out or produces a partial mixing. The key point is that for all $PM_{2.5}$ episodes, the chemical processes that lead to the secondary formation of $PM_{2.5}$ and the chemical speciation of the $PM_{2.5}$ are similar and lead to very similar speciation profiles as demonstrated in all available PM2.5 speciation data.

3. Select episode that have extensive air quality data bases.

The State of Utah operates or has operated 19 FRM monitors during the years being considered for this SIP. Three real-time TEOM-FDMS (Tapered Element Oscillating Microbalance Filter Dynamic Measurement System) monitors are operated along the Wasatch Front and one is operated in Cache Valley. Three National Speciation Network Monitors are also operated along the Wasatch Front. Hawthorne in Salt Lake City samples 1 day out of every 3 days. Lindon (Utah County) and Bountiful (Davis County) operate 1 day out of every 6 days.

As described in Section 1, Utah faces significant monitoring challenges in our winter-time cold pool phenomena. First, Utah has found that up to 50% of FRM filter mass is lost and or unidentifiable after speciation analysis. The largest portion of lost mass is due to the in-situ and laboratory re-volatilization of particulate ammonium nitrate (NH_4NO_3). NH_4NO_3 represents 50% to 75% of $PM_{2.5}$ mass during $PM_{2.5}$ episodes. As a result, re-volatilization losses have a significant impact on speciation analysis. Second, the teflon filter media used in the $PM_{2.5}$ FRM monitors does not allow for organic and elemental carbon to be analyzed. Carbon species account for 10-20% of our $PM_{2.5}$ mass. These uncertainties with filter media and re-volatilization virtually eliminate the usability of speciated FRM data for our SIP analysis.

The backbone of our speciated model performance analysis and attainment tests will be data from the National Speciation Network. This data has been shown to be very accurate and re-volatilization losses are small. In anticipation of the need for SIP modeling we enacted an intensive operating period during 2 episodes in February 2008 and January 2009. We collected 1 in 2 day sampling at all 3 of Utah's National Speciation Network sites.

As a part of special winter inversion study, DAQ collects speciation data every two days during January and February from the monitoring stations located in Utah and Salt Lake valley. Beginning in winter 2009/2010, DAQ acquired a URG-3000 and a SASS speciation sampler to collect speciation data during the inversion episodes in the Cache valley. The samplers were installed in late winter 2010 and are located at the Logan sampling site. Speciation data was collected at Logan for most of February and March 2010. DAQ will continue to collect speciation data at Logan during the 2010-2011 winter season.

In addition to the February and March speciation data collected at Logan during 2010 speciation data from a mass spectrometry study is available from January – March 2004 (see section 1.4.3).

To supplement our National Speciation Network data we plan is to use the real-time FDMS $PM_{2.5}$ monitors to evaluate hourly model output. This hourly total $PM_{2.5}$ data is critically important to evaluating hour by hour model performance. FDMS data is not speciated, but we have significant confidence in the consistency of the percentage of NH_4NO_3 that is typically measured on the National Speciation Network filters. This consistency will allow us to use the FDMS data to develop hourly pseudo observations of NH_4NO_3 to augment our model performance analysis. Figure 2.3 shows the $PM_{2.5}$ monitoring network.

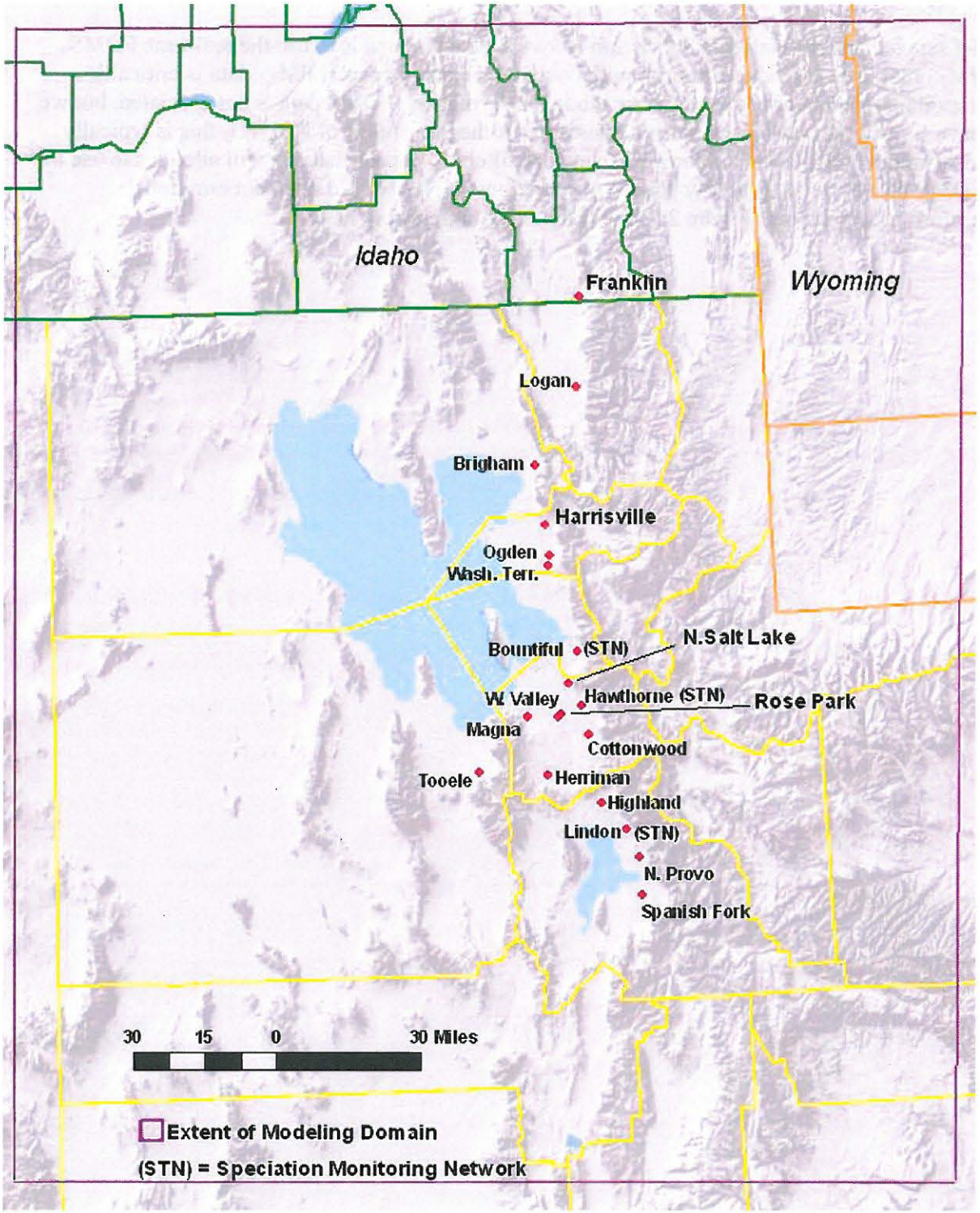


Figure 2.3 UDAQ $PM_{2.5}$ monitoring network

4. Select enough episodes such that the model attainment test is based on multiple days at each monitor violating NAAQS.

For all of our $PM_{2.5}$ episodes, UDAQ's conceptual model is that chemical processes and the chemical speciation are essentially identical. Based on previous modeling experience, we will choose discrete episodes of medium length with a smooth steady build-up of $PM_{2.5}$. These episodes might not necessarily be the episodes of highest $PM_{2.5}$ concentration, but they will provide episodes representative of the processes that lead to NAAQS $PM_{2.5}$ exceedences. Each episode has concentrations close to the design value in accordance with "Criteria 2". Rather than model four or more non-ideal episodes, we have chosen four episodes that will maximize our potential for the most complete characterization of episode dynamics.

2.5.5 Selected Episodes

From the most recent 5-year period of 2005-2009 we developed a long list of candidate $PM_{2.5}$ episodes. Three episodes were selected based on the medium length steady build-up criterion described above. A fourth multi-event episode was selected using the multiple build-up and mix out criteria described above and in more detail in the section titled "Episode 4". In general we want to select episodes with hourly $PM_{2.5}$ concentrations that are reflective of conditions that lead to 24-hour NAAQS exceedences. The episodes that we select may not contain the highest $PM_{2.5}$ concentrations, but will contain concentrations that are reflective of the most frequent observed 24-hour NAAQS exceedence concentrations. For example, Figure 2.4 shows the concentration frequency of 24-hour $PM_{2.5}$ exceedences at our main Salt Lake City monitoring location. Sixty five percent of exceedences at Hawthorne occur when concentrations are less than 45 ug/m^3. Finally, we want to select episodes that have hourly $PM_{2.5}$ data and have speciated data collected by the National Speciation Network. Tables containing available data are included in each selected episode's discussion section.

From a synoptic weather pattern point of view, each of the selected episodes features a similar pattern. The typical pattern includes a deep trough over the eastern United States with a building and eastward moving ridge over the western United States. The episodes typically begin as the ridge begins to build eastward, near surface winds weaken, and rapid stabilization due to warm advection and subsidence dominate. As the ridge centers over Utah and subsidence peaks, the atmosphere becomes extremely stable and a subsidence inversion descends towards the surface. During this time, weak insolation, light winds, and cold temperatures promote the development of a persistent cold air pool. Not until the ridge moves eastward or breaks down from north to south is there enough mixing in the atmosphere to completely erode the persistent cold air pool.

All of the episodes fit this general pattern of building ridge, lowering subsidence inversion, and cold (or cool) pool development, however, each episode has its own variations. For example, the graphics in Appendix 2.1, 2.2, and 2.3 show that the ridge position and strength was different in each episode and each episode's atmospheric stability and cold pool structure was unique. While each episode has its unique characteristics, the commanding similarity between each episode is stability and stagnation that traps locally produce emissions and allows secondary $PM_{2.5}$ formation and concentration build-up.

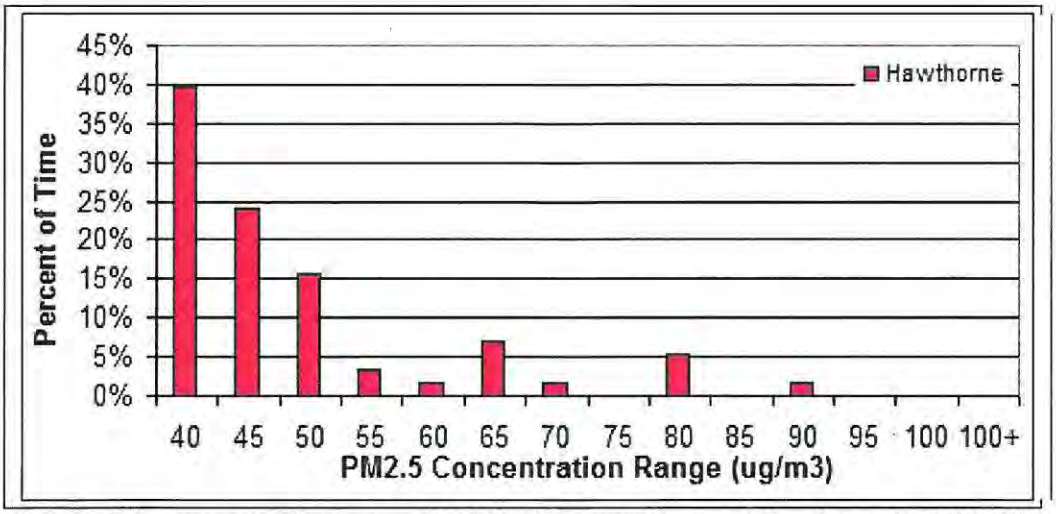


Figure 2.4 Concentration frequency of NAAQS $PM_{2.5}$ exceedences at Hawthorne for 2005-2008. An x-axis value of 40 means $PM_{2.5}$ concentrations between 35 and 40 ug/m3. Approximately 40% of all NAAQS $PM_{2.5}$ exceedences occurred at a concentration between 25 and 40 ug/m3.

The following sections will describe the 3 episodes that we have selected. The descriptions of each episode will rely on $PM_{2.5}$ data collected from our 4 main sites (Logan, Ogden, Hawthorne, and Lindon). Each of these sites features a FDMS monitor and a FRM monitor.

Episode 1: January 11-20, 2007

A cold front passed through Utah during the early portion of the episode and brought very cold temperatures and several inches of fresh snow at the National Weather Service Salt Lake City AWOS observation station (KSLC) began the episode with 3 inches of new snow) to the Wasatch Front. The trough was quickly followed by a ridge that built north into British Columbia and began expanding east into Utah. This ridge did not fully center itself over Utah, but the associated light winds, cold temperatures, fresh snow, and subsidence inversion produced very stagnant conditions along the Wasatch Front. High temperatures in Salt Lake City throughout the episode were in the high teens to mid-20's Fahrenheit. Maximum "mixing depths" during the heart of the episode were in the range of 250m to 300m above ground level (Appendix 2.4).

Figure 2.5 shows hourly $PM_{2.5}$ concentrations from Utah's 4 FDMS $PM_{2.5}$ monitors for January 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes less suited after January 18 because of the complexities in the meteorological conditions leading to temporary $PM_{2.5}$ reductions. This episode is marginally suited for Cache Valley modeling because hourly concentrations measured at Logan only reach the 40 to 45 ug/m3 range. Table 2.2 shows 24-hour average $PM_{2.5}$ concentrations measured using the FRM. Hawthorne 24-hour averages reached 48.4 ug/m3 on January 17 while Lindon reached 61.7 ug/m3 on January 18. As shown almost 80% of all NAAQS $PM_{2.5}$ historical exceedences measured at Hawthorne occurred at concentrations lower than the January 17 48.4 ug/m3 value. This puts this episode in the top 20% of episodes that occurred between 2005 and 2008 and above the baseline design value.

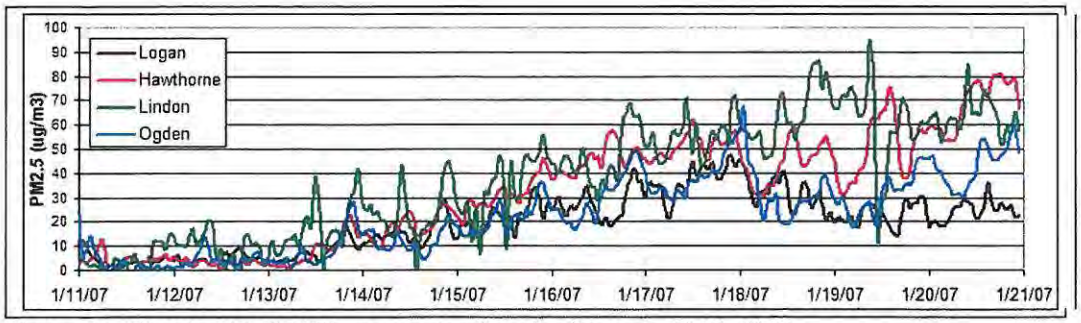


Figure 2. 5 Hourly FDMS $PM_{2.5}$ concentrations for January 11-20, 2007

Table 2.2 24-Hour FRM $PM_{2.5}$ concentrations for January 11-21, 2007. See Appendix 2.7 for a monitoring station look-up table.

Date	BR	L4	BT	CW	N2	MG	HW	WV	HE	T3	NP	LN	HG	SF	O2	WT	NOG	FRK
11-Jan-07		3.0			6.1		5.1					4.7						1.8
12-Jan-07	3.2	6.0	3.5	6.9	8.3		3.5			7.5	9.1	9.5	11.5	7.6	5.9	5.6	3.4	3.3
13-Jan-07		8.1					8.7	12.3				16.0						5.6
14-Jan-07		14.7					17.7											7.2
15-Jan-07	14.0	20.1	27.7	37.4	33.5		31.4	32.0		16.5			29.4	27.9	22.7	21.6	18.4	8.7
16-Jan-07		27.1			47.7		44.8											13.4
17-Jan-07		35.2					48.4											27.3
18-Jan-07	24.9	31.1	29.6	49.8	52.2		42.8	49.4		24.2		61.7	51.5	55.0	31.7	26.2	30.2	19.2
19-Jan-07		22.9			55.6		47.3					66.9						13.4
20-Jan-07		24.6			66.5		65.1					68.9						24.8
21-Jan-07	14.1	18.4	19.8	18.0	20.4	8.1	16.2	25.6		8.8	47.6	42.0	38.6	41.5	27.5		26.2	14.4

Episode 2: February 14-18, 2008

The February 2008 episode features a cold front passage at the start of the episode that brought significant new snow to the Wasatch Front (KSLC began the episode with 6 inches of new snow). A ridge began building eastward from the Pacific Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered from 700 mb on February 16 down to almost 800 mb by February 19th. Despite the lowering subsidence inversion, the KSLC upper air sounding shows that the afternoon lower atmosphere mixed through a depth of 400 m on February 19th, but it was capped by the very strong subsidence inversion above this level (Appendix 2.5). Temperatures during this episode were mild with high temperatures at KSLC in the upper 30's and lower 40's Fahrenheit.

The 24-hour average $PM_{2.5}$ exceedences observed during the proposed modeling period of February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for modeling are the high hourly values and smooth concentration build-up. The first 24-hour exceedence occurred on February 16 and was followed by a rapid increase in $PM_{2.5}$ through the first half of February 17 (Figure 2.6). During the second half of February 17, a subtle meteorological feature produced a mid-morning partial mix-out of particulate matter and forced 24-hour averages to fall. After February 18, the atmosphere began to stabilize again and resulted in even higher $PM_{2.5}$ concentrations during February 20, 21, and 22. Modeling the 14th through the 19th of this episode should successfully capture these dynamics. The smooth gradual build-up of hourly $PM_{2.5}$ is ideal for modeling. In Salt Lake and Weber counties, the 24-hour averages

are about 5 ug/m^3 lower than the baseline design value, but are very close to baseline in the Cache Valley and in Utah County (Table 2.3).

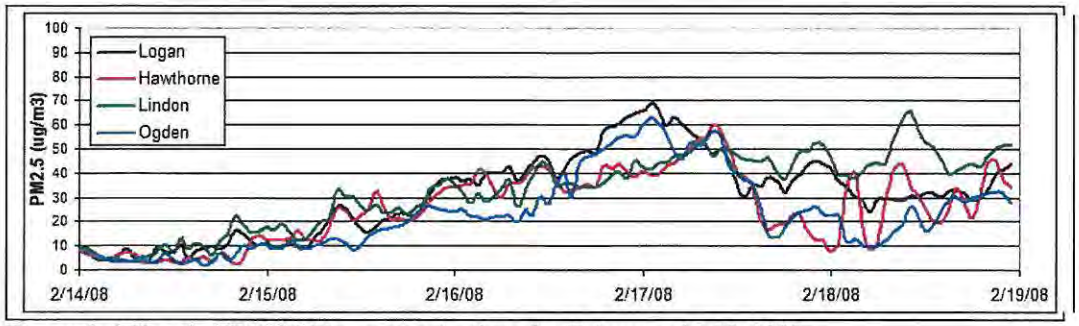


Figure 2. 6 Hourly FDMS $PM_{2.5}$ concentrations for February 14-19, 2008

Table 2.3 24-Hour FRM PM2.5 concentrations for February 14-22, 2008. See Appendix 2.7 for a monitoring station look-up table.

Date	BR	L4	BT	CW	N2	MG	HW	WV	HE	T3	NP	LN	HG	SF	O2	WT	NOG
14-Feb-08		5.6		4.6			5.0				9.4	9.0			3.6		
15-Feb-08	10.7	18.5	19.7	17.9		12.2	19.0		13.6	8.9	23.0	24.2	17.2	24.2	13.2	11.3	12.9
16-Feb-08		42.8		36.5			35.3				33.0	35.5			32.3		
17-Feb-08		42.7		36.8			31.1				45.9	45.6			36.2		
18-Feb-08	22.7	29.7	21.2	23.2		17.6	26.4	31.5	13.5	8.8	39.5	46.3	26.2	27.6	19.9	17.7	23.0
19-Feb-08		40.5		36.3			37.4				37.0	44.7			29.2		
20-Feb-08		49.2		47.2			44.2				36.2	42.2			35.6		
21-Feb-08	43.4	69.2	49.4	43.6		43.9	42.3	45.5	42.3	36	46.1	44.7	38.4	43.3	46.4		44.7
22-Feb-08		71.5		18.2			15.3				19.6	18.3			29.6		

Episode 3: January 13-23, 2009

The third episode also featured a cold front passage with light snow (KSLC began the episode with 2 inches of new snow) and a strong ridge that built eastward from the Pacific coast. Salt Lake City temperatures during this episode began in the lower 40's but cooled to the mid-30's as the cold pool strengthened. The ridge centered over Utah on January 20 and the subsidence inversion lowered to nearly 850 mb. This very strong subsidence allowed a strong cold pool to form and prevented virtually all vertical mixing. Maximum afternoon mixing depths recorded by the KSL sounding were between 0 and 200 m above ground level (Appendix 2.6).

Extremely high concentrations of $PM_{2.5}$ formed during this cold pool episode (Figure 2.7 and Table 2.4). Hourly $PM_{2.5}$ concentrations at Hawthorne increased from near zero on January 14 to 99 ug/m3 six days later on January 19 (Figure 2.5). $PM_{2.5}$ concentrations built steadily through the episode, however, extreme diurnal concentration swings occurred at Hawthorne. We believe that these observed concentration swings are the result of instrument malfunction. At temperatures below freezing and higher relative humidity the dicot heads on the FDMS machines freeze and plug the inlet resulting in an apparent dramatic decrease in $PM_{2.5}$ concentrations.

Prior to this episode DAQ had contracted with Brigham Young University (BYU) atmospheric chemists Dr. Jaron Hansen and Dr. Delbert Etaugh to execute a measurement field campaign at the Salt Lake City Hawthorne site in order to capture a significant $PM_{2.5}$ episode during the

winter of 2009. BYU used a URG 9000 instrument to measure nitrite, nitrate, and sulphate along with all of the regularly collected species at the Hawthorne site. In addition, DAQ ran the National Speciation Network $PM_{2.5}$ monitor on an every other day schedule to capture as much speciated $PM_{2.5}$ data as possible.

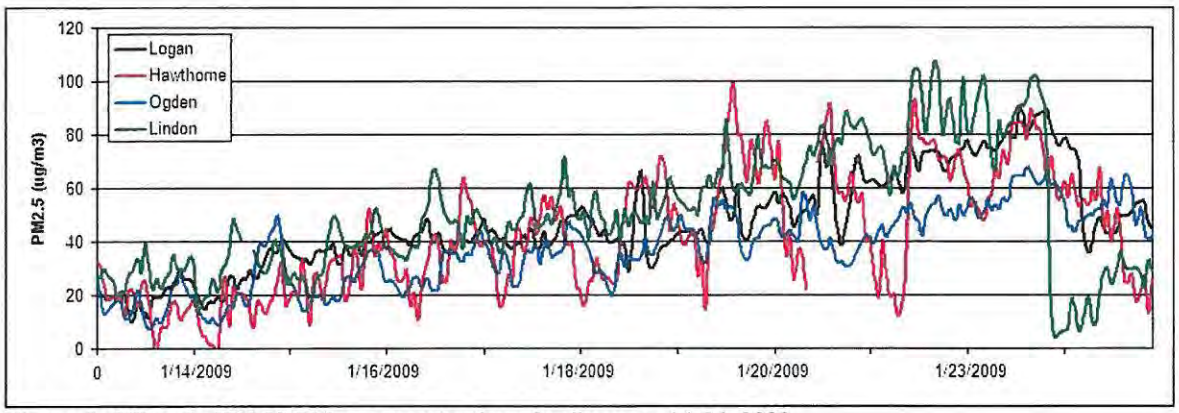


Figure 2. 7 Hourly FDMS $PM_{2.5}$ concentrations for January 14-24, 2009.

Table 2.4 24-Hour FRM PM2.5 concentrations for January 18-26, 2009. See Appendix 2.7 for a monitoring station look-up table.

Date	BR	L4	BT	CW	N2	MG	HW	WV	HE	T3	NP	LN	HG	SF	O2	WT	NOG
8-Jan-09		9.7		12.2			12.3				30.8	35.7			8.1		
9-Jan-09		4.6		6.3			6.2				5.3	5.1			5.6		
10-Jan-09	20.5	16	16	15.4		9.9	16.2			4.7	20.2	24.5	17.8	20.5	19.7		18.5
11-Jan-09		21.9		18.5			18.3				23.8	30.4			18.8		
12-Jan-09		19.2		22.2			22.3					32.5			25.2		
13-Jan-09	12.5	14.9		16.6		7.8	15.7			13.0		26.4	14.9	33.0	12.6		11.7
14-Jan-09		21.7		16.5			16.5				27.0	31.6			20.6		
15-Jan-09		30.7		29.7			31.7				31.6	36.1			20.8		
16-Jan-09	27.2	35.0	25.3	33.7		31.3	37.4			20.7	38.0	44.9	31.8	39.9	25.2		27.0
17-Jan-09		36.1		46.8			47.3				45.7	49.3			31.9		
18-Jan-09		35.1		51.2			55.6				52.2	50.4			33.5		
19-Jan-09	38.6	41.7	55.9	63.9		52.1	69.2			33.3	56.7	63.9	58.1	59.2	41.7		41.1
20-Jan-09		47.9		65.5			69.8				72.8	75.6			37.4		
21-Jan-09		58.5	53.3	74.3			66.9				69.3	80.4			45.6		
22-Jan-09	47.9	68.9		72.8		69.0	72.1			67.0	78.2	73.1	52.8	77.3	56.4		51.2
23-Jan-09		44.0	43.3	48.2			51.3				15.4	17.4			48.7		
24-Jan-09		14.3		12.8			13.9				13.7	13.1			17.7		
25-Jan-09	3.6	5.7	5.6	4.6		2.2	5.2			2.1	3	3.2	1.5		3.3		3.1
26-Jan-09		5.4		5.1			5.4				5.5	7.3			5.1		

Episode 4: December 8, 2009 – January 22, 2010

The fourth episode that was selected is more similar to a "season" than a single $PM_{2.5}$ episode. During the winter of 2009 and 2010 Utah was dominated by a semi-permanent ridge of high pressure that prevented strong storms from crossing Utah. This 45 day period was characterized by 5 to 6 individual $PM_{2.5}$ episodes each followed by a partial PM2.5 mix out when a weak weather system passed through the ridge. The long length of the episode and repetitive PM2.5

build-up and mix-out cycles makes it ideal for evaluating model strengths and weaknesses and $PM_{2.5}$ control strategies.

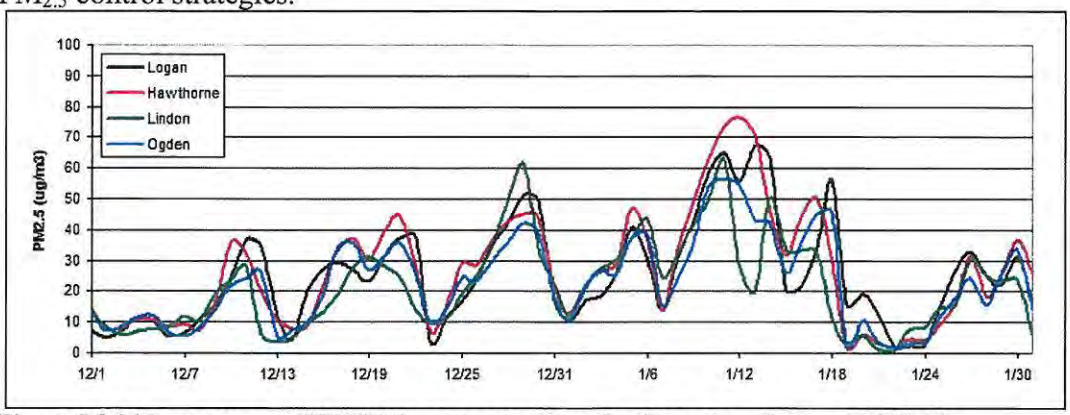


Figure 2.8 24 hour average FRM $PM_{2.5}$ concentrations for December-January, 2009-10.

Table 2.5 24-Hour FRM PM2.5 concentrations for December-January, 2009-10. See Appendix 2.7 for a monitoring station look-up table.

Date	BR	L4	BT	CW	MG	HW	T3	NP	LN	HG	SF	O2	NOG	FRK
12/8/2009		10.8		10.4		7.4	11.1	8.1	10.3			8.3		
12/9/2009	10.8	16.0	13.5	20.1	12.4	16.6	6.7	14.2	19.2	15.0	14.1	13.8	10.6	9.3
12/10/2009		24.2		24.5		35.5	9.9	20.8	23.3			21.3		
12/11/2009		37.0		35.5		32.1	20.4	23.9	28.0			24.2		
12/12/2009	27.0	34.7	28.2	21.2	20.2	19.9	18.4	9.7	6.0	6.7	4.9	26.5	18.2	26.5
12/13/2009		11.8		8.1		10.6	8.2	3.0	3.7			5.2		
12/14/2009		4.0		8.4		7.7	7.9	5.3	5.0			7.5		
12/15/2009	9.6	19.7	9.7	10.4	6.2	8.3	5.4	8.2	9.5	4.9	2.7	9.8	8.7	12.7
12/16/2009		27.1		21.9		22.1	17.8	11.0	13.0			18.4		
12/17/2009		29.5		35.7		33.3	17.7	15.6	18.7			34.2		
12/18/2009	30.4	26.6	38.0	42.8	30.6	37.0	19.2	22.8	28.0	25.1	17.7	35.4	32.6	33.1
12/19/2009		23.1		41.0		30.1	21.8	26.2	31.1			26.8		
12/20/2009		31.5		40.3		39.8	20.5	29.8	28.1			31.7		
12/21/2009	30.8	37.2	14.2	49.5	27.6	44.1	20	19.8	24.7	14.6	14.9	35.5	29.2	42.6
12/22/2009		37.4		29.8		27.2	20.4	10.5	13.8			25.1		
12/23/2009		3.3		6.8		6.6	9.8	8.5	10.2			9.5		
12/24/2009	10.8	12.0	35.5	21.0	13.0	15.6	8.4	8.0	11.3	11.7	7.0	14.4	12.6	7.5
12/25/2009		16.8		32.3		28.8	17.2	13.8	19.0			23.9		
12/26/2009		23.7		33.0		28.4	19.3	21.5	24.9			23.4		
12/27/2009	25.6	35.5	44.1	46.3	34.9	36.9	26.1	29.2	34.5	34.5	27.2	30.0	30.2	
12/28/2009		41.7		51.8		42.6	40.5	42.3	48.5			35.6		
12/29/2009		51.4		53.2		45.4	41.1	57.3	61.3			42.1		
12/30/2009	35.5	49.4			32.0	43.8	23.2	34.8	34.1	25.4	43.3	39.2	37.6	40.3
12/31/2009		17.1		23.5		21.3	4.5	21.5	22.2			17.9		
1/1/2010		10.7		15.8		12.9	12.9	9.4	11.9			10.6		
1/2/2010	18.8	17.3	23.8	22.3	16.4	21.9	6.9	18.8	21.1	11.4	19.6	21.8	20.4	11.7
1/3/2010		18.3		26.3		26.5	14.6	18.0	27.1			26.6		
1/4/2010		25.9		32.2		29.1	19.9	23.3	30.1			25.3		
1/5/2010	50.0	40.6	43.4	45.9	34.1	46.8	25.9	30.6	36.8	30.0	28.0	37.1	39.3	
1/6/2010		30.2		38.3		36.2	30	38.1	43.6			38.3		
1/7/2010		13.6		14.1		13.7	11.4	19.7	24.4			15.4		
1/8/2010	21.8	30.9	31.1	34.7	28.0	33.1	22.2	25.7	31.8	25.7	27.6	23.7	23.1	23
1/9/2010		42.5		50.3		49.3	40.4	39.9	41.7			35.5		
1/10/2010		58.3		62.5		62.7	45.7	49.0	49.2			54.1		
1/11/2010	48.8	64.7	56.9	73.6	63.2	73.5	42.4	62.6	62.8	57.7	59.8	56.3	55.3	44.9
1/12/2010		55.6		70.5		76.4	45.8	31.9	28.8			55.0		
1/13/2010		67.5		60.8		70.8	41.8	16.1	19.7			42.8		
1/14/2010	51.9	63.7	36.8	43.7	28.0	45.5	13.3	53.2	50.6	39.1	51.6	42.0	43.4	70
1/15/2010		20.6		26.4		31.6	15.1	28.7	33.5			26.1		
1/16/2010		21.4		36.9		43.7	24.4	30.8	33.1			35.7		
1/17/2010	46.1	34.1	45.6	47.3	35.9	50.1	32.3	33.0	32.4	21.6	29.8	45.4	39.3	34.2
1/18/2010		56.3		29.2		29.6	28.2	10.8	11.4			45.6		
1/19/2010		15.8		2.0		1.9	6.7	2.9	3.2			2.8		
1/20/2010	8.7	19.1	6.8	4.9	3.5	6.2	2.9	4.9	5.9	4.4	3.1	10.4	10.3	13
1/21/2010		12.8		2.6		3.2	6.8	1.4	1.3			3.6		
1/22/2010		2.0		1.2		1.8	7.2	0.9	0.8			1.9		

2.5.6 Summary

Utah faces several significant $PM_{2.5}$ modeling challenges. The biggest challenge will be to develop meteorological fields that are able to resolve the extreme stagnation that leads to the buildup of PM2.5 during winter cold pool episodes. These challenges are unique to Utah and

may require unique adaptive approaches to modeling. The episode selection process utilizes EPA episode selection criteria in conjunction with DAQ modeling experience to select episodes that provide the best opportunity for meeting model performance criteria and more importantly, appropriately characterize Utah's $PM_{2.5}$ problem.

2.6 Modeling Setup

Most of these technical details will be finalized when we have our final and official base case runs of WRF and CMAQ. The section will include all of the various physics options, initialization detail, nudging details, model version, etc of WRF, MCIP, & CMAQ.

2.7 Emissions Inputs

2.7.1 Introduction

The emissions processing model used in conjunction with CMAQ is the Sparse Matrix Operator Kernel Emissions Modeling System (SMOKE version 2.5). Modeling staff at UDAQ have extensive experience with this model and have been using it on a regular basis since 2001. The emissions processing model takes the annual, county-wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory which, in the end, produces a refined version of the inventory.

1) Temporal processing: Convert emissions from annual to daily and hourly values.
2) Spatial processing: Convert emissions from a county-wide average to emissions in a 4 square kilometer grid cell.
3) Speciation: Break $PM_{2.5}$ and VOC emissions into their component subspecies using the latest, Carbon Bond 5, speciation profiles.

The process of breaking down the emissions inventory into time and space-resolved components for the air quality model is done with sets of activity profiles and associated cross reference files. These are created for point or large industrial source emissions, area sources which are small but spread out over large areas such dry cleaning establishments, and mobile sources such as automobile and truck traffic. The existing inventories of primary $PM_{2.5}$ and $PM_{2.5}$ precursors are modified to reflect winter conditions for each episode-year. Because of the interaction with ammonia in the formation of ammonium nitrate, special attention is paid to ammonia sources in the modeling domain and all aspects of the inventory are reviewed thoroughly for accuracy and completeness. The 2008 annual inventory will be used to create the future year projection inventories.

Emission inventories are calculated on an average time scale that is far more generalized than what is required by the air quality model. Most activities such as fuel combustion or evaporative processes are estimated for an annual average. The mobile emissions model is used to create an hourly profile of emissions. However, estimated vehicle miles traveled (VMT) is, itself, calculated as an annual average. Consequently, a significant amount of time is spent in the creation and quality assurance of temporal profiles used to disaggregate the annual data into monthly, daily, and hourly slices needed for model-ready emissions files.

The emissions from large industrial sources are placed at the location of the source itself. For area and mobile source emissions, spatial surrogates are created. For example, the emissions from wood stoves for home heating are placed in the model using population density as the surrogate. Using this approach no wood stove emissions for home heating will be put into the model in areas of the county that are unpopulated. Emissions from automobiles are distributed using traffic estimates from the traffic demand model, where available and from road locations and population density in areas not covered by traffic demand modeling.

Splitting the $PM_{2.5}$ and VOC emissions into subspecies is done to allow the air quality model to process the chemical reactions in the atmosphere. Since the reaction of these subspecies in the air accounts for a significant part of the total $PM_{2.5}$ concentrations along the Wasatch Front and in the Cache Valley it is important to account for them. A set of chemical profiles and cross reference files is created for the sources of these emissions and used for this processing. Once the emissions are speciated, the individual species serve as input to the air quality model.

Once cross reference tables are created to define the relationships between the annual emissions inventory and the temporal, spatial, and chemical aspects of the data the SMOKE emissions model is run. Figure 2.9 shows the daily emissions inventory of five important pollutants for the Wasatch Front as well as Cache, Box Elder, and Tooele counties for 2008.

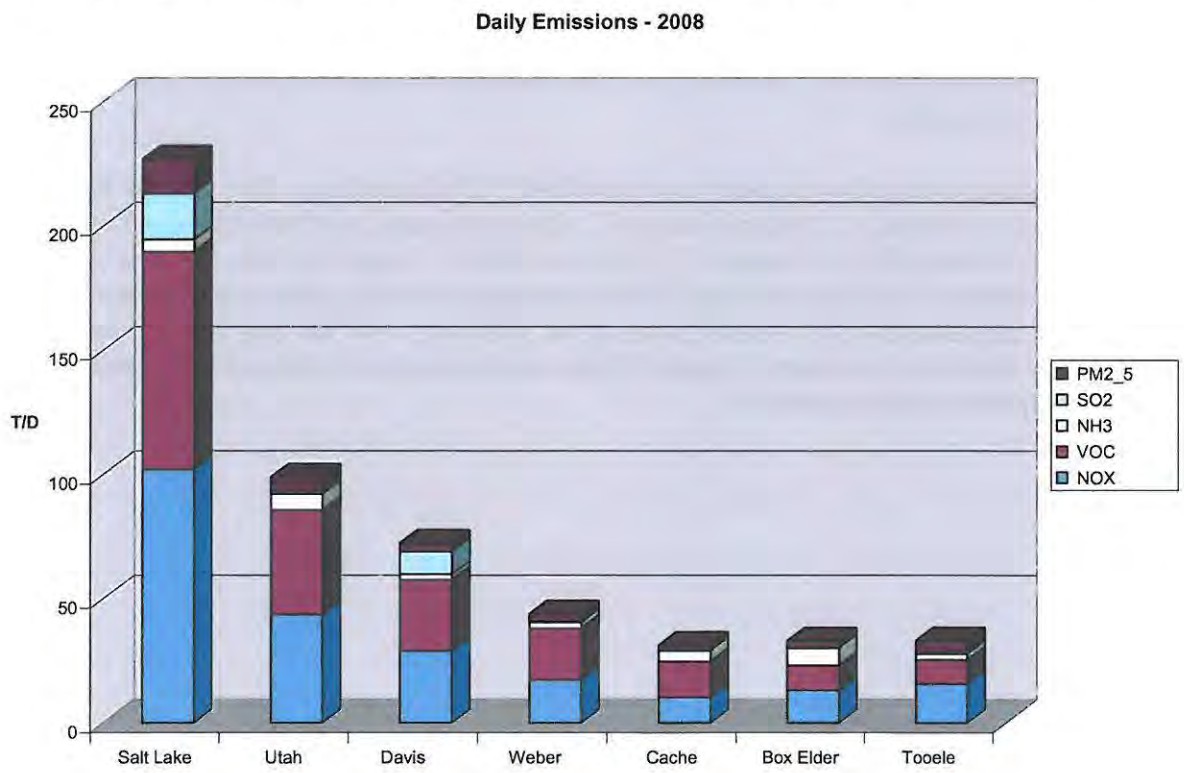


Figure 2.9 Day-specific emissions inventory for February, 2008

2.7.2 Idaho and Wyoming Inventory

Since the Cache Valley extends into Idaho, Utah is providing the air quality modeling to the state of Idaho in support of their SIP for the non-attainment area that extends into Franklin County, Idaho. To provide this analysis UDAQ extended the domain northward a significant distance north of Franklin County to avoid model edge-effects in the air quality model results.

Idaho Department of Environmental Quality (IDEQ) staff will provide the emission inventory that is consistent with the modeling input created by UDAQ.

Regional transport of emissions during winter time inversions is insignificant. Since Wyoming is far-removed from the problem valleys in the Utah and Idaho, and because the state of Wyoming has not yet created a SIP-based emissions inventory, data from the 2005 NEI will be used as the base inventory. UDAQ, with the assistance of Region 8, will make every effort to obtain an updated emissions inventory for Southwest Wyoming including the latest oil and gas inventory. This will be distributed throughout the portions of the counties in the domain using population surrogates.

Parts of three counties in southwest Wyoming are also in the modeling domain simply because the domain is rectangular and extends to eastward and northward limits that encompass part of the state. Given the limited regional transport of emissions during winter time inversions it is unlikely that the emissions from Wyoming will have significant impact on the non-attainment areas of the Cache valley.

Wyoming emissions were downloaded from the WRAP EDMS data base. The version of the inventory used is "version 11, 2005 preliminary". Emission inputs and SMOKE output reports were sent to Wyoming DEQ on January 13, 2010 for review. A response from the state of Wyoming on February 16, 2010 indicated that the emission inventory group there did not have any further information that they wished to add to the inventory. Nor did they feel that any changes to the data were necessary. Figure 2.10 shows the portions of Idaho and Wyoming that are in the air quality modeling domain.

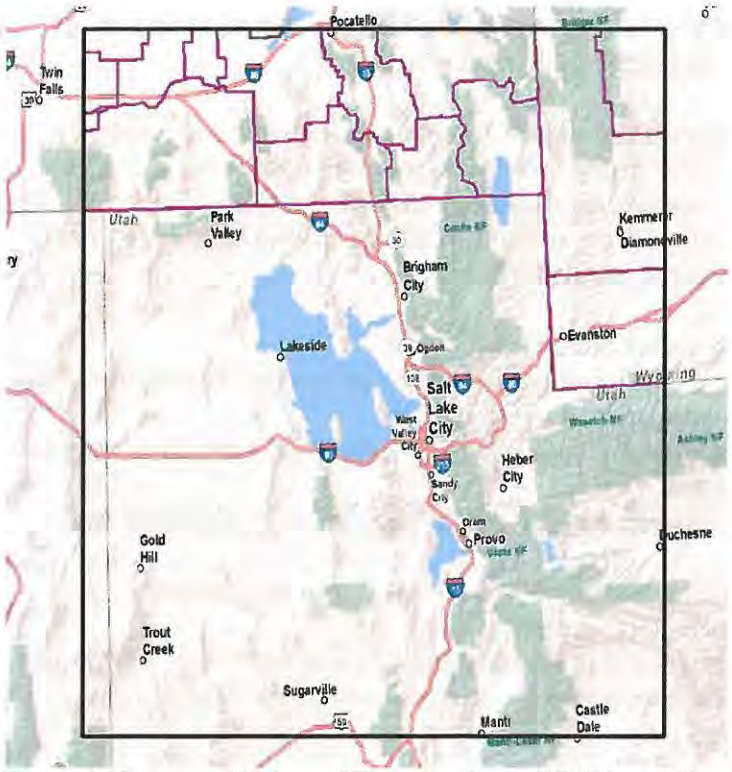


Figure 2.10 Areas of Idaho and Wyoming in the UDAQ modeling domain

2.7.3 Spatial Surrogates used for Distributing Emissions

The function of the emissions model in developing the air quality inputs is to allocate a generalized, county-wide annual emissions inventory into a much more detailed set of emissions. Before SMOKE can be run to create input for the air quality model several types of data sets must be created using a geographic information system (GIS). This pre-processing allows the emissions to be distributed spatially to individual grid cells throughout the modeling domain. Day-specific information, which is available for the mobile and non-road portions of the inventory can also be incorporated into the model.

This section describes the process of creating those inputs for the CMAQ air quality model. One of the most time consuming tasks in creating a model-ready emissions inventory is the creation of spatial surrogates. A spatial surrogates cross reference file is used by SMOKE to disaggregate the county-level inventory to individual grid cells in the modeling domain.

GIS processing is used extensively to produce the cross referenced index file that has the percent of each surrogate, in the individual grid cells, within each county. One of the most important surrogates, population, is created from 2000 census data that is tracked by a geographic unit known as a census block-group. The extraction and recombining of the various GIS layers into the final data set is done mostly through programming code during and after the Arc GIS processing.

Extensive QA/QC is done throughout all phases of the surrogate creation to insure that correct percentages of each category are maintained in the individual grid cells.

As mentioned in the section above, the surrogate created for population density is arguably the most important of the spatial surrogates. The majority of the area source emissions as distributed by population density. In the urbanized counties mobile emissions from local roads are distributed by population density. In all of the outlying/rural counties, mobile emissions from arterial and local roads are distributed with the population surrogate.

The creation of the population density surrogate is a 5 step process:

1. Convert the census data from an absolute number in varying geographic boundaries into a population density number (population per square-meter).
2. Keep track of the population by each individual county so each county-specific emissions inventory can be properly distributed.
3. Convert population density from population/sq. meter to population/16 sq. kilometers (the area of each grid cell).
4. Convert these values into percentages and quality-check the results so that the percentages in the grid cells of each county sum to 1.
5. Employ a special procedure for counties that are only partially covered by the modeling domain (see section below on the creation of population surrogates for Wyoming for a detailed description of this method).

As a further refinement to this process, high-resolution aerial photography is used to eliminate small percentages of population in areas that are clearly devoid of any type of settlement. Figures 2.11 and 2.12 show the results of applying this type of filter to the surrogate creation process.

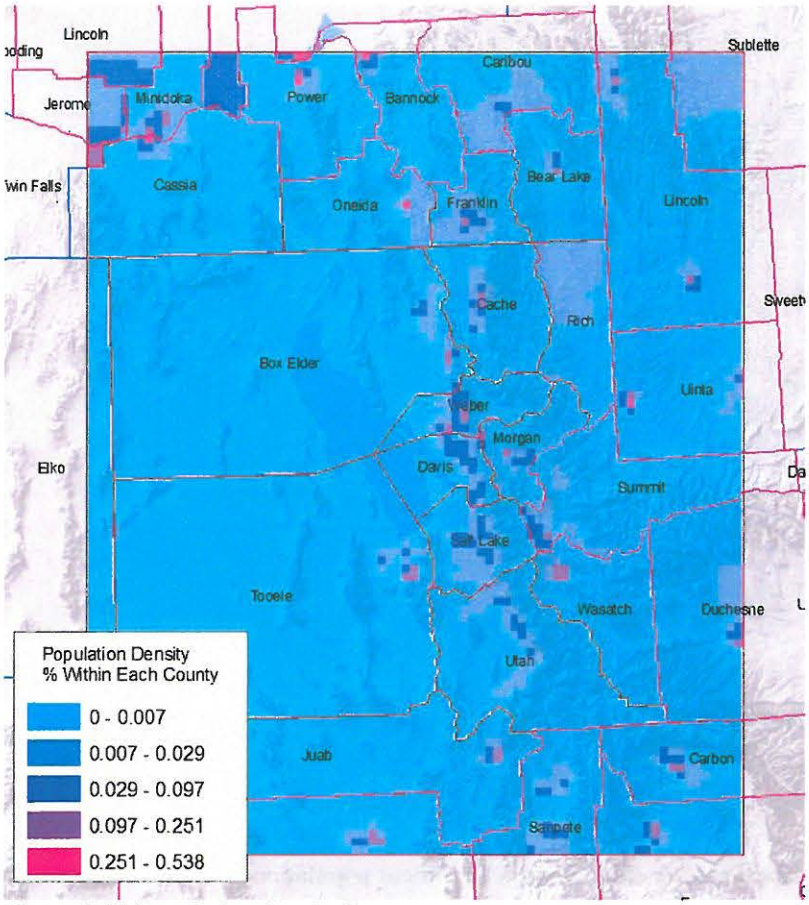


Figure 2.11 Population density by-county

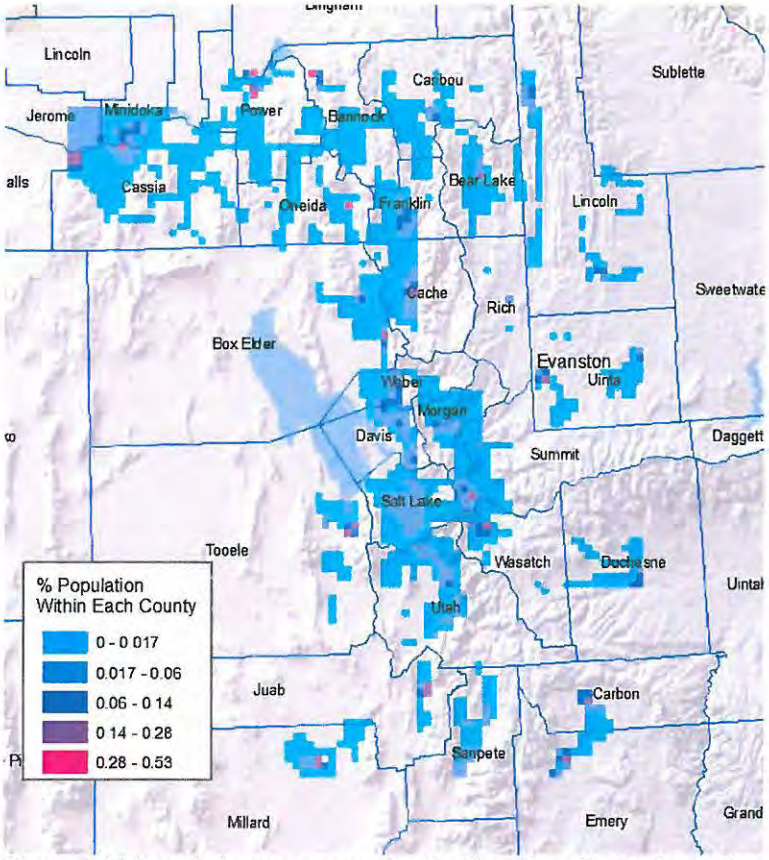


Figure 2.12 Population surrogate distribution after eliminating cells without population

2.7.4 Method to Create Partial-County Emission Inventories

In each state there are a number of counties that are only partially covered by the modeling domain. The example described below shows how a full county-wide inventory is apportioned to areas of the domain that do not cover the full county area. This is done using a five step process.

1) Use the latest Traffic Analysis Zone geography and population data (2006) from the Wasatch Front Regional Council for the four Wasatch Front counties.
2) Use the census "blockgroup" GIS layer to obtain the year 2000 population for all other counties.
3) Use a series of "gridding" functions in GIS to get a population density for each grid cell of the modeling domain in each county.
4) Sum up the population in all of the grid cells in a particular county and divide that number by the total population in the county.
5) Use the result of step number 3 to factor the county-wide emissions inventory.

For example, if 75% of a county's population is within the modeling domain, the spatial surrogate for each grid cell in the county will account for a matching reduction of the full county inventory during the SMOKE model processing.

The emissions inventory for Wyoming will be dealt with as a special case regarding partial-county inventories. The full county-wide emissions inventories for each of the three counties within the domain will be used even though each of the Wyoming counties is only partially within the modeling domain. This is a conservative approach that ensures the inclusion of all emissions from the Wyoming inventory used by UDAQ in the modeling.

2.7.5 Temporal Processing

Updating the temporal, spatial, and speciation profiles has been an ongoing process at UDAQ. The kinds of changes that were made to these profiles and the research done for them are not time dependent and so the profiles continue to be current and valid for all inventories. Spatial profiles, in particular, continue to be updated when necessary to reflect changes in population and economic activity distributions over time. The technical support documentation for the SIP modeling will contain a section that deals specifically with the emissions inventory processing. Any changes to the temporal, spatial, or speciation profiles for specific SCC codes will described in an appendix attached to that document.

The goal of temporal processing is to provide more detail about the emissions inventory during the actual episode being modeled. For example, beginning with annual average data, one first decides how the activity is distributed over the year. A larger proportion of emissions from home heating fuels will occur during the winter months as opposed to summer. Next would be the distribution throughout the month. For automobile emissions one might assume that there is a difference between the amount of daily driving done on the weekends and that done during the work week. Since the modeled episodes run longer than one week the amount of mobile source emissions on the weekend and non-weekend days is adjusted accordingly. The final level of temporal refinement seeks to distribute the emissions throughout the day. If a particular industrial process operates seven days a week but only at night, those emissions will be put into the model only during those hours of operation.

The following figures show examples of temporal profiles for specific SCC codes from the mobile, area and point source categories. These are chosen to show an example from each of the three levels of processing. Figure 2.16 shows the seasonal profile for prescribed burning which shows no burning during winter months. Figure 2.17 shows the weekly profile of one particular process at a large industrial source, and Figure 2.18 shows the hourly emissions profile for six different sources.

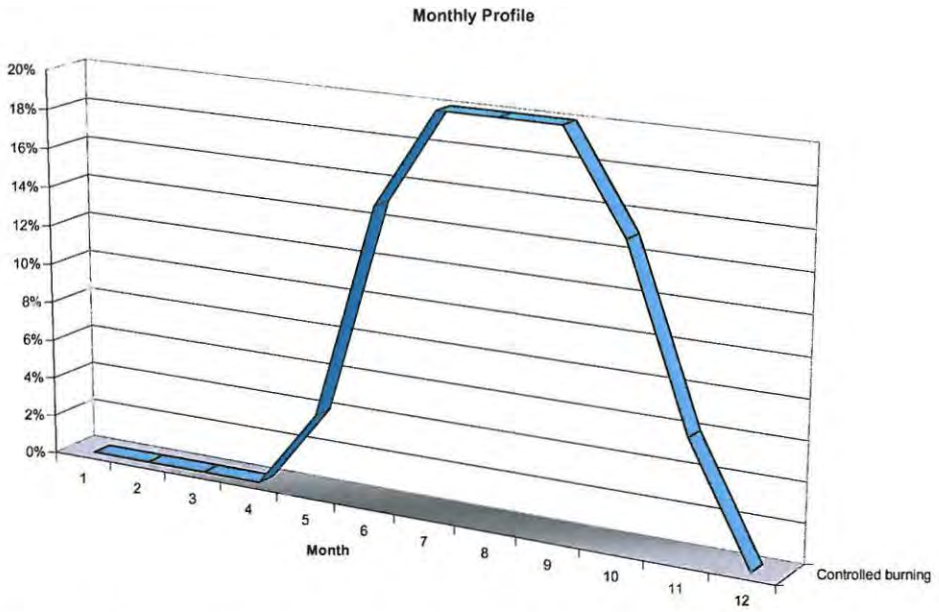


Figure 2.16 Monthly profile of controlled burning emissions

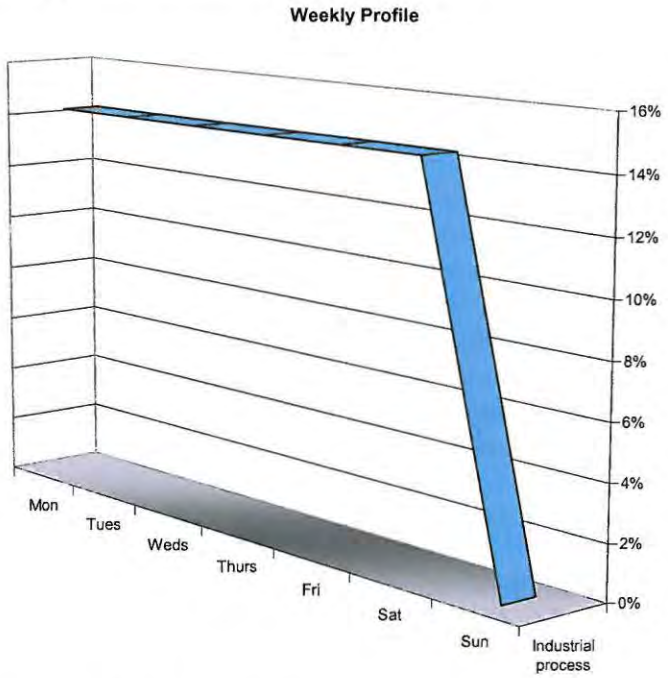


Figure 2.17 Daily profile of large industrial source emissions

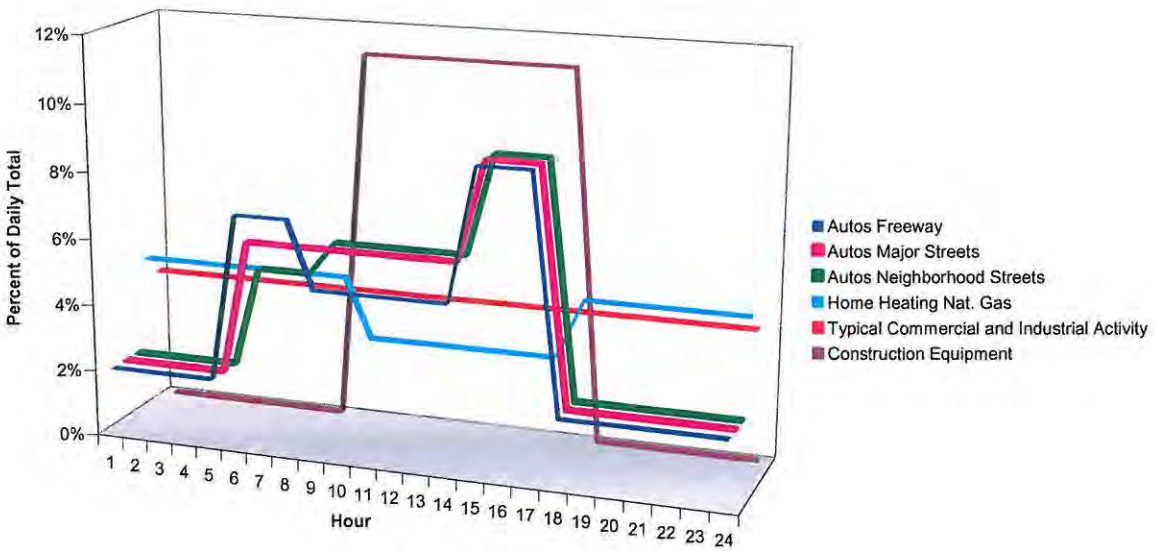


Figure 2.18 Hourly emissions profile for area, mobile, non-road, and industrial sources

Development of area source temporal profiles has been an ongoing process at UDAQ. The SMOKE model has a set of cross referenced index files which the program uses to link emissions from specific SCC codes to variations in seasonal, daily, and hourly inputs to the air quality model. These profiles are represented graphically in figures 2.16 – 2.18, above. UDAQ has changed and edited many of the default profiles to reflect common understanding of activities that take place on a seasonal basis. Figure 2.16 shows a change which reflects the seasonal distribution of open burning activities. Other applications include the concentration of emission estimates from snow blowers into the three month winter season, the exclusion of yard maintenance emissions during the winter, and a significant reduction in emissions from cut-back asphalt application during winter. Many more examples could be listed. In addition, for activities where a common understanding exists about whether they take place seven days a week or just during the work week, and specificity about the activity during the day, these are also reflected by changes in the profiles.

Temporal profiles for on-road mobile sources are developed using the default profiles included with the MOVES model. UDOT is currently developing county-specific temporal profiles for road and vehicle classes in Utah. If these profiles differ significantly from those used by MOVES, those changes will be reflected in SMOKE temporal profiles and the inventory will be reprocessed to account for those changes.

The first iteration of changes to temporal profiles for individual point sources emitting 50 tons or more of PM_{10}, SO_2, NO_x, or VOC were undertaken during the modeling phase of the PM_{10} re-

designation SIP. The modeling for this project was begun in early 2003. For each specific episode period questionnaires are sent to large sources for information regarding special circumstances that may have affected operating conditions. If adjustments to the episode-specific inventory are needed based on the questionnaire results, these adjustments are made before processing the inventory with SMOKE. Detailed lists of the temporal, spatial, and speciated cross reference files will be provided as appendices in the technical support documentation.

2.7.6 Inputs for Base and Future Year Episodes

The annual inventory for area and point sources is used with SMOKE temporal and spatial profiles for each individual episode. Point source data is also adjusted, where necessary, based on a detailed questionnaire sent to the largest sources asking for information about any special circumstances that may have applied during each episode. These emissions will be based on the 2008 triennial inventory. The detailed methodology for the development of the entire emissions inventory is found in the Inventory Preparation Plan document (IPP). Point sources are described in Section V and area sources in Section VI of that document.

On-road mobile source emissions will be created with the MOVES model. MOVES will calculate emissions for a 24-hr (daily) averaging period, and the temporal profiles of SMOKE will then subdivide these emissions into hourly values. On-road mobile source emissions will be geographically positioned within the rural areas of the modeling domain by using population as a surrogate. In the urbanized areas, emissions will be positioned using an overlay of the transportation network. Details of the mobile emissions inventory development are found in Section VII of the IPP.

Another source of emissions to be accounted for in the projection year modeling is the sum of banked emissions that can potentially be used to offset future emissions increases in non-attainment areas. The banked emissions will be included in the modeling analysis as outlined below:

1) Banked emissions will be modeled as a constant amount throughout each of the projection years.
2) Banked emissions will be located in the modeling domain in the same county in which they are registered.
3) Within each particular county, banked emissions will be located in what is considered to be a core industrial area. This area or areas will be placed in the modeling domain as a collection of grid cells and labeled "pseudo sites". Banked emissions will then be distributed evenly amongst these pseudo sites.
4) The inclusion of banked emissions in the vertical layers of the model will be determined on a case by case basis. UDAQ will confer with EPA to determine the most appropriate method to include these emissions in the model.

2.7.7 Inventory Quality Assurance

Quality assurance of the model-ready emissions inventory will be done by the emissions modelers. The tools used will be detailed reports of the SMOKE output that are created at each major step in the process. The level of detail that is now available via customized reporting tools allow for detailed analysis of process-specific inputs if needed.

In addition to the spreadsheet-style reports UDAQ also uses GIS tools to provide graphic analysis of the emissions database. The technical support documentation will include tables and geographic maps of the emissions inputs to the CMAQ model.

2.8 Model Input Quality Assurance Methods

MM5 and WRF data will be verified and quality assured using model performance bias and error statistics. Bias and error statistics will be computed for temperature, wind, and vertical atmospheric structure. We will look most closely at the model performance statistics in valley locations where elevated $PM_{2.5}$ is observed.

3. Model Performance Evaluation

UDAQ anticipates having model results for four past episodes during winter periods in 2007, 2008, 2009, and 2010. We will evaluate the model performance on all four of these episodes using the methods described in section 3.2 and 3.3.

3.1 Ambient air quality database

UDAQ's Air Monitoring Center maintains an extensive network of particulate and gaseous air monitoring sites. The monitor locations are located near and within populated cities and towns. In northern Utah, population is confined to the western front of the Wasatch Mountains and as a result Utah's air quality monitors are located linearly north to south along the Wasatch Front. Two notable exceptions are Tooele, Utah and Logan, Utah. Both of these locations are located in separate mountain valleys. The linear network of Utah's monitors will be an important factor as UDAQ follows EPA recommended modeling guidance and conducts $PM_{2.5}$ species interpolation and the "unmonitored area analysis".

UDAQ has developed the following air quality database with which the $PM_{2.5}$ SIP can be developed:

- Up to 17 Federal Reference Method (FRM) monitors (refer tables in section 2.5).
  - Between 4 and 7 daily monitors
  - Between 5 and 13 every third day monitors.
- Three Speciation Network (STN) sites.
  - One 1 in 3 day site.
  - Two every sixth day sites.
  - Two special studies where speciated data collected every other day.
- One URG Ambient Ion Monitor.
  - Continuous data available early 2010.
  - Special study data available in 2009.

❖ Four hourly ozone and pre-cursor monitors.

3.2 Evaluation Procedures

Base case model performance evaluation requires 3 main decision steps:

1. Identify a window of model grid cells to use for comparison with monitor.
2. Identify which window grid cell or window statistic to use for comparison with monitor.
3. Identify statistical performance measures.

Step1 and Step 2 are treated in section 3.0 of the EPA Ozone and $PM_{2.5}$ modeling guidance document with respect to the development of a model attainment test. Step 3 is treated in section 5.0 with respect to base case model performance evaluation. In UDAQ's judgment, it is appropriate to provide consistency between the methodology used to evaluate base case performance and the methodology used to evaluate attainment in the future. In the following text, UDAQ outlines EPA's suggestions from guidance section 3.2 for steps 1 and 2 described above and describes how UDAQ intends to formulate a model performance evaluation system appropriate for our domain.

3.2.1 Identify a Window of Model Grid Cells

EPA suggests that instead of using a single model grid cell to evaluate model performance a "window" of nearby cells should be used. EPA outlines 4 reasons why a window of model grid cells should be used:

1. Migration of predicted pollutant peak.
2. Intended spatial scale of monitor siting.
3. Model uncertainty provides leeway in predicted location of concentrations.
4. Misalignment of model grid cells and monitor location.

The guidance document defines cells "near" a monitor as cells located within a 15km radius of the monitor location. Table 3.2 in the modeling guidance indicates that the default recommendation for a 4km resolution modeling domain would be an array (window) of 7 cells x 7 cells (28km x 28km) with the monitor located in the center cell. EPA recognizes that the default definition of "near" may not be appropriate for all applications due to unique features of the modeling domain such as:

- Topographic features
- Mesoscale flow patterns
- Density of the monitoring network
- Density of emissions
- Other factors as appropriate

The definition of "near/nearby" (window size) can be changed to more accurately represent the unique features listed above provided an adequate justification is made.

Utah's modeling domain is unique for numerous reasons. Each of EPA's "unique features" described above is present in our modeling domain and necessitates a custom approach to defining the grid cell window. The default window size of 28km x 28km is far too large for use within our domain. Figure 3.1 shows the spatial relationship between topography, emission density, road networks, and monitor locations. Grid cell resolution is 4km x 4km. UDAQ believes that numerous justifications for using a non-default window size can be made following EPA's list of unique modeling domain features:

Topographic features: Utah's significant terrain is aligned north to south and controls the population distribution up and down the Wasatch Front. Use of a 28km x 28km window would draw in high mountain terrain that is far removed from elevated $PM_{2.5}$ concentrations.

Mesoscale flow patterns: Utah's non-attainment areas have numerous mountain canyons that create diurnal mesoscale flow patterns. In addition, the stagnant weather conditions that lead to elevated $PM_{2.5}$ concentrations typically feature very light and variable wind flow. The impact of these characteristics on predicted concentrations are more appropriately captured by a smaller window that captures near-monitor mesoscale conditions.

Density of the monitoring network: With few exceptions, the monitors within the UDAQ monitoring network are arranged in a linear fashion north to south along the Wasatch Front. A large and square grid cell window would encapsulate grid cells far from the near-monitor meteorological and emission conditions.

Density of emissions: The density of emissions is coincident with the population distribution and road networks of the Wasatch Front and Cache Valley. A large grid cell window would encapsulate grid cells with little to no emissions and would include grid cells in the mountains and over the Great Salt Lake.

To determine an appropriate window size UDAQ consulted a model domain map of road networks, monitor locations, topography, and emissions density. Figure 3.2 shows cell windows that capture the appropriate emissions density, uniqueness of monitor location, and representative valley topography. A 2 cell x 2 cell (8km x 8km) window appears to be appropriate for several reasons:

1) Limits grid cells to valley floors and does not include elevated terrain grid cells. This is especially important given the number of monitors located close to the eastern Wasatch Mountain benches.
2) Incorporates highest emissions density cells and eliminates low density cells. Outside of the Salt Lake Valley emissions rapidly fall off west of I15.
3) Identifies unique windows for most monitors. Many monitors are located in close proximity to one another and the smaller window allows unique windows to be identified for each monitor.

The 2 by 2 cell window will be the default window size selection for UDAQ, however, we plan on leaving the final window size selection flexible. For example, $PM_{2.5}$ speciation data shows very similar speciation across Salt Lake valley. This homogeneity combined with emissions

density distribution may allow for a larger window size. A larger window size would allow the model evaluation performance to consider predicted $PM_{2.5}$ that falls within the homogeneous Salt Lake Valley rather than limit predictions to the chosen 2 by 2 cell window.

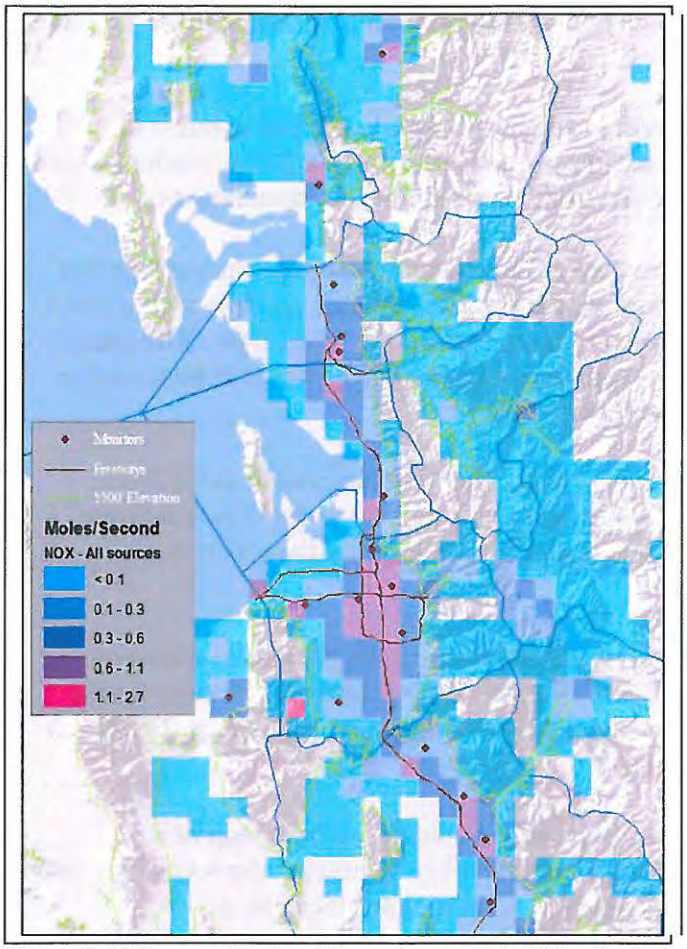


Figure 3. 1 Map used to identify custom model grid cell windows

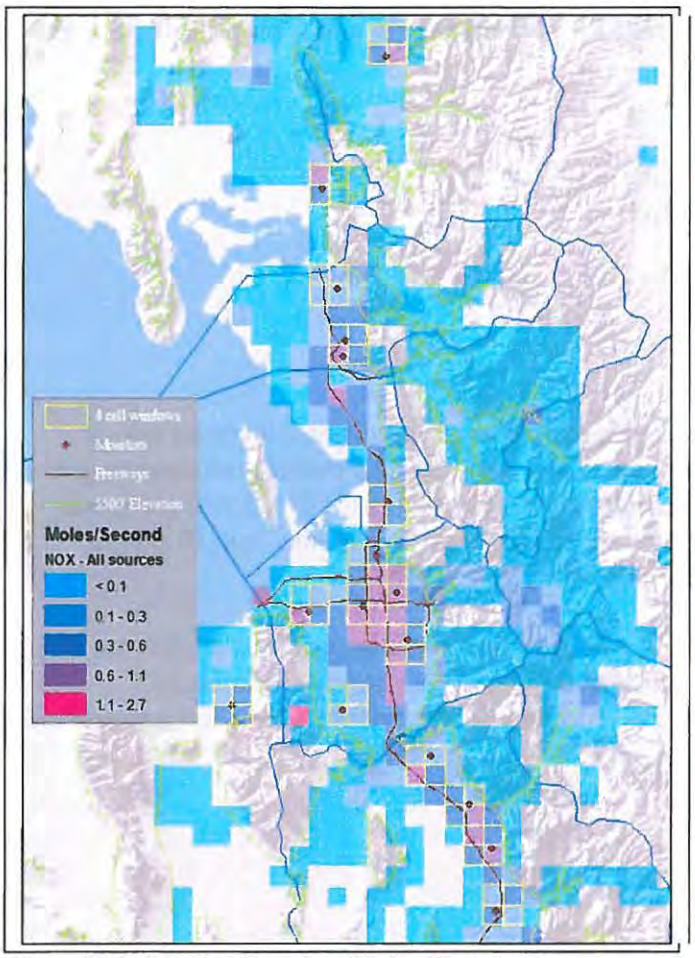


Figure 3. 2 Modeling domain with 4-cell windows

3.2.2 Identify a Window Statistic to Compare With Monitor

Based on prior and preliminary modeling experience, it is UDAQ's assumption that model concentrations will show an under-prediction relative to observed values. Provided that the model is under-predicting with accurate speciation percentages, UDAQ will likely select a window statistic that represents a mean value or higher. The range of possible statistic options are: mean of the window cells, 75th percentile of the window cells, and maximum window cell. It is difficult to determine the best statistic before model results are finalized, but the choice of model statistic(s) will be fully documented and explained in the Technical Support Documentation.

3.2.3 Performance Metrics and Tests

Chapter 18.0 of EPA's ozone and $PM_{2.5}$ guidance document provides guidelines on computing model performance metrics. UDAQ intends to closely adhere to the Boylan and Russel 2006 recommendations that are outlined in the guidance chapter by computing the following metrics

for 24 hour average total $PM_{2.5}$, 24 hour average $PM_{2.5}$ components, and appropriate hourly gas phase pre-cursor species:

- Mean Normalized Bias (MNB)
- Mean Normalized Gross Error (MNGE)
- Average Peak Prediction Bias and Error
- Mean Fractional Bias (percent)
- Mean Fractional Error (percent)
- Normalized Mean Bias (percent)
- Normalized Mean Error (percent)

Boylan and Russel 2006 indicate that the mean fractional error and bias are the most robust metrics for $PM_{2.5}$ model performance evaluation. They recommend a model performance goal of +50% and +/- 30% for mean fractional error and mean fractional bias. UDAQ will use these performance goals as targets, but they will not be considered as "bright line" cut-off points. These two metrics will form the core of our performance evaluation.

In addition, UDAQ will consider and compute whether other statistics included in EPA's Appendix A (root mean square error, correlation coefficients, etc) provide meaningful information for Utah's episodic $PM_{2.5}$ episodes. Numerous performance evaluation graphics will also be created including:

- Time-Series plots
- Scatter plots
- Soccer plots
- Bugle plots

UDAQ intends to compute these sets of statistics for all days of the $PM_{2.5}$ episode, but will also compute a separate set of statistics for days when the $PM_{2.5}$ is near or above the NAAQS standard. The performance statistics should be computed and weighted for days that represent conditions under which $PM_{2.5}$ forms rapidly. The ultimate goal is to reduce the formation of $PM_{2.5}$ and it is prudent to focus attention on the days when $PM_{2.5}$ forms rapidly versus days when $PM_{2.5}$ is low and even when $PM_{2.5}$ is high but diminishing.

3.3 Diagnostic Testing

Diagnostic testing of model performance will be extensive. Past and current experience with modeling winter inversions in intermountain valleys has shown that replicating inversion dynamics is a difficult task for meteorological models. The EPA modeling guidance explains the importance of diagnostic testing as a means to check the model's estimate of $PM_{2.5}$ in response to changes in precursor emissions. The results of these tests can provide confidence in the model's ability reflect changes in pollutant concentrations that would be expected from control strategy implementation. Section 18.5 of the guidance document suggests five possible approaches with an explanation of each technique as well as caveats about the interpretation of results.

- Observational models
- Probing tools

- Receptor models
- Retrospective analyses
- Sensitivity analyses

The first and last of these tests are the ones that will most likely be used for this analysis. UDAQ does not have receptor model capability and a retrospective analysis will not be possible during the time available to create the SIP. The limited use of probing tools may be useful to UDAQ during the evaluation period using process analysis tools that we have some limited experience with. However, the other technique mentioned, that of source apportionment, is not available in the current version of CMAQ from the CMAS modeling center.

The use of observational models, as described in the guidance, is dependent on the availability of measurements of important precursor compounds during the modeling episodes. UDAQ has access to limited data sets that might be of use for such an analysis; in fact, we have done some of that type of performance testing already. We intend to use whatever data is available to help us to understand the model's capability to respond to changes in emissions inputs. In this context, we feel that the use of refined, emissions sensitivity testing will also provide insight into the model's handling of secondary pollutant formation.

3.4 Modeled Attainment Test Using the Modeled Attainment Test Software (MATS)

The MATS program is designed to perform two basic analyses of future year modeling.

1. Interpolate the species fractions of the PM mass from the STN monitors to the FRM monitors. The model also calculates the relative response factor (RRF) for grid cells near each monitor and uses these to calculate a future year design value for these cells.
2. Perform an unmonitored area analysis on grid cells in areas of the domain that are far from monitors. This is done by adjusting the modeled values in grid cells with the observed values from monitors in the domain. The adjustment is based on an inverse distance weighting so that monitored data nearest to a grid cell exerts the most influence in the adjustment. The capability to perform an unmonitored area for daily average $PM_{2.5}$ is ***not*** currently implemented in MATS.

UDAQ will use MATS for the modeled attainment test at grid cells near monitors (number 1, above). It was noted in comments by EPA Region 10 that, given the distance and terrain barriers between Logan and the Wasatch Front, interpolating speciation profiles between these two locations is problematic. UDAQ shares this concern. Referring to the discussion of Table 1.2 on pages 9 and 10 of this document it seems probable that a MATS interpolation would probably not present a problem. This is because the ratios of the major components of $PM_{2.5}$ are quite similar among all of the monitors from Utah County in the south to Cache County in the north.

MATS uses the SANDWICH method to reconcile the differences between data collected using the FRM and CSN monitors. Given the fact that we have only 3 speciation monitors, we do not have alternative data sets on which to draw for an alternate speciation profile for the subset of our FRM monitors that are located at a distance from the CSN monitors . For this reason we believe that the most appropriate course is to use the MATS-interpolated speciation profiles for all of the monitors in our domain.

Also, please keep in mind that the modeled attainment test uses speciated *design values* which are themselves an average of five years worth of data. There is an inherent smoothing of the data with this method. While this smoothing does not relate to the large geographic distance between some of the monitors and the three CSN sites, the fact remains that there is simply no other data available to perform alternate analyses.

3.4.1 Future Year Modeling

UDAQ will perform a model performance evaluation on all 4 episodes. Each episode that meets performance criteria (criteria are outlined in section 3.4.1) with support from supplemental analysis will be used for future year modeling. Based on our years of modeling experience, UDAQ feels that it is possible that one or more of the selected episodes may not meet performance criteria due to the inability of MM5/WRF to capture Utah's unique cold pools. In this situation UDAQ will consult with both EPA Regions and the State of Idaho to determine if the performance criteria can be relaxed on a case-by-case basis.

It is possible that EPA will release a version of MATS sometime in 2011 that will be capable of an unmonitored area analysis for daily $PM_{2.5}$. The issues of a clustered set of observation data, as opposed to an evenly distributed network of data point throughout the domain will still remain. In addition, significant terrain barriers that impose physical constraints on a simple distance-weighted spatial interpolation scheme pose real limitations on the theoretical validity of such an interpolation. As stated above, UDAQ will consult with the technical group from EPA and the State of Idaho to decide how to address this issue.

3.4.2 Unmonitored Area Analysis Outside of MATS

As noted in the previous section, the next version of MATS will include the ability to perform an unmonitored area analysis for daily $PM_{2.5}$. However, MATS is not presently capable of this analysis and for that reason we are proposing a method for an unmonitored area analysis that is similar to MATS but without the spatial interpolation. If a new version of MATS is released during the evaluation period of the $PM_{2.5}$ SIP, that version of MATS will be used to do the unmonitored area analysis for the 24-hour-average $PM_{2.5}$ attainment test.

UDAQ does not view the absence of interpolation as a weakness in this proposal because there is not a sufficient observation network to do a credible spatial interpolation whether or not one uses MATS. Because of the sparse observational data greater weight will be placed on our air quality modeling in this analysis. The modeled data in the unmonitored areas will be anchored to the observations by calculating a model bias for individual monitors representing different air basins in the domain.

First, the modeling domain will be separated into five different regions within the modeled attainment test area shown in Figure 2.2. For example, the Logan monitor will solely be used for extrapolating $PM_{2.5}$ information to all of Cache Valley. Likewise the Toole monitor will be utilized for Toole County. The unmonitored region of Box Elder and Weber counties might be an average of the stations in those two counties. Utah County will use the monitors in that county and the area surrounding Salt Lake and Davis counties will be based on the monitors in

those areas. This approach will create a more accurate representation of the state's distinct air basins.

The next step is to create model-bias factor for each of the four air basins. The goal here is to have one bias factor for each individual air basin. This is done using a two step method:

1. Modeled 24-hr values in the four grid cells surrounding each monitor will be averaged over the top 10% of $PM_{2.5}$ concentrations for each episode.
2. From observational data, base year design values are calculated in MATS. A bias factor is created by dividing the base year design value by the value calculated in step 1.

This bias factor is then multiplied by the future year $PM_{2.5}$ estimates for each grid cell within the air basin. For example, if the base year design value is 20% larger than the model derived base year estimate near that monitor, then all future year $PM_{2.5}$ in the unmonitored area of the air basin will be multiplied by 1.2. This bias correction is done in order to make the future year modeling results more realistic.
The final step is to create the future year design value for each grid cell in the unmonitored area. In each grid cell $PM_{2.5}$ will be averaged over 10% of the days during the episode corresponding to the highest $PM_{2.5}$ values. This becomes the future year design value and is compared against the NAAQS for each cell within the unmonitored area.

The method described above applies to air basins that have only one $PM_{2.5}$ monitor. If an air basin has more than one monitor the bias factor will be calculated as an average of each individual bias factor in the air basin.

4. Supplemental Analyses

EPA modeling guidance requires that a SIP include significant additional analyses in conjunction with the model attainment test. The purpose of the additional analyses is to reduce the uncertainty associated with a model only approach. EPA provides guidance on numerous possible additional analyses that can lend support to the modeled demonstration.

Of particular interest are analyses that help determine whether the model likely over-predicts, under-predicts, or accurately predicts the air quality improvement projected to occur by the attainment date. EPA describes three basic types of supplemental analyses that are recommended to supplement the primary modeling analysis. They are:

1) Additional modeling
2) Analyses of trends in ambient air quality and emissions
3) Observational models and diagnostic analyses

In addition to this "primary" modeling analysis, EPA lists various other models, applications, and tools that can be used to supplement the results of the modeled attainment test. These include, but are not limited to:

1. Use of available regional or national scale modeling applications that are suitable for the local area.

2. Use of other appropriate local modeling attainment demonstrations that include the non-attainment area of interest.
3. Use of photochemical source apportionment and/or process analysis modeling tools to help explain why attainment is (or is not) demonstrated.
4. Use of multiple air quality models/model input data sets (e.g., multiple meteorological data sets, alternative chemical mechanisms or emissions inventories, etc.). For results to be most relevant to the way we recommend models be applied in attainment demonstrations, it is preferable that such procedures focus on the sensitivity of estimated relative response factors (RRF) and resulting projected design values to the variations in inputs or model formulations.
5. Use of dispersion models to address primary $PM_{2.5}$ contributions to monitors. In areas with large spatial gradients of primary $PM_{2.5}$, dispersion models are best suited to characterizing the change in primary $PM_{2.5}$ in the future. Areas that are relying on local primary PM controls to reach attainment should submit a local area analysis as part of the primary attainment demonstration. In other areas, a local area analysis may be useful as a supplemental analysis.
6. Application of the attainment test with alternative procedures compared to the default recommendations in Sections 3, 4, and 5 of the guidance. Any alternate approaches should be accompanied with a technical justification as to why the approach is appropriate for the area in question and should be discussed with the appropriate EPA regional office.

UDAQ Supplemental Analysis Plans

UDAQ believes that the greatest $PM_{2.5}$ modeling challenge is directly related to how well the meteorological modeling can reproduce the strong stability and light winds that trap pollution in Utah's non-attainment areas. To that end, UDAQ plans to concentrate supplemental analyses on meteorological model uncertainty evaluation. Fortunately, Utah's $PM_{2.5}$ problem results from stagnation and trapping of local emissions and does not depend on long range transport. The fact that local emission mixes are consistent from day to day and are input into stagnant terrain trapped air (the bathtub effect) presents an ideal opportunity to apply observation based analyses of key $PM_{2.5}$ precursor emissions. To this end, UDAQ has identified 4 supplemental analyses that will focus on "Additional modeling" and "Observational models and diagnostic analyses":

4.1 Additional Analyses to Corroborate Modeled Attainment Test

Additional Modeling

1) Multi-Episode Modeling:

UDAQ's episode selection process identified 4 periods of elevated $PM_{2.5}$ concentrations during 4 different winter seasons. Three of the four periods constitute single $PM_{2.5}$ event episodes consisting of between 7 and 20 days. The modeling period from the winter of 2009-10 consists of 5 unique $PM_{2.5}$ event episodes that occurred over the course of 45 days. The diversity of modeling 8 $PM_{2.5}$ episodes modeled will serve as a robust base from which to evaluate attainment strategies. Furthermore, the meteorological modeling of the 4 periods (8 episodes) includes many model configurations including a 30 member MM5/WRF ensemble for the 2008 episode and a variety of physics and FDDA options applied to the 2009-2010 episode. The diversity of episodes and model configurations will provide valuable information regarding the impact of meteorological modeling on

concentration predictions. The number of selected episodes for modeling represents an effort above and beyond that which is normally required for a SIP demonstration. UDAQ has included these episodes in the modeling protocol. However, they were selected specifically for the purpose of providing supplemental analyses.

2) Ensemble Meteorological modeling:

The modeling period in February 2008 was conducted in conjunction with the National Center for Atmospheric Research (NCAR) and Dugway Proving Ground. NCAR developed a 30 member MM5 and WRF ensemble model data set for UDAQ to evaluate the sensitivity of CMAQ $PM_{2.5}$ production. In addition, UDAQ in-house WRF modeling will test physics options, initialization options, grid nudging, and observation nudging for their impact on CMAQ modeled chemistry. As in number 1 above, the ensemble modeling was selected at the outset for the primary purpose of evaluating meteorological model uncertainty on CMAQ predictions and thus providing a supplemental analysis.

3) Ensemble emissions modeling:

UDAQ will develop a small set of ensemble emissions inventories for evaluation of CMAQ emissions related uncertainty. The emission inventory "members" will each reflect adjustments to one or more portions of the inventory in order to treat the uncertainties that are associated with the inventory. For example, one member might reflect uncertainty associated with area source VOC emissions. It is likely that the base-line are inventory has uncertainty bars of +/- 20% so the member would simply be assuming that it is equally likely that the area source VOC inventory is base-line, +20% from base-line or -20% from base-line. In this way, we can gain (or reduce) confidence in the attainment test conclusions.

4) Trends:

UDAQ will produce an emissions trends analysis in order to evaluate the direction of $PM_{2.5}$ precursor emissions. A trends analysis of $PM_{2.5}$ concentrations will not be conducted because past attempts at producing such an analysis have been confounded by the controlling impact of seasonal weather patterns. A concentration analysis would only produce uncertainty and would not be helpful as a supplemental analysis.

4.2 Weight of Evidence Determination

In the event that model results and performance tests require a "Weight of Evidence" (WOE) submittal DAQ has identified 2 main sources of supporting data. The data is based on observation studies commissioned by DAQ.

Observational models and diagnostic analyses

1) Brigham Young University chemistry study Winter 2009:

Speciated $PM_{2.5}$ data show that NH4NO3 constitutes between 50% and 75% of total observed $PM_{2.5}$. NH_4NO_3 is known to form through a reaction between HNO_3 and NH_3.

Consequently, the control of HNO_3 production will likely be a critical component of a successful attainment demonstration. What is not known is if the majority of HNO_3 production occurs during the day, during the night or if HNO_3 production is limited by a precursor. To this end, during the winter of 2009 UDAQ funded a $PM_{2.5}$ study aimed at identifying the dominant HNO_3 production pathway. Results from the study indicate that NH4NO3 is limited by HNO_3 production and there was some evidence that HNO_3 is most actively produce during the daytime, however, the results are somewhat inconclusive and UDAQ will investigating further (see below). A journal paper has been submitted with the results of this study (*Kuprov, 2010).*

2) URG Ambient Ion Monitor data:

During the late winter of 2009-2010 UDAQ purchased a URG ambient ion monitor in order to measure HNO3 and other $PM_{2.5}$ precursors. This instrument is combined with real-time ambient NH3 and organic carbon monitors. A small set of URG data was collected during the late winter while the URG was undergoing testing and setup. UDAQ fully expects that during the winter of 2010-11 a significant set of data will be collected that will provide robust information related to the formation of HNO3 and the behavior of organic carbon. UDAQ believes that this data will be critical identifying limiting NH4NO3 precursors and to evaluating and corroborating model response to emission control strategies.

4.3 Large Point Source Incremental Modeling

Section 5.3 of the EPA modeling guidance suggests that in some cases it may be appropriate to perform dispersion modeling on large sources of primary PM2.5 to determine whether such sources may impact an exceedence of the NAAQS. However, in an area such as northern Utah where the main species of PM are not primary but secondary components the guidance is not clear on specific recommendations.

After discussions with EPA Region 8 concerning the nature of the PM2.5 problem in Utah and Idaho, as indicated by the speciated monitors, it has been decided to forgo this analysis. EPA and UDAQ agree that this issue and may be revisited in the future if such an analysis appears to be necessary. In addition, if EPA does establish modeling guidance that relates more directly to the conditions in northern Utah, UDAQ and EPA Region 8 will revisit this issue in light of the updated modeling guidance.

5. Procedural Requirements

5.1 Plan for Archiving Technical Data

The air quality modeling system consists of three major components:

- Emissions processor
- Meteorological model
- Photochemical air quality grid model

All of the data sets related to these activities, as well as the model code for each process, are housed with multiple backups on the UDAQ Linux computer network.

A set of spreadsheets which detail model inputs and sensitivity test options for all of the episodes and all of the model runs are maintained on a Google account for that purpose.

5.2 List of Deliverables

As a part of the technical support documentation for this modeling analysis UDAQ will provide the following documentation.

- Database of all model runs completed, including meteorological and emissions inputs used.
- Report on model performance evaluation for all episodes
- Emission inventory reports and graphic analysis of base year, future year, and control strategy inventories
- Graphical and statistical analysis of meteorology model performance evaluation
- Graphical and statistical analysis of air quality model performance evaluation

6. References

Boylan, J.W., Russell, A.G. PM and light extinction model performance metrics, goals, and criteria for three-dimensional air quality models. Atmos. Environ. 40: 4946-4959.

Kuprov, R., Etough, D.J., Hansen, J.C., Cruickshank, T., Olson, N., Composition and Secondary Formation of Fine Particulate Material in the Salt Lake Valley: Winter 2009. Submitted, 2010),

Malloy, Q.G.J., Qi, L., Warren, B., Cocker III, D.R., Erupe, M.E., Silva, P.J. Secondary organic aerosol formation from primary aliphatic amines with NO3 radical. Atmospheric Chemistry and Physics, 2009. V.9, pp.2051-2060.

Silva, P. J., Vawdrey, E. L., Corbett, M., Erupe, M., 2007: Fine particle concentrations and composition during wintertime inversions in Logan, Utah, USA, Atmospheric Environment, 41, pp. 5410-5422.

Martin, R., Cache Valley Air Quality Studies, August 2006, http://www.airquality.utah.gov/Public-Interest/Current-Issues/cache-valley-PM/Outreach/Cache%20Valley%20Air%20Quality%20Studies%202006.pdf.

Malek, E., Davis, T., Martin, R.S., Silva, P.J., 2006: Meteorological and environmental aspects of one of the worst national air pollution episodes (January, 2004) in Logan, Cache Valley, Utah, USA, Atmospheric Research, 79, pp. 108-122.

Whiteman, D.C., Bian, X., Zhong, S. Wintertime Evolution of the Temperature Inversion in the Colorado Plateau Basin. Journal of Applied Meteorology, August 1999, V.38, Is.8, pp. 1103-1117.

Roebber, Paul J., David M. Schultz, Brian A. Colle, David J. Stensrud, 2004: Toward Improved Prediction: High-Resolution and Ensemble Modeling Systems in Operations. Wea. Forecasting, 19, 936-949

Mass, Clifford F., David Ovens, Ken Westrick, Brian A. Colle, 2002: Does Increasing Horizontal Resolution Produce More Skillful Forecasts?. Bull. Amer. Meteor. Soc., 83, 407-430

Jeanne L. Hoadley, Ken Westrick, Sue A. Ferguson, Scott L. Goodrick, Larry Bradshaw, Paul Werth. (2004) The Effect of Model Resolution in Predicting Meteorological Parameters Used in Fire Danger Rating. Journal of Applied Meteorology 43:10, 1333-1347

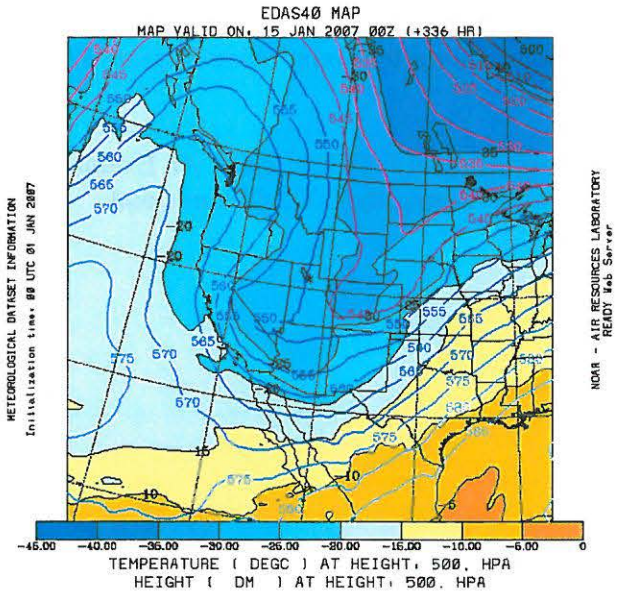
Zhong, Shiyuan, Jerome Fast, 2003: An Evaluation of the MM5, RAMS, and Meso-Eta Models at Subkilometer Resolution Using VTMX Field Campaign Data in the Salt Lake Valley. Mon. Wea. Rev., 131, 1301-1322

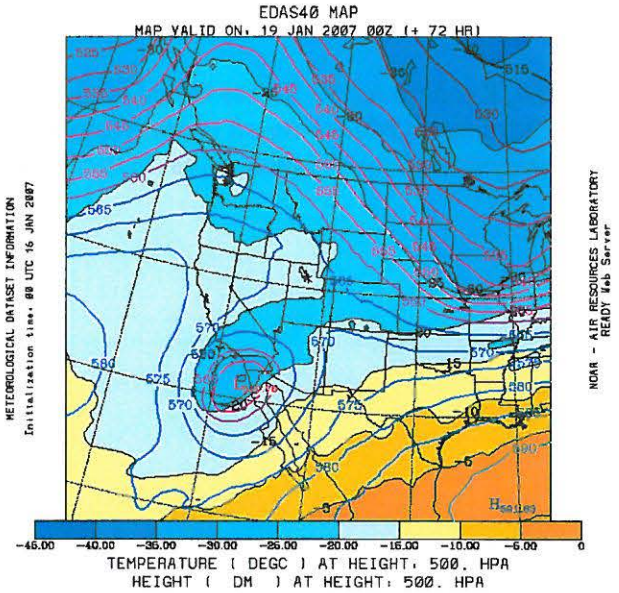
Kain, John S., and Coauthors, 2008: Some Practical Considerations Regarding Horizontal Resolution in the First Generation of Operational Convection-Allowing NWP. Wea. Forecasting, 23, 931-952

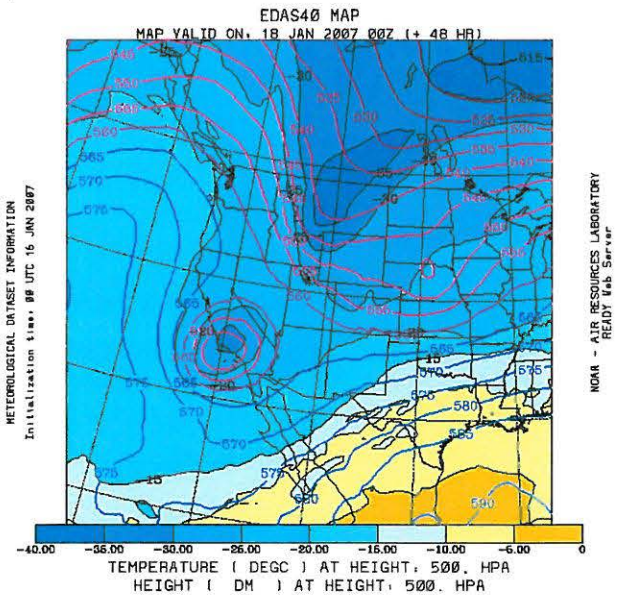
Zhong, Shiyuan, Hee-Jin In, Xindi Bian, Joseph Charney, Warren Heilman, Brian Potter, 2005: Evaluation of Real-Time High-Resolution MM5 Predictions over the Great Lakes Region. Wea. Forecasting, 20, 63-81

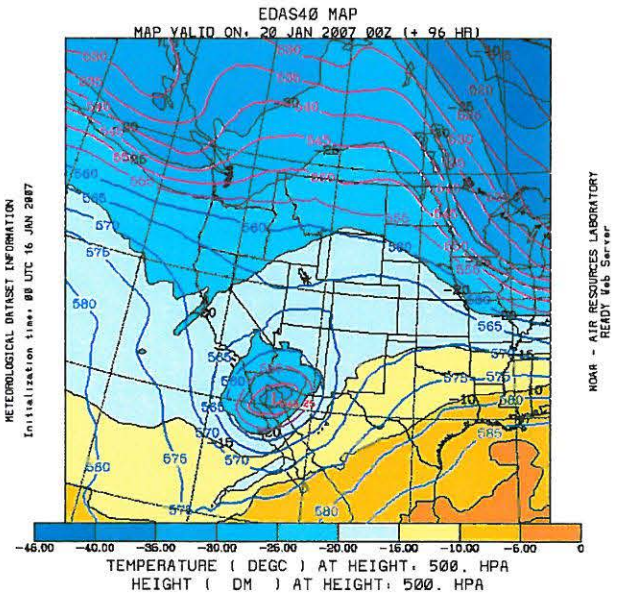
Hart, Kenneth A., W. James Steenburgh, Daryl J. Onton, Andrew J. Siffert, 2004: An Evaluation of Mesoscale-Model-Based Model Output Statistics (MOS) during the 2002 Olympic and Paralympic Winter Games. Wea. Forecasting, 19, 200-218

Appendix 2.1 – 2007 500mb Maps

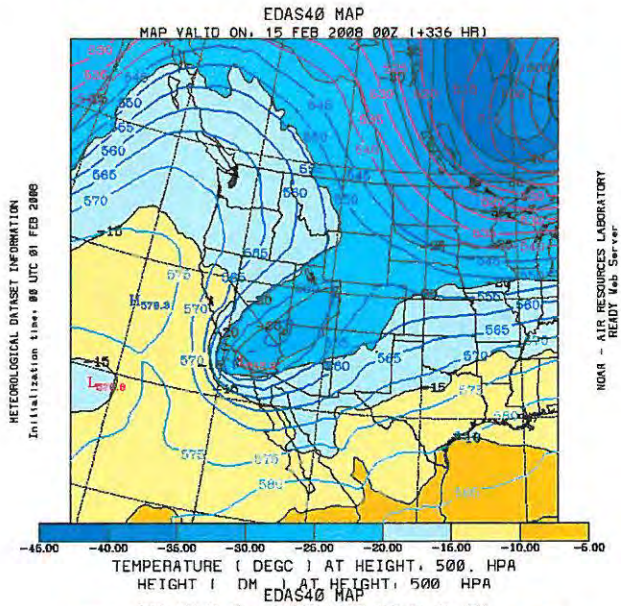


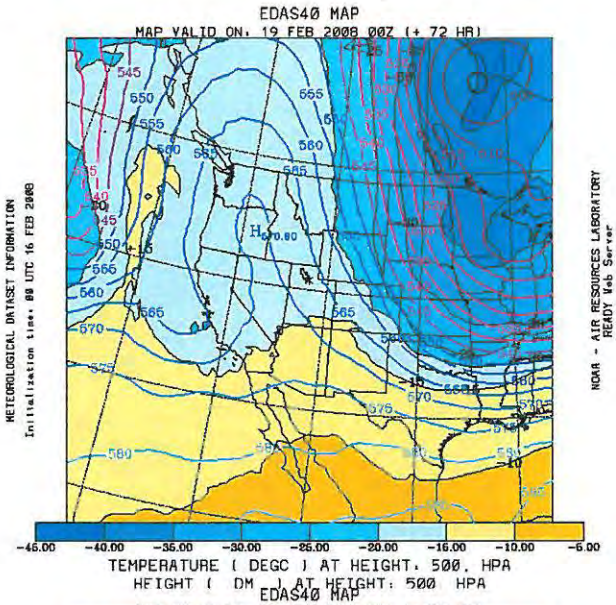


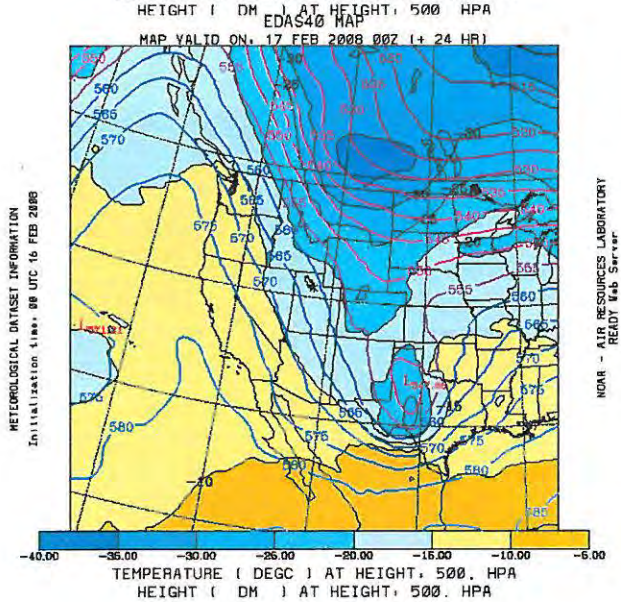


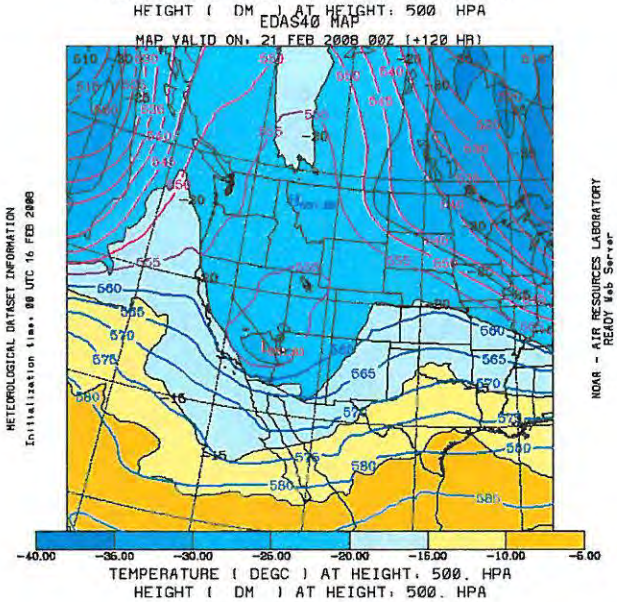


Appendix 2.2 – 2008 500mb Maps

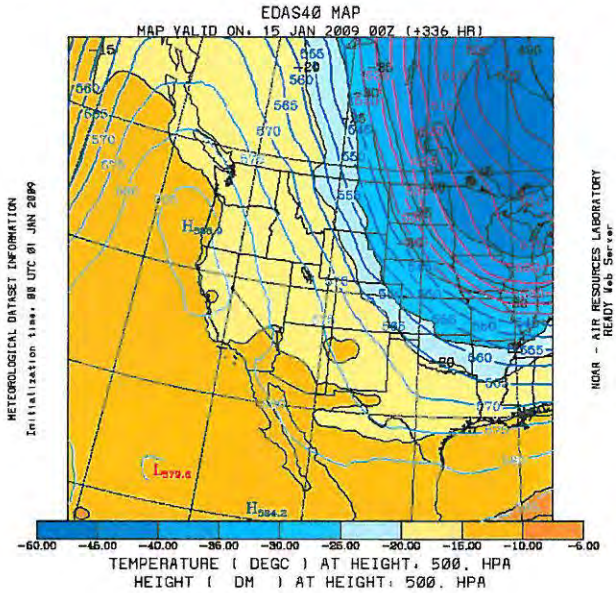


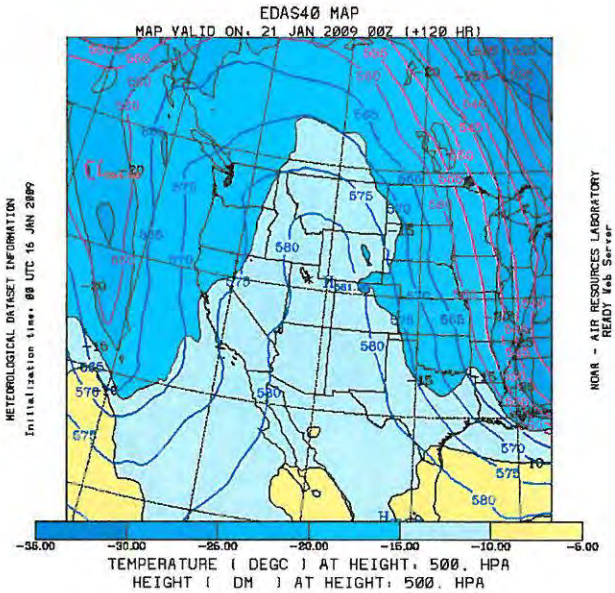


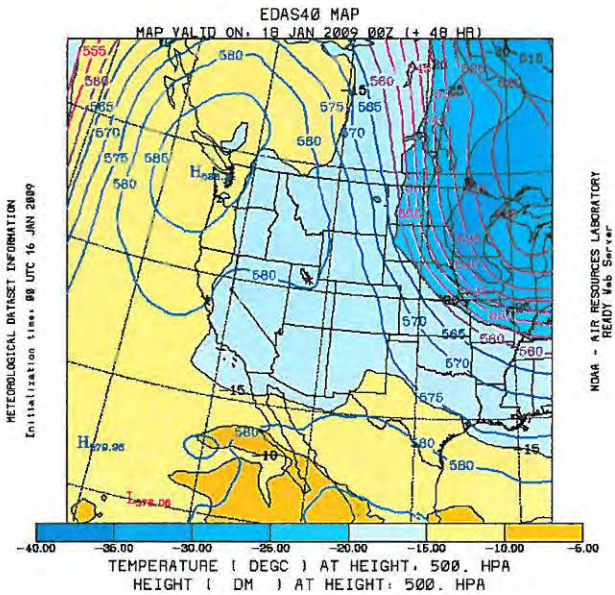


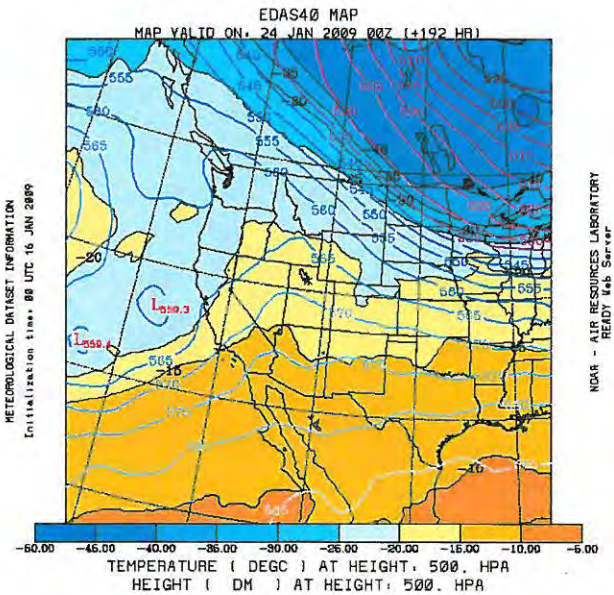


Appendix 2.3 – 2009 500mb Maps



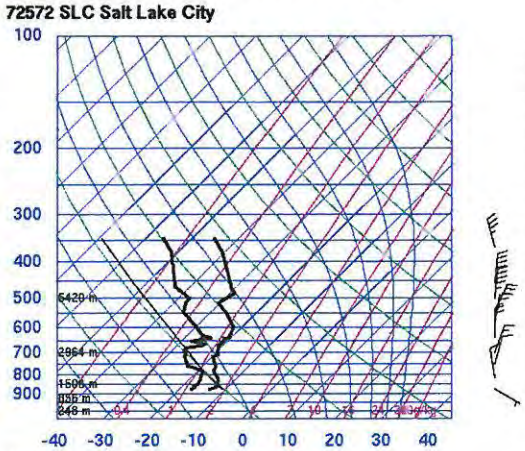






Appendix 2.4 – 2007 Soundings

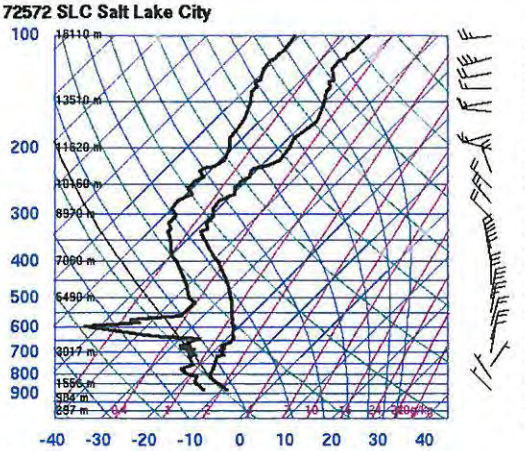
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1269.
SHOW 17.32
LIFT 17.45
LFTV 17.48
SWET 48.99
KINX -7.50
CTOT 12.40
VTOT 16.80
TOTL 29.20
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 254.7
LCLP 789.1
MLTH 272.5
MLMR 1.14
THCK 5172.
PWAT 3.00

12Z 14 Jan 2007 **University of Wyoming**

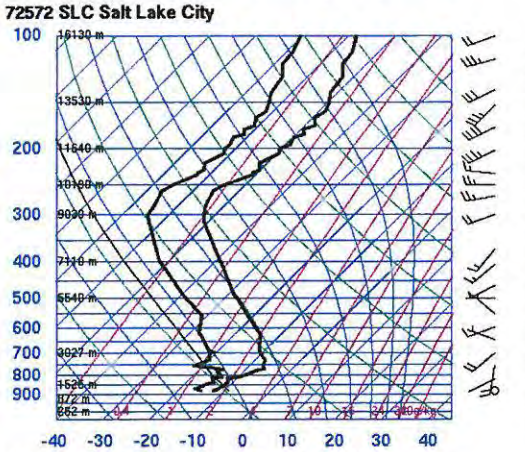
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1269.
SHOW 17.92
LIFT 17.83
LFTV 17.86
SWET 40.00
KINX -7.40
CTOT 11.50
VTOT 16.20
TOTL 27.70
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 255.9
LCLP 791.0
MLTH 273.7
MLMR 1.27
THCK 5193.
PWAT 3.01

00Z 15 Jan 2007 **University of Wyoming**

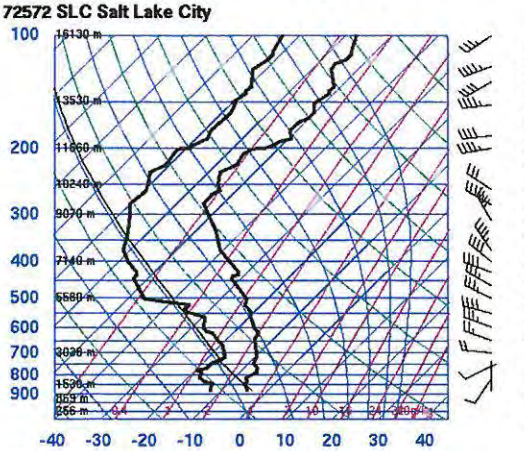
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1269.
SHOW 18.20
LIFT 18.26
LFTV 18.28
SWET 10.99
KINX -11.0
CTOT 11.50
VTOT 15.80
TOTL 27.30
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 256.8
LCLP 797.9
MLTH 273.9
MLMR 1.35
THCK 5276.
PWAT 3.93

12Z 17 Jan 2007 **University of Wyoming**

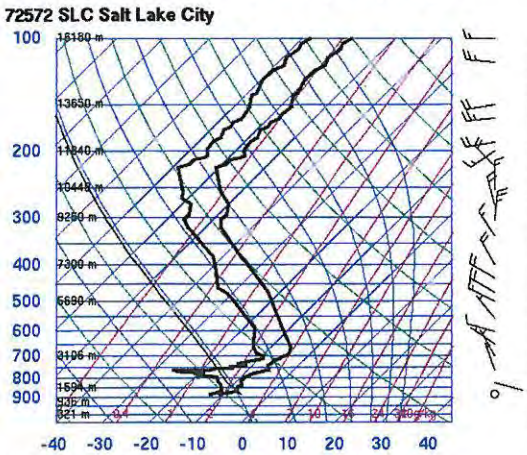
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1269.
SHOW 16.04
LIFT 15.87
LFTV 15.86
SWET 40.99
KINX -2.30
CTOT 11.20
VTOT 18.20
TOTL 29.40
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 257.5
LCLP 749.4
MLTH 279.7
MLMR 1.53
THCK 5304.
PWAT 4.13

00Z 18 Jan 2007 **University of Wyoming**

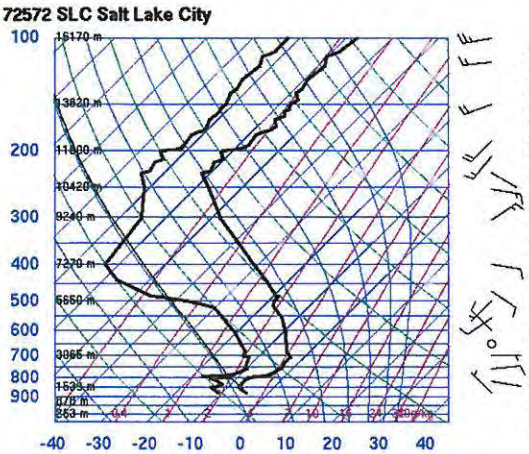
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1269.
SHOW 22.02
LIFT 22.79
LFTV 22.88
SWET 23.00
KINX -5.10
CTOT 8.00
VTOT 11.40
TOTL 19.40
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 260.4
LCLP 812.0
MLTH 276.3
MLMR 1.78
THCK 5369.
PWAT 7.27

12Z 19 Jan 2007 **University of Wyoming**

72572 SLC Salt Lake City

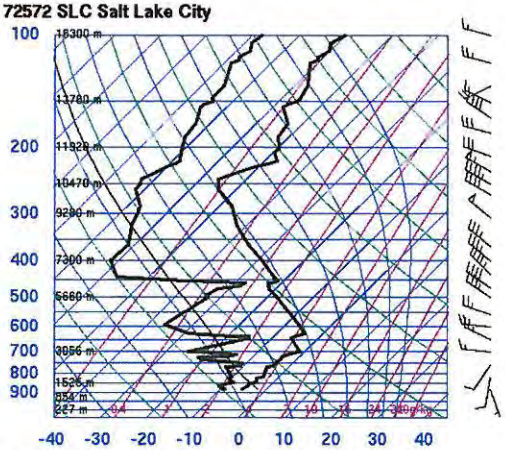


SLAT 40.77
SLON -111.95
SELV 1269.
SHOW 22.86
LIFT 22.23
LFTV 22.25
SWET 16.98
KINX -12.3
CTOT 5.20
VTOT 11.20
TOTL 16.40
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 259.6
LCLP 780.9
MLTH 278.6
MLMR 1.74
THCK 5387
PWAT 6.10

00Z 20 Jan 2007 **University of Wyoming**

Appendix 2.5 – 2008 Soundings

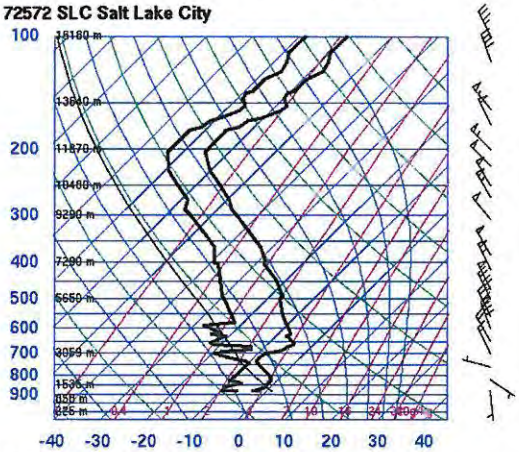
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1289.
SHOW 20.39
LIFT 20.24
LFTV 20.27
SWET 59.01
KINX -17.9
CTOT 8.00
VTOT 13.00
TOTL 21.00
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 262.0
LCLP 780.8
MLTH 281.2
MLMR 2.11
THCK 5433.
PWAT 5.18

12Z 16 Feb 2008 University of Wyoming

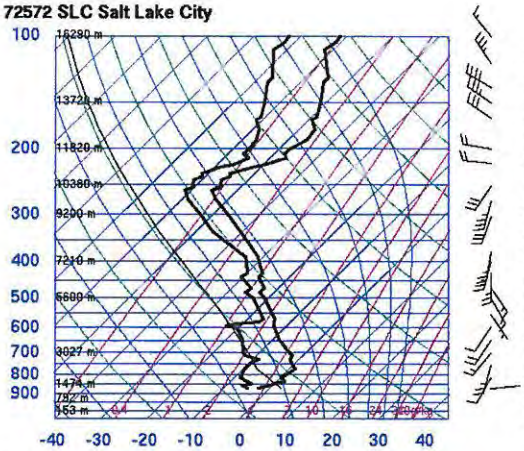
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1289.
SHOW 17.71
LIFT 18.09
LFTV 18.14
SWET 58.99
KINX -3.70
CTOT 8.80
VTOT 15.80
TOTL 24.60
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 262.5
LCLP 756.1
MLTH 284.3
MLMR 2.28
THCK 5425.
PWAT 6.99

12Z 18 Feb 2008 University of Wyoming

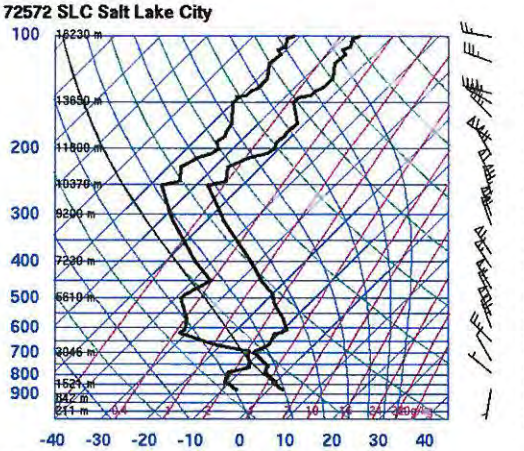
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1289.
SHOW 11.80
LIFT 11.84
LFTV 11.75
SWET 19.99
KINX 5.30
CTOT 15.60
VTOT 20.60
TOTL 36.20
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 265.5
LCLP 765.8
MLTH 286.6
MLMR 2.84
THCK 5447
PWAT 8.94

12Z 20 Feb 2008 University of Wyoming

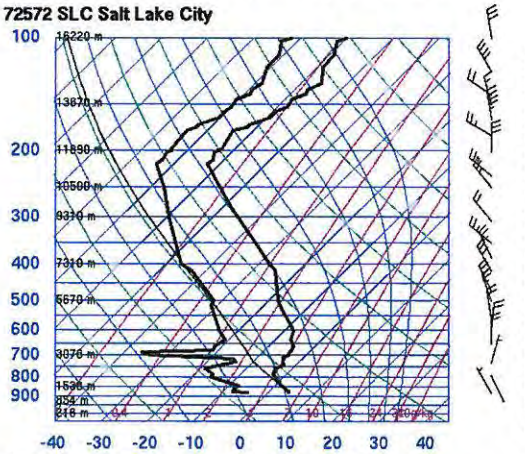
72572 SLC Salt Lake City



SLAT 40.77
SLON -111.95
SELV 1289.
SHOW 15.01
LIFT 14.90
LFTV 14.88
SWET 65.16
KINX 8.20
CTOT 9.30
VTOT 19.30
TOTL 28.60
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 261.3
LCLP 723.0
MLTH 286.7
MLMR 2.17
THCK 5399
PWAT 5.78

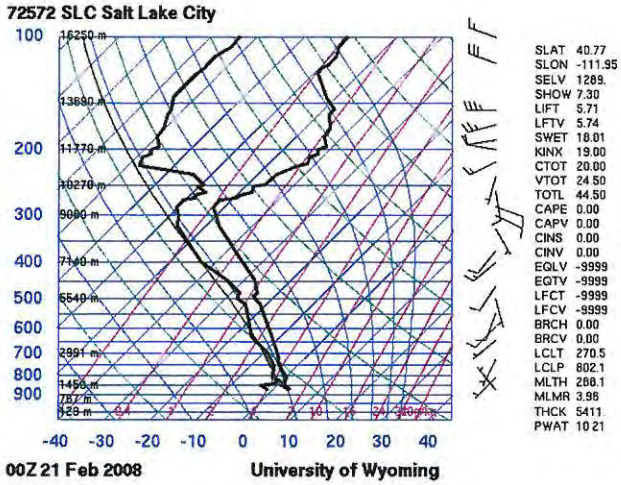
00Z 17 Feb 2008 University of Wyoming

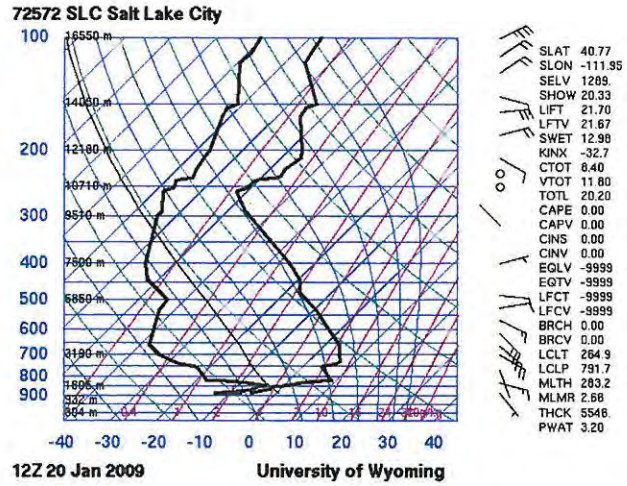
72572 SLC Salt Lake City



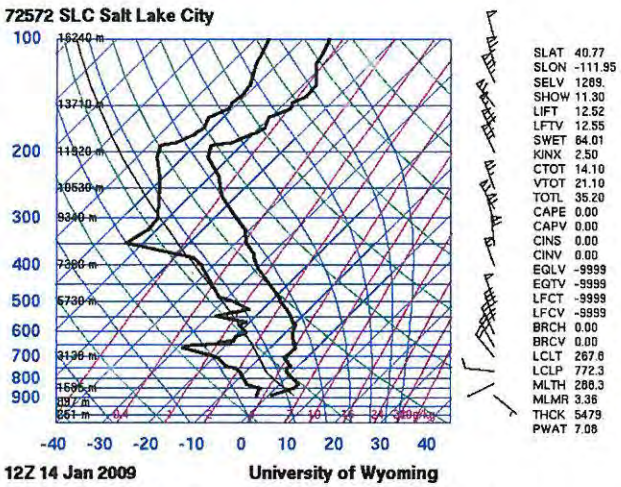
SLAT 40.77
SLON -111.95
SELV 1289.
SHOW 14.39
LIFT 14.50
LFTV 14.51
SWET 32.81
KINX -18.5
CTOT 9.70
VTOT 19.70
TOTL 29.40
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 262.5
LCLP 722.4
MLTH 286.0
MLMR 2.38
THCK 5454.
PWAT 5.24

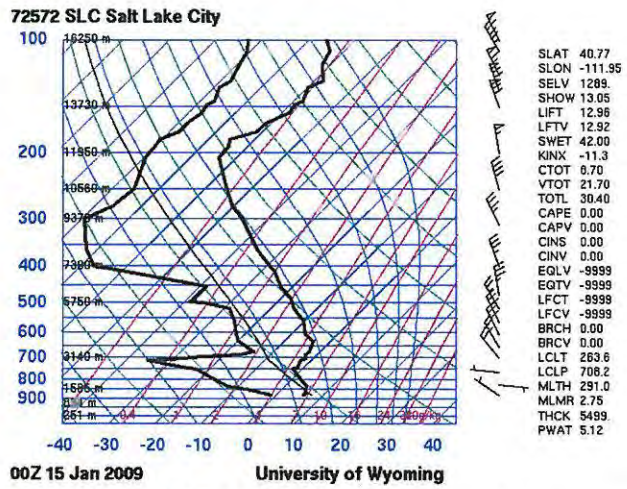
00Z 19 Feb 2008 University of Wyoming

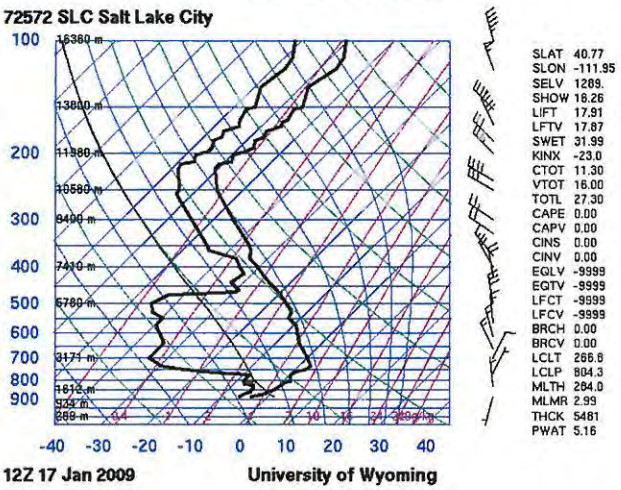


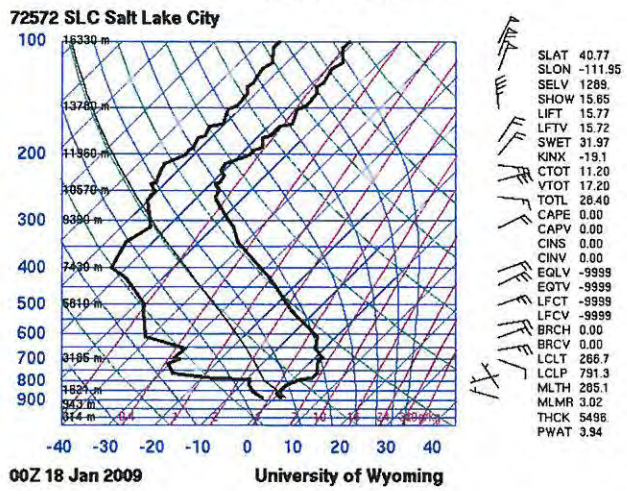


Appendix 2.6 – 2009 KSLC Soundings

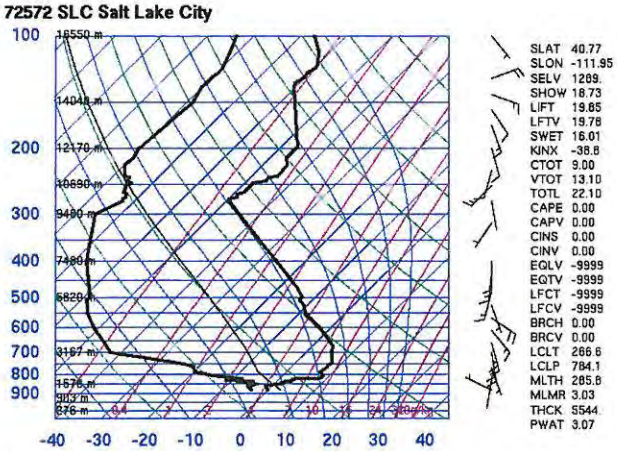






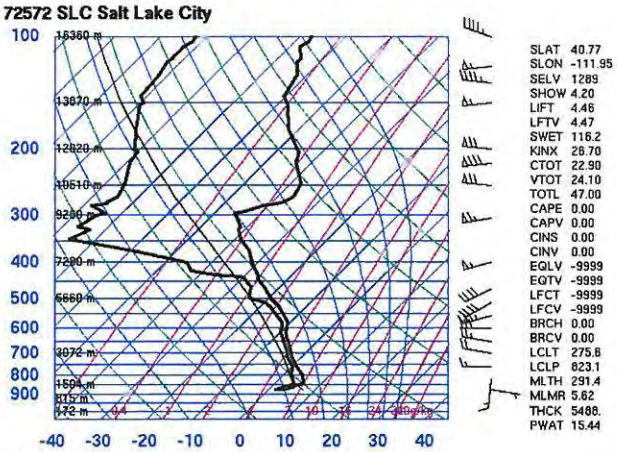


72572 SLC Salt Lake City



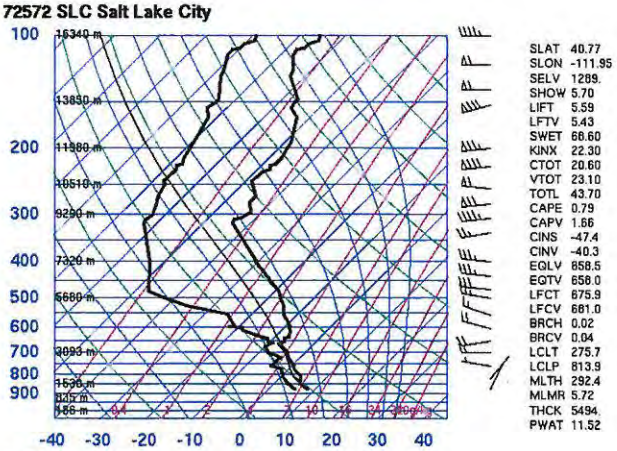
00Z 21 Jan 2009 **University of Wyoming**

72572 SLC Salt Lake City



12Z 23 Jan 2009 **University of Wyoming**

72572 SLC Salt Lake City



00Z 24 Jan 2009 **University of Wyoming**

Appendix 2.7 – Monitoring Locations

BR	Brigham City, Utah
L4	Logan, Utah
BT	Bountiful, Utah
CW	Cottonwood, Utah
N2	North Salt Lake, Utah
MG	Magna, Utah
HW	Hawthorne (Salt Lake City), Utah
WV	West Valley, Utah
HE	Herriman, Utah
T3	Tooele, Utah
NP	North Provo, Utah
LN	Lindon, Utah
HG	Highland, Utah
SF	Spanish Fork, Utah
O2	Ogden, Utah
WT	Washington Terrace, Utah
NOG	North Ogden, Utah
FRK	Franklin, Idaho

Photochemical Modeling

$PM_{2.5}$ State Implementation Plan

Photochemical Modeling

Prepared by:

Utah Division of Air Quality
195 North 1950 West
Salt Lake City, Utah84116

12 September 2012

1.0 Photochemical Modeling

Photochemical models are relied on by federal and state regulatory agencies to support their planning efforts. Used properly, models can assist policy makers in deciding which control programs are most effective in improving air quality, and meeting specific goals and objectives. During the winter, $PM_{2.5}$ pollution in northern Utah is formed predominantly through secondary chemical reactions in the atmosphere. This buildup of pollution then gets trapped in the valleys during temperature inversions. For this reason a modeling system that simulates the interactions of weather, pollution and chemistry is the most appropriate tool to judge the effectiveness of pollution reduction strategies. The Community Multiscale Air Quality (CMAQ) model, approved and recommended by EPA for this type of application, has been used for the Utah $PM_{2.5}$ SIP. This section reviews the development and evaluation of the photochemical system used for the Utah 24-hr $PM_{2.5}$ analyses.

1.1 CMAQ Photochemical Model

Version 4.7.1 of the CMAQ model was selected to perform the photochemical modeling for the Utah $PM_{2.5}$ SIP. CMAQ was selected because it is the open source atmospheric chemistry model co-sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA). A detailed overview of CMAQ, in the form of the CMAQ Model Science Documentation can be found at:

http://www.epa.gov/asmdnerl/CMAQ/CMAQscienceDoc.html

This section will describe the configuration of CMAQ, including information on the input processors (e.g., MCIP, ICON, BCON, JPROC) and the Chemistry-Transport Model (CCTM) science modules (e.g, vertical advection, diffusion).

1.1.1 MCIP

MCIP version3.6 was used to take WRF meteorological data and create meteorology files that can be used in the SMOKE emissions model and CMAQ. MCIP was used to trim the 4-km WRF domain (82 x 100 grid cells) to match the emissions processing and photochemical (CMAQ) modeling domain (79x 97 grid cells) that covers the non-attainment areas of northern Utah (Figure 1.1).

UDAQ used the vertical layer collapsing option in MCIP. UDAQ did this primarily as a computational time saver as numerous base and future year and emission control strategy simulations need to be performed. Table 1.1 gives the vertical layers for MCIP. MCIP is collapsed to 17 layers, keeping the height of the first 10 layers the same as the WRF configuration, and then collapsing the upper vertical layers. A photochemical modeling sensitivity was performed without MCIP layer collapsing and no difference was seen in the concentrations of $PM_{2.5}$ and its precursors (e.g., NO_x and O_3) in the lowest model layers when comparing the layer collapsing and no layer collapsing simulations.

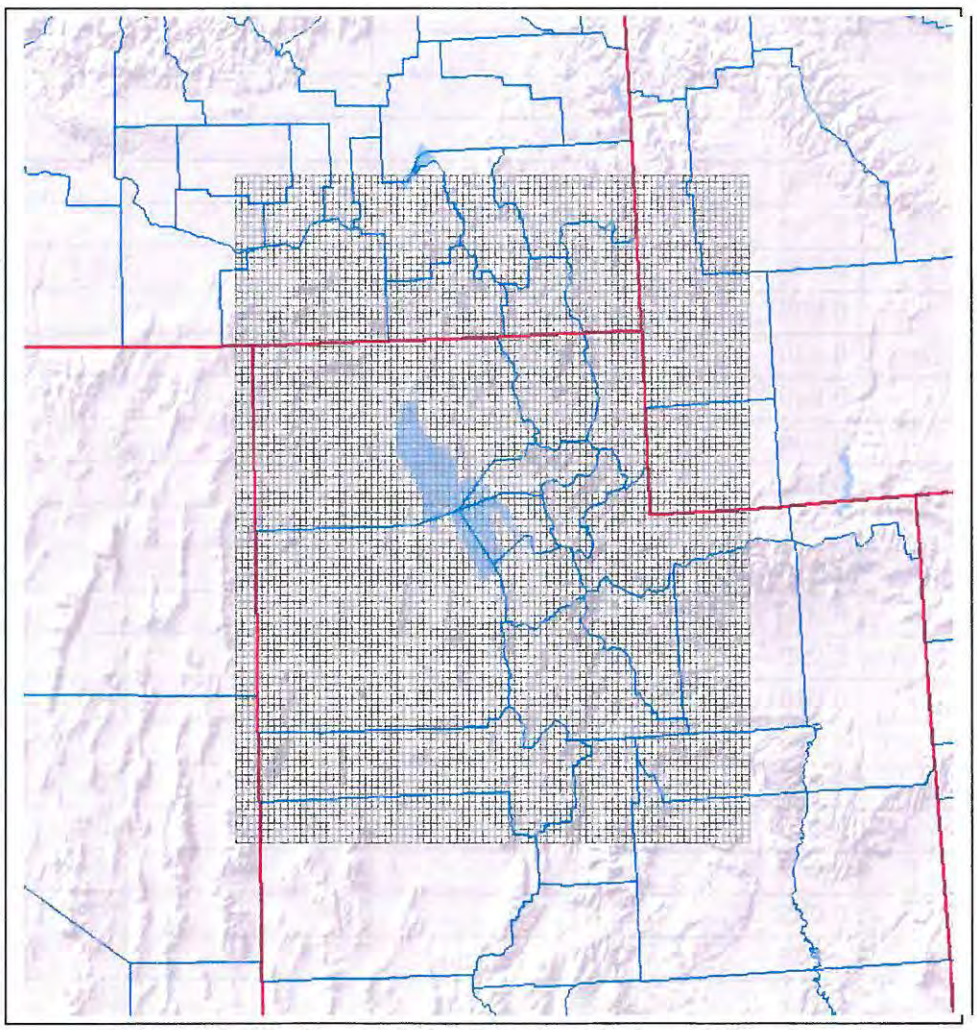


Figure 1.1: Northern Utah photochemical modeling domain

Table 1.1: Vertical Layers of CMAQ meteorological and emissions data.

WRF Model Layer	Sigma	Height (meters)	MCIP Model Layer	Height (meters)
34 – top	0.000	14,662		
33	0.050	12,822		
32	0.100	11,356		
31	0.150	10,127		
30	0.200	9,066	17	9,066
39	0.250	8,127		
28	0.300	7,284		
27	0.350	6,517		
26	0.400	5,812		
25	0.450	5,160		
24	0.500	4,553	16	4,553
23	0.550	3,948		
22	0.600	3,448		
21	0.650	2,942	15	2,942
20	0.700	2,462		
19	0.740	2,095		
18	0.770	1,828	14	1,828
17	0.800	1,569		
16	0.820	1,400		
15	0.840	1,235		
14	0.860	1,071	13	1,071
13	0.880	911		
12	0.900	753	12	753
11	0.910	675	11	675
10	0.920	598	10	598
9	0.930	521	9	521
8	0.940	445	8	445
7	0.950	369	7	369
6	0.960	294	6	294
5	0.970	220	5	220
4	0.980	146	4	146
3	0.985	109	3	109
2	0.990	73	2	73
1	0.995	36	1	36
0 – ground	1.000	0	0 – ground	0

1.1.2 Initial (ICON) and Boundary (BCON) Conditions

The ridge-dominated synoptic meteorology during $PM_{2.5}$ cold pool episodes features weak transport winds and near calm surface winds. As a result, transport of $PM_{2.5}$ and precursors from the rural regions at the domain periphery is very small. In addition, most of the observed Wasatch Front and Cache Valley $PM_{2.5}$ is formed in-situ (and trapped) via fresh locally derived emission sources and secondary chemistry. In essence, Utah's cold pools represent an isolated system that is controlled only by locally derived emissions, meteorology, and chemistry.

CMAQ model simulations are initialized prior to the start of $PM_{2.5}$ build-up. The very small initial concentrations of diurnally produced gaseous concentrations have little consequence to the ultimate build-up of $PM_{2.5}$. UDAQ has configured CMAQ to use EPA default profiles for background chemistry concentrations. UDAQ supplements the initialization and boundary default profiles by using rural values taken from bordering National Park air quality monitoring stations for chemistry initialization.

1.1.3 Photolysis Rates (JPROC)

Photolysis rates for CMAQ are produced by the JPROC preprocessor. JPROC produces a photolysis rate lookup table that consists of photolysis rates at various latitudes, altitudes, and sun angle. UDAQ modified the JPROC lookup table to better represent the snow cover that occurs in Northern Utah during wintertime. To do this modification, UDAQ made changes to the surface albedo of wavelengths less than 500 nanometers in the subroutine *setalb.f*. The albedo for wavelength less than 500 nanometers was changed from approximately 0.05 to 0.55 to represent snow covered ground.

1.1.4 CMAQ Chemistry Transport Mode (CCTM)

There are numerous configuration options in CCTM that can be selected to optimize the CMAQ model. For Utah wintertime $PM_{2.5}$ simulations, the CCTM options were set as follows:

```
#> user choices: various modules

 set Revision = release        # release = latest CVS revision
#set Revision = '"CMAQv4_7.1"'

set ModDriver = ( module ctm                  $Revision; )
# set ModDriver = ( module ctm_yamo             $Revision; )

 if ( $?ParOpt ) then
    set ModPar = ( module par                  $Revision; )
    else
    set ModPar = ( module par_noop             $Revision; )
endif
```

```
 set ModInit    = ( module init                $Revision; )
# set ModInit    = ( module init_yamo           $Revision; )

#set ModAdjc    = ( module adjcon_noop         $Revision; )
 set ModAdjc    = ( module denrate             $Revision; )
# set ModAdjc    = ( // yamo option does not need denrate )

 set ModCpl     = ( module gencoor             $Revision; )

#set ModHadv    = ( module hadv_noop           $Revision; )
 set ModHadv    = ( module hppm                $Revision; )
# set ModHadv    = ( module hyamo               $Revision; )

 set ModVadv    = ( module vadv_noop           $Revision; )
# set ModVadv    = ( module vppm                $Revision; )
# set ModVadv    = ( module vyamo               $Revision; )

#set ModHdiff   = ( module hdiff_noop          $Revision; )
 set ModHdiff   = ( module multiscale          $Revision; )

#set ModVdiff   = ( module vdiff_noop          $Revision; )
#set ModVdiff   = ( module eddy                $Revision; )
#set ModVdiff   = ( module acm2                $Revision; )
 set ModVdiff   = ( module acm2_inline         $Revision; )

#set ModPhot    = ( module phot_noop           $Revision; )
 set ModPhot    = ( module phot_table          $Revision; )
#set ModPhot    = ( module phot_sat            $Revision; )
#set ModPhot    = ( module phot_inline         $Revision; )

# set ModChem    = ( module chem_noop           $Revision; )
#set ModChem    = ( module smvgear             $Revision; )
#set ModChem    = ( module ros3                $Revision; )
#set ModChem    = ( module ebi_cb05cl          $Revision; )
 set ModChem    = ( module ebi_cb05cl_ae5      $Revision; )
#set ModChem    = ( module ebi_saprc99         $Revision; )
#set ModChem    = ( module ebi_saprc99_ae5     $Revision; )

# set ModAero    = ( module aero_noop           $Revision; )
#set ModAero    = ( module aero4               $Revision; )
 set ModAero    = ( module aero5               $Revision; )

# set ModAdepv   = ( module aero_depv_noop      $Revision; )
 set ModAdepv   = ( module aero_depv2           $Revision; )

#set ModCloud   = ( module cloud_noop           $Revision; )
#set ModCloud   = ( module cloud_acm            $Revision; )
 set ModCloud   = ( module cloud_acm_ae5        $Revision; )

 set ModPa      = ( module pa                  $Revision; )

 set ModUtil    = ( module util                $Revision; )

#> user choices: emissions processing in chem or vdiff (default) ...
#set Cemis        # Uncomment to process in chem

#> user choices: mechanism
```

```
#set Mechanism = cb05cl_ae4_aq
 set Mechanism = cb05cl_ae5_aq
#set Mechanism = saprc99_ae4_aq
#set Mechanism = saprc99_ae5_aq
 set Tracer    = trac0                # default: no tracer species

#> user choices: set process analysis linkages - TURN OFF PROCESS
ANALYSIS
#set PABase    = $GlobInc
#set PAOpt     = pa_noop
```

Of note is the use of the Carbon Bond-05 chemistry mechanism (`cb05cl_ae5_aq`). Also, the vertical advection module is deactivated (`module vadv_noop`). Deactivating the vertical advection in the CCTM improved model performance significantly (see Section 1.2.1). In order to assess control strategies to reduce Utah 24-hr $PM_{2.5}$, the air quality model must replicate the formation of secondarily formed ammonium nitrate. The configuration of the CCTM that led to the best performance of ammonium nitrate was with vertical advection deactivated.

Numerous model sensitivities were performed by UDAQ over the past 2 to 3 years that led to the conclusion to deactivate vertical advection. UDAQ performed sensitivities with consultation from EPA, testing aspects of CMAQ that are important to the simulation of secondary nitrate. Tests were performed on the vertical diffusion module in CCTM, examining if there is an optimal setting for eddy diffusivity, friction velocity, and roughness length. Sensitivities on horizontal diffusion were performed to test its role in $PM_{2.5}$ formation. Likewise, numerous sensitivities were performed on the emissions and meteorological inputs. In the end, the best model performance occurs when deactivating vertical advection.

1.1.5 Ammonia Inventory Adjustments

Ammonia (NH_3) plays an important role as it reacts with nitric acid (HNO_3) for the formation of ammonium nitrate (NH_4NO_3). There is uncertainty in the emissions inventory of NH_3 as it is not currently measured at UDAQ's monitoring site. Studies performed at Utah State University have shown NH_3 to be in abundance in the Cache Valley and that the limiting reagent is HNO_3 in the formation of NH_4NO_3. A study by Brigham Young University in the winter of 2009 obtained measurements of NH_3 from a URG Corp. Ambient Ion Monitor (AIM) stationed at the Hawthorne monitoring site in Salt Lake City. URG measurements showed concentrations of NH_3 nearly steady at 15 to 20 ppbv throughout the high $PM_{2.5}$ episodes.

UDAQ made adjustments in the NH_3 inventory to better represent the results of these special measurement studies. In consultation with EPA Region 8, UDAQ added 0.005 mol/s of NH_3 to every model grid cell and to every time step of the merged SMOKE emissions file.

1.2 CMAQ Model Performance

The model performance evaluation focused on the magnitude, spatial pattern, and temporal profile of modeled and measured concentrations. In addition, a statistical model performance evaluation based on EPA guidance was conducted. This exercise is intended to assess whether, and to what degree, confidence in the model is warranted (and to assess whether model improvements are necessary (i.e., deactivating vertical advection)).

CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained air monitoring sites (Figure 1.2). Measurements of observed $PM_{2.5}$ concentrations along with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are made throughout winter at most of the locations in Figure 1.2. $PM_{2.5}$ speciation performance was assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

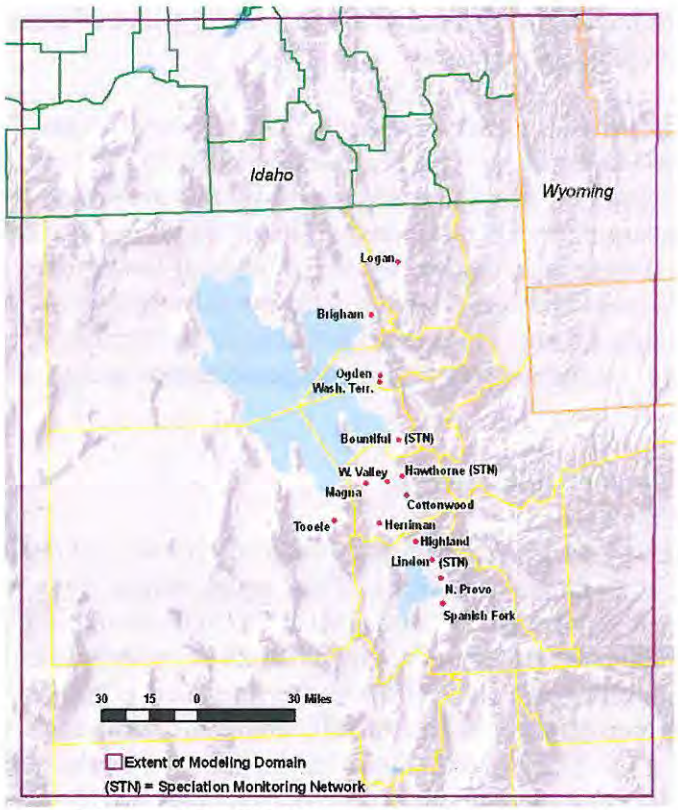


Figure 1.2: UDAQ monitoring network.

1.2.1 24-hr PM2.5 and PM2.5 Speciation Performance

Time series of 24-hr PM2.5 concentrations for 13 Dec. 2009 – 15 Jan. 2010 modeling period are shown in Figs. 1.3 – 1.6 at the Hawthorne site in Salt Lake City (Fig. 1.3), the Ogden site in Weber County (Fig 1.4), the Lindon site in Utah County (Fig. 1.5), and the Logan site in Cache County (Fig. 1.6). For the most part, CMAQ replicates the buildup and washout of each individual episode. Also, when vertical advection is deactivated, CMAQ can reproduce the high 24-hr $PM_{2.5}$ concentrations observed during the most of the episodes. While CMAQ builds 24-hr $PM_{2.5}$ concentrations during the 8 Jan. – 14 Jan. 2010 episode, it was not able to produce the > 60 ug/m3 concentrations observed at the monitoring locations.

It is often seen that CMAQ "washes" out the $PM_{2.5}$ concentrations a day or two earlier than that seen in the observations. For example, on the day 21 Dec., the concentration of $PM_{2.5}$ continues to build while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these times, the observed cold pool that holds the $PM_{2.5}$ is often very shallow and the winds just above this cold pool are southerly and strong before the approaching cold front. This situation is very difficult for a meteorological and photochemical model to reproduce. An example of this situation is shown in Fig. 1.7, where the lowest part of the Salt Lake Valley is still under a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of the high $PM_{2.5}$ concentrations.

During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25 Dec. as $PM_{2.5}$ concentrations drop on this day before resuming an increase through Dec. 30. The meteorological model, and thus CMAQ, correctly pick up this disturbance. However, rather than a partial clearing, as seen in the observations, the model completely clears out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors of Ogden and Logan. The monitors to the south (Hawthorne, Lindon) are not influenced by this disturbance and the building of $PM_{2.5}$ is replicated by CMAQ. This highlights another challenge of modeling $PM_{2.5}$ episodes in Utah. Often during cold pool events, weak disturbances will pass through Utah that will de-stabilize the valley inversion and cause a partial clear out of $PM_{2.5}$. However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance exits, the valley inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ completely mixes out the valley inversion during these weak disturbances.

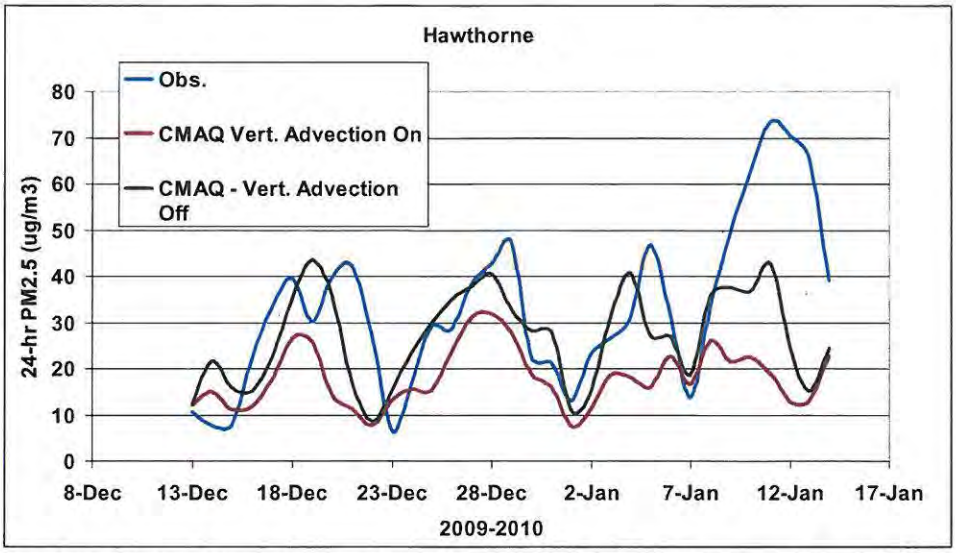


Figure 1.3: 24-hr $PM_{2.5}$ time series. Observed PM2.5 (blue trace), modeled with vertical advection deactivated (green trace), and modeled with vertical advection activated (red trace).

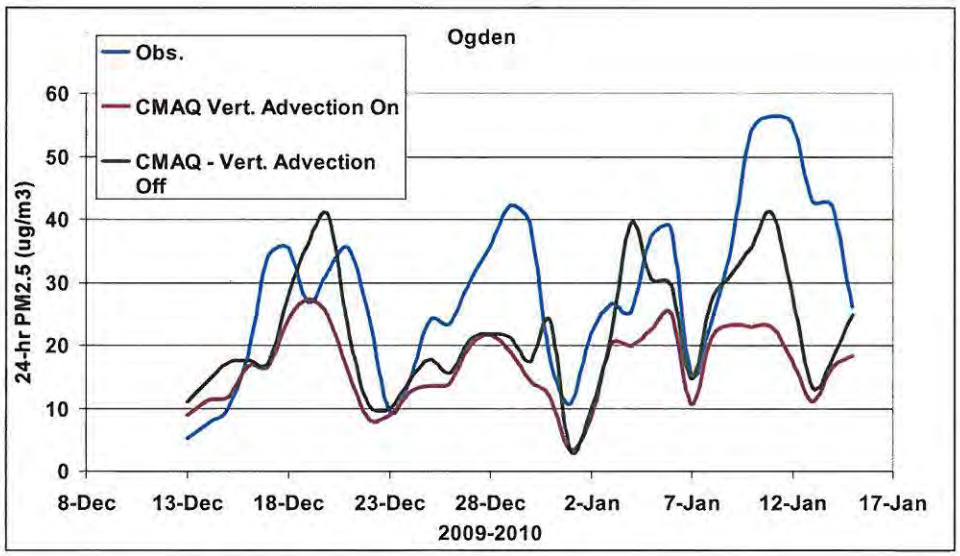


Figure 1.4: 24-hr $PM_{2.5}$ Time Series - Ogden Monitoring Site.

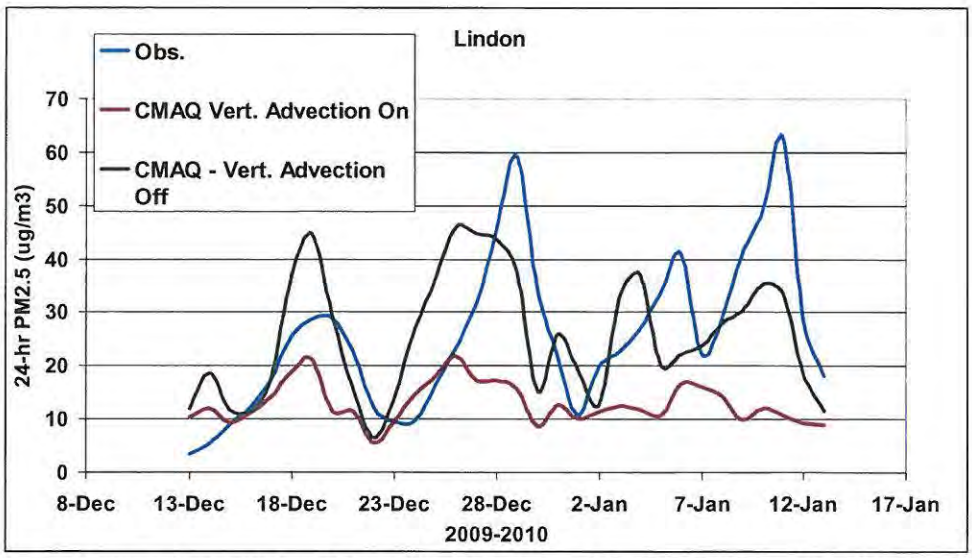


Figure 1.5: 24-hr $PM_{2.5}$ Time Series - Lindon Monitoring Site.

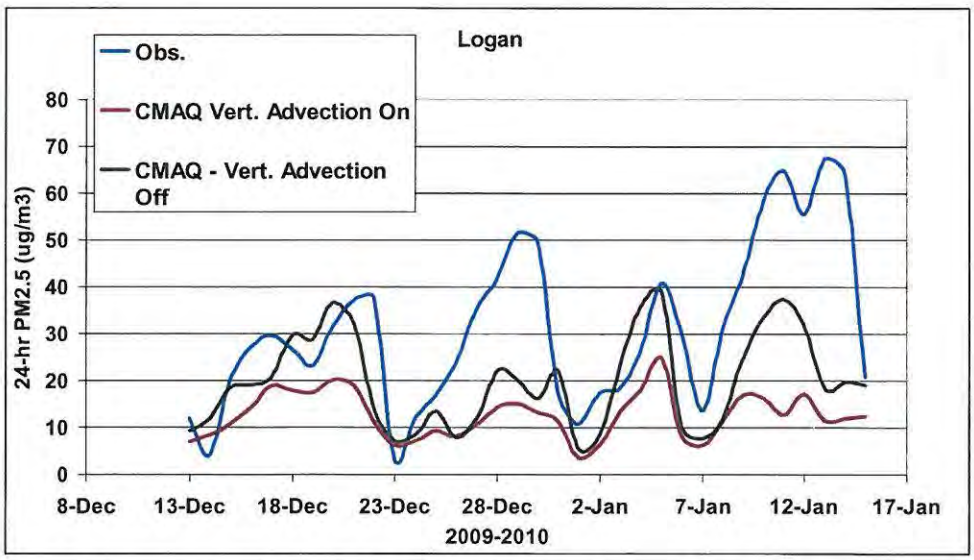


Figure 1.6: 24-hr $PM_{2.5}$ Time Series - Logan Monitoring Site.

Figure 1.7: An example of the Salt Lake Valley at the end of a high PM2.5 episode. The lowest elevations of the Salt Lake Valley are still experiencing an inversion and elevated PM2.5 concentrations while the $PM_{2.5}$ has been 'cleared out' throughout the rest of the valley. These 'end of episode' clear out periods are difficult to replicate in the photochemical model.

It is clear that model performance improves when turning off the vertical advection module in CMAQ. This configuration allows for an increase in the buildup of $PM_{2.5}$ during the high concentration episodes when compared to the simulation with vertical advection on. However, it is important to verify that the increase in PM2.5 concentrations seen when deactivating the vertical advection is due to an increase in the production of secondary nitrate, which CMAQ struggles to produce when vertical advection is on.

Figure 1.8 – 1.10 are time series of simulated and observed 24-hr nitrate for the 3 STN sites along the Wasatch Front of Utah. There were 12 STN samples collected at the Hawthorne site during modeling time period (blue dots), 11 at the Lindon site and 9 at the Bountiful site. Deactivating the vertical advection can increase CMAQ simulated nitrate by greater than 15 ug/m3 during high $PM_{2.5}$ episodes, bringing the simulated concentration more in line with what is observed on the STN filters. It appears the majority of the $PM_{2.5}$ increase that is seen in CMAQ simulations with vertical advection off is due more formation of nitrate, which is what is desired.

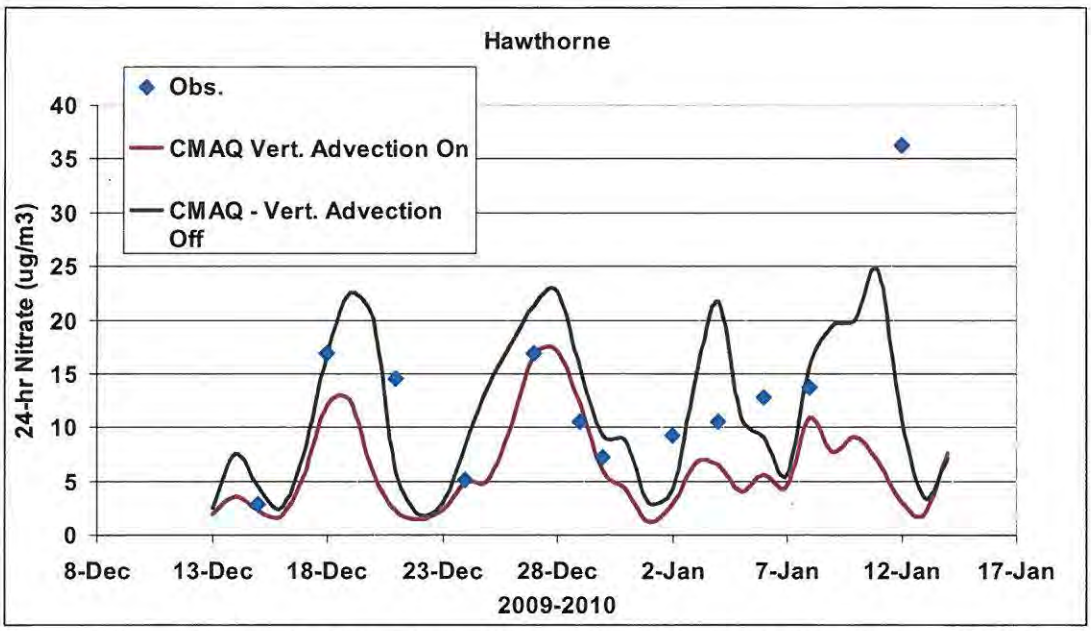


Figure 1.8: 24-hr particulate nitrate time series. Observed nitrate from STN filters (blue dots), modeled with vertical advection deactivated (green trace), and modeled with vertical advection activated (red trace).

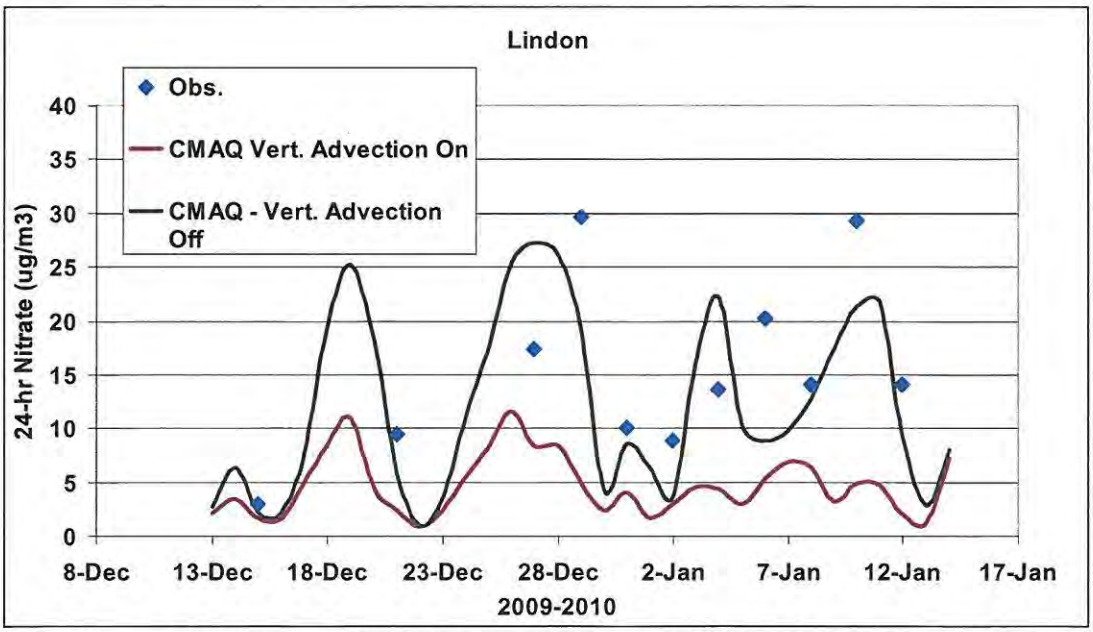


Figure 1.9: Same as Fig. 1.8, except for the Lindon STN Monitoring Site.

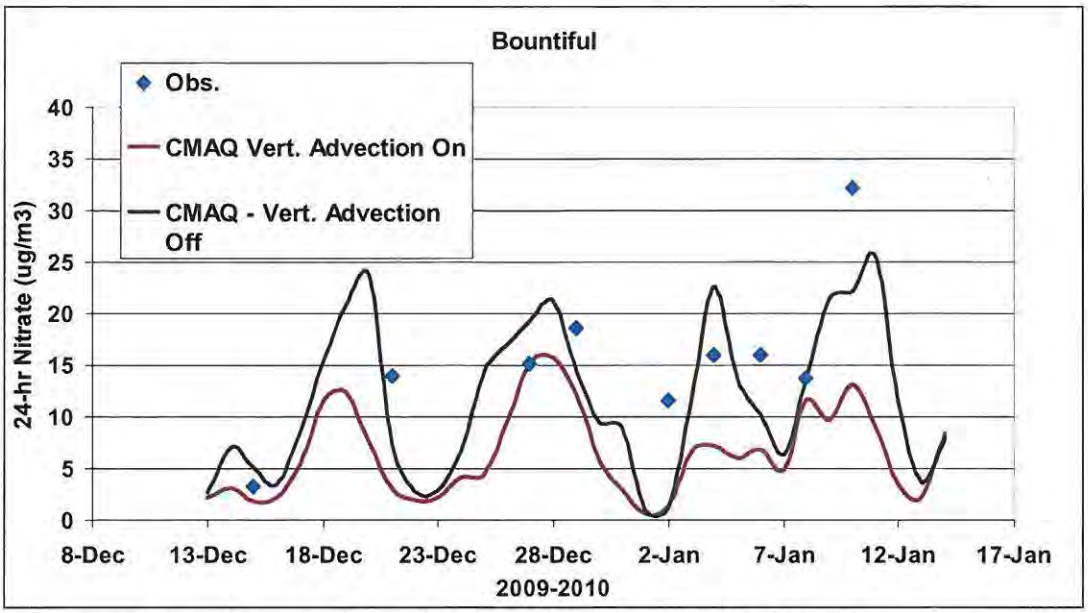


Figure 1.10: Same as Fig. 1.8, except for the Bountiful STN monitoring site.

Figures 1.11 and 1.12 compare the simulation of nitrate for 4-km modeling domain with vertical advection off and vertical advection on for Dec. 29, 2009 at 00 UTC. With vertical advection off (Fig. 1.11), the production of nitrate is greatly increased along the Wasatch Front and the Cache Valley when compared in the vertical advection on simulation (Fig. 1.12). It is most noticeable in Utah county where the nitrate concentration increases from ~5 ug/m3 to >25 ug/m3. Also in the Cache Valley, the turning off of vertical advection increases the nitrate concentrations from ~5 ug/m3 to ~15 ug/m3.

Nitrate

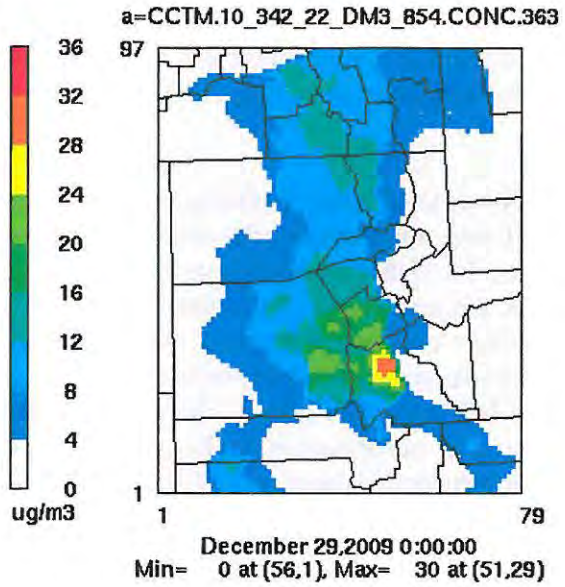


Figure 1.11: Model particulate nitrate with vertical advection deactivated for Dec. 29, 2009.

Nitrate

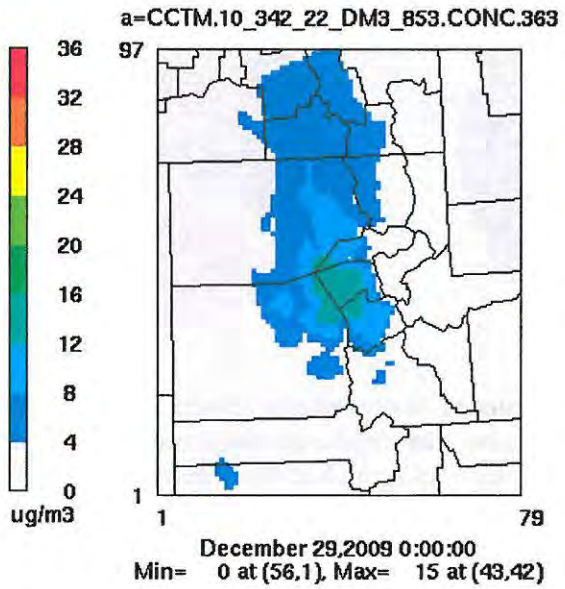


Figure 1.12: Model particulate nitrate with vertical advection activated for Dec. 29, 2009.

$PM_{2.5}$ simulated and observed speciation is shown at the 3 STN sites in Figures 1.13 – 1.15. The observed speciation is constructed using days in which the STN filter 24-hr $PM_{2.5}$ concentration was > 25 ug/m3. For the 2009-2010 modeling period, the observed speciation pie charts was created using 10 filter days at Hawthorne, 9 days at Lindon, and 8 days at Bountiful. The speciation of this small dataset appears similar to a comparison of a larger dataset of STN filter speciated data from 2005-2010 for high wintertime PM2.5 days.

The simulated speciation is constructed using modeling days that produced 24-hr $PM_{2.5}$ concentrations > 25 ug/m3. Using this criterion, the simulated speciation pie chart is created from 18 modeling days for Hawthorne, 16 days at Lindon, and 16 days at Bountiful. At all 3 STN sites, the percentage of simulated nitrate is over-predicted by 5 to 7%. The simulated ammonium percentage is nearly identical to the observed STN speciation. At the Hawthorne site, organic carbon looks to be under-predicted by CMAQ with a percentage of $PM_{2.5}$ at 12% and an observed organic carbon at 21%. This discrepancy in organic carbon does not appear at the Bountiful and Lindon site, as organic carbon speciation performance at these two STN sites looks good.

There is no STN site in the Logan non-attainment area, and very little speciation information is available in the Cache Valley. Figure 1.16 shows the simulated speciation at Logan. Ammonium (20%) and nitrate (60%) make up a higher percentage of the simulated PM2.5 at Logan when compared to sites along the Wasatch Front.

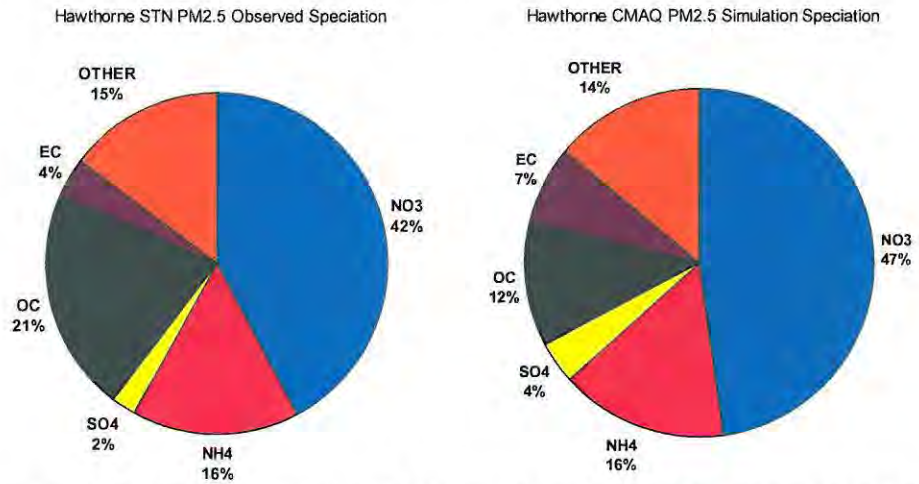


Figure 1.13: The composition of observed and model simulated average 24-hr $PM_{2.5}$ concentrations averaged over days when an observed and modeled day had 24-hr concentrations > 25 ug/m3 at the Hawthorne STN site.

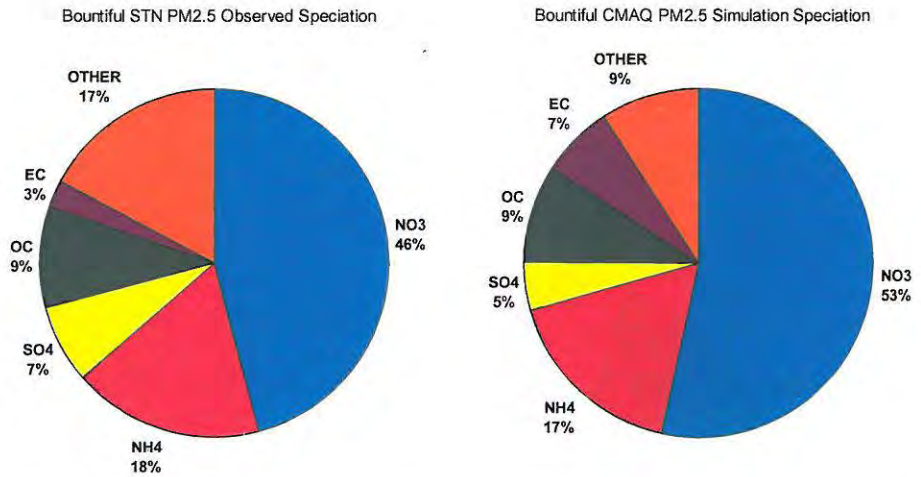


Figure 1.14: Same as Fig. 1.13, except for the Bountiful STN monitoring site.

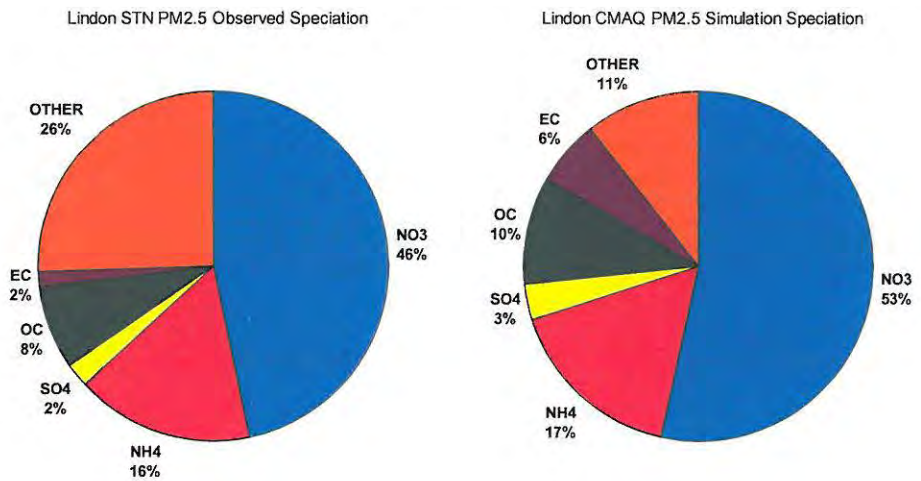


Figure 1.15: Same as Fig. 1.13, except for the Lindon STN monitoring site.

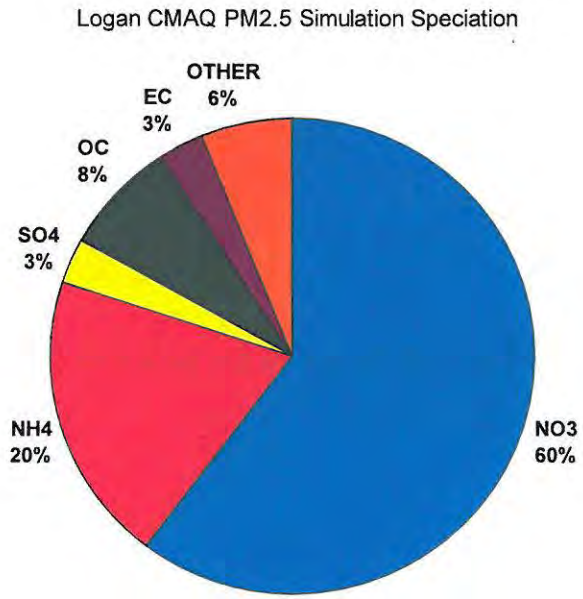


Figure 1.16: The composition of model simulated average 24-hr PM2.5 concentrations averaged over days when a modeled day had 24-hr concentrations > 25 ug/m3 at the Logan monitoring.

In addition to the time series analysis, EPA guidance recommends a statistical analysis of $PM_{2.5}$ (http://www.epa.gov/ttn/scram/guidance/guide/final-03-pm-rh-guidance.pdf). Useful metrics mentioned in the EPA guidance include mean fractional bias and mean fractional error, normalized mean bias, and normalized mean error. Model performance statistics for the 2009-2010 modeling episode are given in Table 1.2. Based on these performance scores the CMAQ simulated 24-hr $PM_{2.5}$ concentrations agree well with the observed values, with correlation coefficients above 0.46 at all locations. Overall, CMAQ under-predicts the 24-hr $PM_{2.5}$ (mean bias in Table 1.2), but this can be explained due to the early CMAQ model washouts described in Section 1.1.2.

Table 1.2: Performance statistics for 2009-2010 modeling period at the Hawthorne, Ogden, Lindon, and Logan monitoring sites.

Site	# of Observations	Mean CMAQ simulations (ug/m3)	Mean Observations (ug/m3)	Ratio of Means (Sim/Obs)	Mean Bias (ug/m3)	Mean Fractional Bias (%)	Mean Error (ug/m3)	Mean Fractional Error (%)	Correlation Coefficient
Hawthorne	33	26.9	33.1	0.81	-6.2	-6%	12.0	20%	0.46
Ogden	33	21.8	28.8	0.76	-6.9	-12%	10.7	22%	0.57
Lindon	33	25.4	25.6	0.99	0.0	3%	10.3	22%	0.54
Logan	33	20.0	29.3	0.68	-9.3	-16%	12.2	26%	0.51

Figures 1.17 – 1.20 provide scatterplots of CMAQ simulated versus observed 24-hr $PM_{2.5}$ for the 33 days in the 2009-2010 modeling episode. The correlation coefficient (R^2 value) is greater than 0.50 at the Ogden, Lindon, and Logan monitoring sites, while at Hawthorne the R^2 value is 0.46. These scatterplots show good model performance, except on days when CMAQ exhibits an early episodic washout (i.e., Fig. 1.17).

Bugle and soccer plots of normalized mean bias (NMB) and normalized mean error (NME) are shown in Figures 1.21 – 1.32. These performance metrics are described in *Boylan and Russel 2006* and the performance goal (solid red line) and criteria (dashed red lines) for 24-hr $PM_{2.5}$ are plotted on each figure. *Boylan and Russel 2006* recommend a model performance goal of +50% percent and performance criteria of +75% for NME. The recommendation of NMB is a performance goal of +/- 30% and performance criteria of +/- 60%.

When the observed 24-hr $PM_{2.5}$ is greater than 20 ug/m3 at Hawthorne, all but two days meet the performance goal for NME (Fig. 1.21). Again, these are two days where CMAQ model exhibits an early episodic washout. All days meet the performance criteria

for NMB and NME at the Ogden (Fig. 1.24-1.26), Lindon (Fig. 1.27-1.29), and Logan (Fig. 1.30 -1.32) sites, with the majority of days meeting the performance goal.

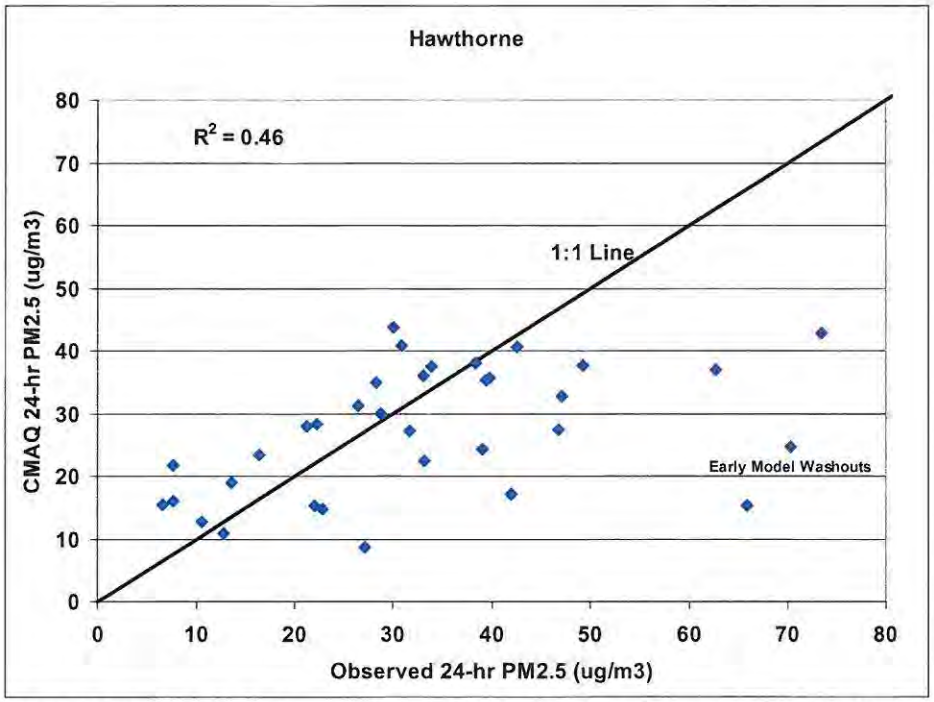
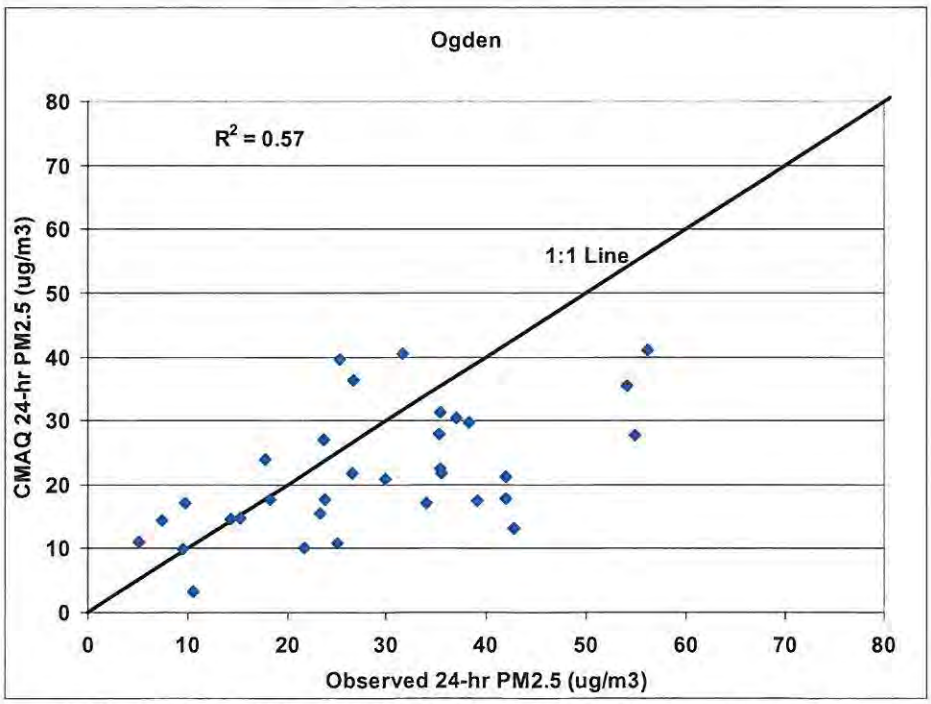
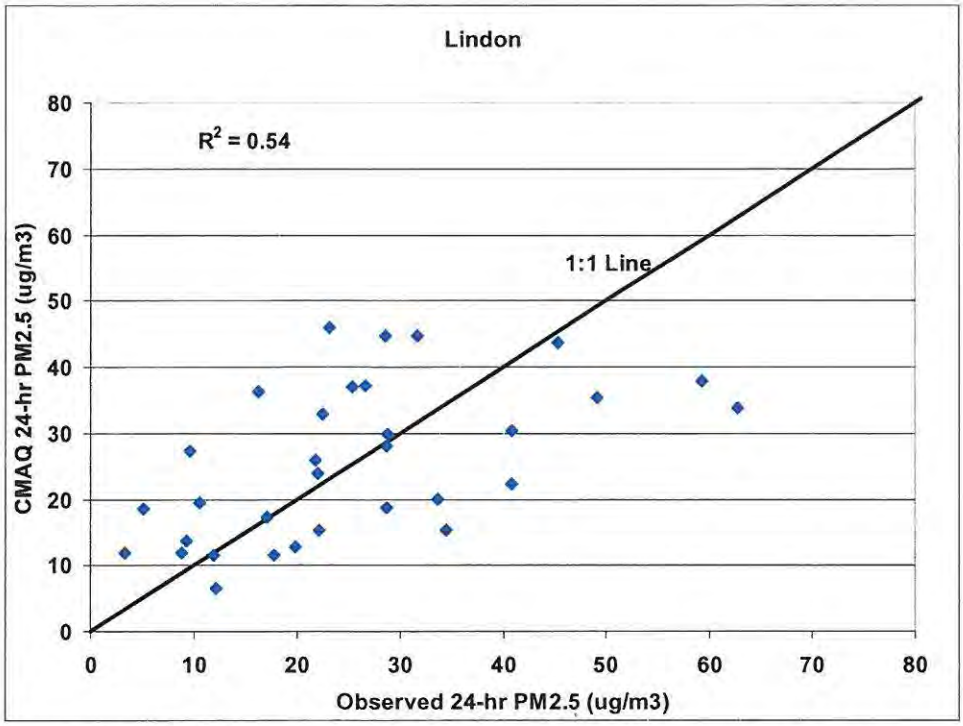


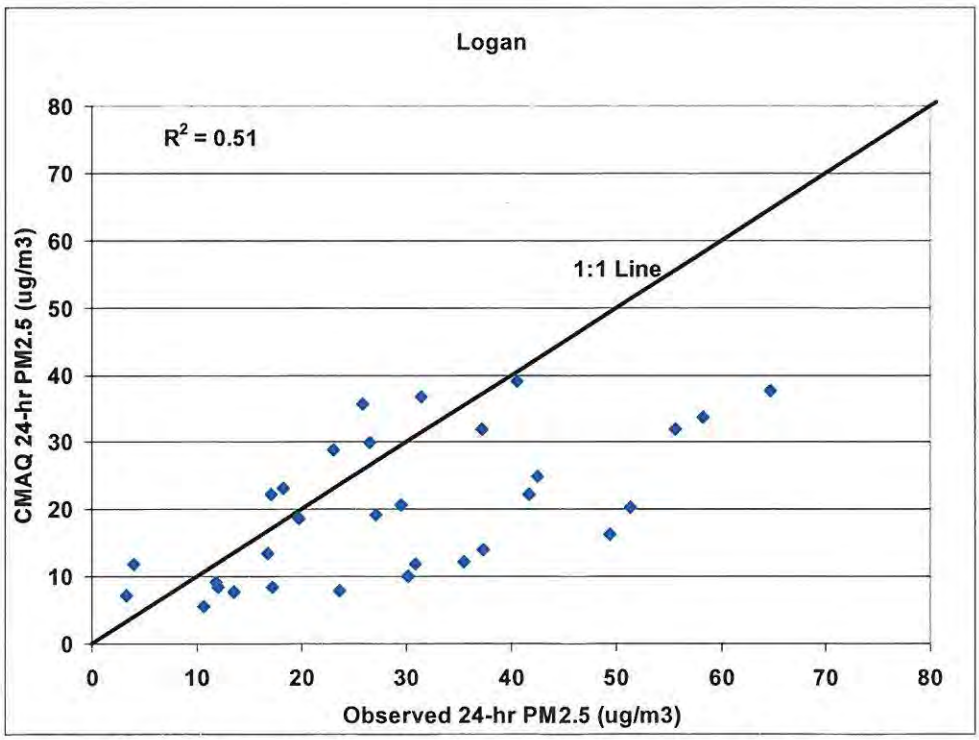
Figure 1.17: Scatter plot of 24-hr $PM_{2.5}$ at the Hawthorne monitoring site.



1.18: Scatter plot of 24-hr $PM_{2.5}$ at the Ogden monitoring site.



1.19: Scatter plot of 24-hr $PM_{2.5}$ at the Lindon monitoring site.



1.20: Scatter plot of 24-hr $PM_{2.5}$ at the Logan monitoring site.

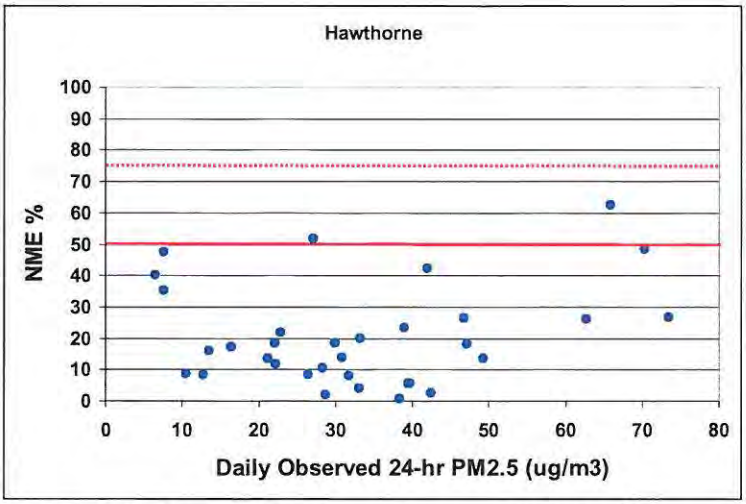


Figure 1.21: Bugle plot of normalized mean errors of 24-hr $PM_{2.5}$ at the Hawthorne monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

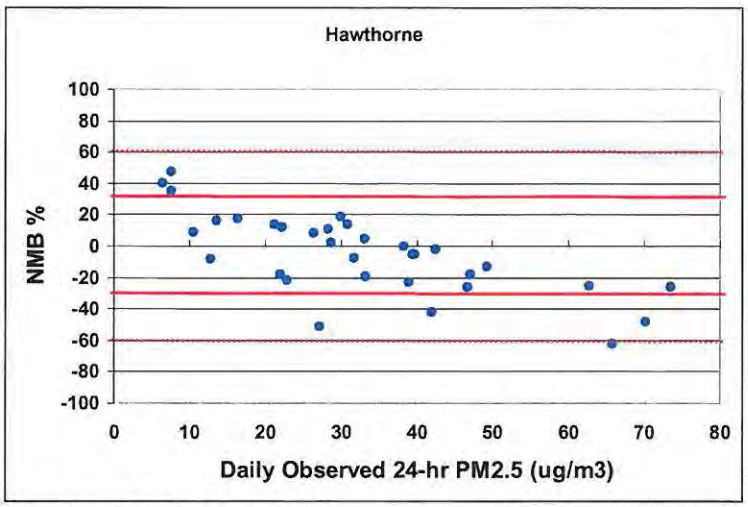


Figure 1.22: Bugle plot of normalized mean bias of 24-hr $PM_{2.5}$ at the Hawthorne monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

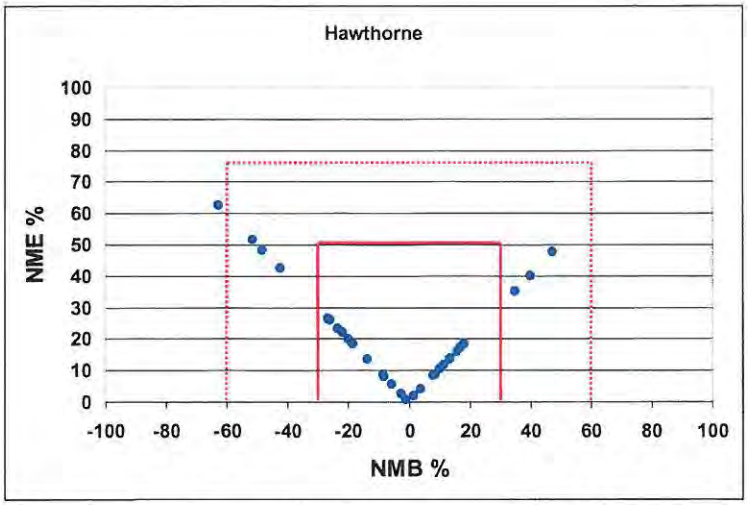


Figure 1.23: Soccer plot of normalized mean errors and biases at the Hawthorne monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

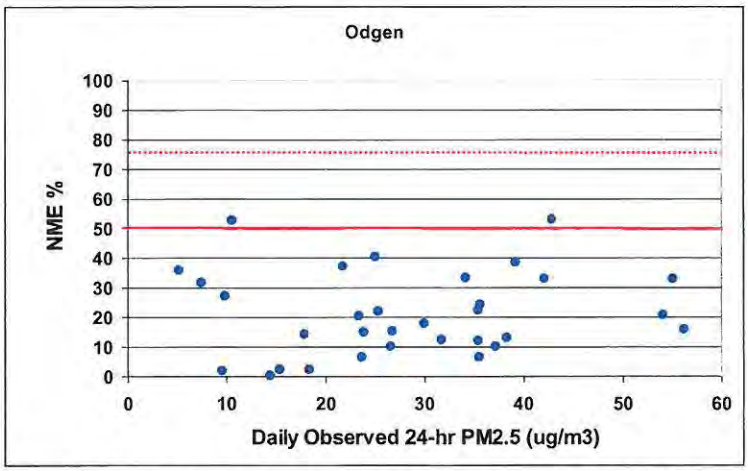


Figure 1.24: Bugle plot of normalized mean errors of 24-hr $PM_{2.5}$ at the Ogden monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

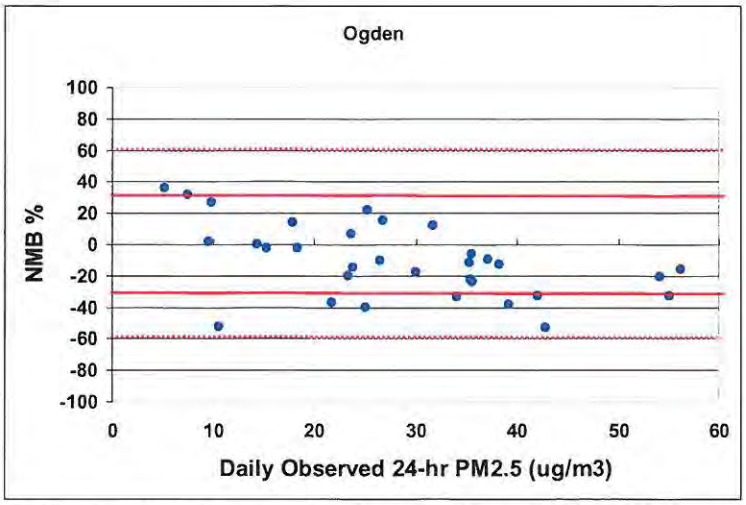


Figure 1.25: Bugle plot of normalized mean bias of 24-hr $PM_{2.5}$ at the Ogden monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

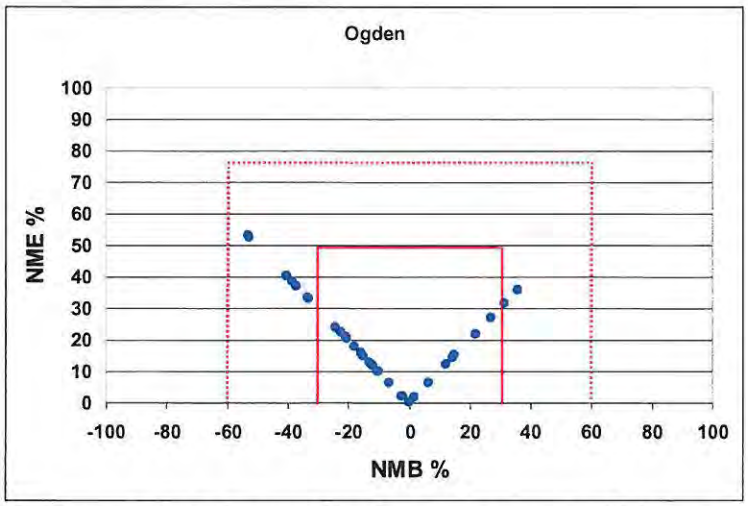


Figure 1.26: Soccer plot of normalized mean errors and biases at the Ogden monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

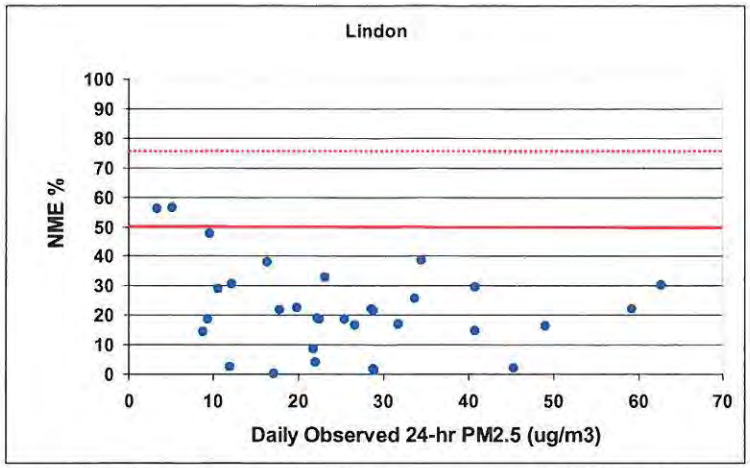


Figure 1.27: Bugle plot of normalized mean errors of 24-hr $PM_{2.5}$ at the Lindon monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

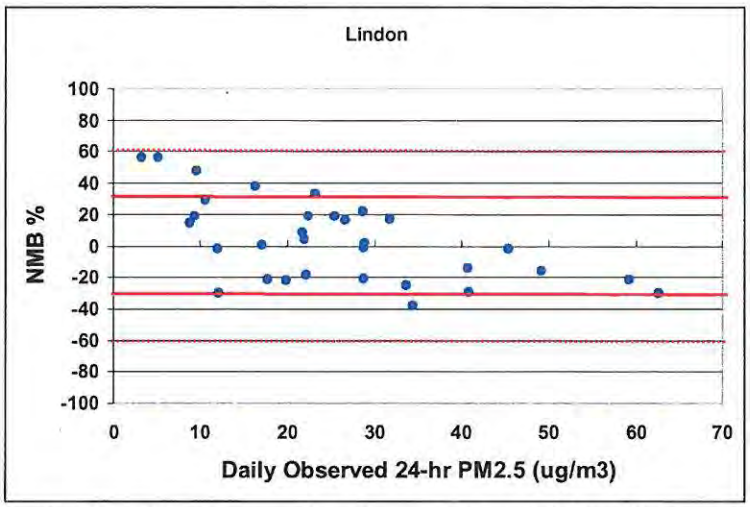


Figure 1.28: Bugle plot of normalized mean bias of 24-hr $PM_{2.5}$ at the Lindon monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

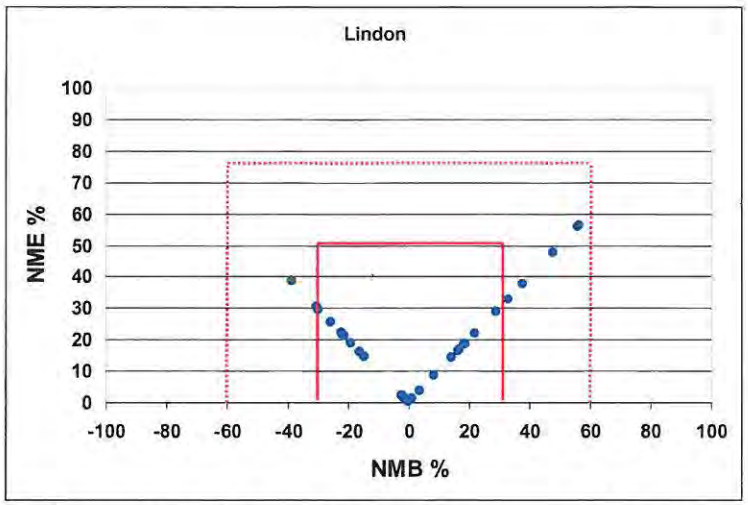


Figure 1.29: Soccer plot of normalized mean errors and biases at the Lindon monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

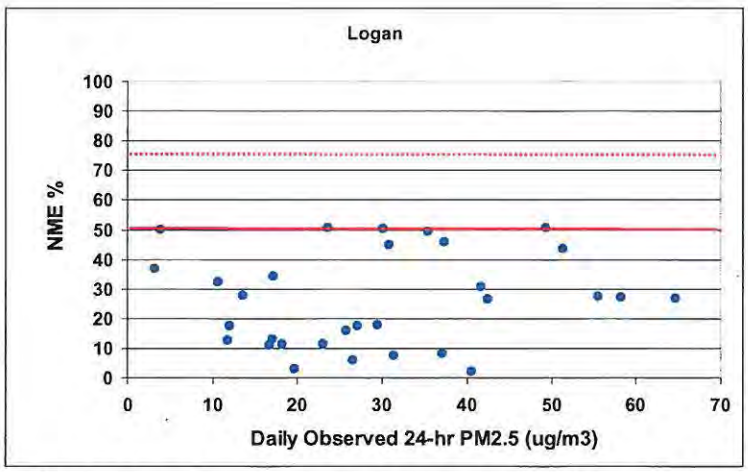


Figure 1.30: Bugle plot of normalized mean errors of 24-hr $PM_{2.5}$ at the Logan monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

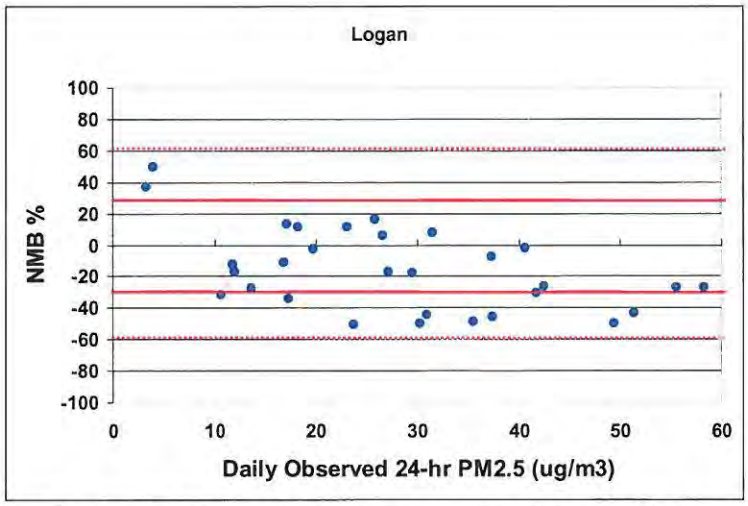


Figure 1.31: Bugle plot of normalized mean bias of 24-hr $PM_{2.5}$ at the Logan monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

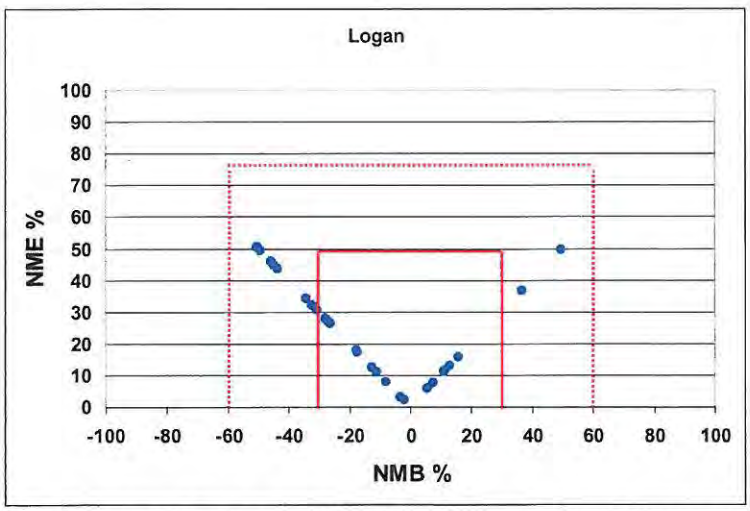


Figure 1.32: Soccer plot of normalized mean errors and biases at the Logan monitoring site. The dashed and solid lines indicate the performance criteria and performance goals in accord with Boylan and Russell (2006).

1.2.2 Secondary $PM_{2.5}$ Precursor Performance

Since the majority of the $PM_{2.5}$ during Utah winters is formed secondarily, it becomes important that CMAQ can adequately simulate the gaseous precursors that chemically produce the secondary particulate. The CMAQ performance of nitrogen oxides (NO_x) are shown in a time series at the Hawthorne monitor in Figure 1.33 for nitric oxide (NO) and Figure 1.34 for nitrogen dioxide (NO_2). The hourly time series represents a high $PM_{2.5}$ episode from 2009 Dec. 23 – 2009 Dec. 31. CMAQ simulations of NO show the typically diurnal pattern that would be expected; with the morning traffic rush hour NO peak centered around 8 a.m. local time and afternoon rush hour peak at 5 p.m. local time. The observations (blue trace) often show high NO levels during the overnight hours (e.g., 27th of Dec., 2009 where NO is greater than 100 ppb at 3 a.m. local time) that CMAQ is not able to replicate. This overnight spike in NO is not that well understood, and therefore it is not surprising CMAQ is not able to simulate the spike. This overnight spike in NO may be due to an unknown local emission source or due to meteorological phenomenon that is not understood and thereby by replicated in the meteorological modeling.

When vertical advection is deactivated (red trace), the amount of NO that CMAQ is able to "hold" in the lowest model layer is increased. This allows for much better model performance of NO_2 and ozone (O_3), and ultimately better prediction of secondarily formed ammonium nitrate (Section 1.2.1). Figure 1.34 and Figure 1.35 show NO_2 and O_3 performance at the Hawthorne monitor, respectively. When vertical advection is deactivated, O_3 and NO_2 performance is enhanced, especially during the overnight hours. For example, on the 27th and 28th of December at Hawthorne, CMAQ with the vertical advection deactivated (red trace) better simulates the observed NO_2 and O_3 than with CMAQ vertical advection activated (green trace). And as stated previously, getting better performance of the precursors with vertical advection deactivated leads to better performance in CMAQ predictions of $PM_{2.5}$, which is the goal.

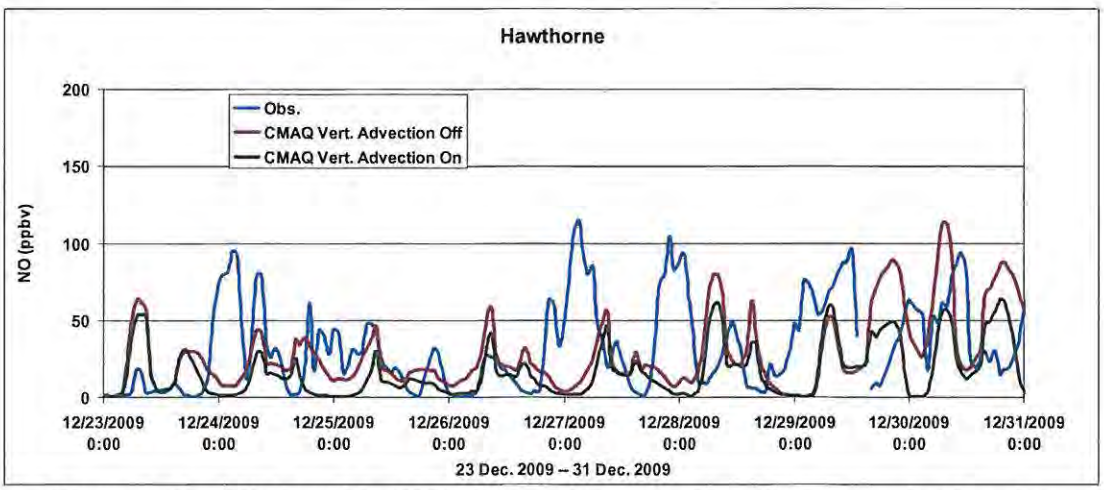


Figure 1.33: Nitric oxide (NO) time series at the Hawthorne monitoring site. Observed NO (blue trace), modeled with vertical advection deactivated (red trace), and modeled with vertical advection activated (green trace).

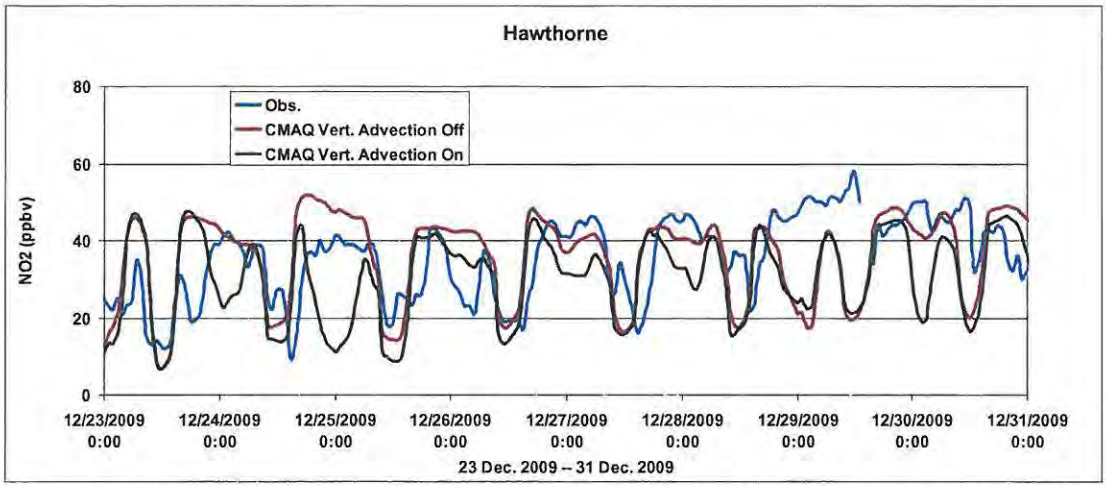


Figure 1.34: Nitrogen dioxide (NO_2) time series at the Hawthorne monitoring site. Observed NO_2 (blue trace), modeled with vertical advection deactivated (red trace), and modeled with vertical advection activated (green trace).

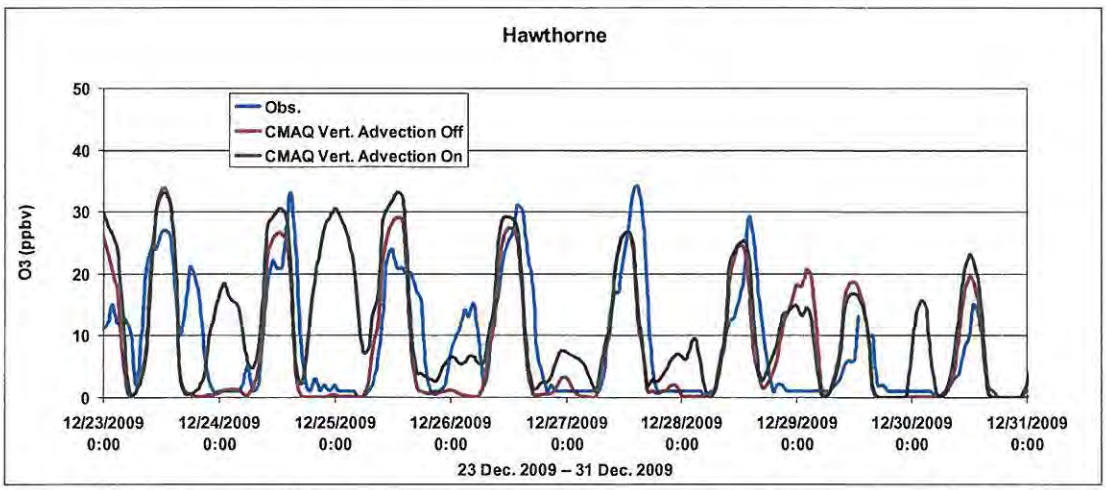


Figure 1.35: Ozone (O_3) time series at the Hawthorne monitoring site. Observed O_3 (blue trace), modeled with vertical advection deactivated (red trace), and modeled with vertical advection activated (green trace).

1.2.3 Carbon Monoxide

While carbon monoxide (CO) does play a role in the formation of $PM_{2.5}$, it is a relatively inert gaseous tracer emitted by anthropogenic sources that can be used to evaluate model performance. Time series of carbon monoxide at the Hawthorne is shown in Figure 1.36. Deactivating the vertical advection leads CMAQ to "hold" more CO in the lowest model layer similar to NO (Section 1.2.3) and also improves model performance (e.g., 25th of Dec.).

The performance results for CO (along with NO_x, O_3, and ammonium nitrate) gives UDAQ confidence that not only does deactivating vertical advection leads to better model performance, there does not appear to be any adverse side affects to model performance due to the deactivation of vertical advection.

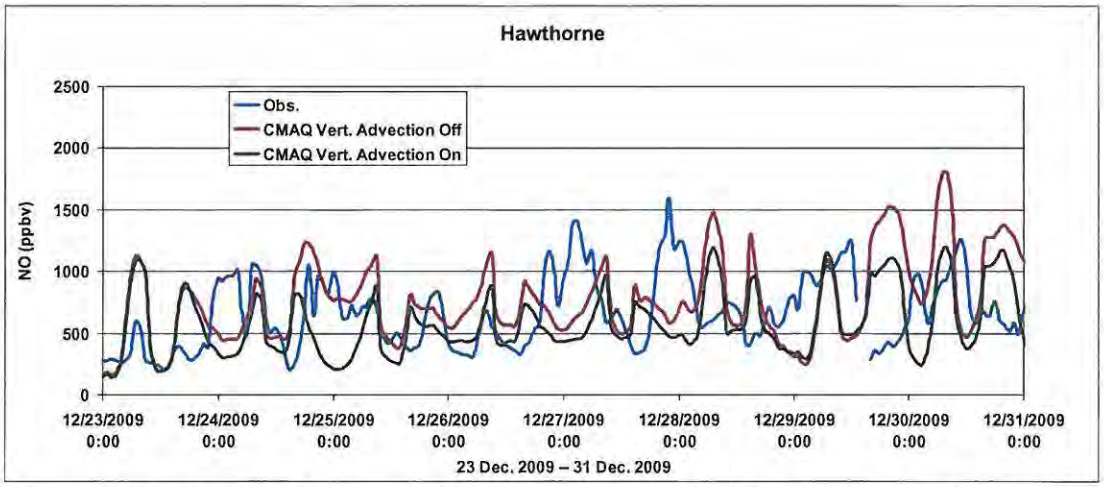


Figure 1.36: Carbon Monoxide (CO) time series at the Hawthorne monitoring site. Observed CO (blue trace), modeled with vertical advection deactivated (red trace), and modeled with vertical advection activated (green trace).

1.3 Summary Model Performance Evaluation

Model performance for 24-hr $PM_{2.5}$ is good and generally acceptable and can be characterized as follows:

- Good replication of the episodic buildup and clear out of $PM_{2.5}$. Often the model will clear out the simulated $PM_{2.5}$ a day too early at the end of an episode. This clear out time period is difficult to model (i.e., Figure 1.7).

- Good agreement in the magnitude of $PM_{2.5}$, as the model can consistently produce the high concentrations of $PM_{2.5}$.

- Spatial patterns of modeled 24-hr $PM_{2.5}$, show for the most part, that the $PM_{2.5}$ is being confined in the valley basins, consistent to what is observed.

- Model performance statistics of normalized mean error and normalized mean bias show that the model meets performance goals and criteria, with the exception being when the CMAQ model exhibits an early episodic washout.

- The precursors for secondarily formed $PM_{2.5}$ are simulated well when CMAQ model vertical advection is deactivated. This deactivation improves the CMAQ performance of NO_x and ozone and allows CMAQ to "hold" these precursors in the lowest model layers leading to an increase (and better performance) for modeled ammonium nitrate.

- Speciation and composition of the modeled $PM_{2.5}$ matches the observed speciation quite well. Modeled and observed nitrate are between 40% and 50% of the $PM_{2.5}$. Ammonium is between 15% and 20% for both modeled and observed $PM_{2.5}$. Organic carbon is underestimated at the Hawthorne location, but is reasonably estimated at the other locations (Bountiful, Lindon).

1.4 Supplementary Analysis and Weight of Evidence

EPA's modeling guidelines recommend that attainment demonstrations consist of a primary (guideline) modeling analysis and supplemental analyses. Three basic types of supplemental analyses are recommended:

- additional modeling
- analyses of trends in ambient air quality and emissions, and
- observational models and diagnostic analyses

UDAQ's supplemental analysis focuses on additional modeling along with analysis of volatile organic carbons (VOCs) and NO_x measurements. There is air toxic monitoring at the Bountiful monitoring site that measures hazardous air pollutants (HAPs) over a 24-hour period once in every six days. A subset of the HAPs measured is a suite of VOCs. These Bountiful measurements of VOCs along with co-located NO_x will provide an ability to have an observational analysis of the VOC-NO_x make-up of the Wasatch Front airshed.

1.4.1 Additional Modeling – Additional Episodes in 2007 and 2008

In addition to 2009-2010 modeling period that included multiple $PM_{2.5}$ episodes, UDAQ modeled individual episodes from the winter of 2007 and 2008. By modeling these additional wintertime seasons, UDAQ ensures it is modeling numerous and diverse wintertime conditions that lead to exceedences of 24-hr $PM_{2.5}$ NAAQS. The number of selected episodes for modeling represents an effort above and beyond that which is normally required for a SIP demonstration.

The 2007 episode extends 10 days covering January 11-20, 2007, while the 2008 episode is a shorter 6 day episode covering February 14-19, 2008. The Performance of the 2007 and 2008 episode are provided at numerous monitoring locations in Appendix A.

1.4.2 Additional Modeling -- Utah NOx-VOC Chemistry in CMAQ

Ammonium nitrate is the largest contributor to $PM_{2.5}$ in the three Utah non-attainment areas (NAAs). In preliminary model simulations, UDAQ found that NO_x emissions reductions cause increases in $PM_{2.5}$ in some locations, and reductions in other locations within the NAAs. The preliminary modeling also showed that VOC emissions reductions were beneficial for reducing the ammonium nitrate portion of $PM_{2.5}$ mass. While the $PM_{2.5}$ rule (FR 72, 20586) states that NO_x is presumptively included as an attainment plan precursor and that VOC and NH3 are presumptively excluded, the rule also recognizes that VOC or NH3 emissions reductions can be effective in some areas. The rule provides a mechanism (e.g., photochemical modeling) to reverse the general presumptions for these three precursors.

CMAQ sensitivity simulations were conducted to test the changes in $PM_{2.5}$ secondary nitrate concentrations resulting from changes in the emissions of NO_x and VOCs. The sensitivities will be performed on the 2008 inventory and the 2019 inventory that has incorporated emission reduction control strategies.

2008 Base Inventory

Sensitivity simulations performed on the 2008 Base Inventory are shown at Hawthorne (Fig. 1.37), Lindon (Fig. 1.38), and Logan (Fig. 1.39). The simulations include a Base simulation (blue trace), and sensitivities for a 15% reduction in NO_x (green trace), a 15% increase in NO_x (red trace), and a 15% reduction in VOCs (purple trace).

At the Hawthorne and Lindon monitor, sensitivities on the 2008 Inventory show a decrease in NO_x emissions lead to an increase in secondary nitrate formation, while an increase in NO_x emissions lead to a decrease in nitrate. A 15% reduction in VOCs leads to reduction in nitrate.

Further examination of the modeling results show that when NO_x emissions are reduced in the 2008 Inventory, it leads to an increase in ozone during afternoon hours. The photolysis of ozone increases the hydroxyl radicals (OH) in the atmosphere, which leads to an increase in nitric acid and ultimately particulate nitrate. The opposite is the case when NO_x is increased in the inventory, where afternoon ozone is decreased by NO_x titration, leading to less OH radicals and particulate nitrate.

At Logan, where the inventory is smaller than that of the Wasatch Front airshed, reductions in NO_x and VOCs lead to the benefit of reducing particulate nitrate (Fig. 1.39). An increase in NO_x leads to an increase in particulate nitrate at Logan.

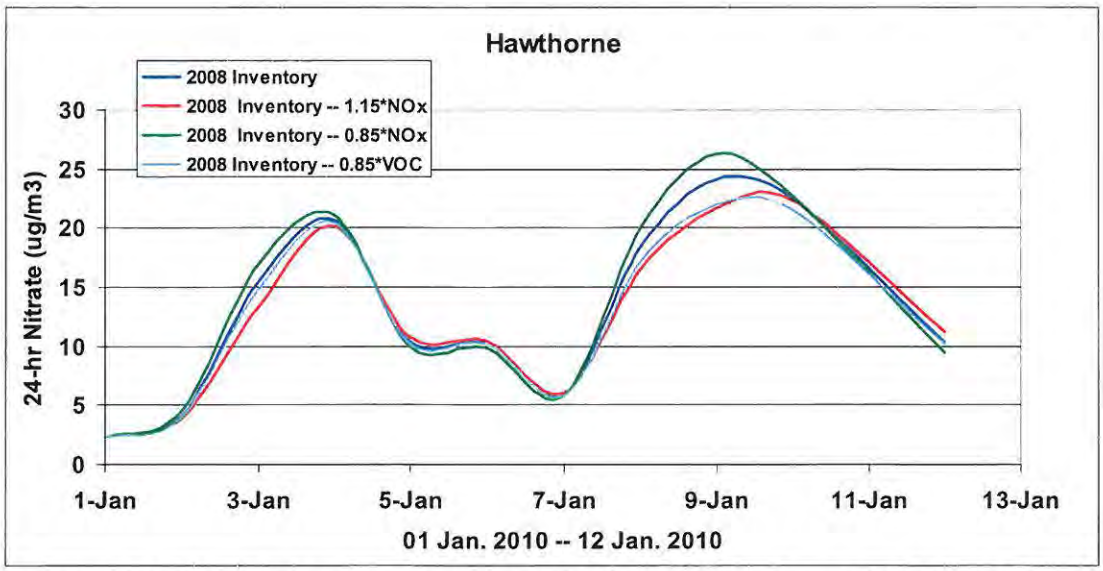


Figure 1.37: Sensitivity simulation on the 2008 Inventory for a 15% NO_x reduction, 15% NO_x increase, and 15% VOC reduction. Modeling results are shown for the Hawthorne monitor location.

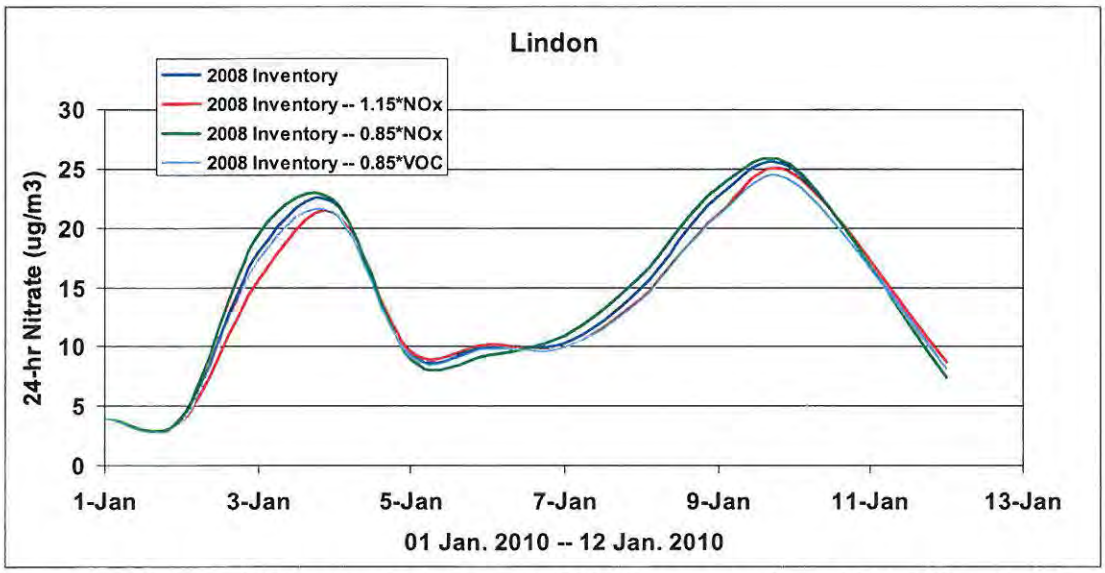


Figure 1.38: Sensitivity simulation on the 2008 Inventory for a 15% NO_x reduction, 15% NO_x increase, and 15% VOC reduction. Modeling results are shown for the Lindon monitor location.

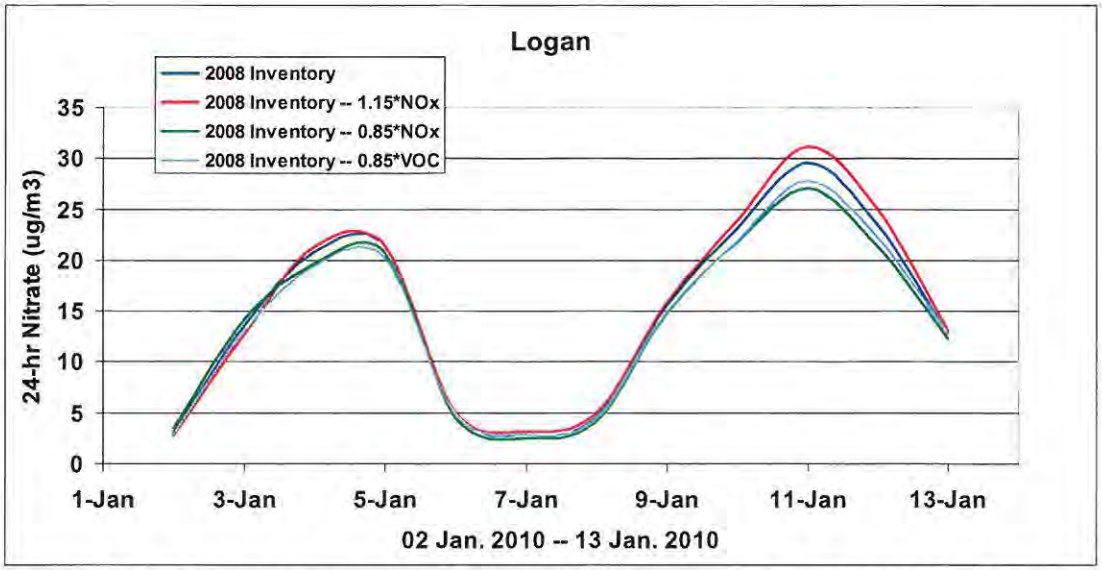


Figure 1.39: Sensitivity simulation on the 2008 Inventory for a 15% NO_x reduction, 15% NO_x increase, and 15% VOC reduction. Modeling results are shown for the Logan monitor location.

2019 Control Inventory

By the year 2019, the NO_x and VOC inventory in the Wasatch Front and Cache Valley airsheds have been significantly reduced via new vehicle standards and control strategies. Therefore, the sensitivities to changes in emissions were performed on the 2019 Control Inventory to see if they differ from the results on the 2008 Inventory. The sensitivity results are shown for Hawthorne (Fig. 1.40), Lindon (Fig. 1.41), and Logan (Fig. 1.42).

By 2019, the NO_x – VOC chemical make-up of the inventory has changed to where both NO_x and VOC reductions are beneficial to reducing particular nitrate at Hawthorne, Lindon, and Logan. In fact, NO_x reductions appear to be even more beneficial than VOC reductions by 2019.

Summary of Sensitivity Simulations

The results of the CMAQ sensitivity simulations indicate that the Wasatch Front airshed is evolving from an airshed that sees a dis-benefit to NO_x reductions in 2008 to a future year (2019) airshed that is positively sensitive reductions in NO_x.

Much of emission control strategy planning by UDAQ focused on the results of the sensitivities to the 2008 Inventory. That is, strategies that dealt with the benefit of VOC reductions and avoided the dis-benefit of NO_x controls. The 2019 Control Inventory was recently developed; thereby the 2019 sensitivities are recent results. The 2019 Control Inventory sensitivity results will lead UDAQ to explore strategies that involve future year NO_x reductions.

NO_x-VOC emission reduction model sensitivities have been performed in the San Joaquin Valley of California over the past 10 to 15 years. The San Joaquin Valley suffers from the same episodic secondary particulate issues as Utah. A discussion of the studies performed in the San Joaquin Valley can be found on pages 48 - 60 of the Technical Support Document of the 2008 $PM_{2.5}$ Plan for the San Joaquin Valley (http://www.epa.gov/region9/air/actions/pdf/ca/SJV-TSD.pdf). Results of the studies in the San Joaquin Valley vary, with some concluding NO_x reductions are more beneficial, and some concluding VOC reductions are more important to reducing secondary $PM_{2.5}$.

While the San Joaquin Valley suffers from the same episodic secondary particulate issues as Utah, drawing conclusion from modeling studies from the San Joaquin Valley and applying them to Utah's situation should be done with caution. Utah has colder, snow-covered winters which play an important role in the formation of secondary particulate nitrate.

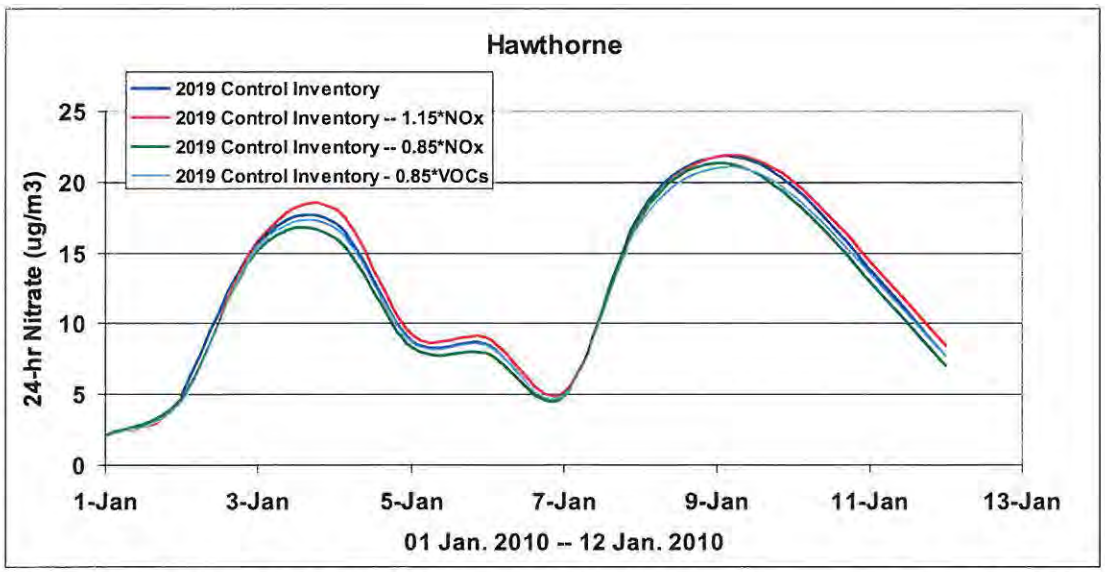


Figure 1.40: Sensitivity simulation on the 2019 Control Inventory for a 15% NO_x reduction, 15% NO_x increase, and 15% VOC reduction. Modeling results are shown for the Hawthorne monitor location.

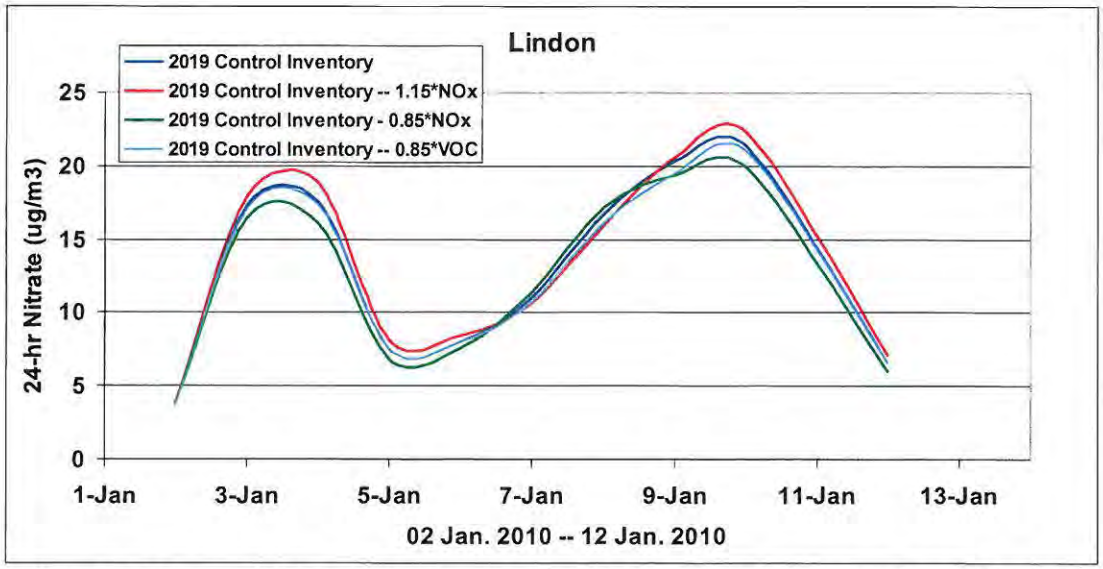


Figure 1.41: Sensitivity simulation on the 2019 Control Inventory for a 15% NO_x reduction, 15% NO_x increase, and 15% VOC reduction. Modeling results are shown for the Lindon monitor location.

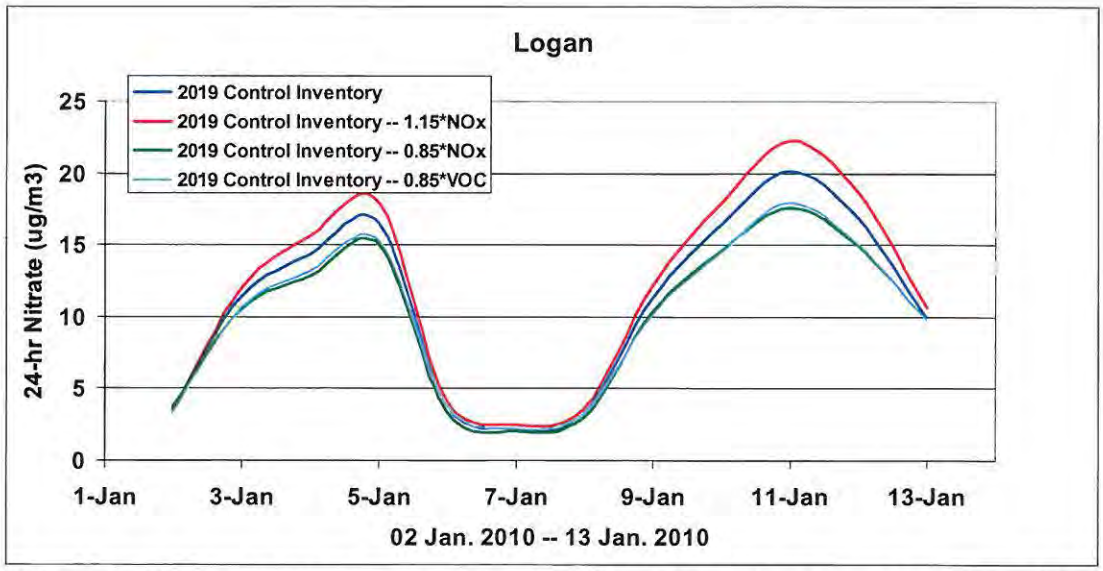


Figure 1.42: Sensitivity simulation on the 2019 Control Inventory for a 15% NO_x reduction, 15% NO_x increase, and 15% VOC reduction. Modeling results are shown for the Logan monitor location.

Conclusion

The $PM_{2.5}$ Implementation Rule states that the identification of VOC as a "Significant contributor" involves showing that a significant reduction in emissions of the precursor from sources in the area is projected to provide a significant reduction in $PM_{2.5}$ concentrations in the nonattainment area. 72 FR 20586, at 20590. Model sensitivity tests demonstrate that a (significant) 15% reduction in VOC emissions resulted in a commensurate reduction in nitrate concentrations that ranged from 5 – 12%. One would have to conclude that these reductions also meet the level of "significant."

Based on air quality modeling and other supporting information (see Section 1.4.3), Utah is proposing to reverse the presumptive exclusion of VOC as a $PM_{2.5}$ precursor. The attainment demonstration Utah has provided includes a combination of VOC and NO_x reductions to control ammonium nitrate, as well as reductions of direct $PM_{2.5}$ and SO_2. This demonstration includes an evaluation of technically and economically feasible control measures to demonstrate expeditious attainment of the $PM_{2.5}$ NAAQS.

1.4.3 Observational Analysis of NO_x – VOC Chemistry

A detailed analysis and discussion of VOCs and NO_x measurements from the Bountiful monitoring site is provided in Appendix B. A discussion of using Formaldehyde and NO_x measurements as an indicator of a NO_x or VOC limited atmospheric regime follows below.

Formaldehyde as an Indicator of Chemistry Sensitivity at Bountiful, Utah

Satellite retrieval of Formaldehyde (HCHO) and NO_2 is being increasingly used to indicate whether the atmosphere is NO_x limited or oxidant limited with respect to ozone formation. The indicator is constructed as a simple ratio of HCHO to NO_2. HCHO is used to represent reactive volatile organic compounds (VOCs) because it is an essential component of nearly all atmospheric chemistry reactions. This indicator can be used with ground based monitor data and extended to winter-time formation of ammonium nitrate because the same chemistry is involved in nitric acid production.

It is possible that the ratio changes significantly during a day due to photochemistry, emissions, and meteorology. Therefore, to be most useful, the ratio should be computed using hourly data of HCHO and NO_2 and a diurnal profile of the ratio constructed. In Utah, DAQ's air monitoring network collects hourly NO_2 data at multiple locations throughout the state. However, HCHO data is collected at only Bountiful for 2004-2010 and is collected only as a 24 hour average 1 out of every 6 days. As a result, hourly variations in HCHO concentrations are unknown and UDAQ was unable to construct a diurnal profile of the ratio.

UDAQ looked at average diurnal profiles of measured NO_2 and then evaluated the range of HCHO concentrations needed to reach critical indicator thresholds. Using the 24 hour average HCHO, assumptions can be made about the likely diurnal range of HCHO and

these assumptions can then be used as a conservative estimate of maximum hourly HCHO concentrations. In this way, we can make conservative estimates as to what concentrations of HCHO would be needed to reach critical indicator thresholds.

Data

Bountiful HCHO Data

The historical record of 24-hour average HCHO from Bountiful, UT is shown in Figure 1.43. HCHO concentrations are highest in the summer and lowest in the winter. Numerous excursions of HCHO above 10 ppb may be related to wildfire VOC emissions (especially during significant wildfire summers of 2005 and 2006) rather than locally produced VOC. Figure 1.44 shows how 24-hour average HCHO concentrations at Bountiful vary with respect to winter month 24-hour average $PM_{2.5}$ concentrations. Elevated concentrations of $PM_{2.5}$ during stagnation events are correlated with higher concentrations of HCHO between 3 and 4 ppb. Maximum winter concentrations are shown in Figure 1.45. The data shows a very significant decrease in maximum winter HCHO concentration during the last 3 years. Maximum concentrations decreased from roughly 5 ppb down to 3 ppb. The reason for this decrease is not known, but it is likely that the numerous air toxics reduction strategies that have been implemented have contributed to this trend.

All of the HCHO data presented in this document will be based off of the full 7 years of available Bountiful data. If the trend of the last 3 years accurately reflects a new state of the atmosphere, then HCHO statistics presented in this document will need to be decreased significantly.

Logan HCHO Data

Utah State University collected a limited 10 day HCHO data set (Table 1.3) from Logan, UT during the winters of 2005 and 2007. The data includes averages from 3 time intervals during the day so the concentrations are not directly comparable to the Bountiful 24-hour average data. The time interval data does allow some evaluation of possible diurnal variations in HCHO concentration. On some days, the variation of concentrations from the 3 daily time intervals was 2 to 3 times the lowest concentration; however, the range around the mean value was less than 2 times the mean.

NO_2 data

Average diurnal profiles were constructed for six $PM_{2.5}$ concentration bins for several Utah locations. $PM_{2.5}$ bins were used to help understand how NO_2 concentrations vary throughout the $PM_{2.5}$ episodes. Figure 1.46 presents NO_2 profiles for Hawthorne and Figure 1.47 presents profiles for Logan. During times when stable meteorological conditions are present (assume when $PM_{2.5}$ is between 10 and 20 ug/m3) concentrations dip to between 20 ppb at Hawthorne and 12 ppb at Logan during the mid-day hours. NO_2 profiles for other locations are also included in the appendix.

What is not clear from the available NO_2 is how NO_2 concentrations vary in outlying Cache County. Are NO_2 concentrations significantly less in locations not located in Logan's urban center? Significantly lower NO_2 concentrations in outlying locations could change the dynamics of the atmosphere's sensitivity to VOC concentrations.

HCHO: NO_2 Indicator Ratio

With NO_2 profiles constructed, it is possible to "back-out" what concentrations of HCHO would be required to create an oxidant limited regime or a NO_x limited regime. The indicator ratio's transition regime falls between 1 and 2. For a purely oxidant limited regime the indicator ratio should be less than 2. For a purely NO_x limited regime the indicator ratio should be above 2.

At Hawthorne and Logan, a purely oxidant limited regime would require mid-day HCHO concentrations to be above 20 ppb and 12 ppb, respectively. Given that measured winter-time HCHO concentrations are in the 2 ppb to 5 ppb range, the indicator ratio points to the existence of an oxidant limited regime at all hours of the day for both Hawthorne (Bountiful) and Logan.

Adjusted HCHO: NO_2 Indicator Ratio

Two uncertainties exist within our NO_2 concentration measurements and our HCHO measurements. First, it has been documented that some NO_x box measurements of NO_2 can inadvertently identify nitric acid (HNO_3) as NO_2. As a result, measured NO_2 concentrations may be biased high. Second, the HCHO measurements at Bountiful are 24 hour averages and may not reflect the highest possible hourly concentrations. To account for these uncertainties, we have developed an adjusted indicator ratio to provide a very conservative new estimate of the atmosphere's sensitivity.

For the adjusted indicator ratio we will reduce NO_2 by an arbitrary 25%. This reduction will help account for any overestimation of NO_2 due to the misidentification of HNO_3. The 24-hour average HCHO concentrations will be doubled to provide a very conservative estimate of possible hourly concentrations. A 2002-2003 HCHO monitoring campaign in the Po Valley of Italy examined diurnal profiles of HCHO in urban locations. The campaign demonstrated that hourly HCHO increased by less than 2 times above the 24-hour mean. The limited data collected in Logan that shows that diurnal hourly concentrations are less than double the 24 hour mean agrees with this more extensive study conducted in Italy.

Figures 1.48 and 1.49 present the adjusted NO_2 profiles. In the 10 ug/m3 to 20 ug/m3 $PM_{2.5}$ bin adjusted NO_2 concentrations fall to 14 ppb and 9 ppb during mid-day for Hawthorne and Logan, respectively. For a purely oxidant limited regime (indicator ratio >= 2) HCHO concentrations would need to be 28 ppb at Hawthorne and 18 ppb at Logan.

To be in the transition regime, HCHO concentrations would still need to be 14 ppb at Hawthorne and 9 ppb at Logan. A doubling of the mean measured Bountiful HCHO concentration for the 10 ug/m3 to 20 ug/m3 bin shown in Figure 1.44 would result in a possible concentration of 5 ppb which is far less than even the 14 ppb required for the transition regime. When doubled, Logan's measured HCHO concentrations fall far below the required 9 ppb for entry into the transition regime.

Conclusion

Ambient NO_2 and HCHO data suggest that the stable atmosphere in Hawthorne and Logan is fully within the oxidant sensitive regime. NO_2 profiles from Utah County and Davis County also suggest that high levels of NO_2 overwhelm the impact of available HCHO. Even with the construction of a very conservative adjusted indicator ratio, both Hawthorne and Logan are fully entrenched in the oxidant limited regime. It is possible that in the outlying areas around Logan, NO_2 concentrations could be low enough to move closer to the transition regime, but this is unknown at this time. These results confirm preliminary CMAQ model results based on the 2008 Emissions Inventory. Furthermore, the marked reduction in winter HCHO concentrations observed during the last 3 years only pushes the atmosphere further into the oxidant limited regime.

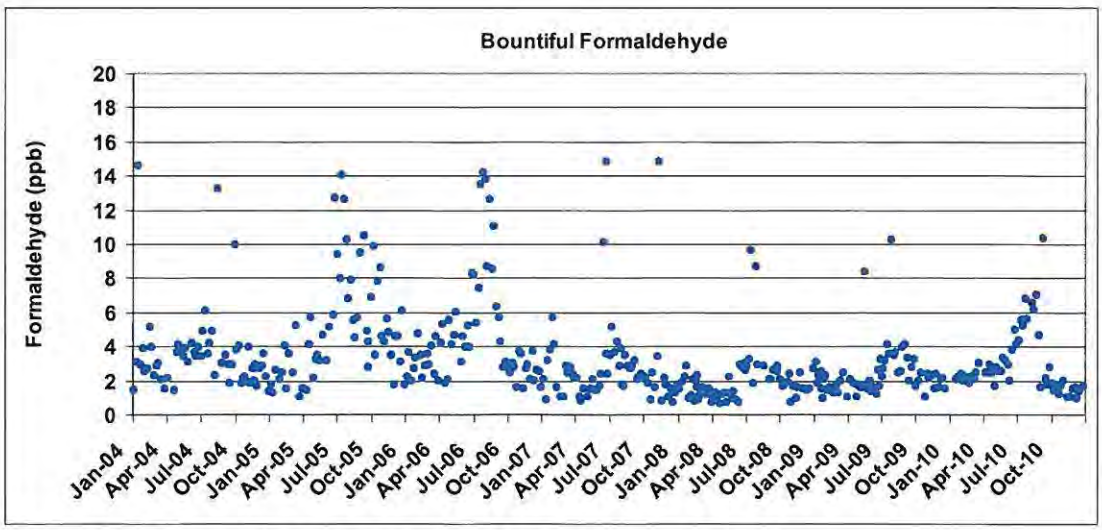


Figure 1.43: Formaldehyde concentrations at Bountiful, UT.

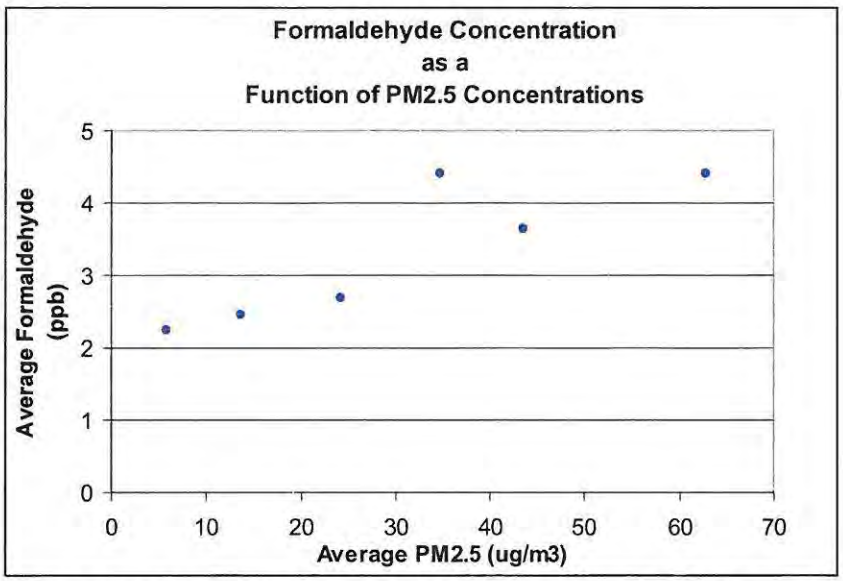


Figure 1.44: Formaldehyde concentrations and 24-hr $PM_{2.5}$ concentrations at Bountiful, UT.

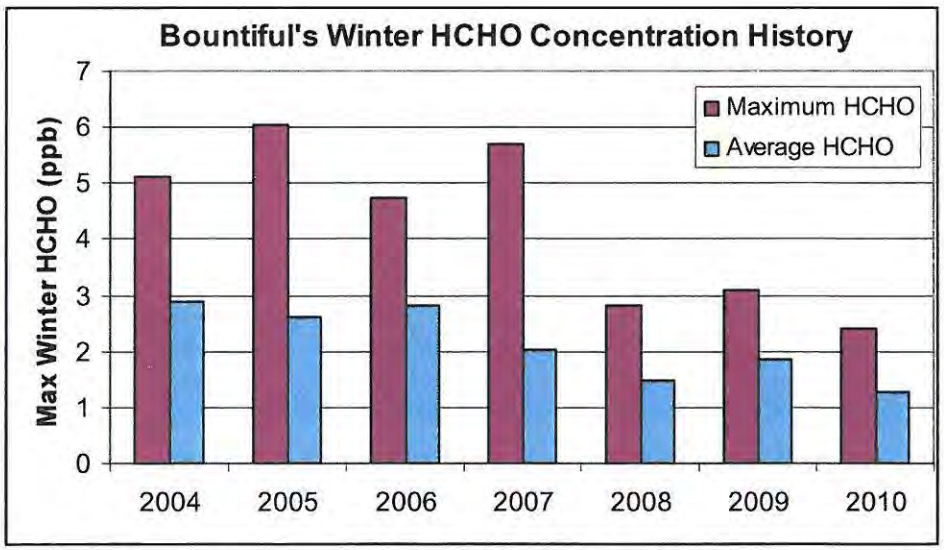


Figure 1.45: Maximum and Average Wintertime Formaldehyde concentrations at Bountiful, UT.

Date	HCHO (ppb)	PM2.5 (ug/m3)
2/24/2005 9:00	0.02	48.4
2/24/2005 15:00	1.05	48.4
2/25/2005 2:01	2.33	45.6
2/25/2005 9:00	0.77	45.6
2/25/2005 15:00	2.38	45.6

2/26/2005 2:01	2.05	53.5
3/1/2005 2:01	2.14	54.6
3/1/2005 9:00	1.33	54.6
3/1/2005 15:00	1.69	54.6
3/2/2005 2:01	0.89	36.7
3/2/2005 9:45	1.05	36.7
3/2/2005 15:00	1.88	36.7
3/15/2005 4:01	1.22	7.8
3/15/2005 9:00	2.04	7.8
3/15/2005 15:00	0.32	7.8
3/16/2005 2:01	0.34	5.8
3/16/2005 9:00	1.40	5.8
3/16/2005 15:00	0.53	5.8
3/6/2007 1:00	4.24	46.4
3/6/2007 7:00	3.37	46.4
3/6/2007 14:00	2.80	46.4
3/7/2007 1:00	*3.21*	43.4
3/7/2007 7:00	4.18	43.4
3/7/2007 14:00	2.71	43.4
3/8/2007 1:00	1.28	4.1
3/8/2007 7:00	1.29	4.1

Table 1.3: Formaldehyde measurements at Logan, UT. Courtesy of Dr. Randy Martin (Utah State University).

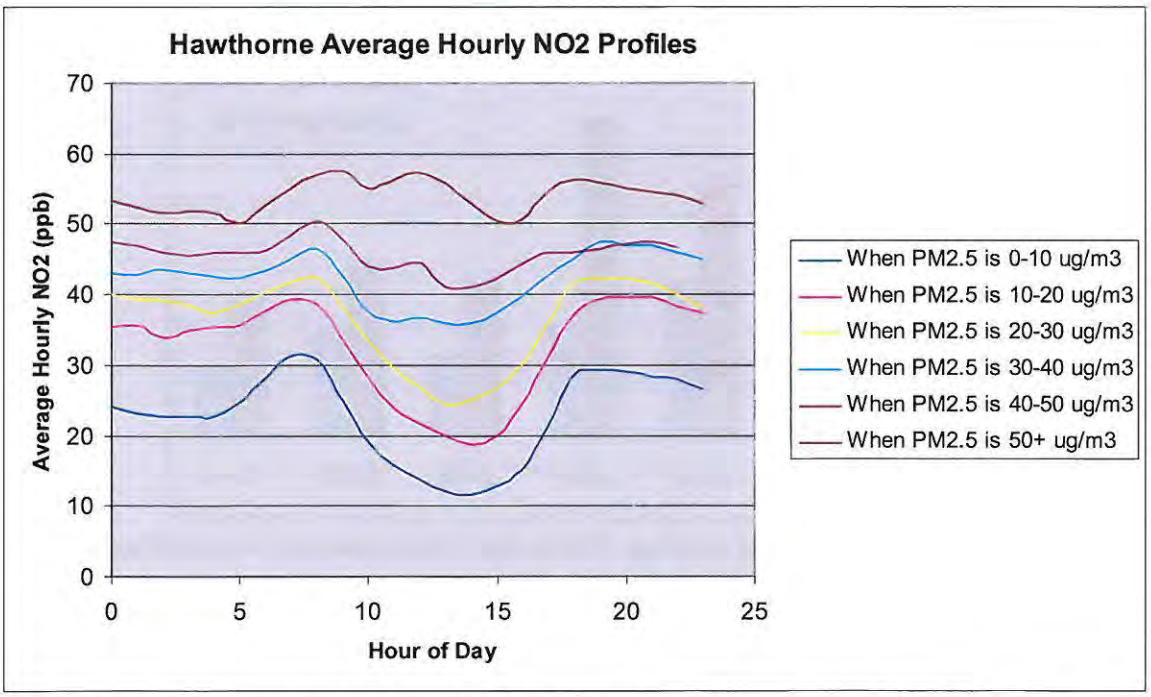


Figure 1.46: Average diurnal profiles for NO_2 at Hawthorne. The NO_2 profiles are binned for corresponding range of 24-hr $PM_{2.5}$.

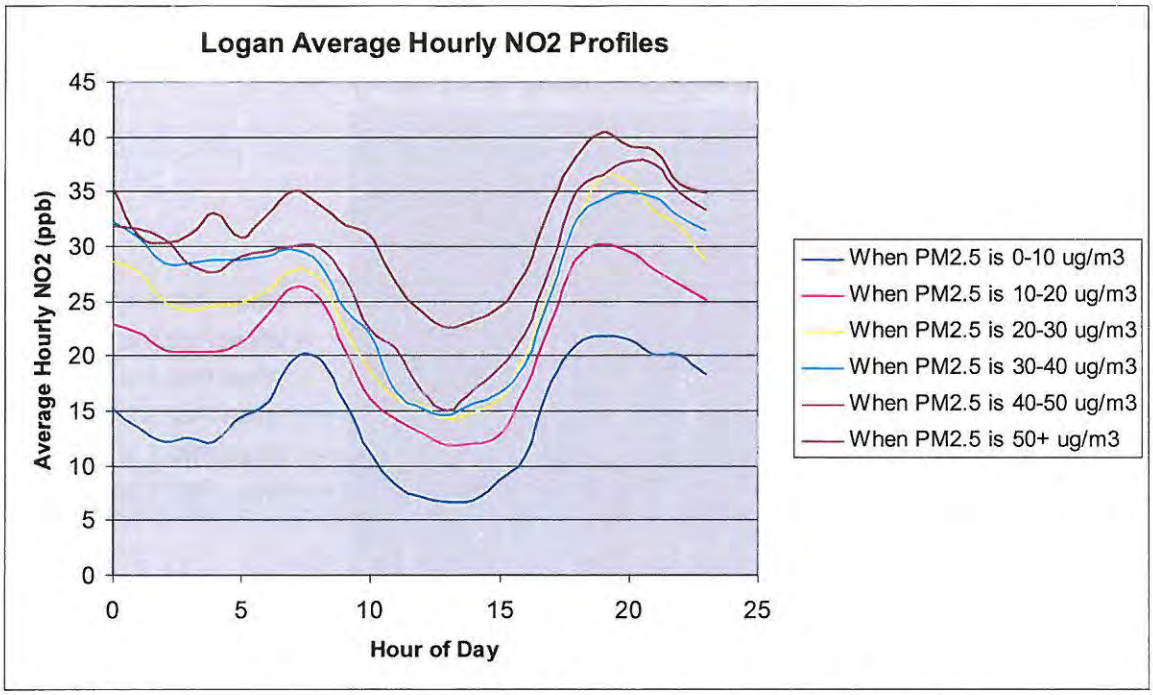


Figure 1.47: Average diurnal profiles for NO_2 at Logan. The NO_2 profiles are binned for corresponding range of 24-hr $PM_{2.5}$.

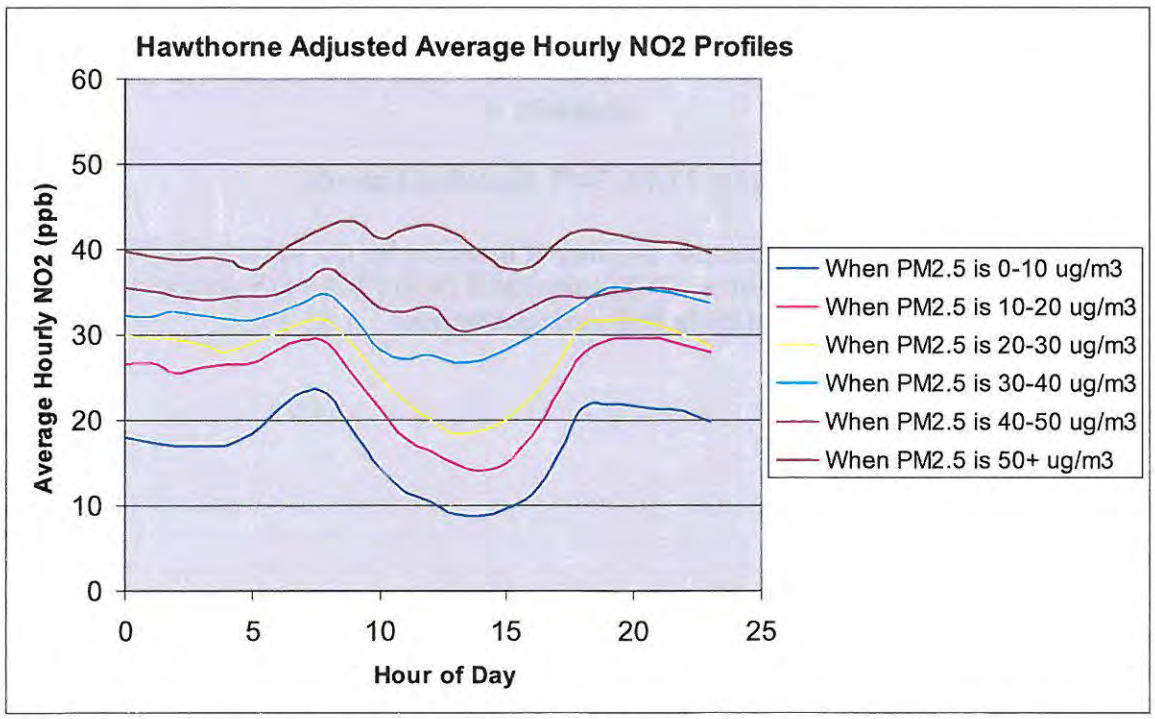


Figure 1.48: Adjusted average diurnal profiles for NO_2 at Hawthorne. The NO_2 profiles are binned for corresponding range of 24-hr $PM_{2.5}$.

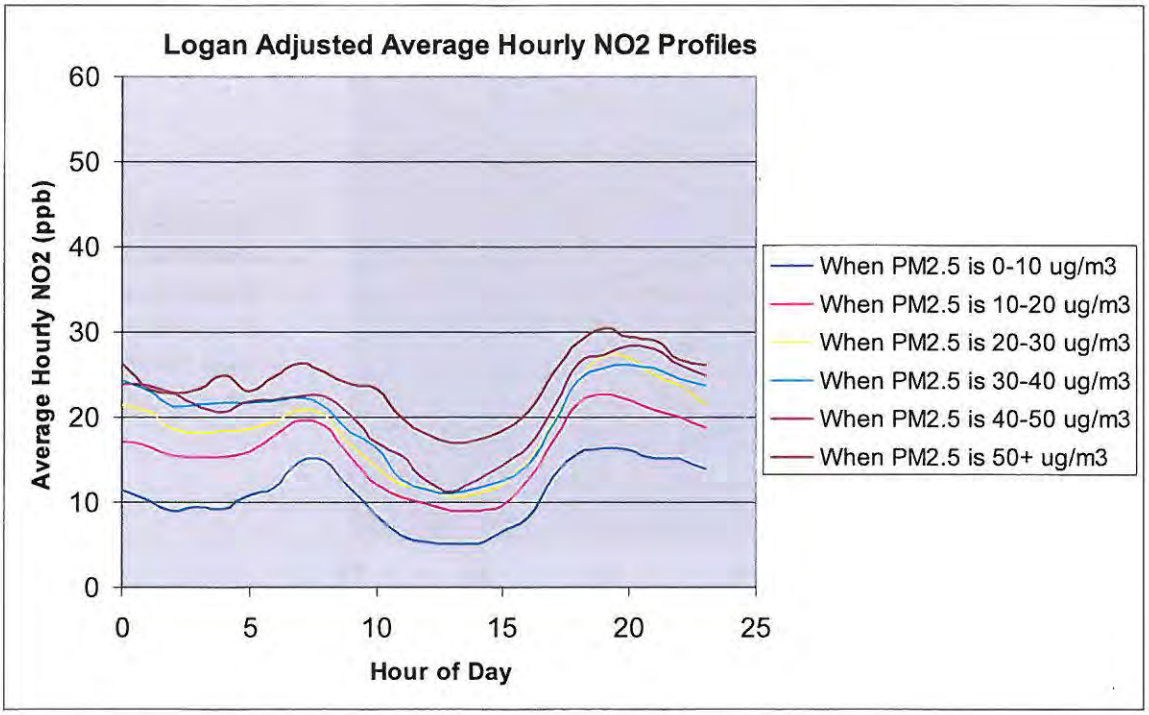
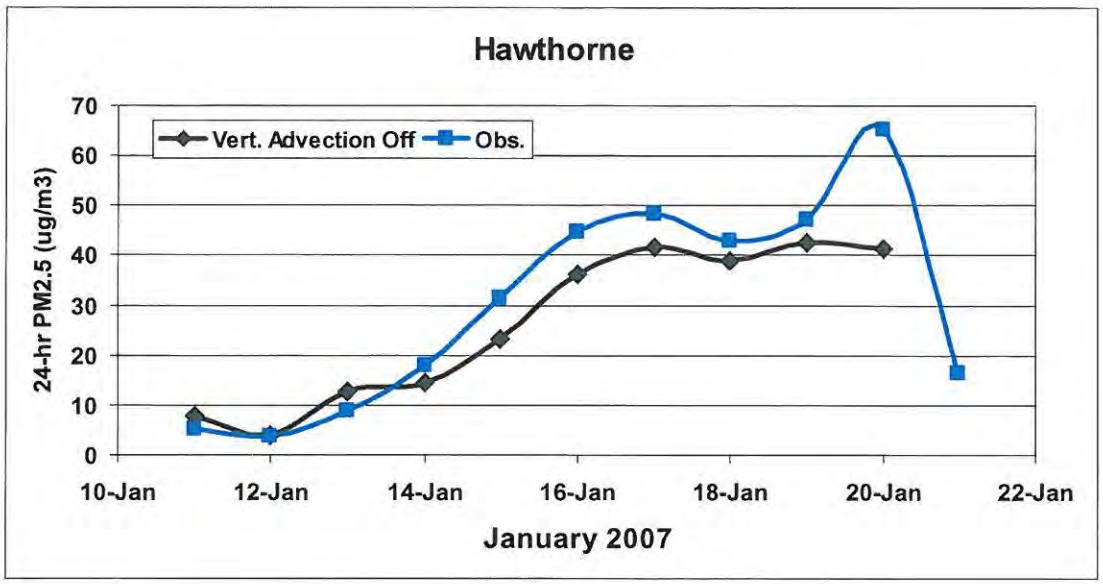


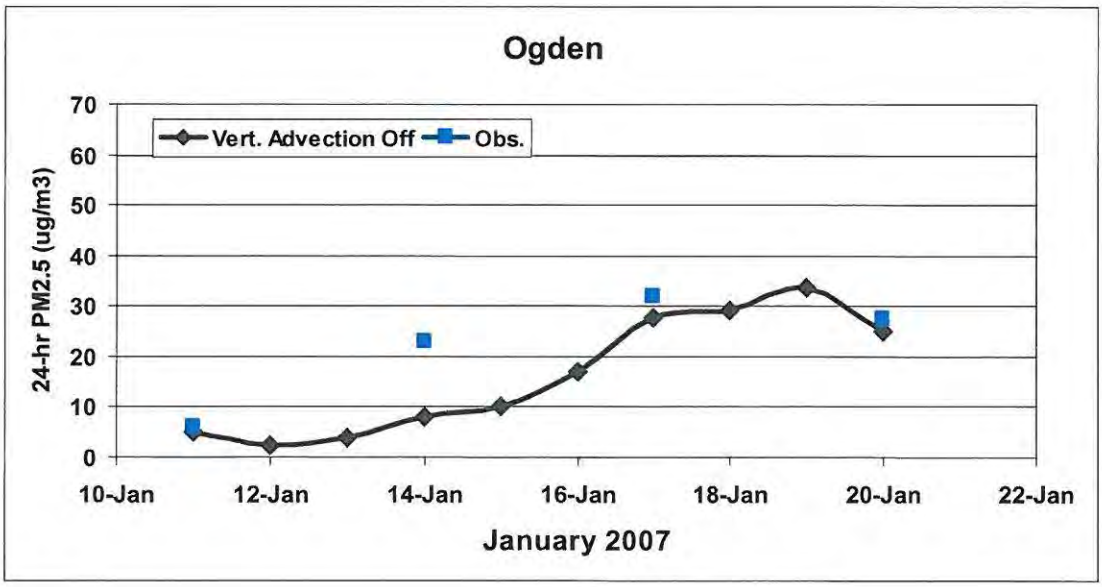
Figure 1.49 Adjusted average diurnal profiles for NO_2 at Logan. The NO_2 profiles are binned for corresponding range of 24-hr $PM_{2.5}$.

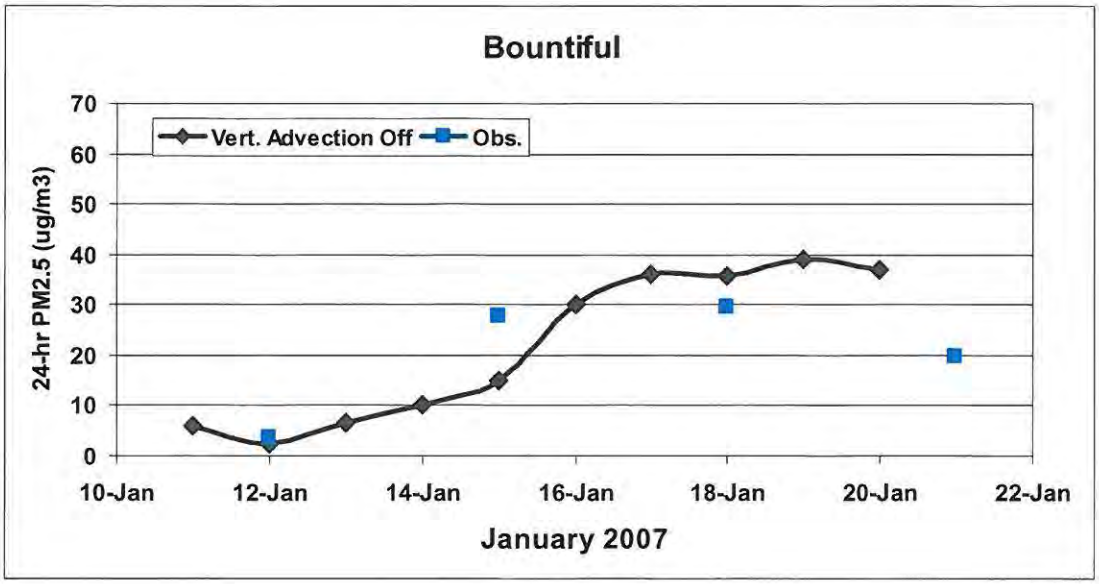
Appendix A

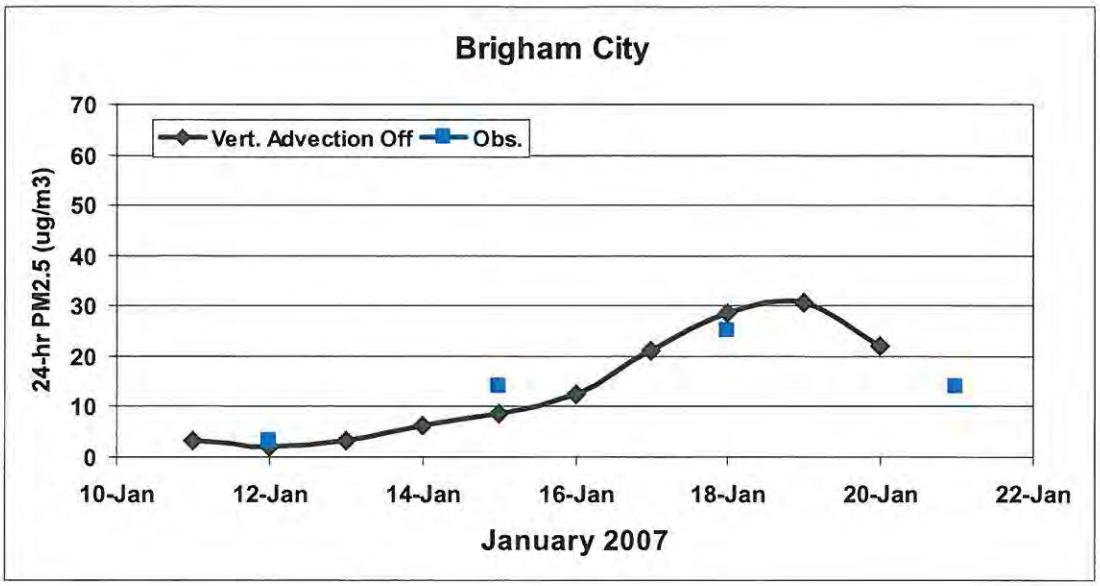
January 11-20, 2007 Modeling Episode

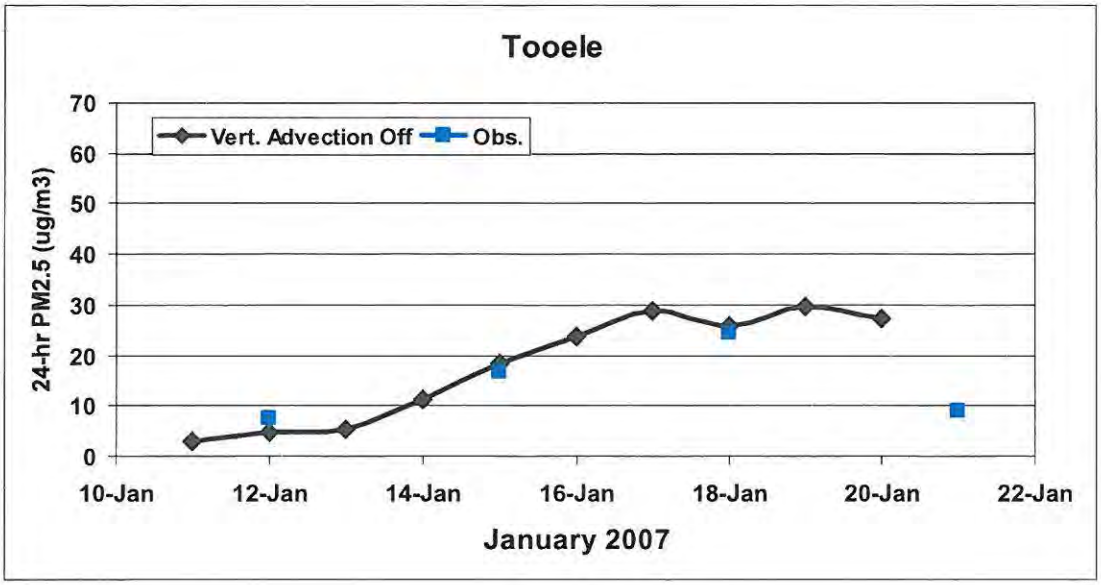
Time-series are presented at various monitoring locations for the January 11-20, 2007 modeling episode. Shown will be CMAQ simulated 24-hr $PM_{2.5}$ with vertical advection de-activated and the observed 24-hr $PM_{2.5}$ concentrations.

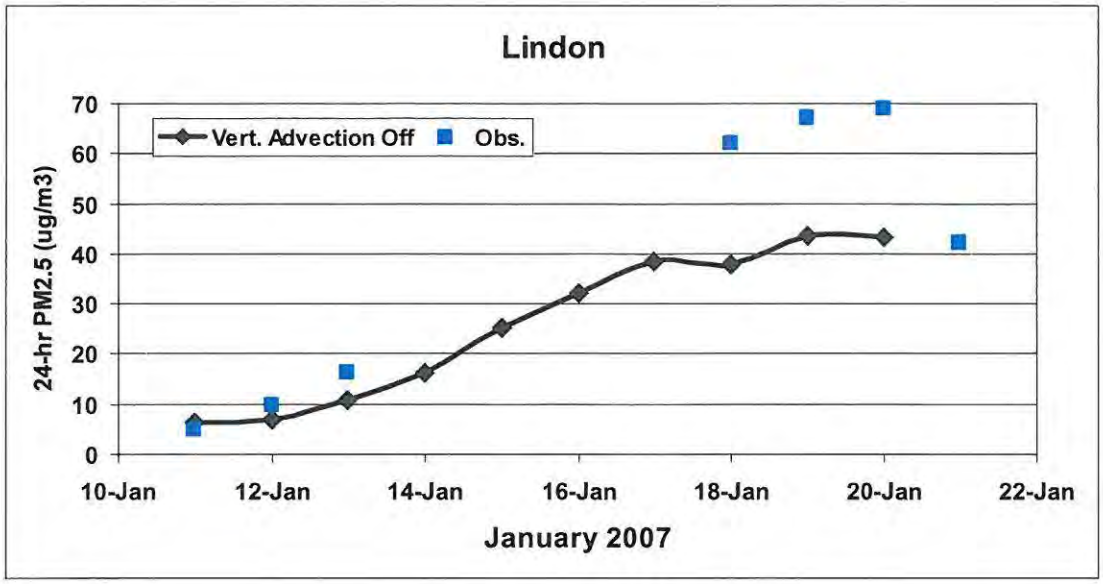

Hawthorne
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
10-Jan
12-Jan
14-Jan
16-Jan
18-Jan
20-Jan
22-Jan
January 2007

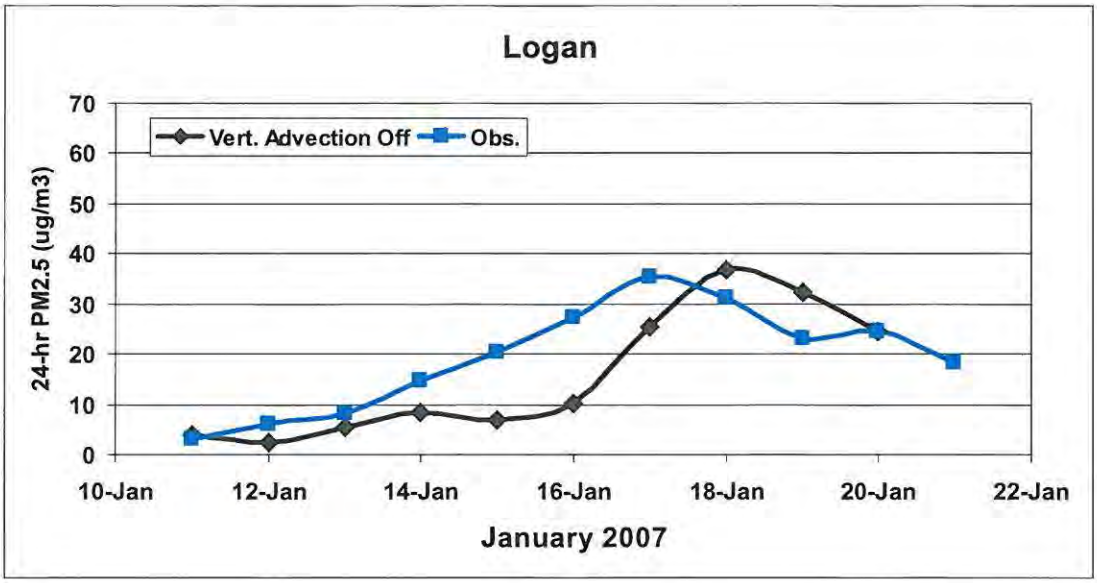

Ogden
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
10-Jan
12-Jan
14-Jan
16-Jan
18-Jan
20-Jan
22-Jan
January 2007


Bountiful
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
10-Jan
12-Jan
14-Jan
16-Jan
18-Jan
20-Jan
22-Jan
January 2007


Brigham City
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
10-Jan
12-Jan
14-Jan
16-Jan
18-Jan
20-Jan
22-Jan
January 2007

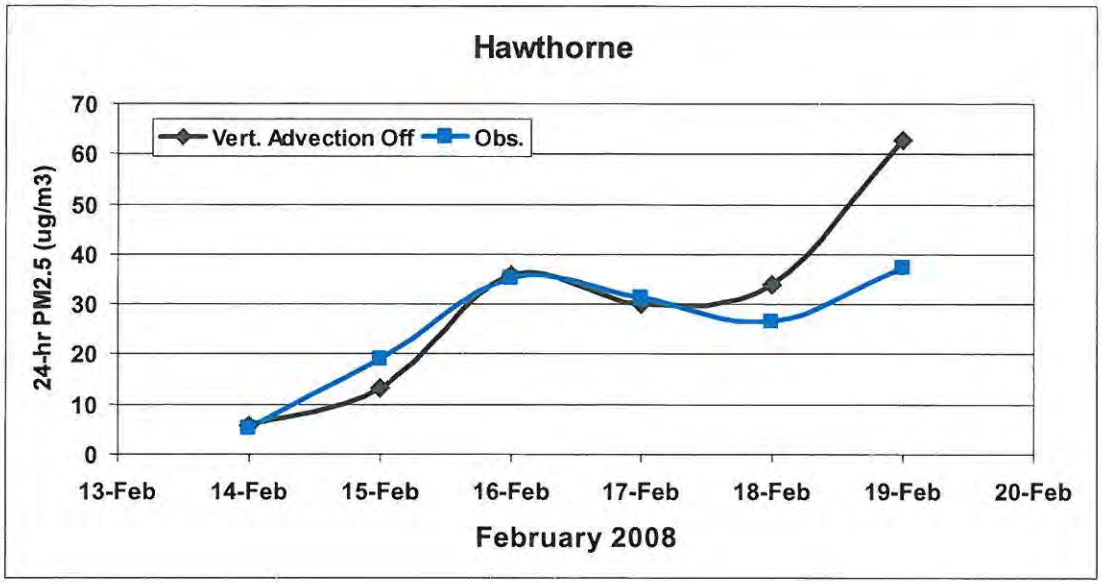

Tooele
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
10-Jan
12-Jan
14-Jan
16-Jan
18-Jan
20-Jan
22-Jan
January 2007

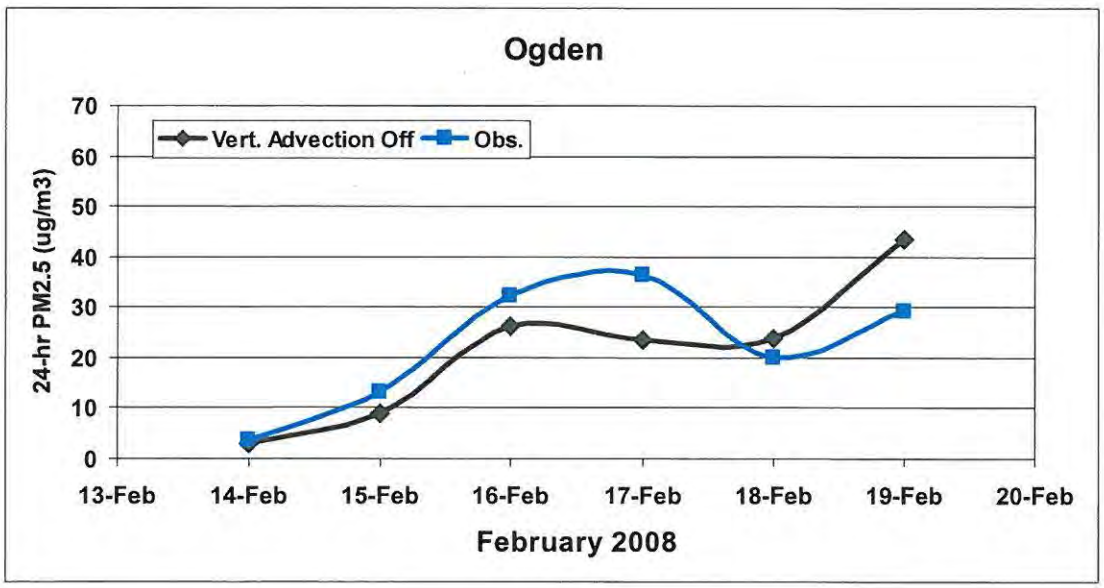

Lindon
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
10-Jan
12-Jan
14-Jan
16-Jan
18-Jan
20-Jan
22-Jan
January 2007

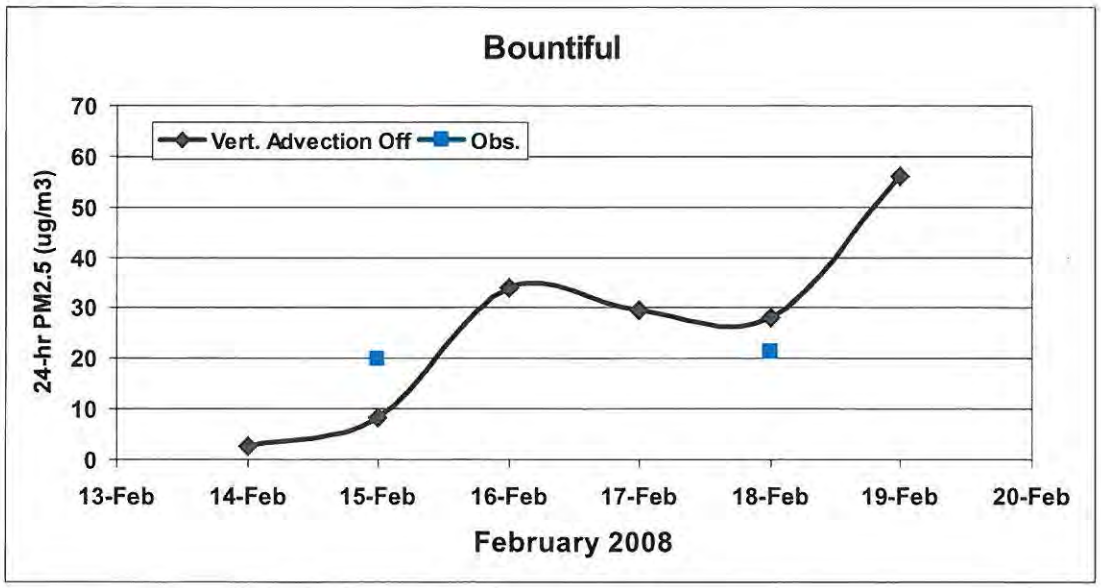


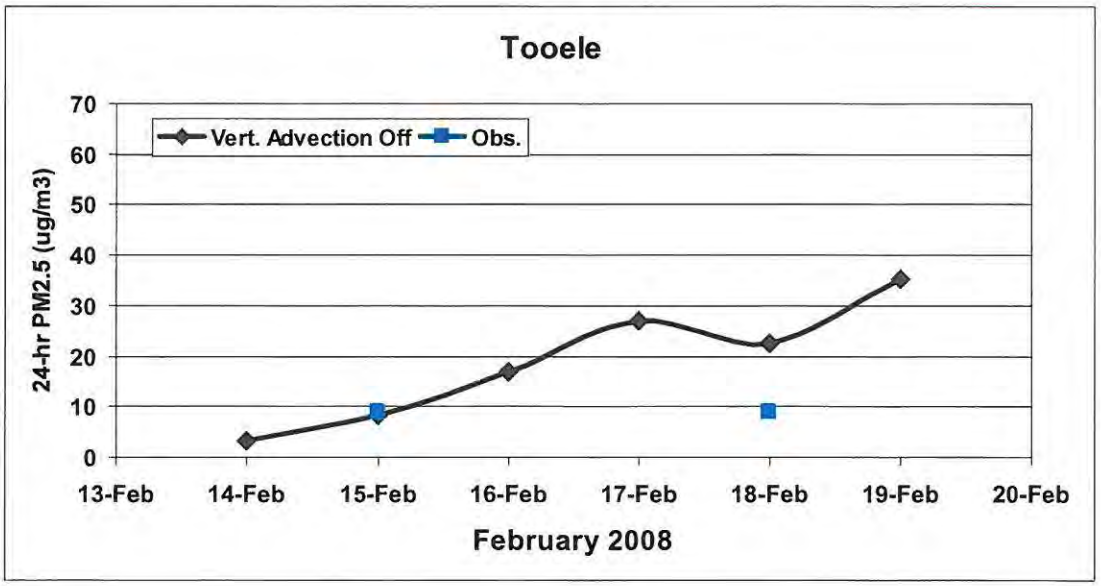
February 14-19, 2008 Modeling Episode

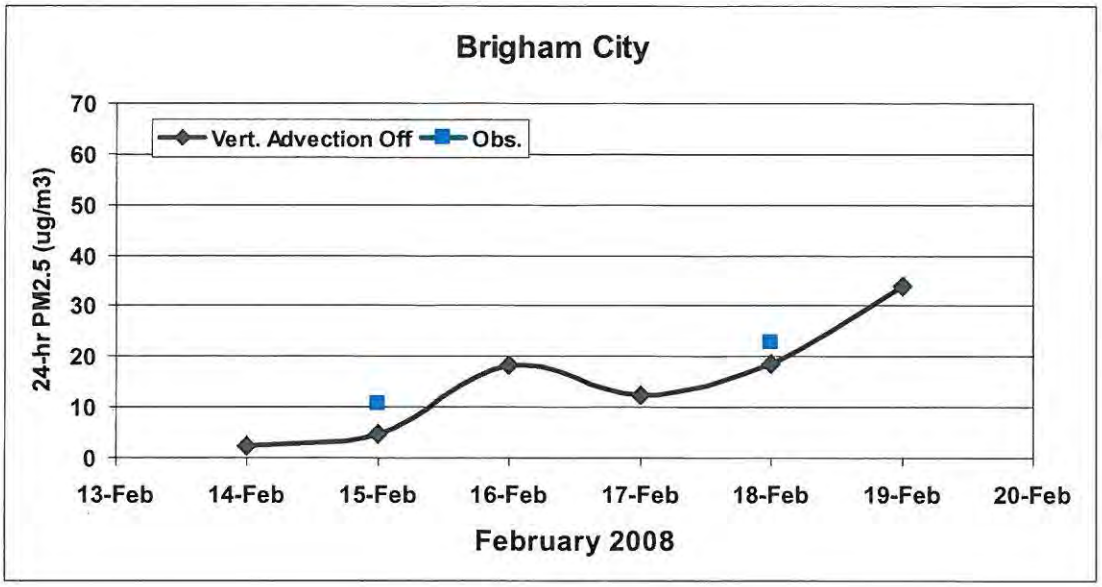
Time-series are presented at various monitoring locations for the February 14-19, 2008 modeling episode. Shown will be CMAQ simulated 24-hr $PM_{2.5}$ with vertical advection de-activated and the observed 24-hr $PM_{2.5}$ concentrations.

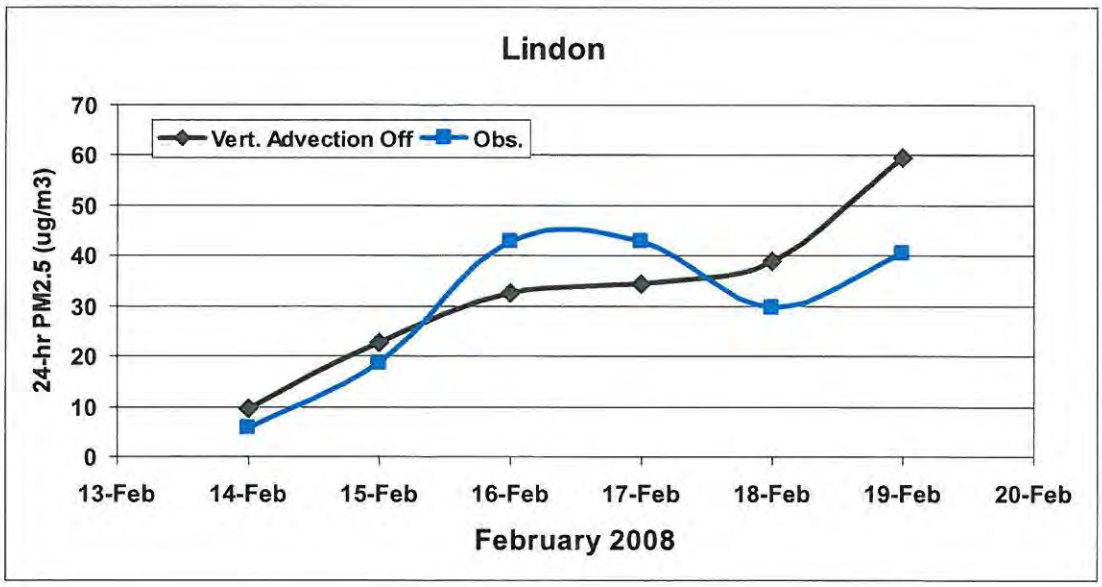

Hawthorne
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008

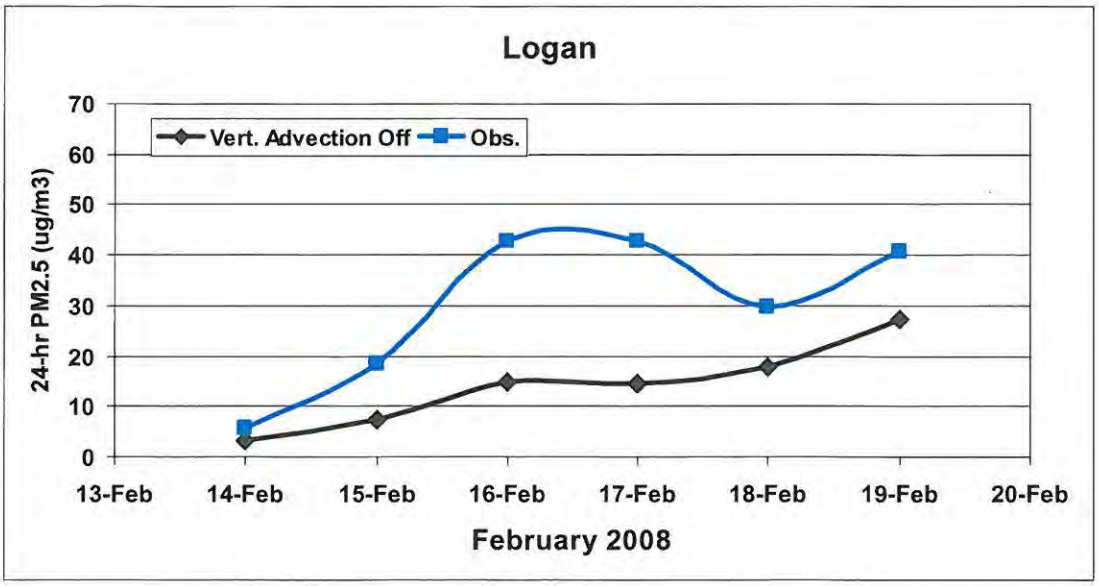

Ogden
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008


Bountiful
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008


Tooele
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008


Brigham City
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008


Lindon
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008


Logan
Vert. Advection Off
Obs.
24-hr PM2.5 (ug/m3)
70
60
50
40
30
20
10
0
13-Feb
14-Feb
15-Feb
16-Feb
17-Feb
18-Feb
19-Feb
20-Feb
February 2008

Appendix B

Introduction

The goal of this report is to obtain an initial assessment of the impact of non-methane hydrocarbons (NMHC) on the formation of the secondary air pollutants, ozone and $PM_{2.5}$. The report will also attempt to examine trends followed by the NMHC's in review as well as other related pollutants.

The organic compounds play a crucial role in almost every aspect of tropospheric chemistry. Their variety, range of concentration and life-times, and their interactions with themselves as well as inorganic components of troposphere are what creates the extraordinarily complex and non-linear responses in formation of ozone and secondary $PM_{2.5}$.

Data Conditioning

Reactive organic species data was obtained from the PAN (Photochemical Assessment Network) – NMOC (Non-Methane Organic Carbon) database accessed through AQS.

A list of 54 volatile organic compounds observed at the Bountiful station between January 6, 2007 and December 29, 2011. The samples were collected on a 1-in-6 day schedule established by the EPA which resulted in 316 valid samples. As original data was delivered in ppbC (parts per billion of carbon) units, these had to be converted to ppb by dividing the reported values by the number of carbon atoms for each species of interest. Isopropyl benzene was the only component with above 90% of the values below the method detection limit (MDL) and was excluded from the analysis.

Several of the isomer analytes were also grouped to reflect common formation processes. Although the photo-reactivities of these species may differ slightly between each isomer it is reasonable to treat them in terms of origination processes. For example, the process of formation of 2-methylhexane will also produce a fraction of 3-methylhexane as a byproduct, and vice versa. Table 1 shows the isomer groups and their components.

Group:	Species:
Trimethylbenzene	1,2,3-Trimethylbenzene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene
Dimethylbutane	2,2-Dimethylbutane 2,3-Dimethylbutane
Dimethylpentane	2,3-Dimethylpentane 2,4-Dimethylpentane
2-Butene	cis-2-Butene trans-2-Butene
2-Pentene	cis-2-Pentene trans-2-Pentene
Diethylbenzene	m-Diethylbenzene p-Diethylbenzene
Ethyltoluene	m-Ethyltoluene o-Ethyltoluene

Xylene	m/p Xylene o-Xylene
Trimethylpentane	2,2,4-Trimethylpentane 2,3,4-Trimethylpantane
Methylpentane	2-methylpentane 3-methylpentane
Methylhexane	2-methylhexane 3-methylhexane
Methylheptane	2-Methylheptane 3-Methylheptane

The uncertainty values were not provided with the data set and were calculated using and were set to 7% of the observed values that were above MDL.

Results

Trends

To determine the general trend of NMOC individual analyte values (in ppb) were combined and yearly means were calculated.

Figure 1.

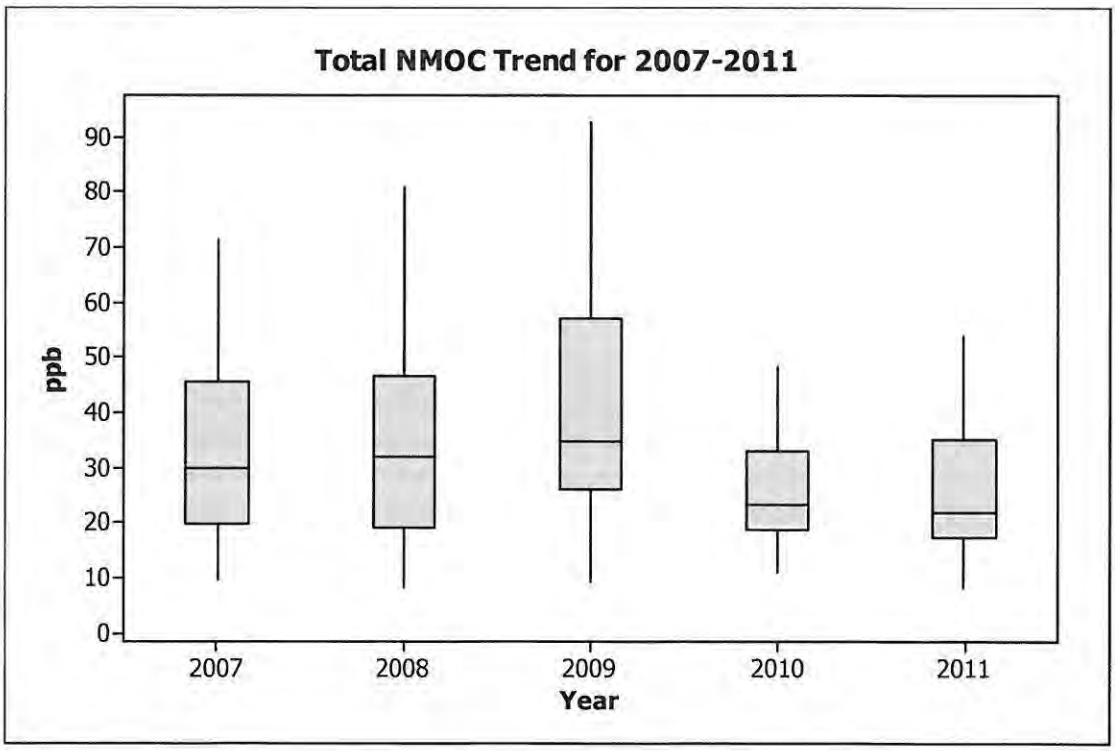


Figure 1 shows the trend of total NMOC concentrations during the five years of the study. A slight skewedness (to the right) in the data is evident from the box plot. A notable break in the steady upward trend is observed between 2009 and 2010. The nearly 28% drop between the mean yearly concentrations was also accompanied by a nearly 40% drop in the 98th percentile values. This marked drop in observed NMOC concentrations is attributed to the influence of economic downturn of 2008 on manufacturing and small businesses in the urban part of the Salt Lake Valley. Although the 98th percentile values increased between 2010 and 2011, a slight downward trend in the means was observed.

It is important to consider that the observed trend of NMOC concentrations was heavily influenced by ethane, propane, n-butane, and isobutane which, together, account for approximately 55% of the observed NMOC's.

Individual yearly trends for the observed species presented a pattern of increasing annual concentrations for ethyl- and diethylbenzene, trimethylbenzene, xylene, styrene, formaldehyde, and n-octane.2011 yearly concentrations of these compounds varied within the range of 7%-16% above their five year averages. Formaldehyde and n-octane stood out, recorded at 35% above their five-year means.

The majority of alkanes displayed a negative overall trend with the 2011 mean concentrations ranging 20%-40% below the five-year average. Table 1 shows the deviation between the five-year mean and the 2011 values for each compound.

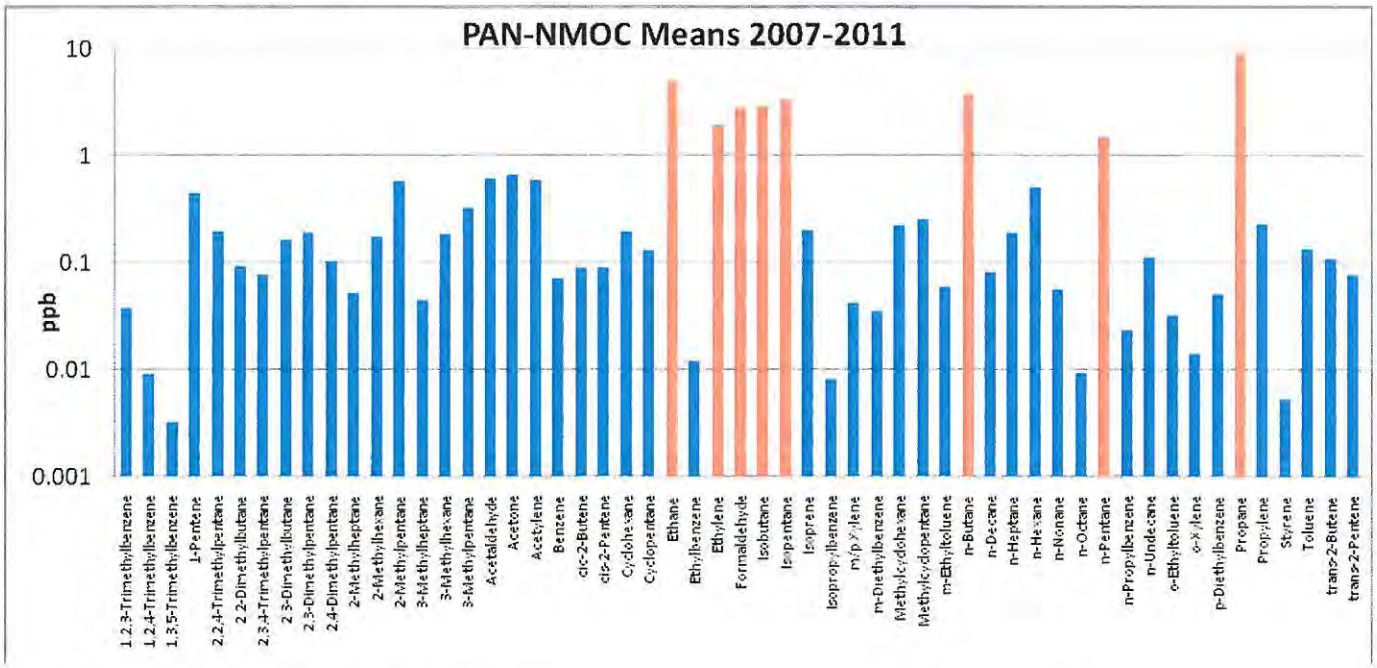
NMOC Name	5yr Mean (ppb)	2011 % diff		NMOC Name	5yr Mean (ppb)	2011 % diff
1-Pentene	0.43	-0.50		**Methylcyclohexane**	**0.22**	**-0.20**
2-Butene	0.20	-0.11		Methylcyclopentane	0.25	-0.31
2-Pentene	0.16	-0.45		**Methylheptane**	**0.10**	**-0.24**
Acetaldehyde	0.59	0.02		Methylhexane	0.35	-0.14
Acetone	**0.65**	**-0.09**		**Methylpentane**	**0.82**	**-0.36**
Acetylene	0.57	-0.11		**n-Butane**	**3.69**	**-0.45**
Benzene	0.07	-0.14		**n-Decane**	**0.08**	**-0.34**
Cyclohexane	**0.19**	**-0.21**		**n-Heptane**	**0.19**	**-0.21**
Cyclopentane	*0.13*	*0.13*		**n-Hexane**	**0.50**	**-0.38**
Diethylbenzene	*0.10*	*-0.12*		**n-Nonane**	**0.05**	**-0.25**
Dimethylbutane	0.23	-0.31		*n-Octane*	*0.01*	*0.39*
Dimethylpentane	0.29	-0.23		**n-Pentane**	**1.46**	**-0.41**
Ethane	**4.92**	**-0.28**		**n-Propylbenzene**	**0.02**	**-0.34**

Ethylbenzene	*0.01*	*0.11*		n-Undecane	0.11	-0.46
Ethylene	1.89	-0.07		**Propane**	**8.97**	**-0.29**
Formaldehyde	*2.77*	*0.32*		Propylene	0.22	-0.04
Isobutane	**2.82**	**-0.45**		*Styrene*	*0.01*	*0.07*
Isopentane	**3.27**	**-0.25**		Toluene	0.13	-0.13
Isoprene	0.20	-0.17		*Trimethylbenzene*	*0.05*	*-0.32*
Ethyltoluene	**0.09**	**-0.41**		**Trimethylpentane**	**0.26**	**-0.30**
				Xylene	*0.06*	*0.12*

Species highlighted in bold exhibit downward trends in their annual mean values. Italicized and underlined species demonstrated upward trend during the study period. Species that were not bolded or italicized displayed no distinguishable trends.

Figure 2 shows the means of the observed species during the study period. Only eight of the fifty four monitored species had their mean concentration above 1 ppb.

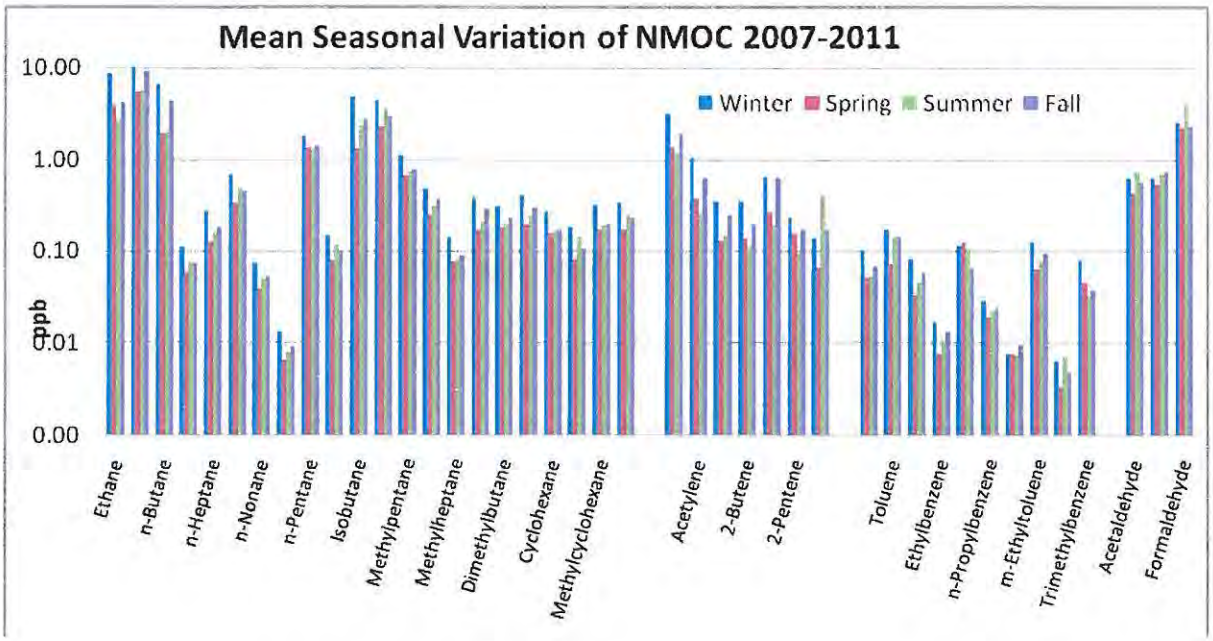
Figure 2.



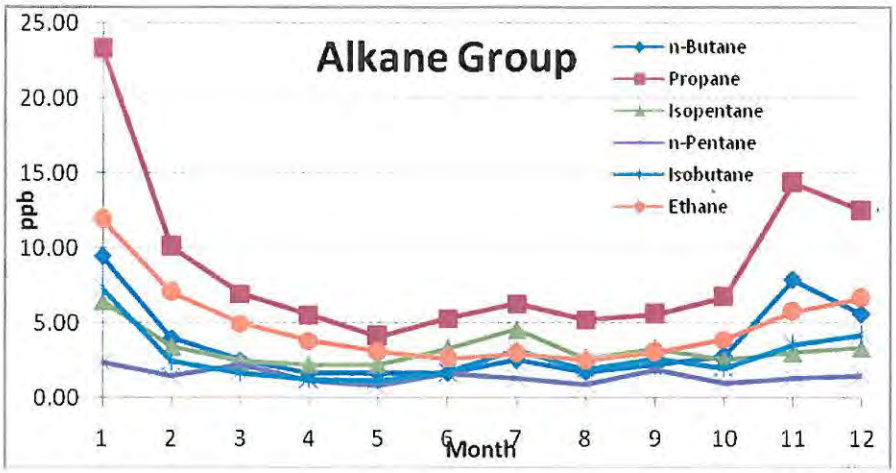
The figure shows that only eight substances were present during the five-year study period with the mean concentration above one part per billion. Propane, ethane, and n-butane are the three top contributors to the total NMOC concentrations over the course of the study, followed by isopentane, isobutane, formaldehyde, and ethylene.
The seasonal variation of individual NMOC species and groups between 2007 and 2011 are shown in figure 3. Two general seasonal patterns are observed. The first pattern presents the peak concentration during the winter season followed by a sharp drop in the

spring and the increased mixing ratios through summer and fall. Most of the species and the isomer groups follow the first pattern.

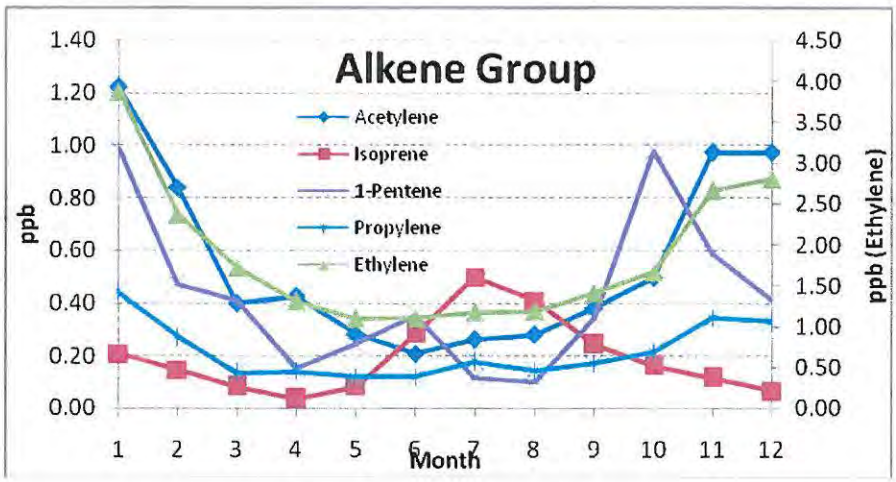
Species following the second seasonal pattern include formaldehyde, isoprene, and acetaldehyde. Their peak mixing ratios are observed during the summer season with little or no variation and much lower concentrations during the rest of the year. Isoprene is a major and the most abundant biogenic organic substance emitted by the plants. Its increased concentrations during the summer are explained by the tendency of plants to intensify its emission rates during extreme temperatures, damage, drought, and other environmental or anthropogenic stimuli. Formaldehyde and acetaldehyde are common to the polluted urban areas as they are the major step in tropospheric photochemical degradation of methanol and ethanol.



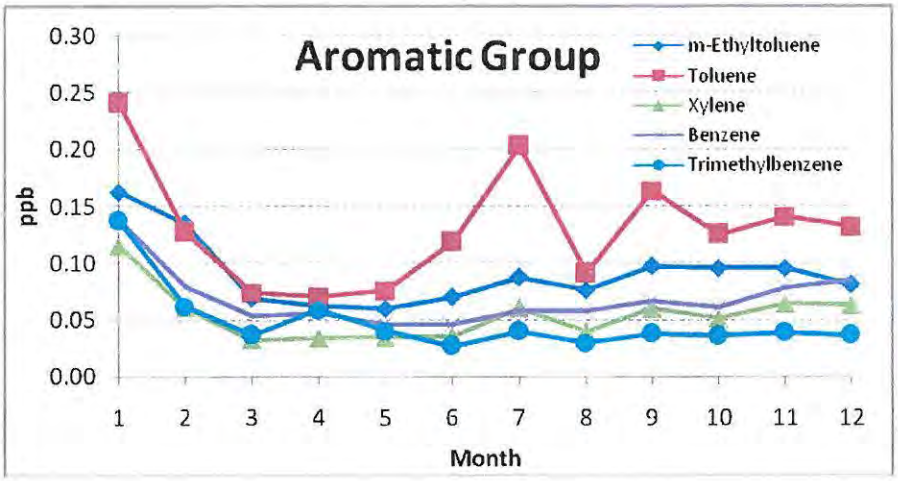
The following figures show monthly variations of major organic species as well as their groups. The alkane group follows a general pattern of the highest mixing ratios during January and December and a slight peaking in the month of July. It is interesting to note that the concentration of n-pentane is fairly constant throughout the year.



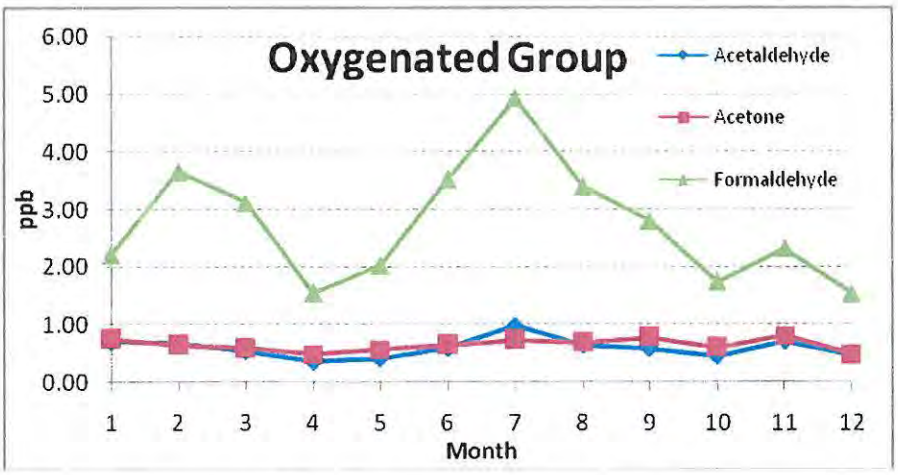
Alkene group presented a generally similar seasonal variation as the alkanes. Isoprene was the exception with its maximum concentrations observed in July and September. 1-Pentene's increased concentration in October was heavily influenced by the three sample days in 2010 during which the concentrations of 1-pentene reached nearly two orders of magnitude above the regular range.



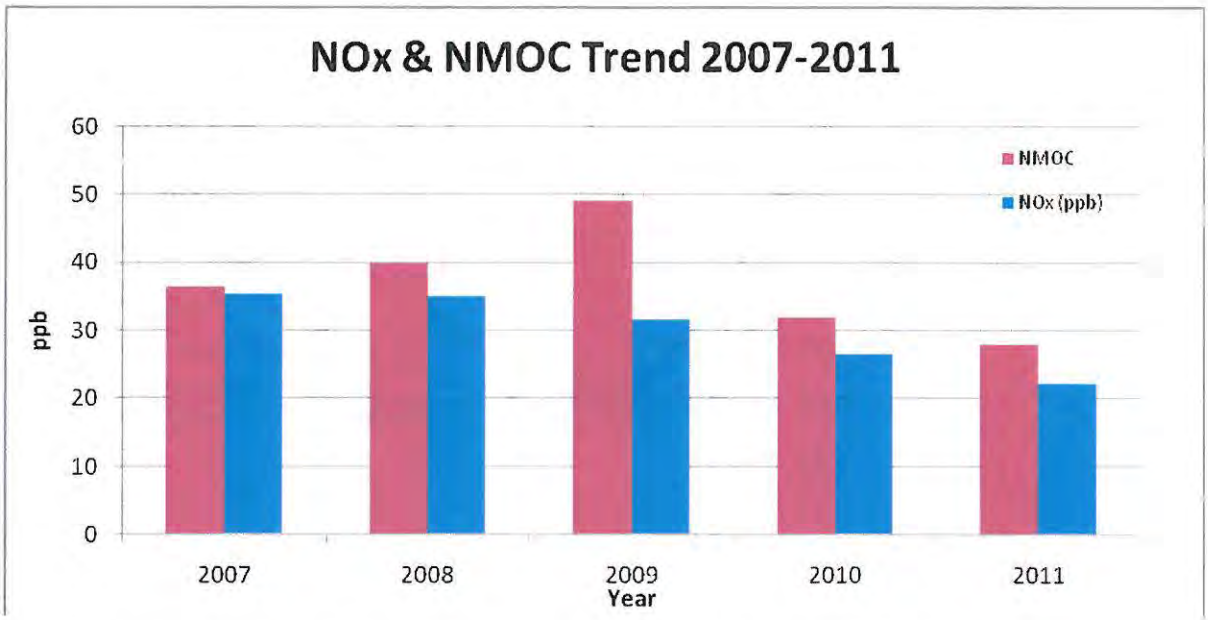
No outliers were detected among the aromatic and the oxygenated species. Aromatics tended to increase during January (12 – 25 ppb) and remained leveled for the rest of the year (5 – 10 ppb). Toluene continued along the same trend in addition to the concentration increased in July and September.



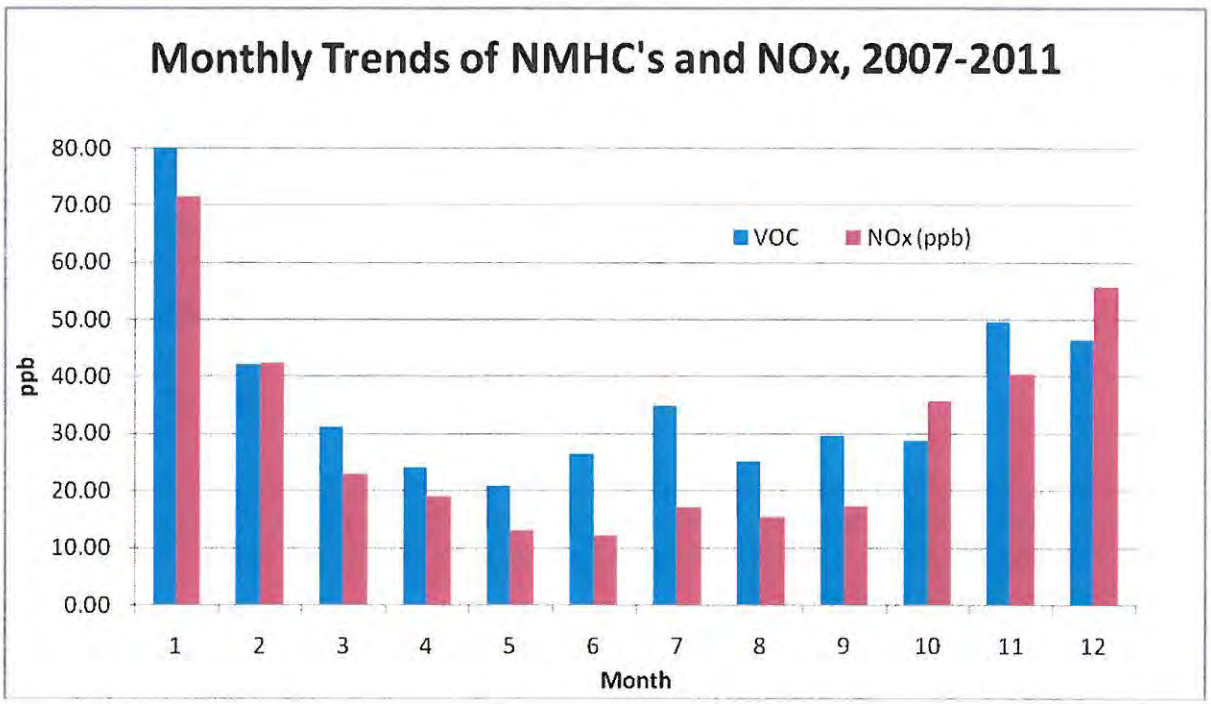
Acetone, and acetaldehyde concentrations were leveled throughout the year with a slight surge in July. Both species remained within the range of 0.5-1.0 ppb throughout the year. Formaldehyde presented a double-peak series with the apexes in February and July. Its lowest mean concentrations were observed in April, October, and December.



The analysis of NO_x data collected between 2007 and 2011 reveals that the mean annual concentrations of NO_x emissions are steadily decreasing. The oxides of nitrogen observed at the Bountiful station declined from the average value of 34.5 ppb in 2007 to 22.2 ppb in 2011. See the following figure.

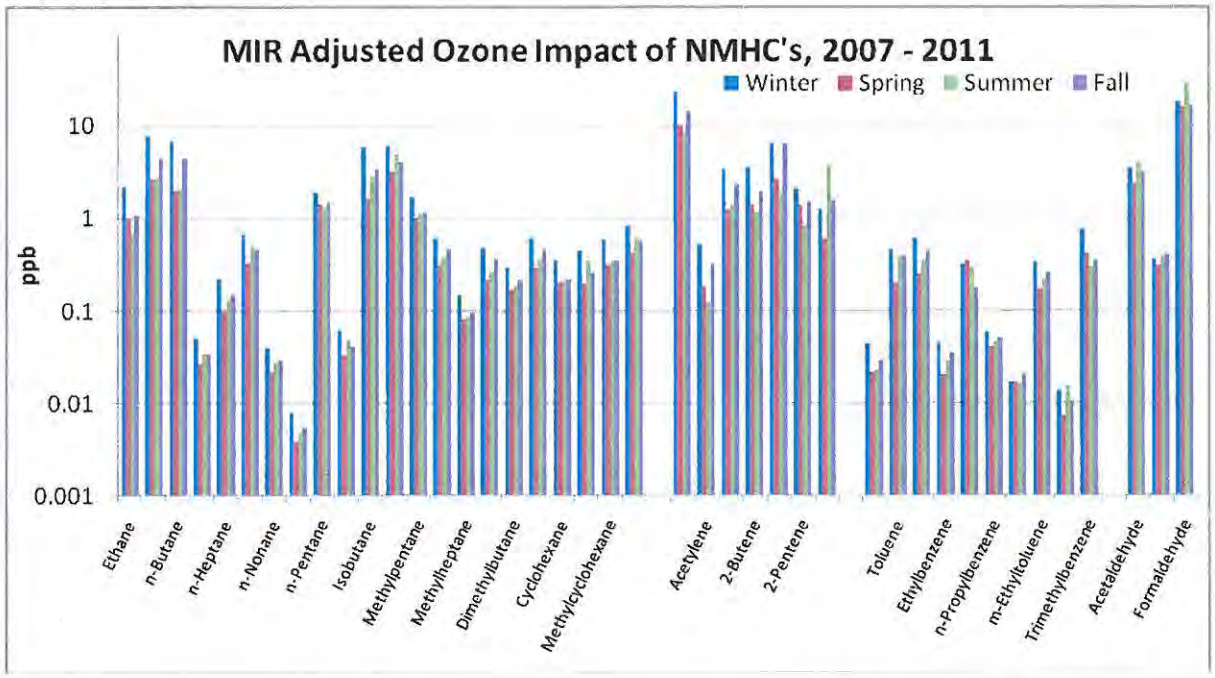


Mean monthly mixing ratios of NO_x present a pattern similar to the one of NMHC's. Maximum NO_x concentrations are observed during the late fall and winter months with a sharp decline between January and February. NMHCconcentrations generally tend to be above those of NO_x, with the ratio varying between 2:1 during the warm months (May through September) and 1:1 during the cold months. See figure.



The mean concentrations of NMHC species were multiplied by their respective MIR coefficients to estimate their theoretical ozone yields. This reflects the relative

contribution of NMHC species to ozone formation in model simulations for conditions that result in the maximum rate of ozone formation. = The MIR weighted VOC concentrations are not related to the actual observed ozone values but are useful in estimating the relative impacts of each of the NMHC species. The following figure shows the MIR adjusted ozone yields of the NMHC's observed at the Bountiful station between 2007 and 2011.



According to the MIR model formaldehyde, ethylene, acetaldehyde, isopentane, and isoprene are top five contributors to the ozone formation. Formaldehyde and ethylene account for approximately 52.0% of total ozone forming potential during the summer months, with acetaldehyde, isopentane, and isoprene accounting for roughly 17.7% in a fairly even manner. However, formaldehyde is a product of the oxidation of other VOC species, hence, formaldehyde mostly indicates the contribution of other VOC species to ozone formation.

Correlation analysis provided additional insights in the emission patterns of the NMHC's around the monitoring site. Some of the NMHC's demonstrated no significant correlation between any other monitored species or between themselves. These included 1-pentene, 2-pentene, diethylbenzene, isoprene, and tri-methylbenzene. Other groups of NMHC's, like methylated and dimethylated alkanes with the carbon chain length between 2 and 7 carbons display a high degree of internal correlation (above R^2>0.75).

Discussion

Between 2007 and 2011 the annual concentrations of NMHC displayed an upward trend for 2007, 2008, and 2009 followed by a sharp decline in 2010 and 2011. The A sharp difference in mean annual concentrations between 2008 and 2009 is observed mostly because of the skewedness of the 2009 data. A prominent decrease between 2009 and

2010 values is most likely caused by the decrease in manufacturing activity due to the economic downturn of 2008.

Seven of the forty one grouped species displayed an upward trend. These are ethyl- and diethylbenzene, formaldehyde, n-octane, styrene, xylene, and trimethylbenzene. All of these species are well identified with the emissions in industrialized urban areas. Ethyl- and diethylbenzene, styrene, xylene, and trimethylbenzene are commonlyemitted during the combustion of fossil fuels. Additionally, xylene and n-octane are used as solvents. (Barrefors and Peterson, 1995)

Formaldehyde stands alone in this group of species as it is the final stage of photochemical oxidation of organic species in atmosphere. Because formaldehyde is both emitted directly and formed chemically in troposphere it is difficult to locate its origination sources aside from what is reported to the state inventory. However, investigating the primary sources and the control strategies for ambient formaldehyde may be a valuable approach, since its high ozone forming potential and high ambient concentrations make it the biggest contributor to the formation of ambient ozone during the summer months.

The list of the following species displayed a downward trend between 2007 and 2011: acetone, ethane, propane, n-butane, isobutane, n-pentane, isopentane, methylpentane, n-hexane, cyclohexane, methylcyclohexane, n-heptane, n-nonane, n-decane, n-propylbenzene, trymethylpentane, ethyltoluene.

Ethane, propane, butane, and pentane constitute the four most abundant NMHC's observed at the Bountiful monitoring site between 2007 and 2011. Even though the ozone forming potential of these species is well below of their unsaturated or aromatic counterparts, their year-around abundance in the ambient makes them important factors in summertime ozone and wintertime $PM_{2.5}$ formation pathways.

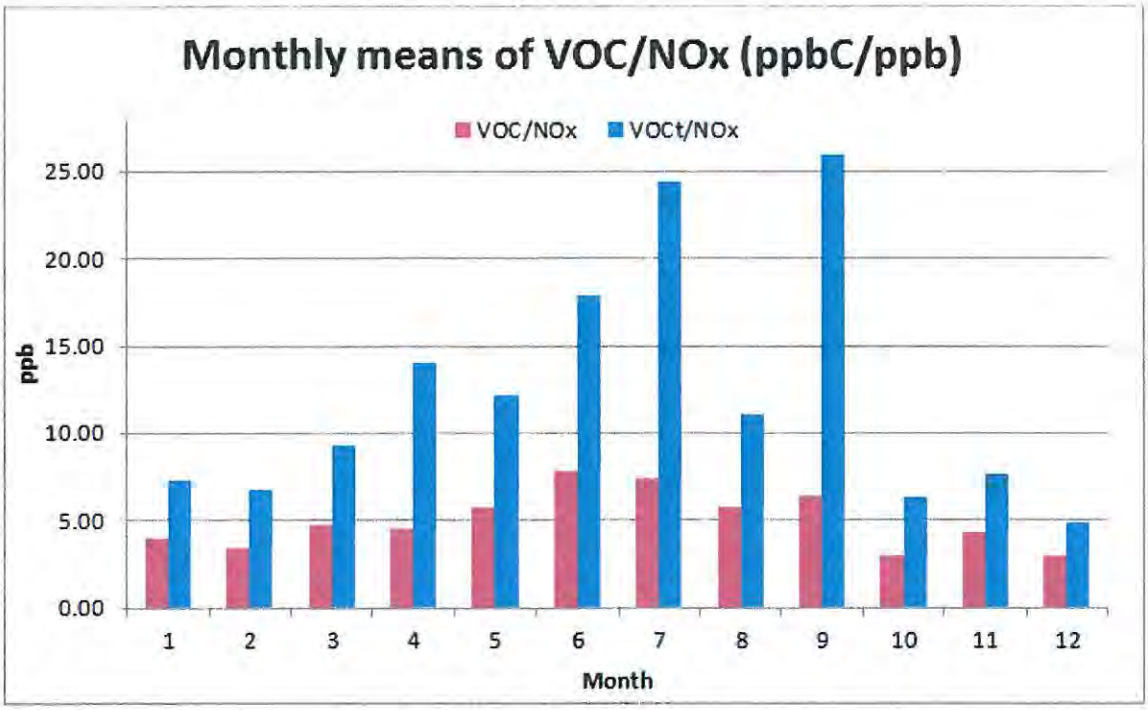
Ethane is the most abundant alkane in the atmosphere with primary sources of emission being exploitation and distribution of natural gas followed by biomass burning. (Rudolph 1995) It is unlikely that wildfires and controlled burnings account for any significant fraction of ethane emissions in Utah. Both wildfires and the controlled burns are infrequent and seldom have a prolonged impact on a regional scale during summer times. The highest observed concentrations of ethane are recorded during winters and are strictly related to the use of natural gas in the Salt Lake Valley.

Propane emissions are primarily related to petrochemical activity and the distribution of natural gas. Mean annual propane mixing ratio decreased sharply in 2010 (down from 7.88 ppb to 5.03 ppb) and continued to decrease through 2011. Interestingly, propane annual mixing ratios are higher than those commonly observed in other large metropolitan areas (Houston, TX, London; Jobson et all 2004, Derwent et all 2000). Investigation into the activity of the refineries located in the Salt Lake area and consulting with the natural gas distribution companies operating in the valley may reveal the reason for such pattern. The rest of the alkanes on the list are generally associated

with evaporation of fossil fuels (especially the ones stored in tanks, i.e. diesel, oils, etc.) as well as the use of solvents.

Seasonal variation of NMHC's is common to those observed in other urban industrialized areas. Wintertime concentrations of organics tend to be elevated because of the prolonged lifetimes (due to the decreased photochemistry and lower temperatures), stratification of the air, generally low horizontal air velocities, and the diminished mixing between the air layers. These factors are further amplified by the increased rate of the use of the natural gas and the higher emissions from the fossil fuel combustion ('cold starts'). This does not mean that the NMHC emission rates during summer are not above those in the winters. However, the increased summertime VOC emission rates are counteracted by the shortened lifetimes, higher wind velocities, and the lack of tight and persistent inversion layers.

A VOC/NO_x ratio presented in units of ppbC/ppb is often found useful in developing ozone control strategies. When adjusted for ppbC, monthly VOC/NO_x ratios of total organics present a bimodal environment with NO_x-limited ozone formation between March and September, and the VOC-limited regime dominating October through February. However, when the VOC (in ppbC) number is constructed by summing all of the monitored NMHC species, the VOC/NO_x ratio peaks near during July and September and continues well below that value for the rest of the year.



It is important to note that VOC/NO_x ratio is generally used for the determination of the limiting factor in ozone formation during warm, summer time, urban conditions. The generally accepted ratio of 8:1 is used to characterize the ozone formation during such conditions. Considering the results from the Uinta Basin study of 2011/2012

(unpublished), during the wintertime this ratio may shift further towards VOCs. Additionally, depending on the predominant species in the VOC mix (alkenes, short-chain, or long chain alkanes, or aromatics) the ratio can further deviate to be as high as 100:1.

One of the mechanisms through which VOC/NO_x ratio provides a direction for the control of ozone formation is by providing the reference to competition between the VOCs and $NO_2$for the hydroxyl radical (OH). In VOC limited conditions the OH termination reaction with NO_2 (to form nitric acid) is favored to the propagation reaction with the VOCs. During the NO_x limited conditions there is insufficient NO_2 to substantially titrate OH radical, which proceeds to formation of peroxy-VOC's which, in turn, bolsters the conversion of NO to NO_2 and the formation of ozone.

Considering this mechanistic approach, it is feasible to apply the summertime VOC/NO_x terms with respect to the secondary formation of $PM_{2.5}$ in wintertime. The OH-radical termination reaction with NO_2 resulting in nitric acid is believed to be the main source of the nitrate in the ammonium nitrate portion of $PM_{2.5}$. The ammonium nitrate fraction of $PM_{2.5}$ tends to vary between 50 –75% during the winter inversion pollution episodes in Utah. Controlling the formation of ammonium nitrate is likely to be the most efficient way of limiting the secondary $PM_{2.5}$ formation during the winter pollution events.

References:

Barrefors, G.; Peterson, G.; Volatile hydrocarbons from domestic wood burning. Chemisphere, **1995**, 21: 547-557

Rudolph, J.; The tropospheric distribution and budget of ethane. Journal of Geophysical Research- Atmospheres; **1995**, 100: 11369–11389

Jobson, B.T.; Berkowitz, C.M.; Kuster, W.C.; et al.; Hydrocarbon source signatures in Houston, Texas: Influence of the petrochemical industry. Journal of Geophysical Research- Atmospheres, **2004**, 109: D24305.

Derwent, R.G.; Davies, T.J.; Delaney, M., et al.; Analysis and interpretation of the continuous hourly monitoring data for 26 C-2–C-8 hydrocarbon at 12 United Kingdom sites during 1996. Atmospheric Environment, **2000**, 34: 297–312

SMOKE Model

1.0 THE SMOKE EMISSIONS MODEL

The emissions model used is the Sparse Matrix Operator Kernel Emissions Modeling System (SMOKE v2.6). The emissions processing model takes the annual, county-wide emissions inventory prepared by DAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory which, in the end, produces a refined version of the inventory.

1) Temporal processing: Convert emissions from annual to daily and hourly values.
2) Spatial processing: Convert emissions from a county-wide average to emissions in a 4 square kilometer grid cell.
3) Speciation: Break PM2.5 and VOC emissions into their component subspecies.

The emissions processing for air quality modeling is done with sets of activity profiles and associated cross reference files. These are created for point or large industrial source emissions, area sources which are small but spread out over large areas such as dry cleaning establishments and mobile sources such as automobile and truck traffic. The existing inventories of primary PM2.5 and PM2.5 precursors are modified to reflect typical winter conditions, augmented with an ammonia emission inventory, and reviewed thoroughly for accuracy and completeness. The 2008 annual inventory has been used to create the future year projection inventories.

The emissions from large industrial sources are placed in the location of the source itself. For area and mobile source emissions spatial surrogates are created. For example, the emissions from wood stoves for home heating are placed in the model using population density as the surrogate. Using this approach no wood stove emissions for home heating will be put into the model in areas of the county that are unpopulated. Emissions from automobiles are distributed using traffic estimates provided by the Metropolitan Planning Organizations.

Splitting the PM2.5 and VOC emissions into subspecies is done to allow the air quality model to process the chemical reactions in the atmosphere. Since the reaction of these subspecies in the air accounts for a significant part of the total PM2.5 concentrations along the Wasatch Front it is important to account for them. A set of chemical profiles and cross reference files is created from the EPA "Speciate 4.3" database is component of the SMOKE emissions model and is used for this processing. Once the emissions are speciated, the individual species serve as input to the air quality model.

Once cross reference tables are created to define the relationships between the annual emissions inventory and the temporal, spatial, and chemical aspects of the data the SMOKE emissions model is run. Temporal and speciation profiles have been updated as new information has become available over the last five years.

The majority of these changes are not time dependent, such as a diurnal profile or rush-hour traffic patterns, so the adjusted profiles are still current for the later-year inventories. Spatial profiles were updated to reflect changes in population and economic activity distributions as new socio-economic data was received.

1.1 Pre-model Inventory Adjustments

There were two adjustments made to the area source inventory and one to the mobile source inventory before being processed by the SMOKE model. These adjustments fall into two categories: 1) elimination of certain area source categories that are not relevant during the winter, and 2) a modification to the credit taken for wood smoke emissions when a "red burn" or "yellow burn" day is called in the nonattainment areas.

1.1.1 Seasonal Adjustment

The winter-time adjustment made to the area source inventory was the removal of ten categories of emissions that do not apply during the winter months. These are listed below and were removed from the base year episodes and the future year projections:

- nonroad, misc nonroad engines, "non-winter"
- non-agricultural, unpaved roads, dust
- agricultural, unpaved roads, dust
- construction, roads, dust
- asphalt paving, cutback
- biogenics
- agricultural land preparations
- agricultural harvesting
- agricultural burning
- fires, forest, all

1.1.2 Wood Smoke Emissions

For Cache County, an inventory reduction credit is given on the basis of an in-place voluntary program regarding residential wood burning. This credit is used to estimate the portion of the affected area source inventory. For the base year modeling, emissions from residential wood burning were reduced by 60% on the days when counties called for "red burn" conditions. They were also reduced by 40% if "yellow burn" conditions applied. Current regulations on residential wood burning are established for the following counties: Salt Lake, Utah, Weber and Davis. For these four counties, residential wood burning was reduced by 80% ("red burn") and 60% ("yellow burn"). While counties are generally flagged independently of each other, Davis County is flagged according to forecasted conditions in Salt Lake County.

To determine whether a day should be flagged, observed daily average PM2.5 was used rather than forecasted estimates (as is actually done). Although there was fair agreement between the two strategies, this choice was made to better facilitate comparisons in air-quality modeling with respects to possible wood-smoke mitigation strategies.

1.2 Temporal Processing

The goal of temporal processing is to provide more detail about the emissions inventory during the actual episode being modeled. For example, beginning with annual average data one first decides how the activity is distributed over the year. A larger proportion of emissions from home heating fuels will occur during the winter months as opposed to summer. Next would be the distribution throughout the month. For automobile emissions one might assume that there is a difference between the amount of daily driving done on the weekends and that done during the work week. Since both of the episodes run longer than one week the amount of mobile source emissions on the weekend and non-weekend days is adjusted accordingly. The final level of temporal refinement seeks to distribute the emissions throughout the day. If a particular industrial process operates seven days a week but only at night, those emissions will be put into the model only during those hours of operation.

Temporal profiles for on-road mobile sources are developed based on vehicle-miles-of-travel (VMT) data obtained from UDAQ. Temporal profiles are developed for urban and rural interstates for weekdays and weekends based on hourly VMT data. Figure 1 shows the VMT data used to develop temporal profiles to distribute on-road mobile source emissions for weekdays and weekends starting at midnight, MST.

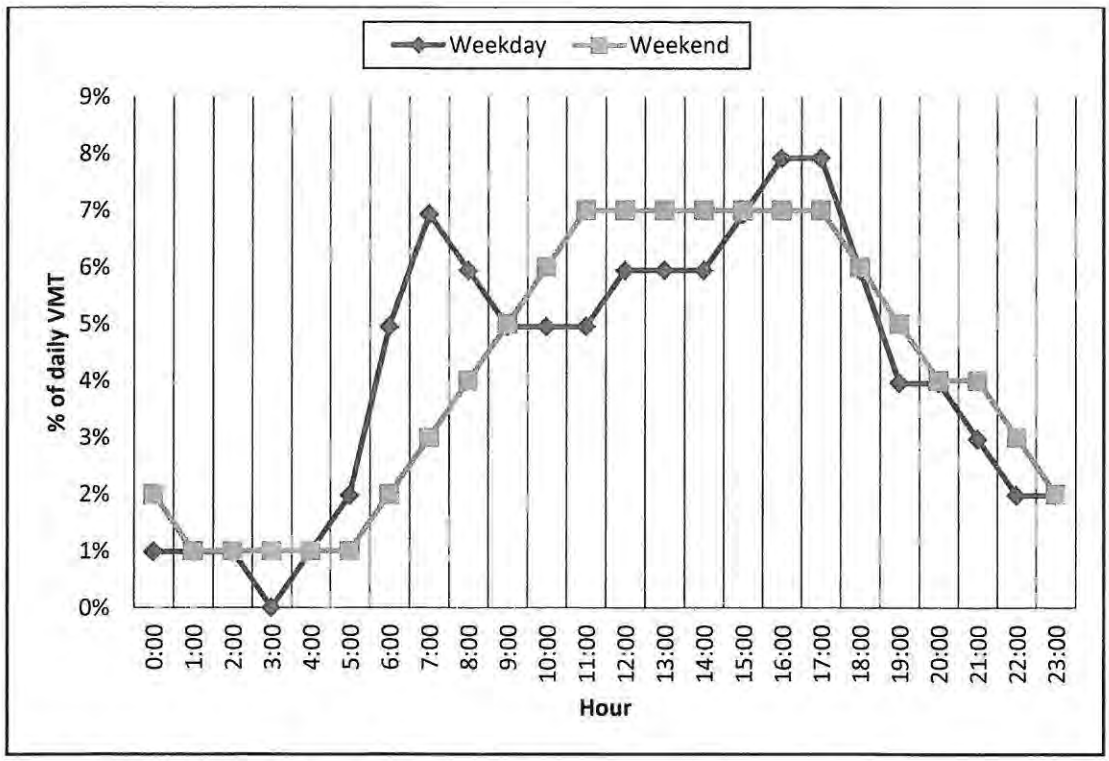


Figure 1. Temporal VMT distributions for weekday and weekend on-road mobile source emissions.

Development of area source temporal profiles began with investigating the EPA-recommended diurnal and weekly profiles assigned by SCC and the monthly profiles contained in the SMOKE emission inventory system. The EPA-assigned profiles are adjusted to reflect actual conditions

of different source categories within the Utah modeling domain. Several new diurnal profiles are created for specific source categories, the temporal profiles for which were not represented in the CARB temporal profile library.

Temporal profiles were developed for 56 individual point sources within the modeling domain that emitted over 100 tons of total PM2.5, SO_x, NO_x and VOC in calendar year 2008. All recommended temporal profiles are based on information supplied by affected companies.

1.3 Spatial processing

Before SMOKE, the emissions processing model, can be run to create input for the air quality model several types of data sets must be created using a geographic information system (GIS). This pre-processing allows the emissions to be distributed spatially to individual grid cells throughout the modeling domain.

The SMOKE emissions model is run at a 4x4 kilometer resolution and the modeling domain covers portions of 17 counties in northern Utah. The function of the emissions model in developing the air quality inputs is to allocate a generalized, county-wide annual emissions inventory into a much more detailed set of emissions. If day-specific information is available this can also be incorporated into the model. The inventory is processed through the emissions model to allocate the emissions to three different dimensions: spatial, temporal, and chemical speciation. This section describes the development of the files necessary for the spatial allocation of the emissions inventory. These files are created primarily with Arc GIS software creating modeling files in three different categories: land use, population density, and vehicle miles traveled, which is used as surrogates for the spatial distribution of certain emissions.

1.4 Population Density

Population density at a resolution of four kilometers for the 2008 base year is developed using three separate data sets. For the four Wasatch Front counties, which contain the urbanized area of the domain, population by traffic analysis zone is provided by the two metropolitan planning organizations (MPO). The Wasatch Front Regional Council (WFRC) provided data for Weber, Davis, and Salt Lake counties. The Mountainlands Association of Governments (MAG) provided data for Utah County. The remaining, outlying, counties in the domain used population estimates provided by the Governor's Office of Planning and Budget (GOPB).

Population by traffic analysis zone is very high-resolution data especially in densely populated areas. This data is converted to population density using GIS gridding techniques. The data is first converted to densities at 25-meter resolution to capture the fine scale boundaries of the traffic analysis zones. It is then aggregated to a four-kilometer resolution to create the population surrogates.

For the outlying counties population is developed from estimates of population within corporate boundaries and the remaining population in the unincorporated areas of the county (http://www.governor.state.ut.us/dea/Profiles/Data/data.html). Using corporate boundaries in the

GIS, town populations are placed within those boundaries. Remaining population is assumed to be spread evenly across the rest of the area of the county. Gridded population in the outlying counties is then created in the same manner as that done for the four Wasatch Front counties. Finally, all three data sets are combined into one gridded population data set for the entire modeling domain.

1.5 Mobile Sources

Mobile source emissions data is distributed to the modeling grid using a combination of link-based data and county totals. The data based on county-wide VMT is distributed using population density as a surrogate. As with the population data, the VMT distribution is based on several different data sources. The MPO's provided link based data for VMT on arterial roads and freeways for the four Wasatch counties. UDOT provided link based VMT for state roads and interstates in the outlying counties as well as estimates of VMT driven on local roads.

Because link based VMT does not exist for VMT on local roadways the distribution of local VMT is created by the use of population surrogates. This is done for all counties in the domain.

1.6 Final Emissions Surrogates

The final output from the all of the GIS processing is an ASCII file that has the percent of each surrogate in the grid cells within each county. The extraction and recombining of the various GIS coverage into the final data set is done mostly through programming code in the Arc GIS programming language, AML.

Extensive quality control is done throughout all phases of the surrogate creation to insure that correct percentages of each category are maintained in the individual grid cells. Below is the complete list of surrogates for mobile and area sources that is used SMOKE for all of the episodes used in this modeling analysis.

1.6.1 Surrogate Descriptions

50	Population
55	Urban
60	Area
61	Forest
62	Agriculture
63	Water
71	Airports
74	Railroads
80	POTW
81	Landfills
20	Interstate Highways
40	Arterial Roads

Rural arterial roads are a separate surrogate because of the way VMT is reported by UDOT for the outlying counties. The emissions are distributed using a road network, and additional VMT is reported in the towns and outlying parts of the county for this surrogate.

1.7 Speciation

Speciation profiles from the U.S. Environmental Protection Agency's (EPA) SPECIATE4.3 library, the California Air Resources Board (CARB) speciation profile library, and road dust speciation profiles from a report prepared for the Colorado Department of Transportation (Cowherd, 1998) are compiled to develop a library of VOC and PM2.5 profiles for use in emissions processing. The raw VOC and PM2.5 profiles contain many different chemical species and these are all provided as the default speciation database within SMOKE.

The EPA default speciation profiles assigned to each area source category were reviewed to determine if the assignment is representative of emissions in Utah. In several cases, the EPA default speciation profile assignments are changed to better represent emissions processes and/or fuel types for Utah.

1.8 Non-Road Sources

Non-road mobile sources are comprised of three main source categories: miscellaneous non-road engines, locomotives and aircraft. Miscellaneous non- road engine emissions were computed by using the EPA NONROAD Model, version 2008.1.0. Locomotive emissions were estimated by applying EPA emission factors to the total amount of fuel used by locomotives. Aircrafts emissions were estimated by applying aircraft specific activity data and *Emissions Dispersion Modeling System (EDMS)*, version 5.1.2.

1.9 Idaho and Wyoming Inventory

Since the Cache Valley extends into Idaho, Utah is providing the air quality modeling to the state of Idaho in support of their SIP for the nonattainment area that extends into Franklin County, Idaho. To provide this analysis UDAQ extended the domain northward a significant distance north of Franklin County to avoid model edge-effects in the air quality model results.

Idaho Department of Environmental Quality (IDEQ) staff provided the emission inventory inputs. Area and mobile source emissions are distributed by population density. Point source emissions are located in the appropriate cells by location.

Parts of three counties in southwest Wyoming are also in the modeling domain simply because the domain is rectangular and extends to eastward and northward limits that encompass part of the state. Regional transport of emissions during winter time inversions is insignificant. Since Wyoming is far-removed from the problem valleys in the Utah and Idaho the emissions inventory is for Wyoming is based on the 2005 NEI data and is distributed throughout the portions of the counties in the domain using population surrogates

1.9.1 Wyoming

Wyoming emissions were downloaded from the WRAP EDMS data base. The version of the inventory used is version 11, 2005 preliminary. Emission inputs and SMOKE output reports were sent to Wyoming DEQ on January 13, 2010 for review. There is one point source in the UDAQ modeling domain in Wyoming. All other emissions are distributed throughout the Wyoming part of the domain using population density as a spatial surrogate. Figure 2 shows the population spatial surrogate used in the model. Portions of the entire county emissions inventory were used depending on the proportion of the total county population is covered by the modeling domain. These values were derived using a GIS to convert population by census-block-group into a value of population density for each grid cell in the domain.

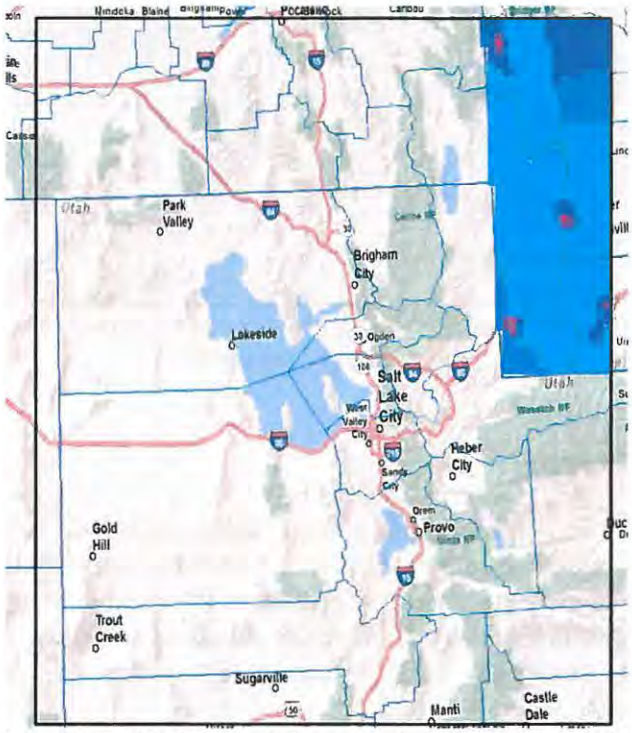


Figure 2. Portion of Wyoming in UDAQ modeling domain. Shows population density and nonpoint distribution of emissions.

1.9.2 Idaho

A 2008 emissions inventory for the Idaho counties in the modeling domain is provided by IDEQ (Idaho Department of Environmental Quality). Emissions are distributed in the domain with the same methods used for Wyoming. Figure 3 shows the population spatial surrogate used in the model. For future-year projections, the inventory is generally held "flat", assuming no growth. However, Idaho mobile on-road is modeled for 2014 and 2019 and livestock inventories for Franklin, Idaho are projected to 2014 and 2019 by IDEQ.

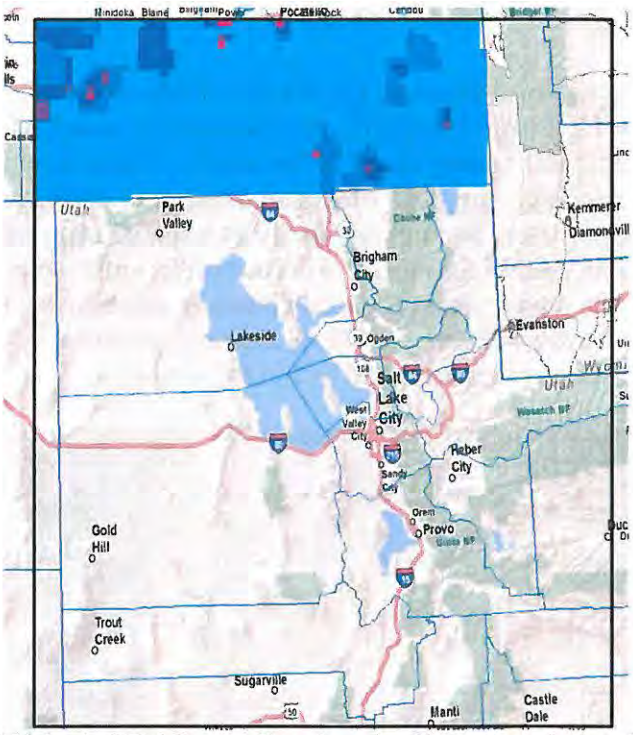


Figure 3. Portion of Idaho in UDAQ modeling domain. Shows population density and nonpoint distribution of emissions.

1.10 Concluding Remarks

UDAQ is confident in our emissions modeling. Several strategies have been implemented for quality control purposes and we have successfully run SMOKE on dozens of occasions. Such emissions model runs have included inventory projections, control strategy analyses and photochemical model sensitivity testing. Getting the emission modeling correct is important since it provides the basis for our air-quality modeling. This is further explained in the photochemical modeling section.

MATS TSD

MATS Technical Support Documentation

I. What is MATS?

MATS (Modeled Attainment Testing Software) is a software utility developed by the EPA. The version of MATS that we refer to in this document is 2.3.1, the most up-to-date version at this time. Using ambient monitor data and air-quality model (CMAQ) output, MATS determines a future-year design value (FDV) that is evaluated against the ambient air quality standard (AAQS) for daily average $PM_{2.5}$. The EPA sets the current AAQS to 35 $\mu g/m^3$.

It should be noted that MATS incorporates the methodology discussed in EPA guidance[1] for daily $PM_{2.5}$ attainment testing. MATS includes the ability to use the SANDWICH technique to post-process monitor observations from the Speciation Trends Network (STN). The purpose of SANDWICH is to artificially adjust observational speciation data as to be similar to a theoretical Federal Reference Method (FRM) monitor filter placed at the same location. This adjustment is attractive because the AAQS is based on the FRM.

Using SANDWICH involves calculating the amount of nitrate (NO_3) that would theoretically not have volatized on an FRM filter prior to laboratory analyses. This adjusted nitrate value is referred to in the MATS documentation as "retained" nitrate. Retained nitrate estimations are a function of hourly relative humidity and ambient temperature observations. MATS does not have the ability to calculate retained nitrate. Instead, UDAQ performs this calculation using AQS observations and equations explained in Chang et al, 2000[2]. MATS makes use of these retained NO_3 estimates to derive the amount of organic carbon (by mass balance) as well as the portion of $PM_{2.5}$ consisting of particle bound water.

Then, MATS spatially interpolates the speciation profiles found at our three STN monitors to the eleven FRM monitors in our modeling domain. These profiles are then used to determine future-year design values at each monitor.

MATS requires four data-sets: "official" $PM_{2.5}$ concentrations, "unofficial" $PM_{2.5}$ concentrations, base-year (baseline) episodic model data and future-year episodic model data. $PM_{2.5}$ concentrations span the five years from 2006 to 2010. To determine a baseline design value (BDV) at each monitor, MATS will perform a moving average (using a three-year window) over the five years giving weighted emphasis to the year, 2008. This choice reflects our baseline inventory year of 2008.

---

[1] http://www.epa.gov/ttn/scram/guidance_sip.htm

[2] http://www.usc.edu/dept/civil_eng/aerosol/papers/AE34(1)85-98.pdf

Computing future-year design values requires the construction of relative response factors (RRF's) from our air-quality model output. For each modeled day, we take the largest modeled $PM_{2.5}$ value over the nine 4km grid-cells centered over the monitor location. The maximum is taken, as opposed to the average cell-value, to avoid the spurious influence of high mountain terrain. We note that our air-quality modeling uses modeled meteorology for the period, December 13, 2009 to January 20, 2010. This period is notable for containing several days of daily $PM_{2.5}$ AAQS exceedances.

Relative response factors are a function of the largest 35%, in terms of $PM_{2.5}$ concentration, of baseline modeled episode days as well as future-year (2014 or 2019) modeled episode days. For each of seven $PM_{2.5}$ species, an RRF is formulated by dividing the species average for the highest future-year days over the corresponding average for base-year days. These seven species are: sulfate (SO_4), NO_3, organic carbon (OC), elemental carbon (EC), crustal material, ammonium (NH_4) and particle bound water (PBW).

Then, species-specific RRF's are multiplied by their corresponding component baseline design values to produce seven FDV's. Finally, FDV's are summed to form a daily $PM_{2.5}$ FDV that can be compared directly to the AAQS. Future-year design values are calculated for each FRM and STN monitor location.

II. MATS Parameterization

The online documentation[3] gives the best overview for using MATS. However, this section is intended to illuminate the specific MATS options that we use in our analysis.

Data Input

For input, we supply daily STN and FRM monitor data as well as daily model data in a MATS-specific comma-delimited text (CSV) format. For species fractions calculations, we supply STN monitor data for 2008, only. For FRM sites, we provide five years of data (2006 – 2010).

Species Fractions Calculations Options

If the EPA has flagged specific days for quality-control concerns, these days are removed from the analysis. We require at least eleven days of valid data per quarter for all monitors (STN and FRM) in our modeling domain. At a minimum, we require one valid quarter for STN monitors and all four quarters must be valid for each FRM site. Finally, we require at least one valid year for all monitors.

For all monitors, only the largest 10% of daily monitor data - in terms of observed $PM_{2.5}$ concentration – are used to create speciation profiles. We use DON (degree-of-

[3] http://www.epa.gov/scram001/modelingapps_mats.htm

neutralization for sulfate) values and use default settings for interpolation options, assumed blank mass concentration and organic carbon mass balance calculations.

$PM_{2.5}$ Calculation Options

For our five-year data-set of FRM data, we require at least one valid design value period. For future NH_4 calculations, we use baseline DON values. Spatial interpolation options, "blank mass" amount and boundaries used OC mass estimation are left set at MATS default values (please see MATS documentation).

Model Data Options

As previously mentioned, we select the maximum modeled concentration for baseline and future years, a 3 x 3 gridded window around each monitor in order to account for possible temporal variability in our air-quality modeling. To construct RRF's, we consider the highest 35% percent of such values over the entire episode. This percentage is selected to best capture the unique $PM_{2.5}$ speciation seen during Utah's winter-time high concentration days.

III. MATS Results

Using MATS, we derive a baseline design value and four forecasted results (FDV's) for each FRM monitor. For each of two years, 2014 and 2019, we model a forecasted projected baseline ("Business-As-Usual"), using population and economic growth factors, and a "Control Basket" that considers a multitude of strategies for controlling future pollution. For each of the three Utah non-attainment areas (NAA's), the corresponding three tables display these results using the parameterization discussed in the previous section.

	2008	2014		2019	
	Observed	Business-As-Usual	Control Basket	Business-As-Usual	Control Basket
Brigham City	31.1	28.3	26.7	27	24.3
Bountiful	36.9	34	33.3	30.8	28.5
Magma	30.8	29.3	29	28.4	24.7
Hawthorne	45.9	43.9	42.6	40.5	35.9
Rose Park	39.1	37.6	36.8	36.4	31.5
Ogden	38.1	35.9	34.3	36.7	32
Harrisville	35.8	33.7	31.8	32.2	28.4
Tooele City	22	20.7	20.6	20	19.1

Table 1: 24-hr $PM_{2.5}$ Design Values in $\mu g/m^3$ for the Salt Lake City-Ogden-Clearfield NAA.

	2008	2014		2019	
	Observed	Business-As-Usual	Control Basket	Business-As-Usual	Control Basket
Logan	39.5	36.8	33.9	35.3	29.9

Table 2: 24-hr $PM_{2.5}$ Design Values in $\mu g/m^3$ for the Logan NAA.

	2008	2014		2019	
	Observed	Business-As-Usual	Control Basket	Business-As-Usual	Control Basket
North Provo	38	37.8	35.9	37.2	32.8
Lindon	44.8	45.5	44	43.8	39.5
Spanish Fork	38.3	37.9	34.3	36.7	32

Table 3: 24-hr $PM_{2.5}$ Design Values in $\mu g/m^3$ for the Provo-Orem NAA.

Appendix

List of MATS input files used in our analysis available on supplementary technical support documentation compact-disc:

- *after_98perc.csv*; Observed "Official" FRM monitor data.
- *CMAQ_2008_Base.csv*; Baseline model data.
- *CMAQ_2014_Base.csv*; Forecasted baseline model data for 2014.
- *CMAQ_2014_Basket.csv*; Control basket model data for 2014.
- *CMAQ_2019_Base.csv*; Forecasted baseline model data for 2019.
- *CMAQ_2019_Basket.csv*; Control basket model data for 2019.
- *Unofficial_PM.csv*; Observed "Unofficial" FRM monitor data.
- *UT_DAQ_Spec-f-Frac-0610.csv*; Observed STN monitor data.

Meteorological Modeling

$PM_{2.5}$ State Implementation Plan

Meteorological Modeling

Prepared by:

Utah Division of Air Quality
195 North 1950 West
Salt Lake City, Utah84116

18 September 2012

1.0 Meteorological Modeling

The Weather Research and Forecasting (WRF), Advanced Research WRF (WRF-ARW) model version 3.2 was used in the PM2.5 State Implementation Plan for the Salt Lake City-Ogden-Clearfield, Provo-Orem, and Logan Non-Attainment Areas. WRF contains separate modules to compute different physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics, and atmospheric radiation. Within WRF the user has many options for selecting the different schemes for each type of physical process. There is also a WRF Preprocessing System (WPS) that generates the initial and boundary conditions used by WRF, based on topographic datasets, land use information, and larger-scale atmospheric and oceanic models.

This meteorological modeling component of the Technical Support Document will be given in three sections. First, a model configuration section will detail how WRF was configured to run the PM2.5 episode simulations. This section will include information on the modeling domain, model resolution, initial and boundary conditions, physical process schemes, and model nudging techniques. Second, a section will be dedicated to WRF model performance. Third, a section will be dedicated to additional work UDAQ performed in support of the meteorological modeling.

1.1.0 WRF Model Configuration

Typically, Utah's exceedances of the PM2.5 NAAQS are episodic and occur in the wintertime. The meteorological situation that leads to elevated wintertime PM2.5 begins with synoptic scale high pressure over the Intermountain Region of the U.S. Under this high pressure, stable cold air boundary layers with weak winds develop in the valley basins of the complex terrain trapping precursors (e.g., NOx) and particulates (e.g., PM2.5). These wintertime stable boundary layers are very challenging to simulate using mesoscale meteorological models. This section will detail UDAQ's configuration of WRF to simulate wintertime stable boundary layer episodes.

1.1.1 Modeling Domain and Resolution

The modeling grid, which was originally set up with the coordination of NCAR and the Army Dugway Proving Ground Division of Meteorology, uses a Lambert Conformal projection with a pole of projection of 40 degrees North, -97 degrees East and standard parallels of 33 and 45 degrees (Table 1.1).

The WRF simulations used three one-way nested horizontal with horizontal grid spacing of 36 km, 12 km, and 4 km, respectively (Table 1.2). Domain 1 covers all of the Western U.S. (Figure 1.1). Domain 2 is made up of much of the Intermountain West centered over Utah (Figure 1.2). Domain 3 encompasses the Wasatch Front of Northern Utah along with the Cache Valley that extends into Southern Idaho (Figure 1.3).

The vertical resolution is an important component in modeling wintertime cold pools. Table 1.3 gives the vertical domain in both sigma and height coordinates. This vertical resolution was chosen as it matched the NCAR's resolution for the domain they use for

simulations over northern Utah. Prior to having in-house capability to run WRF, UDAQ collaborated with NCAR to provide WRF and MM5 meteorological data to support UDAQ's wintertime photochemical modeling efforts. So when UDAQ developed in-house WRF resources, it was decided to match the horizontal and vertical domain of NCAR.

There are 10 layers below 600 meters and 13 layers below 900 meters, which typically forms the top of the wintertime stable boundary layer. It is thought that increasing the vertical resolution near the surface will help the model resolve the vertical temperature structure within the boundary layer and improve wind speeds and direction. UDAQ did an exhaustive amount of sensitivity testing to analyze the effects increasing vertical resolution near the surface. There was little benefit to the WRF performance of surface temperatures, winds, and the vertical temperature profile near the surface when vertical resolution was increased in varying degrees. Also, the higher vertical resolution did not improve CMAQ photochemical modeling performance. In fact, CMAQ performance often degraded with increased vertical resolution. In the end, it was decided to use the vertical resolution presented in Table 1.3, which is the original resolution set up by NCAR.

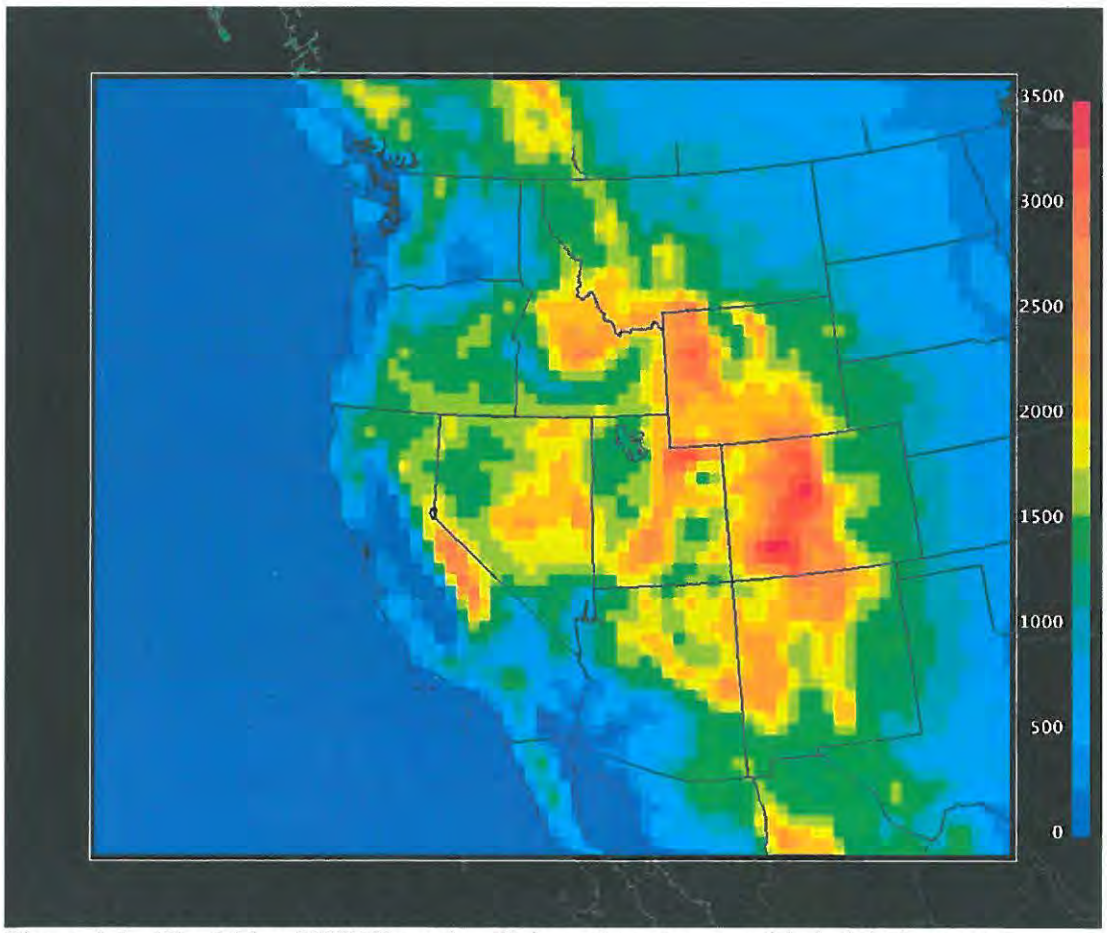


Figure 1.1: The 36 km WRF Domain. Colors show topographic height in meters.

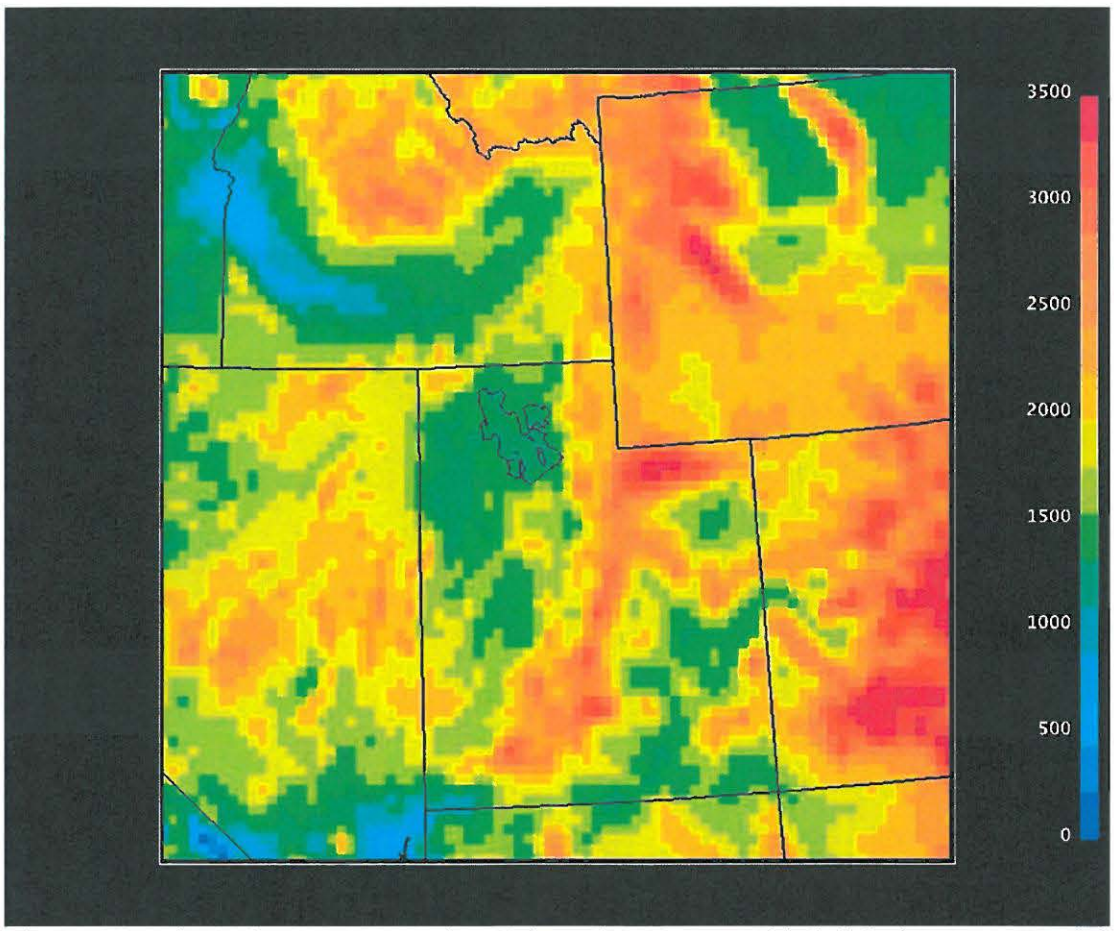


Figure 1.2: The 12 km WRF Domain. Colors show topographic height in meters.

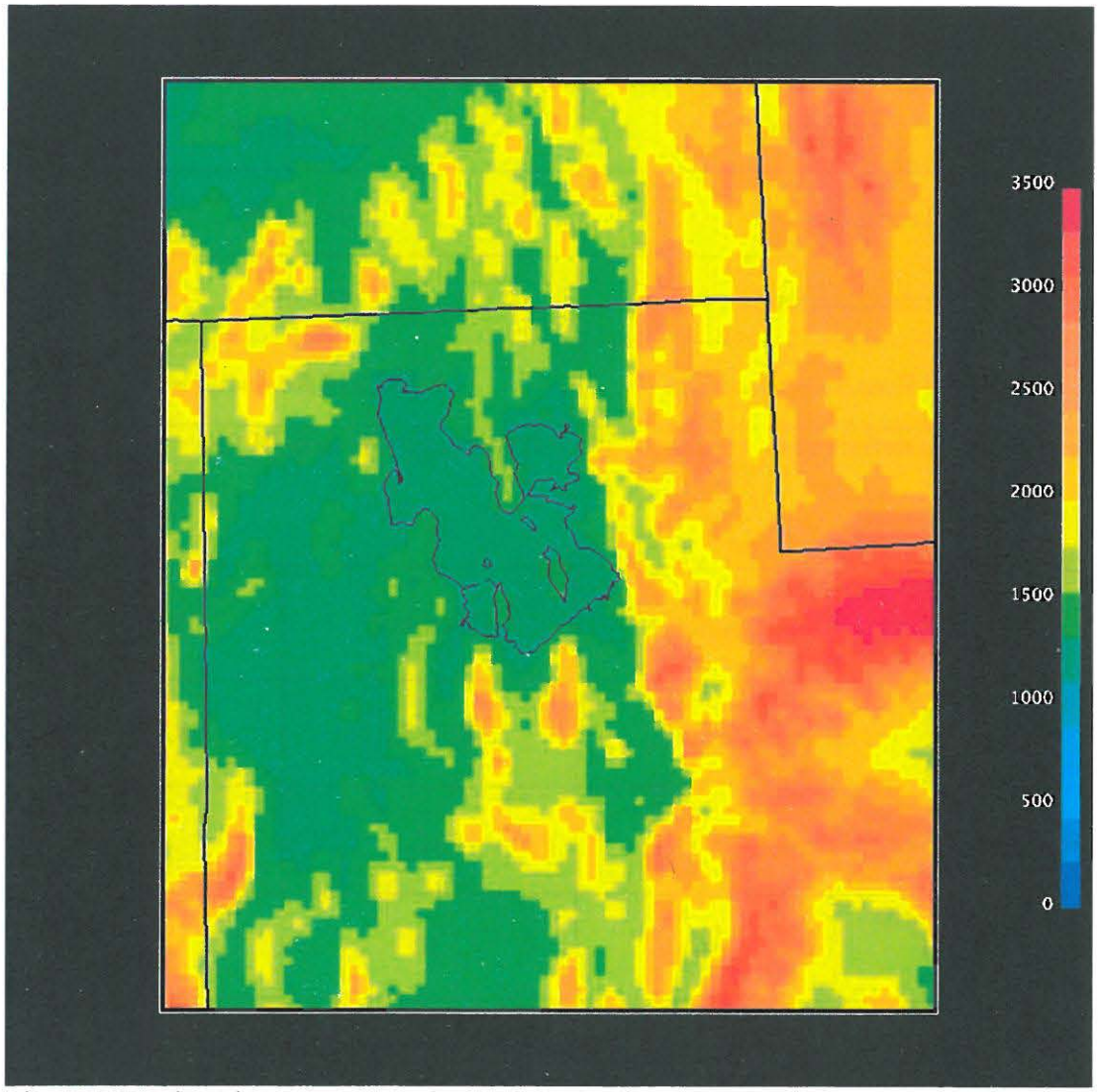


Figure 1.3: The 4 km WRF Domain. Colors show topographic height in meters.

Projection	Lambert conformal
Reference latitude, longitude	45.0, -115.49
True latitudes	30.0, 60.0
Standard longitude	-115.490
Initial and Boundary conditions	NAM 218 Re-analysis

Table 1.1: Grid definitions set up in the WRF Preprocessor System (WPS)

	Domain 1	Domain 2	Domain 3
Grid Size (x by y)	82 x 70	82 x 82	82 x 100
Horizontal Resolution (km)	36	12	4
Model Time Step (seconds)	90	30	10
Topographic Dataset	USGS 10 m	USGS 5 m	USGS 2 m
Re-Initalization Segments	5.5 days	5.5 days	5.5 days

Table 1.2: WRF model grid configurations, time steps, and topographic information for all three modeling domains

Model Layer	Sigma	Height (meters)
34	0.000	14,662
33	0.050	12,822
32	0.100	11,356
31	0.150	10,127
30	0.200	9,066
29	0.250	8,127
28	0.300	7,284
27	0.350	6,517
26	0.400	5,812
25	0.450	5,160
24	0.500	4,553
23	0.550	3,948
22	0.600	3,448
21	0.650	2,942
20	0.700	2,462
19	0.740	2,095
18	0.770	1,828
17	0.800	1,569
16	0.820	1,400
15	0.840	1,235
14	0.860	1,071
13	0.880	911
12	0.900	753
11	0.910	675
10	0.920	598
9	0.930	521
8	0.940	445
7	0.950	369
6	0.960	294
5	0.970	220
4	0.980	146
3	0.985	109
2	0.990	73
1	0.995	36
	1.000	0

Table 1.3: Vertical layer structure used in WRF

1.1.2 Topographic Inputs and Land Use Data

Topographic information was developed using the standard WRF databases (Table 1.2). Domain-1 was based on 10 min. global data, Domain-2 on 5 min. global data, and Domain-3 on 2 min. global data.

Vegetation type and land use information was developed using the USGS 24-category dataset that is available in the WRF Preprocessor System.

1.1.3 Initial and Boundary Conditions

The initial and Domain-1 lateral boundary conditions were obtained from the 12 km North American Model (NAM) archives from the NOAA National Operational Model Archive and Distribution System (NOMADS) website maintained by the National Climate Data Center.

1.1.4 FDDA Data Assimilation

WRF was run using Four Dimensional Data Assimilation (FDDA), applying a combination of analysis nudging, surface analysis nudging, and observational ('obs') nudging. The details of the type of nudging used on each domain and the strength of the nudging is shown in Table 1.4.

The OBSGRID module in WRF was used to produce gridded objective analyses that were used for nudging. The output files of OBSGRID can be used for 3D and surface analysis nudging and 'obs' nudging within WRF. OBSGRID takes as input raw WMO observations (both surface and upper air). It also uses the output from WPS, which consists of large-scale gridded NAM data horizontally interpolated to the model grid to be used in WRF.

For UDAQ's 4 km Domain-3, the only upper air observation available for nudging was the radiosonde launched from the Salt Lake International Airport (KSLC). The surface stations used for nudging in Domain-3 were gathered using NOAA's Meteorological Assimilation Data Ingest System (MADIS).

Analysis nudging is applied to Domain-1 and Domain-2, while 'obs' nudging is applied to the 4-km Domain-3. The 'obs' nudging of temperature and moisture are applied in the boundary layer; however the 'obs' nudging of wind is not. This is because we apply surface analysis nudging to wind in Domain-1.

The technique of using the surface analysis nudging was designed to help replicate the light near-surface wind speeds that are observed during cold pools, which WRF struggles to reproduce. The strategy was to modify the surface analysis grid file and reduce the 10 m wind speed to 25% of its original value. This was done for all gridpoints where the elevation was less than 1550 m, in order to take care of the all the valleys in the domain. For the level from 1550 m to about 2500 m, wind speed was reduced progressively less so that at 2500 m the original wind is used. The rational was to eliminate any distinct boundaries in the wind field to avoid discontinuities in the solution.

Table 1.4: Nudging techniques used in WRF.

		Domain 1	Domain 2	Domain 3
Analysis Nudging	Is it used?	Yes	Yes	No
	Strength (G) of Nudging (s-1)	0.0003	0.0003	0.0003
	Used in boundary layer	Yes	Yes	-
Surface Analysis Nudging	Is it used?	Yes	Yes	Yes*
	Strength (G) of Nudging (s-1)	0.0003	0.0003	0.0004
	Used in boundary layer	Yes	Yes	Yes
Observational Nudging	Is it used?	No	No	Yes+
	Strength (G) of Nudging (s-1)	-	-	0.0004
	Used in boundary layer	-	-	Yes

*Surface Analysis Nudging was used for just wind in Domain 3.
+Observational Nudging was used for just temperature in Domain 3.

1.1.5 WRF Physics Options

The WRF physics options that were used are given in Table 1.5. The selection of planetary boundary layer (PBL) is of importance for Utah wintertime modeling. The ACM2 (Pleim-Xiu) PBL scheme was ultimately chosen for WRF. It was chosen because it keeps consistency in the PBL schemes used in MCIP and also uses new and improved stable boundary layer code (module_bl_acm.F.SBL2010.v3). This was developed by EPA ORD and provided to UDAQ during February 2010. Other PBL schemes were

tested by UDAQ, but none provided results that were improved enough to make a change from the ACM2 scheme. Since ACM2 PBL was used, the Pleim-Xiu surface layer scheme and Pleim-Xiu Land Surface Model were also chosen.

Table 1.5: Physics Options used in WRF

Physics Option	**Option Selected**
Microphysics	Lin et al. scheme
Longwave Radiation	rrtm scheme
Shortwave Radiation	Dudhia scheme
Land Surface Model (LSM)	Pleim-Xiu scheme
Planetary Boundary Layer (PBL)	ACM2 (Pleim) scheme
Surface Layer	Pleim-Xiu scheme
Cumulus parameterization	Kain-Fritsch scheme

1.2.0 WRF Performance Evaluation for 2009-2010 Episode

This section describes the model performance evaluation (MPE) of the WRF meteorological model. The MPE will focus primarily on the meteorological properties that are important to Utah's wintertime PM2.5 episodes. These include WRF results for snow depth, surface temperature, wind speed and direction, and the vertical temperature structure in the planetary boundary layer.

1.2.1 Performance Evaluation Observational Dataset

UDAQ's Air Monitoring Center maintains several air monitoring sites throughout the Salt Lake City-Ogden-Clearfield, Provo-Orem, and Logan Non-Attainment Areas (Figure 3.4). These monitoring sites will provide datasets that will be used to evaluate the performance of WRF. The performance evaluation will focus on the Hawthorne and Ogden monitor for the Salt Lake City-Ogden-Clearfield NAA, the Lindon monitor for the Provo-Orem NAA, and the Logan monitor for the Logan NAA. Performance for the remaining sites will be shown in Appendix A.

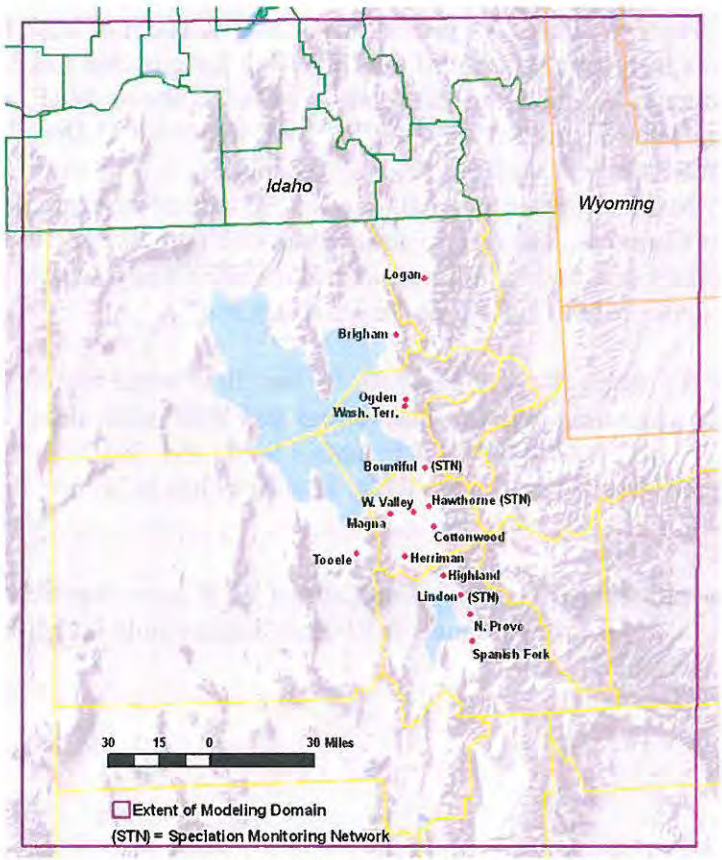


Figure 1.4: UDAQ monitoring network.

1.2.2 Snow Depth and Snow Cover

Snow depth and cover is believed to be important in the development and strength of the temperature inversions during wintertime in Utah basins. Likewise, snow depth is thought to play a significant role in the formation of secondarily formed ammonium nitrate, which makes up a large portion of the overall PM2.5 in Utah.

The observed snow depth and WRF snow depth is shown over Northern Utah in Figures 3.4 – 3.7. Figure 3.4 shows the observed snow depth for 25Dec. 2009 in inches over the Intermountain West region. It is provided by NOAA's National Operational Hydrologic Remote Sensing Center (NOHRSC). Along the Wasatch Front the observed snow depth ranges from 1 to 4 inches. There is a pocket of no snow to south of Utah Lake in Utah County and an area just south and east of the Great Salt Lake in Salt Lake and Davis Counties with a trace to 0.5 inch in snow depth. Figure 3.5 shows WRF snow depth for 25 Dec. 2009 in meters. Figure 3.5 shows WRF snow depth for 25 Dec. 2009 in meters. Snow depths in WRF range from 0.02 meters (~0.8 inches) in the western parts of the Salt Lake County basin to greater than 0.05 meters (~2 inches) in eastern Salt Lake, Utah, Davis, and Weber Counties. The lack of snow south of Utah Lake and to the immediate south and east of the Great Salt Lake is replicated in WRF. The Cache Valley shows significant snow depth in both WRF and the observations.

Figure 3.6 shows the observed snow depth for 03 Jan. 2010 while Figure 3.7 gives WRF snow depth for the same time period. Observations and WRF snow depth are in the 1 to 4 inch range for Salt Lake, Davis, and Utah Counties for 03 Jan. 2010. The snow depth increases in both the observations and WRF to 4 to 10 inches in Weber, Box Elder, and Cache Counties.

These are two examples showing the performance of WRF snow depth. Looking throughout the 2009-2010 episode shows WRF does a reasonable job replicating snow depth over Northern Utah.

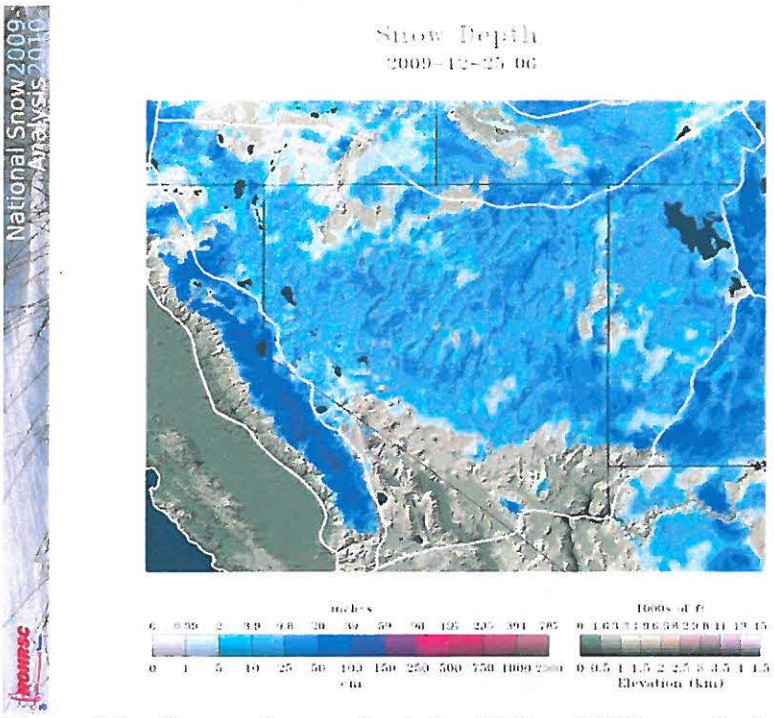


Figure 1.5: Observed snow depth for 25 Dec. 2009 over the Intermountain West.

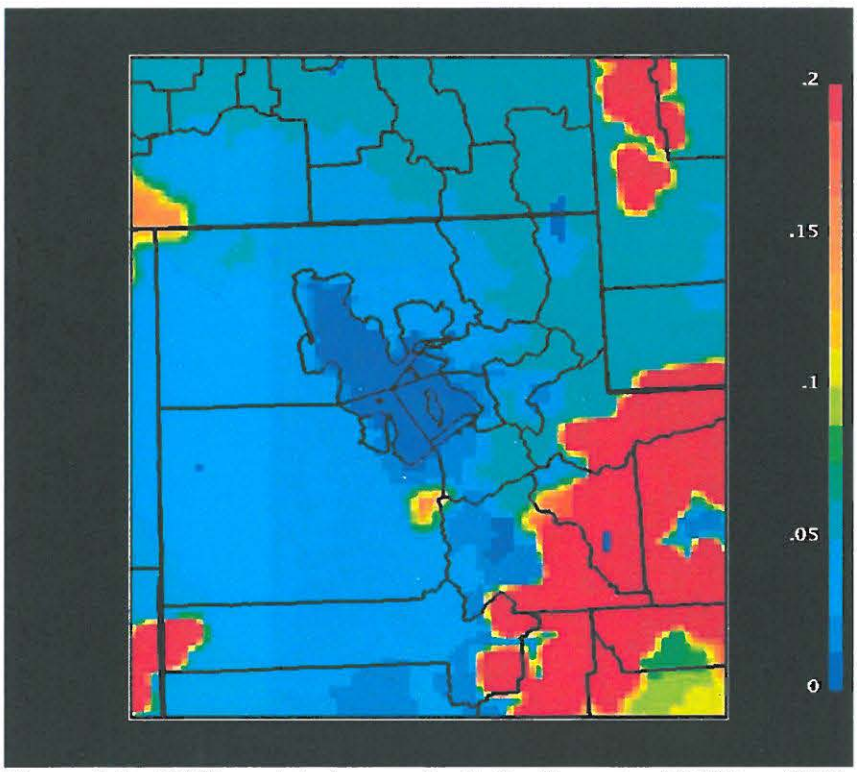


Figure 1.6: WRF modeled snow depth for (in meters) 25 Dec. 2009 over Northern Utah.

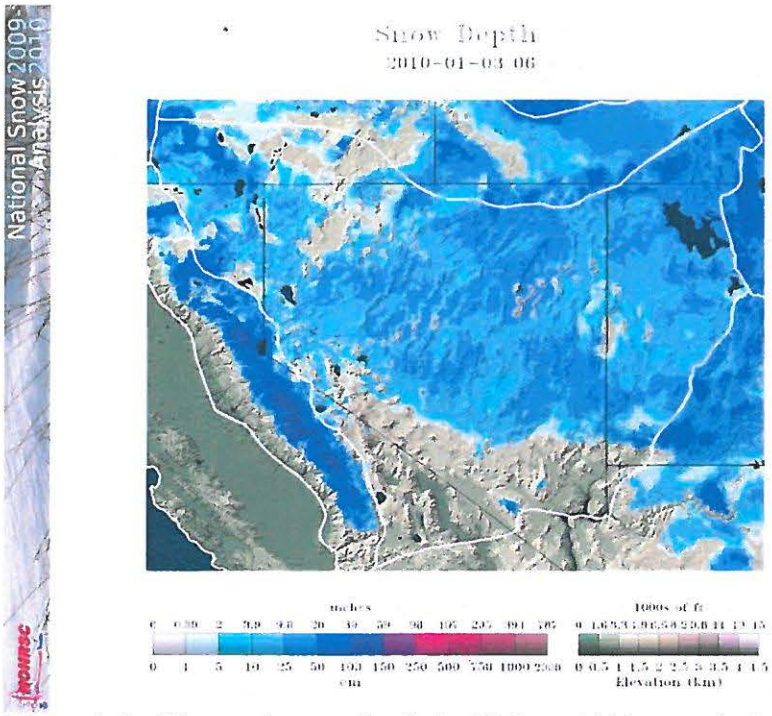


Figure 1.7: Observed snow depth for 03 Dec. 2010 over the Intermountain West.

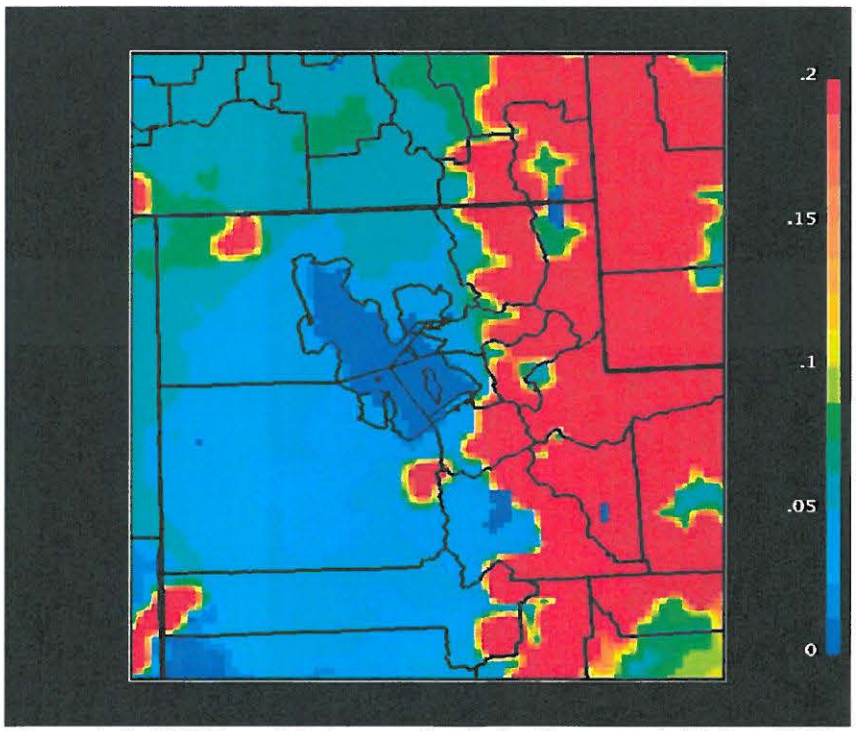


Figure 1.8: WRF modeled snow depth for (in meters) 03 Jan. 2010 over Northern Utah.

1.2.3 Surface Temperature

The surface temperature during an elevated PM2.5 episode will often exhibit a decrease in the maximum and minimum temperature from the start to the end of the episode. An example of this is shown in Figure 1.9 at Logan from 23 Dec. 2009 through 31 Dec. 2009. From the start of the episode (23 Dec. 2009) to the last day of the episode (29 Dec. 2009), the minimum and maximum daily temperatures drop each day, bottoming out at a daily maximum temperature on29 Dec. 2009 of 11 degrees Fahrenheit. This feature in the surface temperatures is extremely challenging to replicate in WRF.

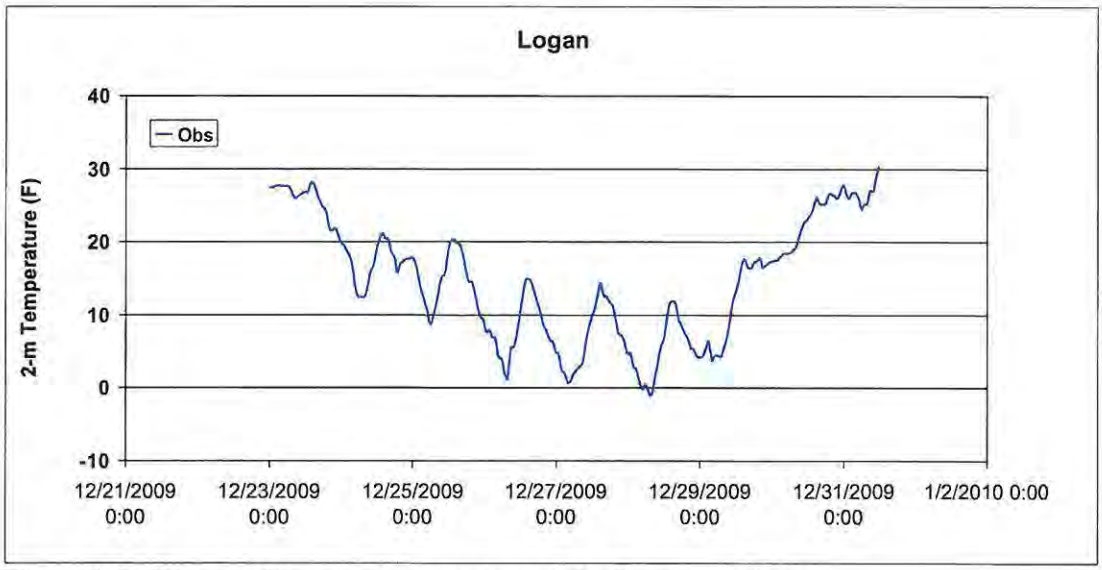


Figure 1.9: Observed 2-meter temperature at the Logan monitor.

WRF performance for 2-m temperature throughout the 2009-2010 episode is given in Figure 1.10 – 1.13.At the Hawthorne monitor, WRF (red trace) does a reasonable job of simulating the nighttime minimum temperatures (Fig. 1.10). However, WRF is much too warm during the daytime, sometimes by as much as 10 degrees at the end of PM2.5 episodes (e.g., 28 Dec. 2009). This trend of a high WRF temperature bias in daytime temperatures shows up at all locations. During these stagnant high pressure events, WRF tends to moderate the surface temperature throughout the event instead of replicating the decreasing temperatures as seen in the observations (Fig. 1.9).

There are many possible reasons for WRF's struggle in simulating surface temperatures during wintertime cold pool events. Some of the possibilities are:

- WRF PBL schemes that were not designed for complex terrain and wintertime stable boundary.
- WRF Land Surface Models that were not designed for complex terrain and wintertime stable boundary.

- The presence of an aerosol (PM2.5) layer that will modulate the radiation in the PBL is not taken into account in WRF.

- At the end of high PM2.5 episodes, the stable cold pool gets very shallow (~100 to 200 m above the surface) and southerly winds just above this shallow cold pool can be as fast as 10 to 20 mph. This situation would be difficult to simulate in a mesoscale model. WRF is able to replicate these strong south winds, but appears to mix the warm south to the surface leading to a destruction of the shallow stable layer and over-predicted of surface temperatures.

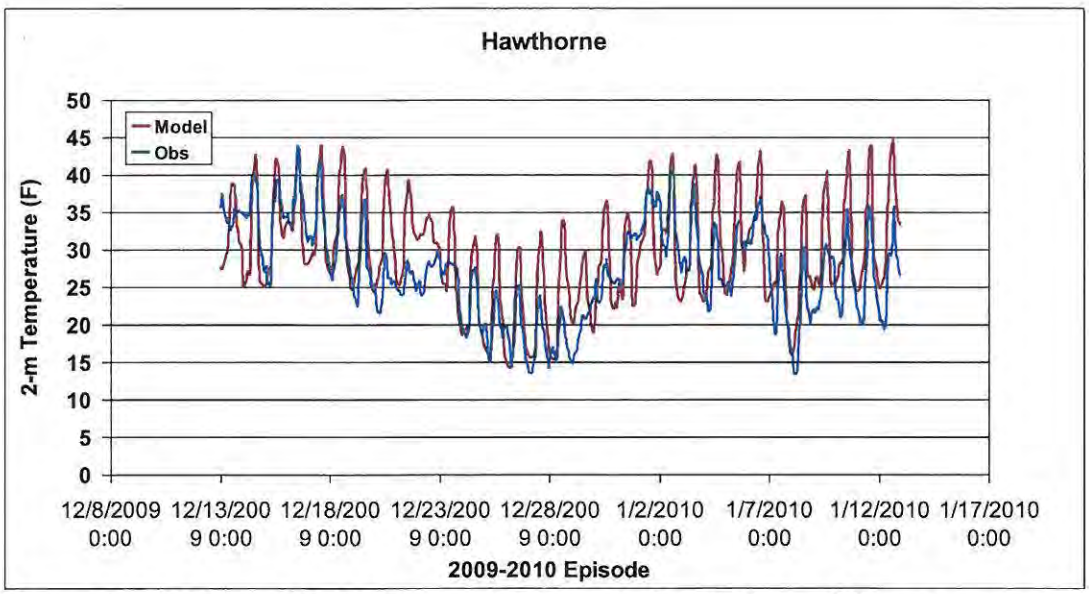


Figure 1.10: WRF modeled 2-meter temperature (red) and observed 2-meter temperature (blue) at the Hawthorne monitor.

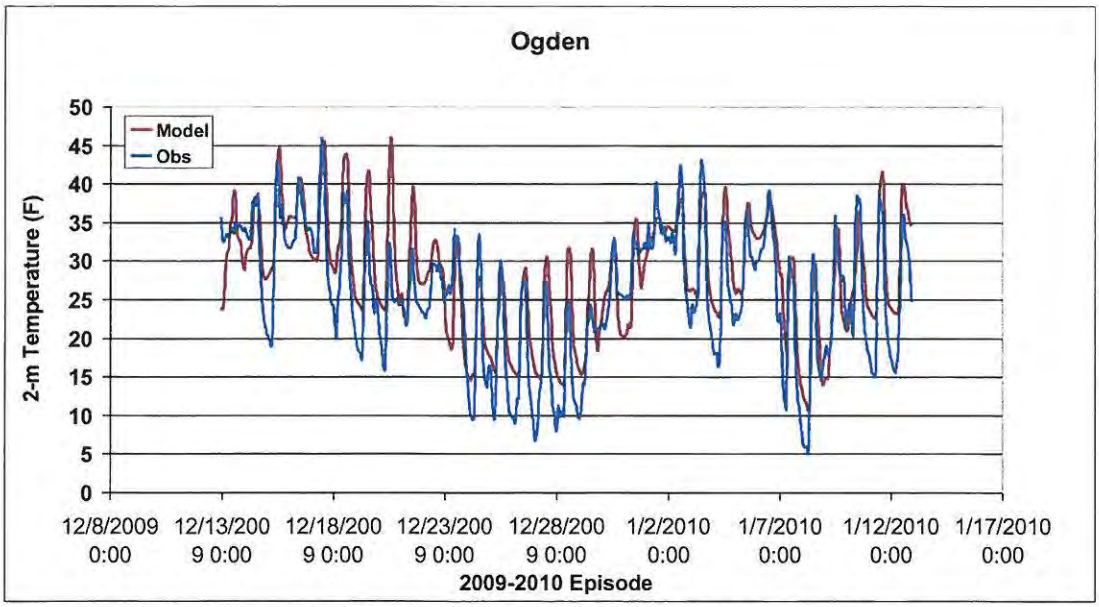


Figure 1.11: WRF modeled 2-meter temperature (red) and observed 2-meter temperature (blue) at the Ogden monitor.

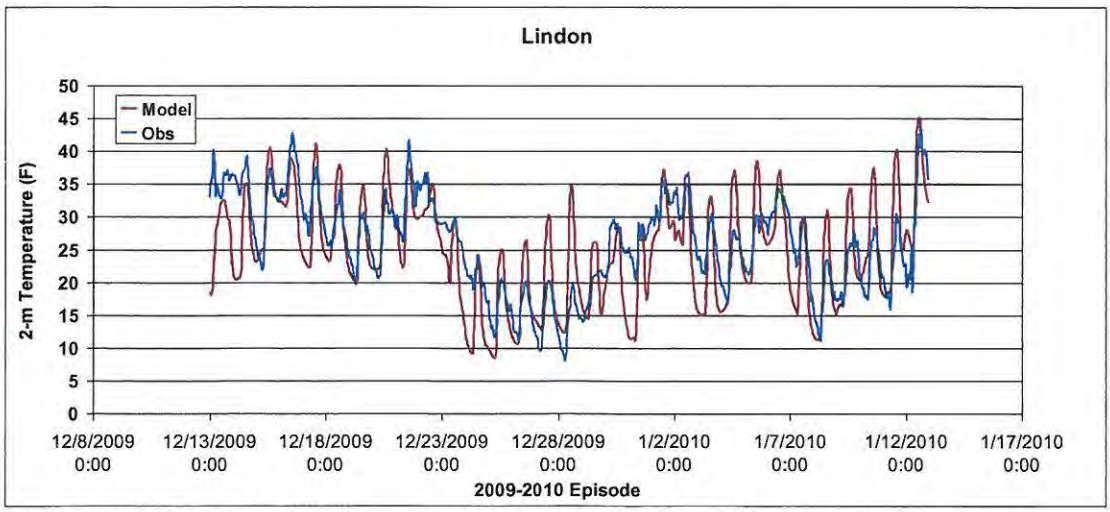


Figure 1.12: WRF modeled 2-meter temperature (red) and observed 2-meter temperature (blue) at the Lindon monitor.

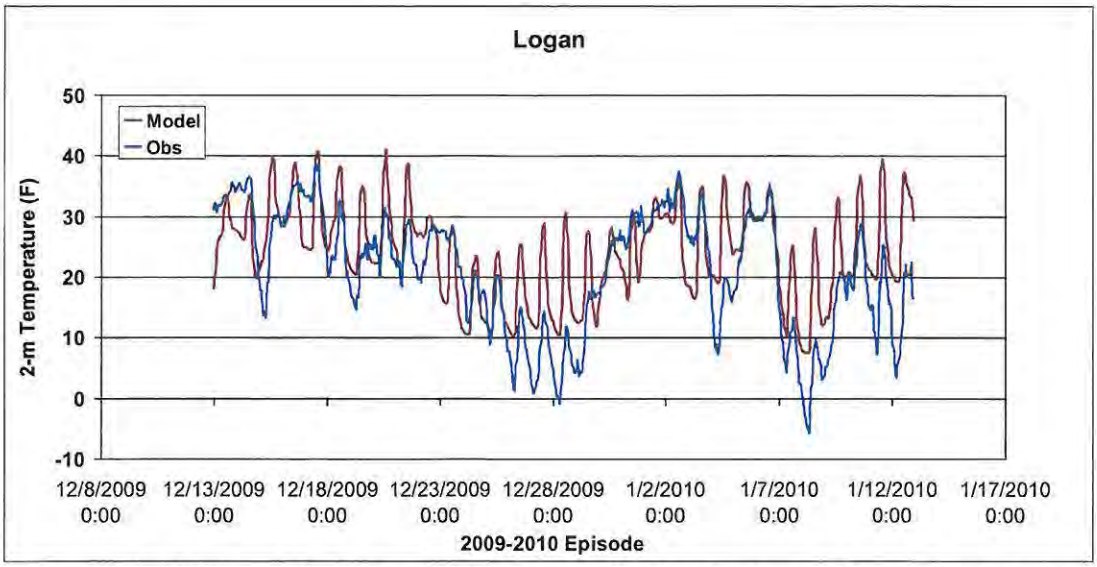


Figure 1.13: WRF modeled 2-meter temperature (red) and observed 2-meter temperature (blue) at the Logan monitor.

1.2.4 Vertical Temperature Profile

The vertical temperature structure of the planetary boundary layer is important in trapping precursor emissions of PM2.5 near the surface. Measurements of the vertical profile can be obtained from a twice daily radiosonde launch at the Salt Lake City International Airport (KSLC).

Figures 1.14 – 1.17 compare the WRF vertical temperature profile to that of the radiosonde for two different days when elevated PM2.5 concentrations occurred. The WRF vertical profile in the morning (Figs. 1.15 and 1.17) show a structure and stability similar to that of the observed profile. However, WRF is typically 1 to 5 degrees warmer throughout the PBL.

Two afternoon profiles are shown by Figures 1.14 and 1.16. In the afternoon, often a mixed layer develops near the surface due to daytime heating and is capped by a valley temperature inversion between 200 and 1,000 meters above the surface. On the afternoon of 2009 Jan. 03, WRF performs well representing the height and stability of the inversion (Fig. 1.16). As was the case with the morning profiles, WRF is too warm in the lower portions of the PBL.

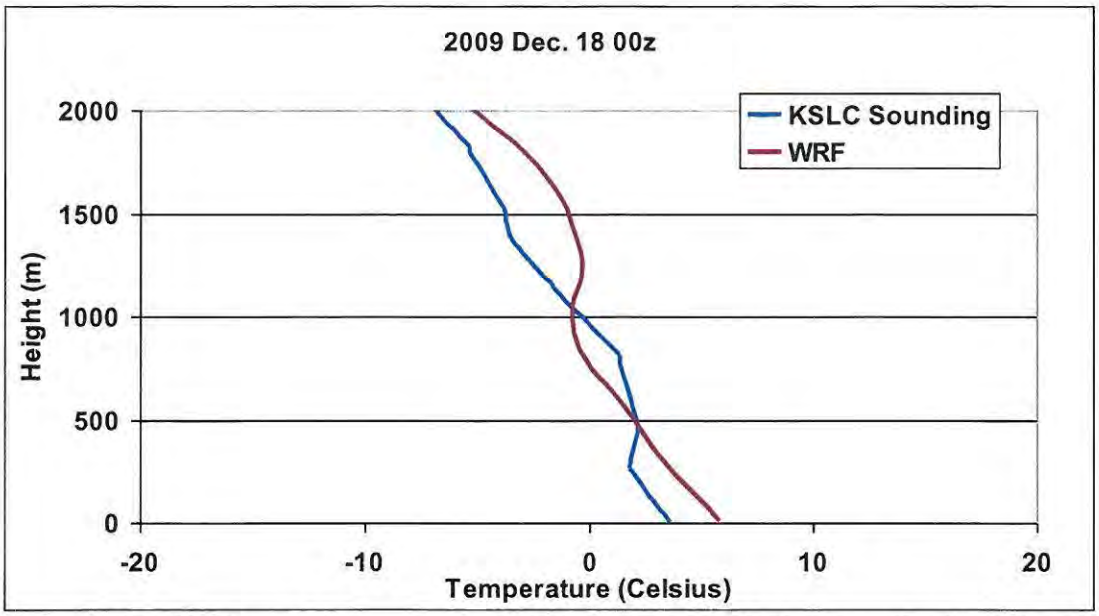


Figure 1.14: WRF vertical temperature profile (red) and KSLC radiosonde (blue) for 18 Dec. 2009 at 00 UTC.

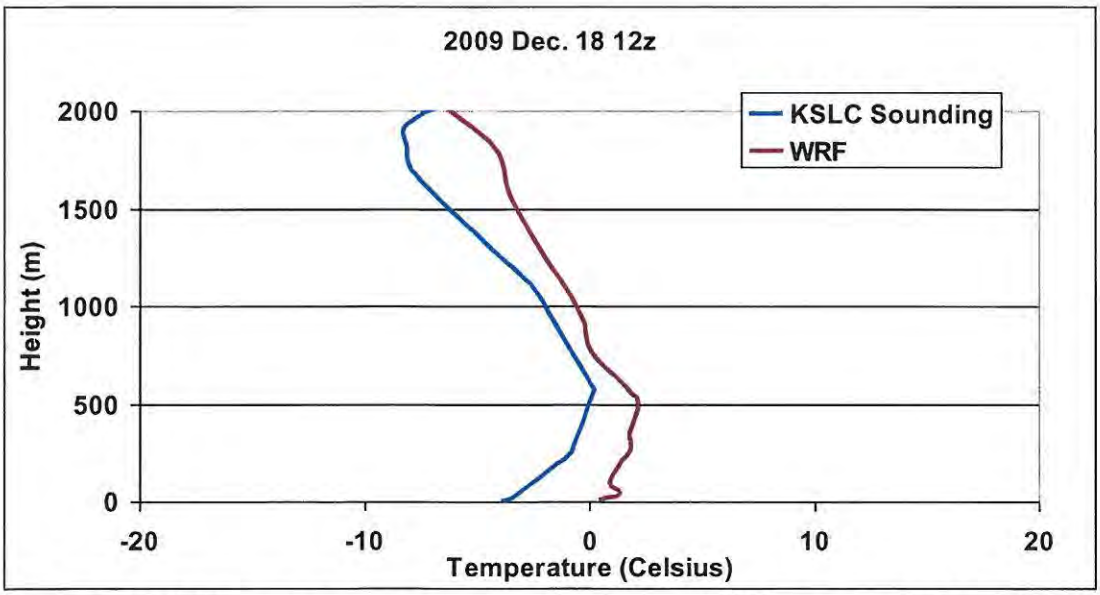


Figure 1.15: WRF vertical temperature profile (red) and KSLC radiosonde (blue) for 18 Dec. 2009 at 12 UTC.

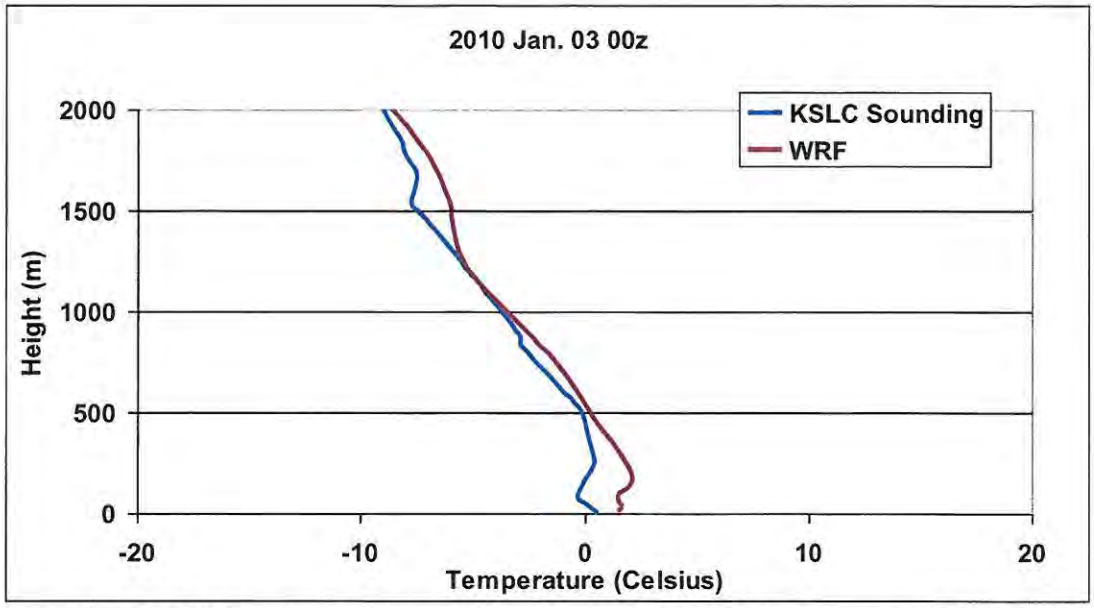


Figure 1.16: WRF vertical temperature profile (red) and KSLC radiosonde (blue) for 03 Jan.. 2010 at 00 UTC.

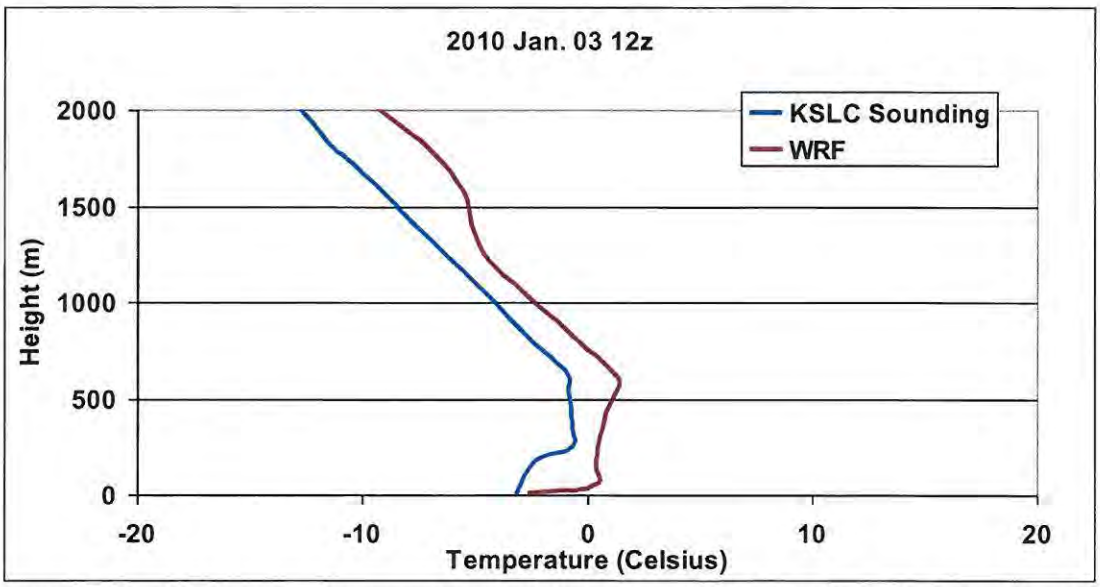


Figure 1.17: WRF vertical temperature profile (red) and KSLC radiosonde (blue) for 18 Dec. 2009 at 12 UTC.

1.2.5 Surface Wind Speed and Direction

During elevated winter PM2.5 episodes, the surface wind speeds are light (< 5 mph) and the flow is often topographically forced. During nighttime, winds typically feature a

downslope flow draining to the low elevation valley bottoms. Upslope flow occurs in the afternoon, driving winds up toward the elevated terrain.

The performance of the surface wind speed and direction will be presented by averaging the hourly wind speed and direction for the days in which high concentrations of PM2.5 were observed. This was done to isolate just the elevated PM2.5 days and allows the data to be more cleanly analyzed. In all, 23 high PM2.5 days are averaged for the 2009-2010 episode.

Figures 1.18 – 1.21 give the average hourly wind speed. At all locations, the diurnal pattern in wind speed in replicated in WRF. That is, WRF reproduces the afternoon increase in winds and slower winds observed during overnight and morning hours. WRF under-estimates the nighttime wind speeds at all locations by ~ 1 mph. Before using the surface analysis FDDA technique described in Section 1.1.4, the WRF wind speed were over-estimated during all hours by ~ 1 to 3 mph. So the surface analysis FDDA technique did help improve surface wind speed performance.

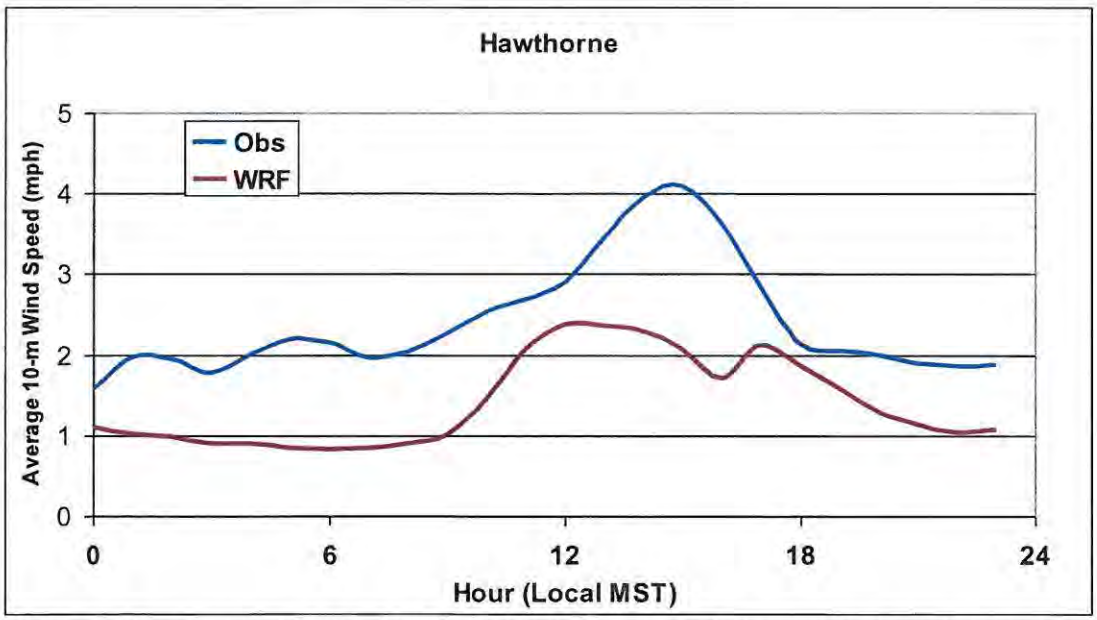


Figure 1.18: Averaged hourly WRF modeled 10-meter wind speed (red) and observed 10-meter wind speed (blue) at the Hawthorne monitor.

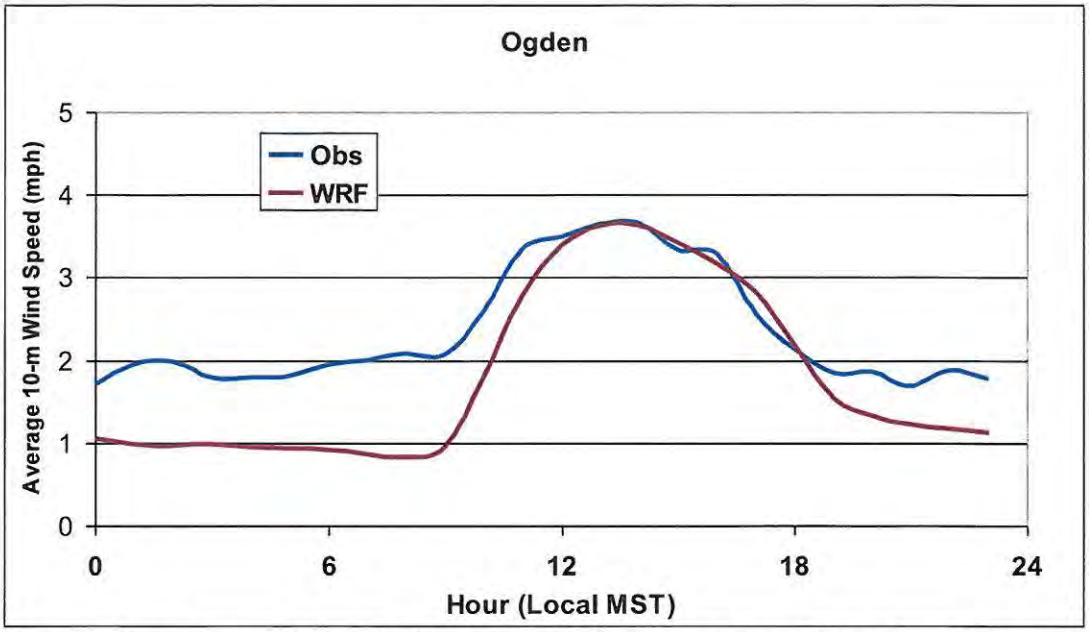


Figure 1.19: Averaged hourly WRF modeled 10-meter wind speed (red) and observed 10-meter wind speed (blue) at the Ogden monitor.

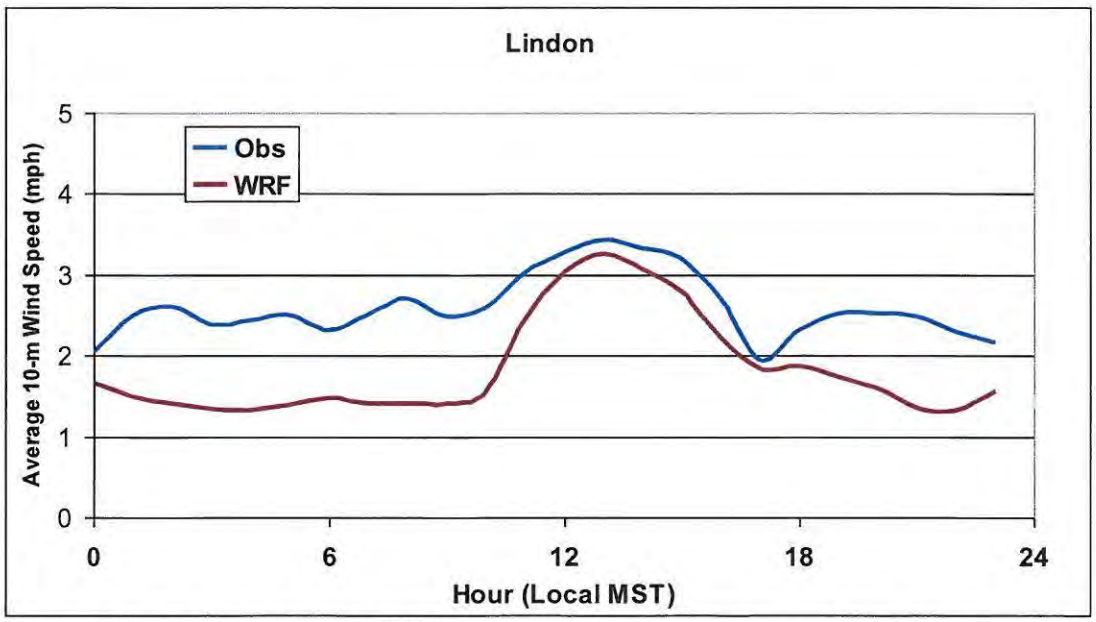


Figure 1.20: Averaged hourly WRF modeled 10-meter wind speed (red) and observed 10-meter wind speed (blue) at the Lindon monitor.

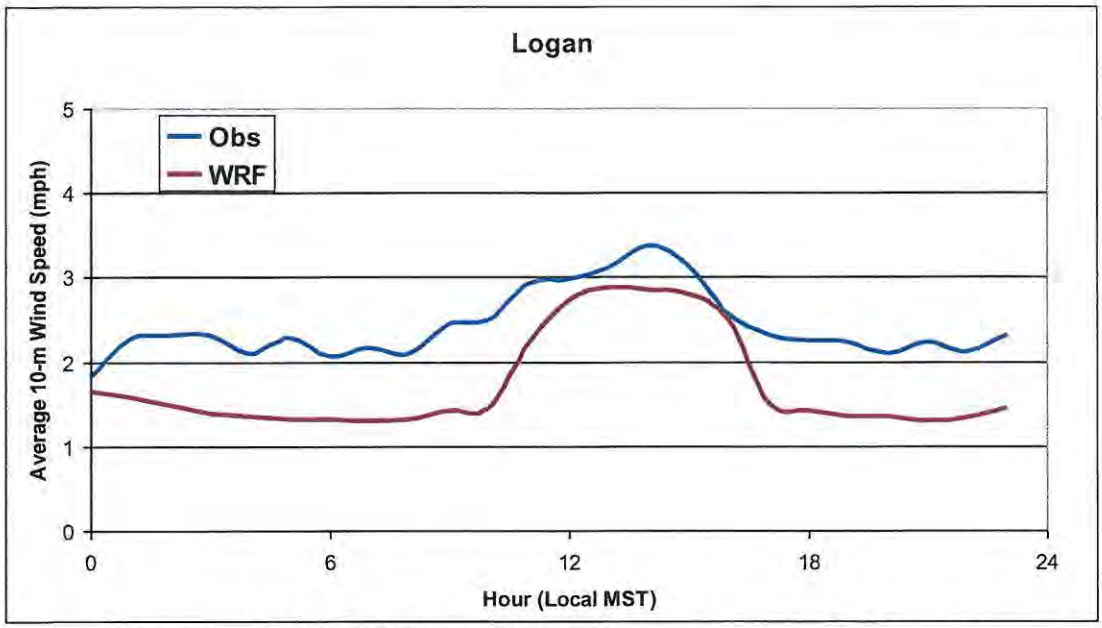


Figure 1.21: Averaged hourly WRF modeled 10-meter wind speed (red) and observed 10-meter wind speed (blue) at the Logan monitor.

Surface wind direction performance can be seen in Figures 1.22– 1.25. WRF replicates the overnight downslope and daytime upslope wind flow quite well. At the Hawthorne monitor (Fig. 1.22), WRF reproduces the nighttime southerly flow. WRF has more of southwest flow during the daytime as compared to the west wind direction in the observations.

At the Lindon monitor, WRF produces southerly nighttime winds while the winds are mostly southeasterly in the observations (Fig. 1.24). During the daytime, the observed southwest wind directions are simulated well by WRF.

The daytime WRF performance at the Logan monitor is good as WRF produces the near westerly upslope flow (Fig. 1.25). However, the WRF shows nighttime downslope flow from the east while the observed wind is out of the south. The representation of the topography in WRF at a 4-km horizontal resolution may explain the differences seen between the nighttime observed and WRF winds. That is, at 4-km, WRF resolution may be too coarse in some instances to accurately simulate terrain induced flow. But overall, WRF seems to picking up the diurnal upslope/downslope flows common during stagnant, high PM2.5 events.

Figure 1.26 shows the wind direction for 2010 Jan. 03 at midnight local time throughout the entire domain. The white wind barbs represent WRF wind direction and the topography is represented by the color-shaded grid. The nighttime downslope flow is evident in the Cache Valley and also along the Wasatch Front, with wind draining toward

the Great Salt Lake. Likewise, Figure 1.27 shows the upslope flow during the daytime hour, this example for 2010 Jan. 03 at 3 p.m. local time.

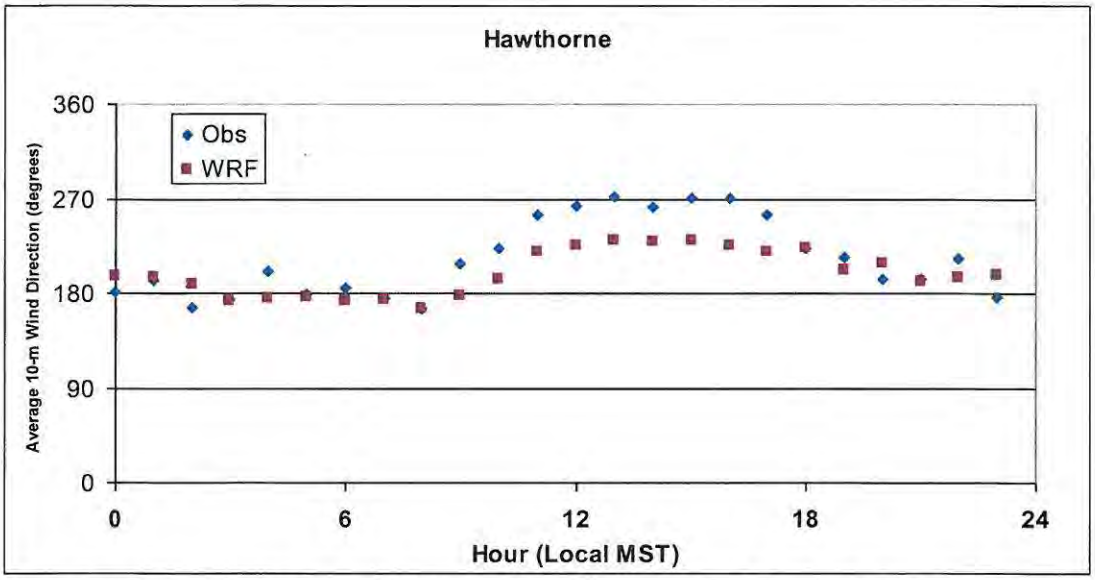


Figure 1.22: Averaged hourly WRF modeled 10-meter wind direction (red) and observed 10-meter wind direction (blue) at the Hawthorne monitor.

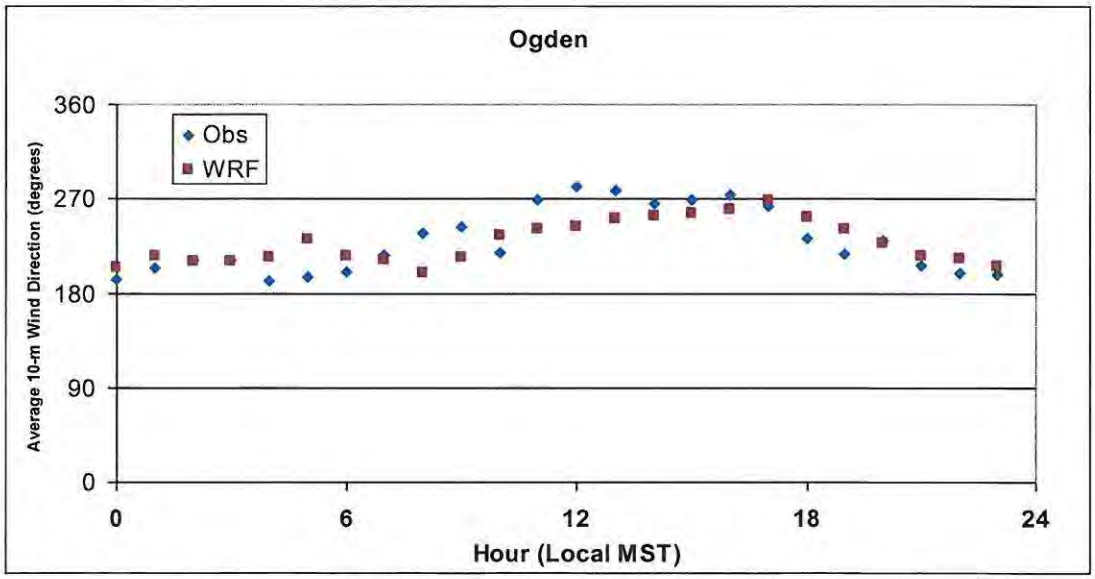


Figure 1.23: Averaged hourly WRF modeled 10-meter wind direction (red) and observed 10-meter wind direction (blue) at the Ogden monitor.

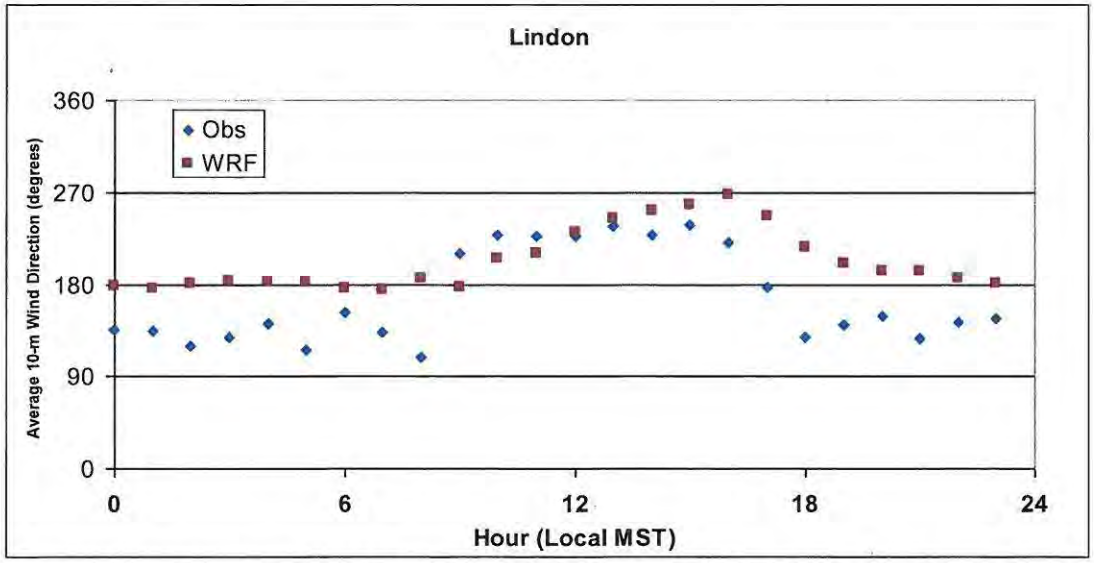


Figure 1.24: Averaged hourly WRF modeled 10-meter wind direction (red) and observed 10-meter wind direction (blue) at the Lindon monitor.

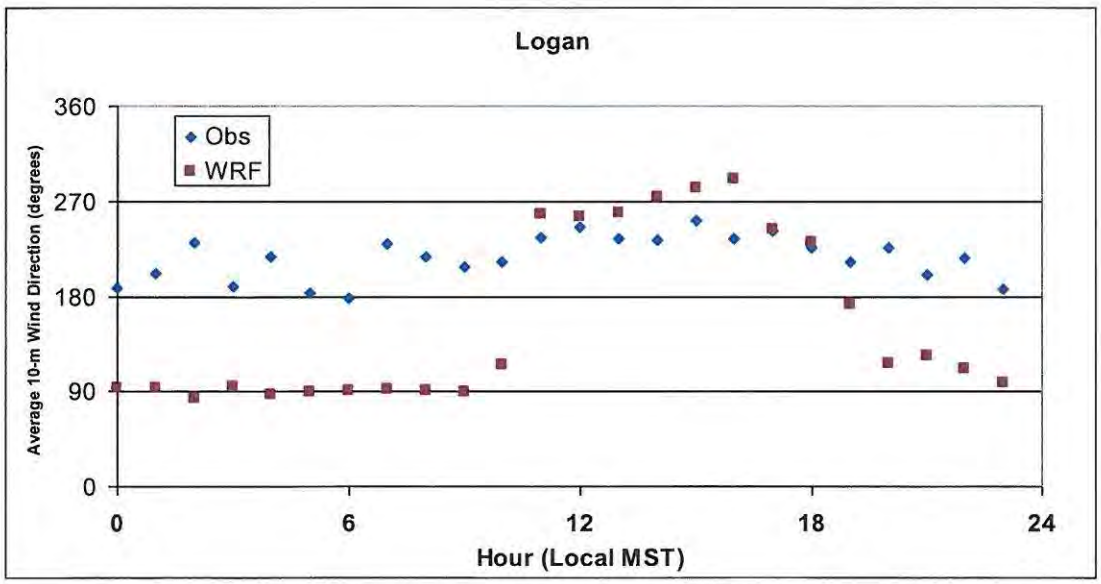


Figure 1.25: Averaged hourly WRF modeled 10-meter wind direction (red) and observed 10-meter wind direction (blue) at the Logan monitor.

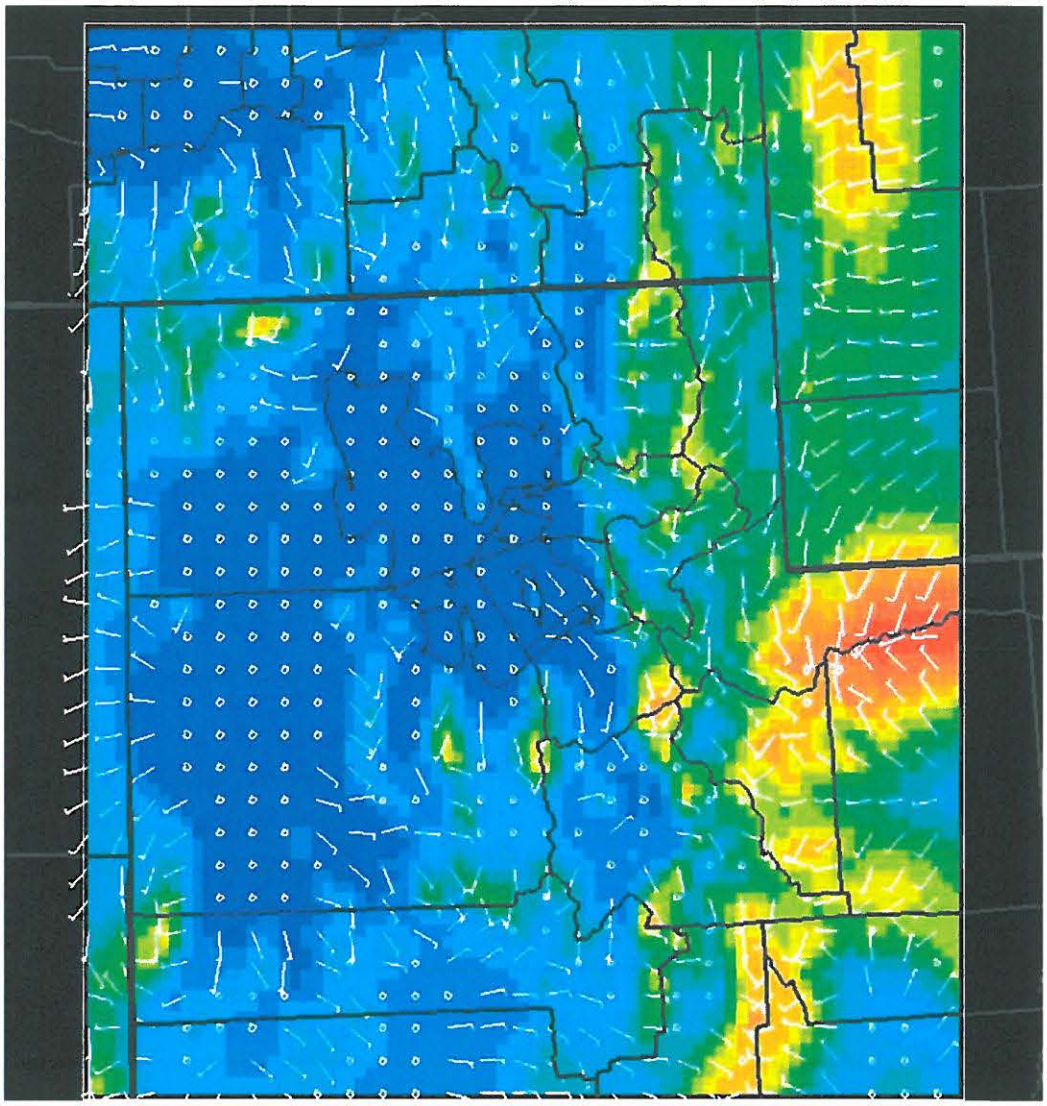


Figure 1.26: WRF wind direction (white wind barbs) and WRF topographic height (color-shaded) for 03 Jan. 2010 at midnight local time.

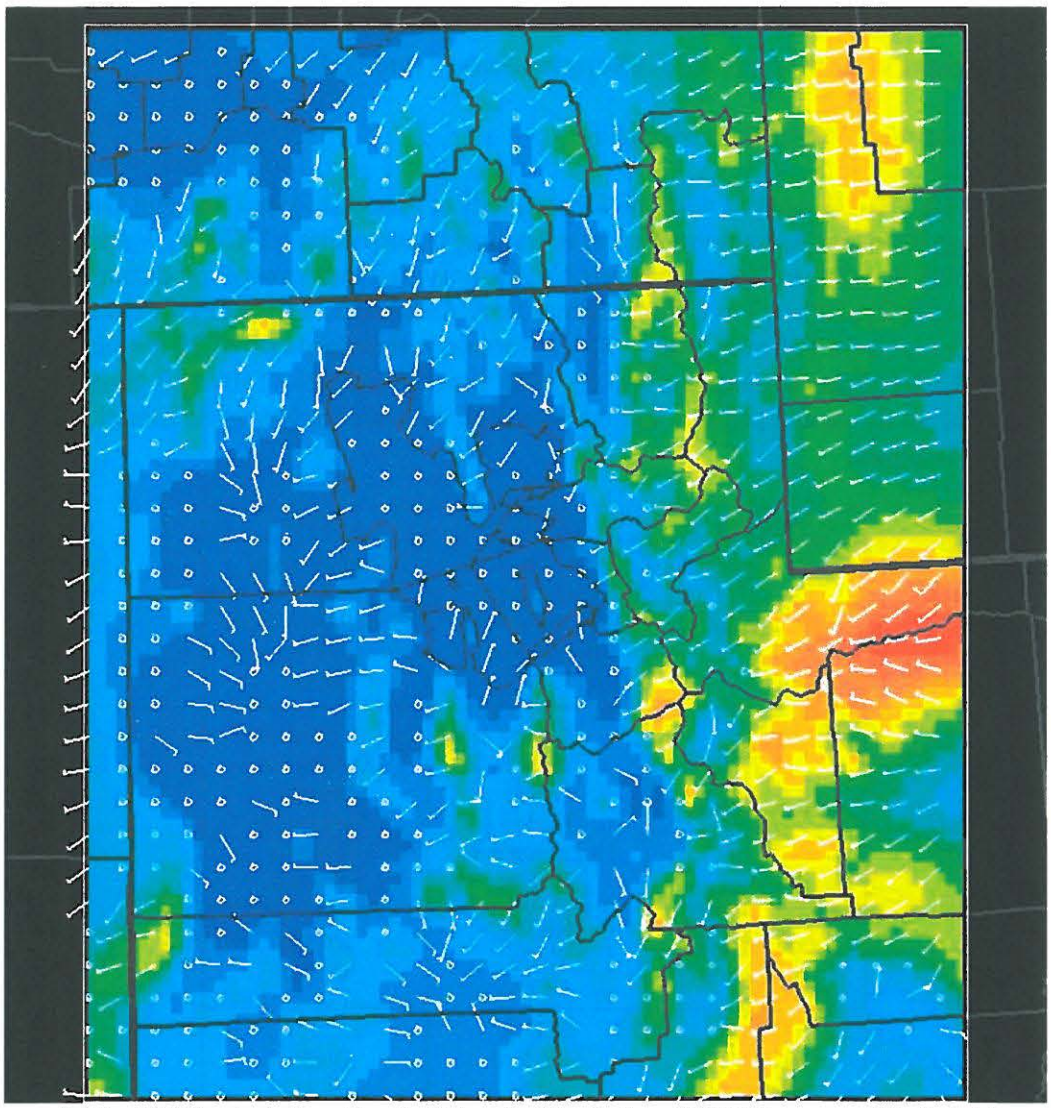


Figure 1.27: WRF wind direction (white wind barbs) and WRF topographic height (color-shaded) for 03 Jan. 2010 at 3 p.m. local time.

1.3.0 Weight of Evidence (WOE)/Supplementary Analysis

1.3.1 Ensemble WRF/MM5 Modeling

Prior to 2010, UDAQ worked with the Department of Army Dugway Proving Ground Meteorology Division for meteorological modeling services using NCAR's state of the Science MM5 & WRF modeling systems NCAR provided meteorological datasets from their Ensemble Real-Time Four Dimensional Data Assimilation (E-RTFDDA) model for a episode from 14-18 February 2008. The ensemble system consists of 30 members including 15 MM5 based members and 15 WRF based members. Table 1.6 gives an overview of all the model physics and initialization datasets the ensemble model allowed UDAQ to evaluate.

Physics	WRF	MM5
Cumulus	Kain-Fritsch Betts-Miller-Janic Grell-Devenyi	Kain-Fritsch Grell Betts-Miller-Janic Fritsch-Chappell Kuo
Microphysics	Kessler Lin et al. WSM5 WSM6 Thompson et al. Ferrier	Hsie Dudhia Ice Reisner 1 Reisner 2 Goddard Schwartz
Long-Wave Radiation	RRTM CAM GFDL	RRTM CCM2
Short-Wave Radiation	Dudhia Goddard CAM GFDL	Dudhia CCM2
PBL	YKU Meller-Yamada-Janic RUC GFS	MRF Blackadar Meller-Yamada-Janic Gyano-Seaman
Initialization Dataset	NAM GFS	NAM GFS
Other	No horizontal diffusion	No horizontal diffusion

Table 1.6: The physical parameter suite used in NCAR's Ensemble Real-Time Four Dimensional Data Assimilation provided to UDAQ for February 2008 episode.

Ensemble modeling performance for 2-m temperature is shown for Hawthorne (Figure 1.28) and Logan (Figure 1.29). The ensemble mean performs well at the Hawthorne monitor. This February episode was warmer than those often that occur in December and January and did not exhibit the decreasing surface temperature trend (Figure 1.9). This being a warmer episode may allow for better model performance for surface temperature. At Logan, almost all members of the ensemble miss the observed nighttime minimum temperatures (at hours ~ 48, 96, and 120 in the time series).

Ensemble modeling performance for 10-m wind speed is shown for Hawthorne (Figure 1.30) and Logan (Figure 1.31). After the initial frontal passage after the first 30 hours of the simulation, the ensemble mean wind speed performs quite well. Overall the ensemble mean nighttime wind speeds are biased high at night. Typically, the observed nighttime wind speed does not get over 3 mph throughout the episode while the majority of ensemble members have nighttime wind speeds between 3 and 5 mph. This nighttime wind bias is even greater at the Logan monitor (Fig. 1.31).

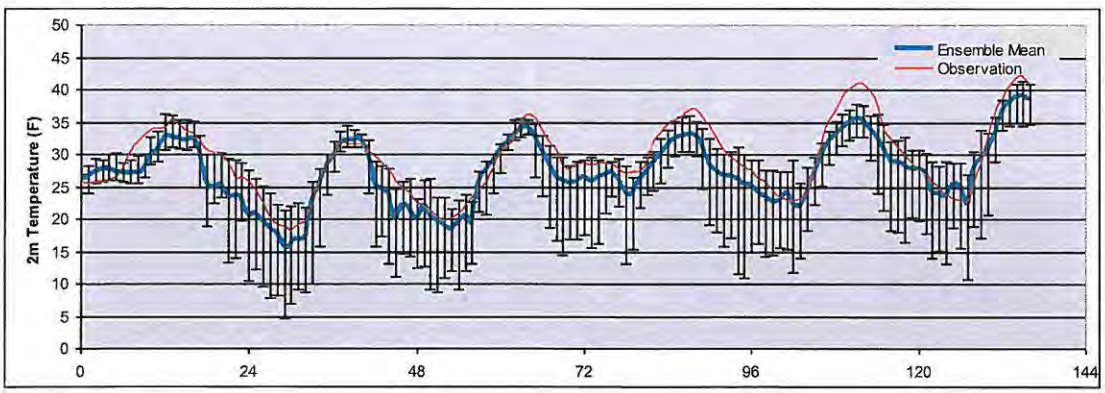


Figure 1.28: Hourly time series representing MM5 and WRF ensemble model performance for 2-m temperature for 14 – 19 Feb 2008 at the Hawthorne monitor. The 0 hour on the x-axis represents 14 Feb 2008 at 00 Local Mountain Time. The model ensemble Mean (blue) and observations (red) are shown. The black bars give the spread of ensemble members.

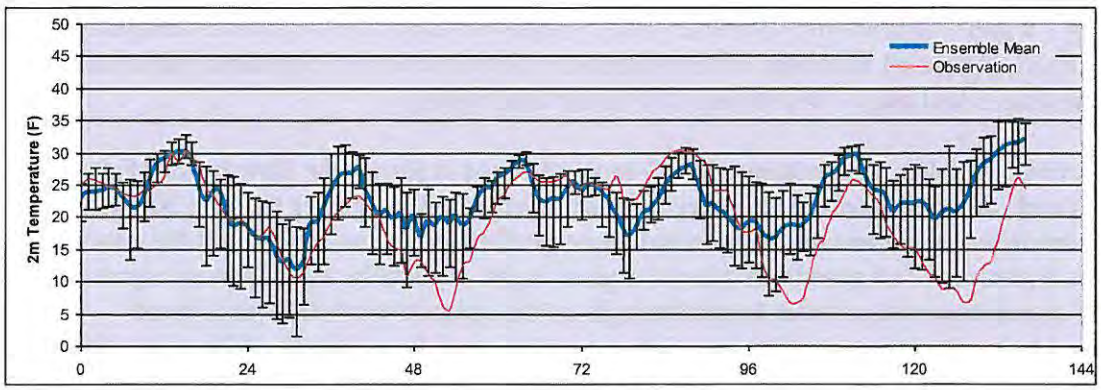


Figure 1.29: Hourly time series representing MM5 and WRF ensemble model performance for 2-m temperature for 14 – 19 Feb 2008 at the Logan monitor. The 0 hour on the x-axis represents 14 Feb 2008 at 00 Local Mountain Time. The model ensemble Mean (blue) and observations (red) are shown. The black bars give the spread of ensemble members.

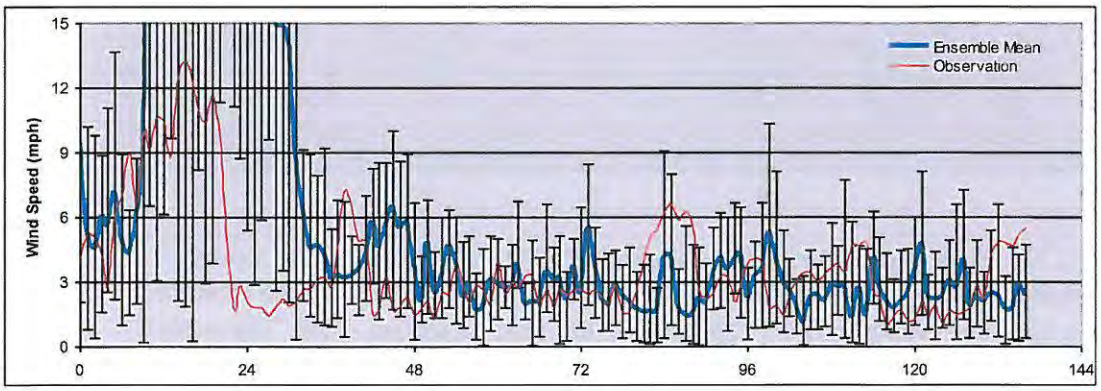


Figure 1.30: Hourly time series representing MM5 and WRF ensemble model performance for 10-m wind speed for 14 – 19 Feb 2008 at the Hawthorne monitor. The 0 hour on the x-axis represents 14 Feb 2008 at 00 Local Mountain Time. The model ensemble Mean (blue) and observations (red) are shown. The black bars give the spread of ensemble members.

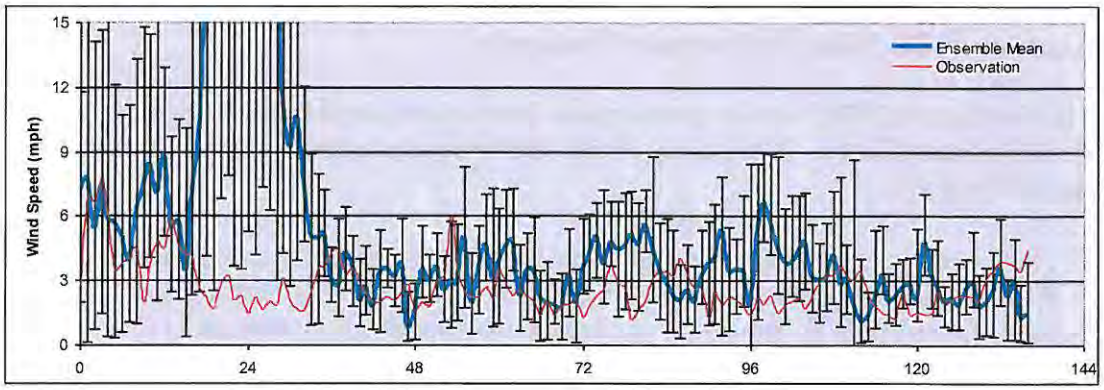


Figure 1.31: Hourly time series representing MM5 and WRF ensemble model performance for 10-m wind speed for 14 – 19 Feb 2008 at the Logan monitor. The 0 hour on the x-axis represents 14 Feb 2008 at 00 Local Mountain Time. The model ensemble Mean (blue) and observations (red) are shown. The black bars give the spread of ensemble members.

1.3.2 Meteorological Modeling Sensitivities

In addition to the ensemble provided by NCAR, UDAQ performed numerous sensitivities to test WRF's ability to better simulate Utah's wintertime conditions. One sensitivity that UDAQ spent a considerable amount of resources on was to test the horizontal and vertical resolution in WRF. UDAQ modeled the Cache Valley (Logan NAA) at horizontal resolution at 1.33 km for the innermost domain. No improvement was seen in WRF's capability to model cold pool situations, especially in its performance of surface temperature.

Numerous attempts were made to assess the effect of increasing vertical resolution. UDAQ replicated modeling work performed for the Fairbanks, AK NAA. This work included WRF being run with very high vertical resolution near the surface - five vertical layers within the first 20 meters. This simulation, as well as others performed by UDAQ, showed limited benefit from increasing the vertical resolution.

Additional WRF sensitivities performed by UDAQ:

- Tested influence of Pleim-Xiu, RUC, and Noah Land Surface Models.
- Tested eddy diffusion in the PBL by examining minimum eddy diffusivity (Kv) and friction velocity.
- Limited horizontal diffusion.

- Tested influence of initialization dataset (NAM, GFS)

The additional WRF sensitivities provided different performance for surface temperatures, winds, and vertical structure. However, none led to a noticeably better performance of the surface temperature during cold pools (as described in Section 1.2.3).

1.4 Summary WRF Model Performance Evaluation

Model performance of WRF was assessed against observations at sites maintained by the Utah Air Monitoring Center. A summary of the performance evaluation results for WRF are presented below:

- The biggest issue with meteorological performance is the existence of a warm bias in surface temperatures during high PM2.5 episodes. This warm bias is common trait of WRF modeling of during Utah wintertime inversions.

- WRF does a good job replicating the light wind speeds (< 5 mph) that occur during high PM2.5 episodes.

- WRF is able simulate the diurnal wind flows common during high PM2.5 episodes. WRF captures the overnight downslope and daytime upslope wind flow that occurs in Utah valley basins.

- WRF has reasonable ability to replicate the vertical temperature structure of the boundary layer (i.e., the temperature inversion). Although it is difficult for WRF to reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree temperature increase over 100 vertical meters).

Appendix E. Reasonably Available Control Methods

- **Road Sanding**
- **Residential Wood Combustion Ordinances**
- **Air Quality Index Program**

This page intentionally left blank for correct double-sided printing.

Road Sanding

Franklin County Road Department
561 West Oneida
Preston, Idaho 83263
(208) 852-0610 (Office)
(208) 221-1571 (Cell)

July 16, 2012

Department of Environmental Quality
444 Hospital Way #300
Pocatello, ID 833201

RE: Letter of Intent-PM 2.5 Reduction

The Franklin County Particulate Matter (PM 2.5) Air Quality Improvement Plan identifies wintertime roadway sanding materials as a significant source of PM 2.5 contribution to our community. The Franklin County Road Department intends to participate in the reduction of airborne PM 2.5 concentrations from County roads by taking the following actions.

1 Public Awareness
The Franklin County Road Department will publish a newspaper article explaining what changes will be made in the sanding application to reduce the airborne particulate level in the area.

2 Anti-Skid Application
The Franklin County Road Department has in the past used a ratio of 10 to 1 (10 parts sand to 1 part salt) Sand-Salt mix. Over the last few years we have reduced the ratio of Sand-Salt to 5 to 1. The Franklin County Road Department for the winter of 2012-2013 plans to use a 4 to 1 Sand-Salt ratio mix.

3 Use of Chemical De-icing Agents
The Franklin County Road Department will apply prior to and during suitable storms a sodium chloride solution to the high volume roads. This will substantially reduce the amount of sand used to maintain safe roads.

Sincerely,

Troy Moser

Troy Moser, Road Supervisor

IDAHO TRANSPORTATION DEPARTMENT
P.O. Box 4700
Pocatello, ID 83205-4700

(208) 239-3300
itd.idaho.gov

October 25, 2012

Melissa Gibbs
Idaho Department of Environmental Quality
444 Hospital Way # 300
Pocatello, Idaho 83201

RE: ROAD SANDING AGREEMENT

Dear Ms. Gibbs:

In compliance with the goals to reduce particulate matter, the Idaho Transportation Department will agree to use straight salt and liquid salt brine prior to and during winter maintenance throughout Franklin County. However, there may be occasional extenuating circumstances that will warrant discretionary changes based upon climate where anti-skid material may be used.

I trust this will satisfy your needs.

Sincerely,

Steve Gertonson, P.E.
District Five Operations Engineer

SG/cp:gh

Residential Wood Combustion Ordinances

ORDINANCE NO. 120

AN ORDINANCE OF THE CITY OF CLIFTON, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE; REPEALING OTHER ORDINANCES OR PARTS OF ORDINANCES IN CONFLICT HEREWITH; WAIVING THE RULE REQUIRING READING OF THIS ORDINANCE ON THREE SEPARATE OCCASIONS; AND ESTABLISHING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF CLIFTON, IDAHO, AS FOLLOWS:

Section 1: *Authority and Purpose.* The purpose of this ordinance is protect air quality resources vital to the public health, safety, and welfare of the City of Clifton by controlling emissions from solid fuel and refuse burning. This ordinance is promulgated under the authority of Idaho Code Section 50-302.

Section 2: *Definitions:* For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

AIR POLLUTION: The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfere unreasonably with the enjoyment of life or property.

BUILDING: Any structure, dwelling, office, industrial plant, garage or barn, whether publicly or privately owned or any other structure as defined by the international building code.

BURN DOWN: That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door fires or burning or incineration included within this ordinance.

CLEAN BURNING APPLIANCE: A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

FIREPLACE: A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace".

HEAT OUTPUT: The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

OPEN BURNING: For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

PARTICULATE MATTER (PM_{10}/$PM_{2.5}$): Any gas borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

PERSON: Any individual, firm, partnership, association, corporation, company, organization or governmental entity.

REFUSE: All solid waste, garbage, and rubbish, including, but not limited to, cardboard, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris or chemically treated wood.

SOLE SOURCE: One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating, No solid fuel heating device(s) shall be the sole source of heat in the building is equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity or propane.

SOLID FUEL: Any form of untreated wood, coal, pressed logs, and pellet fuel.

SOLID FUEL HEATING APPLIANCE: An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty five to one (35 to 1);
B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and
D. Maximum weight of less than eight hundred kilograms (800 kg).

Section 3: *Air Quality Designations and Alert Criteria:*

A. The quality of the city's air shall be determined by monitoring pollutant levels in and/or around the city with equipment and methods approved and provided by DEQ at is expense.

B. The quality of the city's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy five (75) or greater or forecasts air stagnation conditions will continue for at least twenty four (24) hours.

D. No person shall allow, suffer, cause or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

Section 4: *Public Notification*:

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified. In addition DEQ will post information on the DEQ website and the air quality hotline.

Section 5: *Burning Solid Fuel or Refuse*:

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "woodstove".

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications and manufacturer's instructions.

C. Notwithstanding the provisions of any section of the this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate or odors deemed a public nuisance; such prohibited materials consist of , but are not limited to, the following: garbage, tires or

any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, tree stumps, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

1. During an initial fifteen minute start-up period, or

2. During refueling operations which many not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

Section 6: *Solid Fuel Heating Appliance Restrictions and Permits*:

A. From the date that this ordinance is effective, no person may sell or offer for sale within the city limits of Preston any solid fuel heating appliance which is not listed ad certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the City. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances. Installations shall be in accordance with the Uniform Fire Code and manufacturer's instructions.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

Section 7: *Exemptions from Restrictions*:

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The City may grant exemptions from this ordinance if it is determined that:

1. A solid fuel heating appliance is the sole source of heat for the structure in which is situated or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

Section 8: *Minimum Standards For Clean Burning Appliances*:

A. Appliances shall meet the requirements of the code of federal regulations title 40, part 60, subpart AAA, "standards of performance for new residential wood heaters".

Section 9: *Penalty:*

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000.00 and by confinement in the county jail for a period not to exceed six (6) months or by both such fine and imprisonment.

Section 10: The rule requiring that this ordinance be read on three separate occasions is hereby waived.

Section 11: All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed.

Section 12: This ordinance shall be in full force and effect from and after its passage, approval, and publication according to law.

PASSED AND APPROVED by the Mayor and City Council of the City of Clifton, Idaho, this 11th day of August 2012.

CITY OF CLIFTON, IDAHO

By: John Gailey
John Gailey, Mayor

CITY OF CLIFTON OFFICIAL SEAL IDAHO

ATTEST:

Eve Waite
Eve Waite, Clerk

ORDINANCE #287

AN ORDINANCE OF THE CITY OF DAYTON, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE; REPEALING OTHER ORDINANCES OR PARTS OF ORDINANCES IN CONFLICT HEREWITH; WAIVING THE RULE REQUIRING READING OF THIS ORDINANCE ON THREE SEPARATE OCCASIONS; AND ESTABLISHING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF DAYTON, IDAHO, AS FOLLOWS:

Section 1: *Authority and Purpose.* The purpose of this ordinance is to protect air quality resources vital to the public health, safety, and welfare of the City of Dayton by controlling emissions from solid fuel and refuse burning. This ordinance is promulgated under the authority of Idaho Code Section 50-302.

Section 2: *Definitions:* For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

AIR POLLUTION: The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfere unreasonably with the enjoyment of life or property.

BUILDING: Any structure, dwelling, office, industrial plant, garage, or barn, whether publicly or privately owned or any other structure as defined by the International Building Code.

BURN DOWN: That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door fires or burning or incineration included within this ordinance.

CLEAN BURNING APPLIANCE: A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

FIREPLACE: A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace."

HEAT OUTPUT: The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

OPEN BURNING: For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

PARTICULATE MATTER (PM_{10}/$PM_{2.5}$): Any gas-borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

PERSON: Any individual, firm, partnership, association, corporation, company, organization, or governmental entity.

REFUSE: All solid waste, garbage, and rubbish, including, but not limited to, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris, or chemically treated wood.

SOLE SOURCE: One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating. No solid fuel heating device(s) shall be the sole source of heat if the building is equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity, or propane.

SOLID FUEL: Any form of untreated wood, coal, pressed logs, and pellet fuel.

SOLID FUEL HEATING APPLIANCE: An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty-five to one (35 to 1);
B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and
D. Maximum weight of less than eight hundred kilograms (800 kg).

Section 3: *Air Quality Designations and Alert Criteria:*

A. The quality of the city's air shall be determined by monitoring pollutant levels in and/or around the city with equipment and methods approved and provided by DEQ at its expense.

B. The quality of the city's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy-five (75) or greater or forecasts air stagnation conditions will continue for at least twenty-four (24) hours.

D. No person shall allow, suffer, cause, or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

Section 4: *Public Notification by DEQ*:

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified by DEQ. In addition, DEQ will post information on the DEQ website and the air quality hotline.

Section 5: *Burning Solid Fuel or Refuse*:

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "woodstove."

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications, and manufacturer's instructions.

C. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate, or odors deemed a public nuisance; such prohibited materials consist of, but are not limited to, the following: garbage, tires or

any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

1. During an initial fifteen minute start-up period, or

2. During refueling operations which may not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause, or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

Section 6: *Solid Fuel Heating Appliance Restrictions:*

A. From the date that this ordinance is effective, no person may sell or offer for sale except for scrap metal within the city limits of Dayton any solid fuel heating appliance which is not listed and certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the City. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

Section 7: *Exemptions from Restrictions:*

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The City of Dayton may grant exemptions from this ordinance if it is determined that on existing buildings:

1. A solid fuel heating appliance is the sole source of heat for the structure in which it is situated, or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

Section 8: *Minimum Standards for Clean Burning Appliances*:

A. Appliances shall meet the requirements of the Code of Federal Regulations, Title 40, Part 60, Subpart AAA, "Standards of Performance for New Residential Wood Heaters."

Section 9: *Penalty:*

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000 and by confinement in the county jail for a period not to exceed six (6) months or by both such fine and imprisonment.

Section 10: The rule requiring that this ordinance be read on three separate occasions is hereby waived.

Section 11: All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed.

Section 12: This ordinance shall be in full force and effect from and after its passage, approval, and publication according to law.

PASSED AND APPROVED by the Mayor and City Council of the City of Dayton, Idaho, this 8th day of August, 2012.

CITY OF DAYTON, IDAHO

By: Dee Virile Christensen

Dee Virile Christensen, Mayor

ATTEST:

Elva K. Atkinson

Elva K. Atkinson, Clerk

FRANKLIN CITY ORDINANCE

SOLID FUEL HEATING APPLIANCES

NO. 2012-9-12

AN ORDINANCE OF THE CITY OF FRANKLIN, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE.

SECTION 1: AUTHORITY AND PURPOSE:

The purpose of this ordinance is protect air quality resources vital to the public health, safety, and welfare of the City of Franklin by controlling emissions from solid fuel and refuse burning.

SECTION 2: DEFINITIONS:

For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

"**AIR POLLUTION**" The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfereunreasonably with the enjoyment of life or property.

"**BUILDING**" Any structure, dwelling, office, industrial plant, garage or barn, whether publicly or privately owned or any other structure as defined by the international building code.

"**BURN DOWN**" That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door

fires or burning or incineration included within this ordinance.

"**CLEAN BURNING APPLIANCE**" A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

"**FIREPLACE**" A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace".

"**HEAT OUTPUT**" The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

"**OPEN BURNING**" For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

"**PARTICULATE MATTER (PM_{10}/$PM_{2.5}$)**" Any gas borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

"**PERSON**" Any individual, firm, partnership, association, corporation, company, organization or governmental entity.

"**REFUSE**" All solid waste, garbage, and rubbish, including, but not limited to, cardboard, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris or chemically treated wood.

"**SOLE SOURCE**" One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating, No solid fuel heating device(s) shall be the sole source of heat in the building is equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity or propane.

"**SOLID FUEL**" Any form of untreated wood, coal, pressed logs, and pellet fuel.

"**SOLID FUEL HEATING APPLIANCE**" An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty five to one (35 to 1);

B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and
D. Maximum weight of less than eight hundred kilograms (800 kg).

SECTION 3: AIR QUALITY DESIGNATIONS AND ALERT CRITERIA

A. The quality of the City's air shall be determined by monitoring pollutant levels in and/or around the City with equipment and methods approved and provided by DEQ at its expense.

B. The quality of the City's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy five (75) or greater or forecasts air stagnation conditions will continue for at least twenty four (24) hours.

D. No person shall allow, suffer, cause or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

SECTION 4: *PUBLIC NOTIFICATION*

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified. In addition DEQ will post information on the DEQ website and the air quality hotline.

SECTION 5: *BURNING SOLID FUEL OR REFUSE*

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "woodstove".

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications and manufacturer's instructions.

C. Notwithstanding the provisions of any section of the this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate or odors deemed a public nuisance; such prohibited materials consist of , but are not limited to, the following: garbage, tires or any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, tree stumps, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

    1. During an initial fifteen minute start-up period, or

    2. During refueling operations which many not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

SECTION 6: SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS

A. From the date that this ordinance is effective, no person may sell or offer for sale within Franklin City any solid fuel heating appliance which is not listed ad certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the City. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances. Installations shall be in accordance with the Uniform Fire Code and manufacturer's instructions.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

SECTION 7: *EXEMPTIONS FROM RESTRICTIONS*

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The City may grant exemptions from this ordinance if it is determined that:

1. A solid fuel heating appliance is the sole source of heat for the structure in which is situated or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

SECTION 8: *MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES*

A. Appliances shall meet the requirements of the code of federal regulations title 40, part 60, subpart AAA, "standards of performance for new residential wood heaters".

SECTION 9: *PENALTY*

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000.00.

DATED THIS 12 day of September, 2012.

CITY OF FRANKLIN

JEREMY KIMPTON, Mayor

Attest:

LAEL PARKINSON, City Clerk

FRANKLIN COUNTY ORDINANCE

SOLID FUEL HEATING APPLIANCES

NO. 2012-6-25

AN ORDINANCE OF THE COUNTY OF FRANKLIN, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE.

SECTION 1: AUTHORITY AND PURPOSE:

The purpose of this ordinance is protect air quality resources vital to the public health, safety, and welfare of the County of Franklin by controlling emissions from solid fuel and refuse burning.

SECTION 2: DEFINITIONS:

For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

"**AIR POLLUTION**" The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfereunreasonably with the enjoyment of life or property.

"**BUILDING**" Any structure, dwelling, office, industrial plant, garage or barn, whether publicly or privately owned or any other structure as defined by the international building code.

"**BURN DOWN**" That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door

fires or burning or incineration included within this ordinance.

"**CLEAN BURNING APPLIANCE**" A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

"**FIREPLACE**" A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace".

"**HEAT OUTPUT**" The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

"**OPEN BURNING**" For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

"**PARTICULATE MATTER (PM_{10}/$PM_{2.5}$)**" Any gas borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

"**PERSON**" Any individual, firm, partnership, association, corporation, company, organization or governmental entity.

"**REFUSE**" All solid waste, garbage, and rubbish, including, but not limited to, cardboard, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris or chemically treated wood.

"**SOLE SOURCE**" One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating, No solid fuel heating device(s) shall be the sole source of heat in the building is equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity or propane.

"**SOLID FUEL**" Any form of untreated wood, coal, pressed logs, and pellet fuel.

"**SOLID FUEL HEATING APPLIANCE**" An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty five to one (35 to 1);

B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and
D. Maximum weight of less than eight hundred kilograms (800 kg).

SECTION 3: AIR QUALITY DESIGNATIONS AND ALERT CRITERIA

A. The quality of the city's air shall be determined by monitoring pollutant levels in and/or around the city with equipment and methods approved and provided by DEQ at is expense.

B. The quality of the city's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy five (75) or greater or forecasts air stagnation conditions will continue for at least twenty four (24) hours.

D. No person shall allow, suffer, cause or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

SECTION 4: *PUBLIC NOTIFICATION*

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified. In addition DEQ will post information on the DEQ website and the air quality hotline.

SECTION 5: *BURNING SOLID FUEL OR REFUSE*

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "woodstove".

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications and manufacturer's instructions.

C. Notwithstanding the provisions of any section of the this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate or odors deemed a public nuisance; such prohibited materials consist of , but are not limited to, the following: garbage, tires or any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, tree stumps, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

   1. During an initial fifteen minute start-up period, or

   2. During refueling operations which many not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

SECTION 6: SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS

A. From the date that this ordinance is effective, no person may sell or offer for sale within Franklin County any solid fuel heating appliance which is not listed ad certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the County. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances. Installations shall be in accordance with the Uniform Fire Code and manufacturer's instructions.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

SECTION 7: ***EXEMPTIONS FROM RESTRICTIONS***

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The County may grant exemptions from this ordinance if it is determined that:

1. A solid fuel heating appliance is the sole source of heat for the structure in which is situated or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

SECTION 8: ***MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES***

A. Appliances shall meet the requirements of the code of federal regulations title 40, part 60, subpart AAA, "standards of performance for new residential wood heaters".

SECTION 9: ***PENALTY***

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000.00.

DATED THIS 25 day of June, 2012.

Board of Franklin County Commissioners

DIRK BOWLES, Chairman

Attest:

SHAUNA GEDDES, County Clerk

MEMORANDUM OF UNDERSTANDING

SOLID FUEL HEATING APPLICANCES

WHEREAS, The City of Oxford ("Oxford"), Idaho is an incorporated city within Franklin, County ("County"), Idaho;

WHEREAS, Oxford is a small municipality with limited resources and without a fully functioning City Council to pass and provide enforcement of necessary ordinances;

WHEREAS, all municipalities within Franklin County have adopted an ordinance relating to regulation of solid fuel heating appliances to assist the Idaho Department of Environmental Quality in generating a State Implementation Plan ("SIP") to deal with the increasing problem of air pollution within the County;

WHEREAS, Oxford desires to be subject to the same requirements relating to solid fuel heating appliances as the other political subdivisions within the County but does not currently have the resources to pass or enforce such requirements;

WHEREAS, the County has adopted an ordinance relating to solid fuel heating appliances within the unincorporated limits of the County and is willing to apply and enforce the requirements of its ordinance in Oxford;

WHEREAS, Oxford desires the County to apply and enforce its ordinance within the Oxford City limits; and

WHEREAS, the parties desire to set forth the terms and conditions of their agreement relating to application and enforcement of the County's ordinance within the Oxford City limits.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto do stipulate, agree, covenant and promise as follows:

1. Franklin County Ordinance No. 2012-6-25, known as the SOLID FUEL HEATNG APPLIANCE ORDINANCE and attached hereto as Exhibit "A", shall be applicable and enforceable within the incorporated limits of the City of Oxford.

2. The County shall provide enforcement of the attached Ordinance and shall notify the City of Oxford of any enforcement action taken.

3. The City of Oxford shall give its residents reasonable notice of this Agreement and the terms of the Ordinance attached hereto.

4. Either party may terminate this Agreement upon thirty (30) days written notice to the other party.

DATED October 22, 2012

OXFORD CITY

By: Allen Hatch,
Mayor

Attest: Clerk

DATED October 22, 2012

FRANKLIN COUNTY

By: R. Dirk Bowles,
Chairman, Board of Commissioners

Attest: Shauna Geddes, Clerk

Exhibit "A"

FRANKLIN COUNTY ORDINANCE

SOLID FUEL HEATING APPLIANCES

NO. 2012-6-25

AN ORDINANCE OF THE COUNTY OF FRANKLIN, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE.

SECTION 1: AUTHORITY AND PURPOSE:

The purpose of this ordinance is protect air quality resources vital to the public health, safety, and welfare of the County of Franklin by controlling emissions from solid fuel and refuse burning.

SECTION 2: DEFINITIONS:

For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

"**AIR POLLUTION**" The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfereunreasonably with the enjoyment of life or property.

"**BUILDING**" Any structure, dwelling, office, industrial plant, garage or barn, whether publicly or privately owned or any other structure as defined by the international building code.

"**BURN DOWN**" That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door

fires or burning or incineration included within this ordinance.

"**CLEAN BURNING APPLIANCE**" A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

"**FIREPLACE**" A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace".

"**HEAT OUTPUT**" The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

"**OPEN BURNING**" For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

"**PARTICULATE MATTER (PM_{10}/$PM_{2.5}$)**" Any gas borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

"**PERSON**" Any individual, firm, partnership, association, corporation, company, organization or governmental entity.

"**REFUSE**" All solid waste, garbage, and rubbish, including, but not limited to, cardboard, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris or chemically treated wood.

"**SOLE SOURCE**" One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating, No solid fuel heating device(s) shall be the sole source of heat in the building is equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity or propane.

"**SOLID FUEL**" Any form of untreated wood, coal, pressed logs, and pellet fuel.

"**SOLID FUEL HEATING APPLIANCE**" An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty five to one (35 to 1);

B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and
D. Maximum weight of less than eight hundred kilograms (800 kg).

SECTION 3: AIR QUALITY DESIGNATIONS AND ALERT CRITERIA

A. The quality of the city's air shall be determined by monitoring pollutant levels in and/or around the city with equipment and methods approved and provided by DEQ at is expense.

B. The quality of the city's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy five (75) or greater or forecasts air stagnation conditions will continue for at least twenty four (24) hours.

D. No person shall allow, suffer, cause or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

SECTION 4: *PUBLIC NOTIFICATION*

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified. In addition DEQ will post information on the DEQ website and the air quality hotline.

SECTION 5: *BURNING SOLID FUEL OR REFUSE*

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "woodstove".

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications and manufacturer's instructions.

C. Notwithstanding the provisions of any section of the this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate or odors deemed a public nuisance; such prohibited materials consist of , but are not limited to, the following: garbage, tires or any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, tree stumps, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

    1. During an initial fifteen minute start-up period, or

    2. During refueling operations which many not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

SECTION 6: SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS

A. From the date that this ordinance is effective, no person may sell or offer for sale within Franklin County any solid fuel heating appliance which is not listed ad certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the County. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances. Installations shall be in accordance with the Uniform Fire Code and manufacturer's instructions.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

SECTION 7: *EXEMPTIONS FROM RESTRICTIONS*

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The County may grant exemptions from this ordinance if it is determined that:

1. A solid fuel heating appliance is the sole source of heat for the structure in which is situated or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

SECTION 8: *MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES*

A. Appliances shall meet the requirements of the code of federal regulations title 40, part 60, subpart AAA, "standards of performance for new residential wood heaters".

SECTION 9: *PENALTY*

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000.00.

DATED THIS 25 day of June, 2012.

Board of Franklin County Commissioners

DIRK BOWLES, Chairman

Attest:

SHAUNA GEDDES, County Clerk

ORDINANCE NO. 2012-1

AN ORDINANCE OF THE CITY OF PRESTON, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE; REPEALING OTHER ORDINANCES OR PARTS OF ORDINANCES IN CONFLICT HEREWITH; WAIVING THE RULE REQUIRING READING OF THIS ORDINANCE ON THREE SEPARATE OCCASIONS; AND ESTABLISHING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF PRESTON, IDAHO, AS FOLLOWS:

Section 1: *Authority and Purpose.* The purpose of this ordinance is to protect air quality resources vital to the public health, safety, and welfare of the City of Preston by controlling emissions from solid fuel and refuse burning. This ordinance is promulgated under the authority of Idaho Code Section 50-302.

Section 2: *Definitions:* For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

AIR POLLUTION: The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfere unreasonably with the enjoyment of life or property.

BUILDING: Any structure, dwelling, office, industrial plant, garage or barn, whether publicly or privately owned or any other structure as defined by the international building code.

BURN DOWN: That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door fires or burning or incineration included within this ordinance.

CLEAN BURNING APPLIANCE: A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

FIREPLACE: A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace".

HEAT OUTPUT: The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

OPEN BURNING: For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

PARTICULATE MATTER ($PM_{10}/PM_{2.5}$): Any gas borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

PERSON: Any individual, firm, partnership, association, corporation, company, organization or governmental entity.

REFUSE: All solid waste, garbage, and rubbish, including, but not limited to, cardboard, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris or chemically treated wood.

SOLE SOURCE: One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating, No solid fuel heating device(s) shall be the sole source of heat in the building if equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity or propane.

SOLID FUEL: Any form of untreated wood, coal, pressed logs, and pellet fuel.

SOLID FUEL HEATING APPLIANCE: An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty five to one (35 to 1);
B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and

D. Maximum weight of less than eight hundred kilograms (800 kg).

Section 3: *Air Quality Designations and Alert Criteria:*

A. The quality of the city's air shall be determined by monitoring pollutant levels in and/or around the city with equipment and methods approved and provided by DEQ at its expense.

B. The quality of the city's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy five (75) or greater or forecasts air stagnation conditions will continue for at least twenty four (24) hours.

D. No person shall allow, suffer, cause or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

Section 4: *Public Notification*:

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified. In addition DEQ will post information on the DEQ website and the air quality hotline.

Section 5: *Burning Solid Fuel or Refuse*:

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "wood stove".

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications and manufacturer's instructions.

C. Notwithstanding the provisions of any section of the this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate or odors deemed a public nuisance; such prohibited materials consist of, but are not limited to, the following: garbage, tires or any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, tree stumps, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

1. During an initial fifteen minute start-up period, or

2. During refueling operations which many not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

Section 6: *Solid Fuel Heating Appliance Restrictions and Permits*:

A. From the date that this ordinance is effective, no person may sell or offer for sale within the city limits of Preston any solid fuel heating appliance which is not listed and certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the City. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances. Installations shall be in accordance with the Uniform Fire Code and manufacturer's instructions.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

Section 7: *Exemptions from Restrictions*:

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The City may grant exemptions from this ordinance if it is determined that:

1. A solid fuel heating appliance is the sole source of heat for the structure in which it is situated or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

Section 8: *Minimum Standards For Clean Burning Appliances*:

A. Appliances shall meet the requirements of the code of federal regulations title 40, part 60, subpart AAA, "standards of performance for new residential wood heaters".

Section 9: *Penalty:*

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000.00 and by confinement in the county jail for a period not to exceed six (6) months or by both such fine and imprisonment.

Section 10: The rule requiring that this ordinance be read on three separate occasions is hereby waived.

Section 11: All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed.

Section 12: This ordinance shall be in full force and effect from and after its passage, approval, and publication according to law.

PASSED AND APPROVED by the Mayor and City Council of the City of Preston, Idaho, this 11th day of June, 2012.

CITY OF PRESTON, IDAHO

By: F. Lee Hendrickson
F. Lee Hendrickson, Mayor

ATTEST:

Jerry C Larsen
Jerry C Larsen, Clerk

ORDINANCE NO. 2012-01

AN ORDINANCE OF THE CITY OF WESTON, IDAHO, SETTING FORTH THE AUTHORITY AND PURPOSE OF SAID ORDINANCE; DEFINITIONS OF TERMS CONTAINED THEREIN; ESTABLISHING AIR QUALITY DESIGNATIONS AND ALERT CRITERIA; PROHIBITING THE BURNING OF CERTAIN FUELS OR REFUSE WITHIN A SOLID FUEL HEATING APPLIANCE OR THE BURNING OF MATERIALS WHEN AIR POLLUTANTS REACH A CERTAIN LEVEL; ESTABLISHING SOLID FUEL HEATING APPLIANCE RESTRICTIONS AND PERMITS THEREFOR AND EXEMPTIONS FROM RESTRICTIONS; SETTING FORTH MINIMUM STANDARDS FOR CLEAN BURNING APPLIANCES, AND PRESCRIBING A PENALTY FOR VIOLATION OF THIS ORDINANCE; REPEALING OTHER ORDINANCES OR PARTS OF ORDINANCES IN CONFLICT HEREWITH; WAIVING THE RULE REQUIRING READING OF THIS ORDINANCE ON THREE SEPARATE OCCASIONS; AND ESTABLISHING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF WESTON, IDAHO, AS FOLLOWS:

Section 1: *Authority and Purpose.* The purpose of this ordinance is protect air quality resources vital to the public health, safety, and welfare of the City of Weston by controlling emissions from solid fuel and refuse burning. This ordinance is promulgated under the authority of Idaho Code Section 50-302.

Section 2: *Definitions:* For the purpose of this ordinance, the following terms, phrases, words, and derivations all have the meanings given herein. The word "shall" is always mandatory and not merely directive.

AIR POLLUTION: The presence in the outdoor atmosphere of any contaminate or combinations thereof in such quality or of such nature and duration and under such conditions as would be injurious to human health or welfare, to plant or animal life, or to property, to interfereunreasonably with the enjoyment of life or property.

BUILDING: Any structure, dwelling, office, industrial plant, garage or barn, whether publicly or privately owned or any other structure as defined by the international building code.

BURN DOWN: That period of time following an air pollution alert required for the cessation of combustion within solid fuel heating appliances or any other door fires or burning or incineration included within this ordinance.

CLEAN BURNING APPLIANCE: A solid fuel heating appliance that has been certified as clean burning by the United States Environmental Protection Agency (EPA).

FIREPLACE: A residential solid fuel burning device with an air to fuel ratio of greater than thirty (30) which is a permanent structural feature of a building. A fireplace is made up of a concealed masonry or metal flue and a masonry or metal firebox enclosed in a decorative masonry or other building materials. A residential solid fuel burning device which is freestanding or which is installed into an existing "fireplace" opening is not included in the definition of "fireplace".

HEAT OUTPUT: The British thermal unit (BTU)/hour output of a solid fuel heating appliance.

OPEN BURNING: For the purposes of this ordinance, the combustion of any material not contained in a heating appliance. Also for the purposes of this ordinance, the use of a fireplace is considered open burning.

PARTICULATE MATTER (PM_{10}/$PM_{2.5}$): Any gas borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon and other combustible matter.

PERSON: Any individual, firm, partnership, association, corporation, company, organization or governmental entity.

REFUSE: All solid waste, garbage, and rubbish, including, but not limited to, cardboard, plastic, rubber, Styrofoam, petroleum products, foodstuff, Christmas trees, yard debris or chemically treated wood.

SOLE SOURCE: One or more solid fuel heating devices which constitute the only source of heat in a building for the purpose of space heating, No solid fuel heating device(s) shall be the sole source of heat in the building is equipped with a permanently installed furnace or heating system designed to heat the building that is connected or unconnected from its energy source, utilizing oil, natural gas, electricity or propane.

SOLID FUEL: Any form of untreated wood, coal, pressed logs, and pellet fuel.

SOLID FUEL HEATING APPLIANCE: An enclosed device designed for solid fuel combustion that meets all of the following criteria:

A. An air to fuel ratio averaging less than thirty five to one (35 to 1);
B. Firebox volume less than twenty (20) cubic feet;
C. Minimum burn rate less than five kilograms (5kg) per hour; and

D. Maximum weight of less than eight hundred kilograms (800 kg).

Section 3: *Air Quality Designations and Alert Criteria:*

A. The quality of the city's air shall be determined by monitoring pollutant levels in and/or around the city with equipment and methods approved and provided by DEQ at is expense.

B. The quality of the city's air shall be designated by DEQ according to the following table (as may be amended from time to time by the EPA):

Air Quality Index (AQI)

DESIGNATIONS	AQI
GOOD	0-50
MODERATE	51-100
UNHEALTHY FOR SENSITIVE GROUPS	101-150
UNHEALTHY	151-200
VERY UNHEALTHY	201-300
HAZARDOUS	301-500

C. All wood burning, including, but not limited to, within a solid fuel heating appliance designed for wood fuel (commonly known as a "wood stove") or open fireplace, is prohibited whenever the DEQ forecasts an AQI of seventy five (75) or greater or forecasts air stagnation conditions will continue for at least twenty four (24) hours.

D. No person shall allow, suffer, cause or permit any open burning of any kind (see IDAPA 58.01.01.600 – 623) whenever DEQ forecasts an AQI of 75 or greater or forecasts air stagnation conditions will continue for at least 24 hours.

Section 4: *Public Notification*:

Whenever air pollution alert conditions are met, local print and news media, local officials, the police and fire departments, and city officials will be notified. In addition DEQ will post information on the DEQ website and the air quality hotline.

Section 5: *Burning Solid Fuel or Refuse*:

A. No person shall cause or allow refuse or coal to be burned in a solid fuel heating appliance designed for wood fuel commonly known as a "woodstove".

B. No person shall cause or allow a wood stove to be operated contrary to the design, specifications and manufacturer's instructions.

C. Notwithstanding the provisions of any section of the this ordinance, no person shall allow, suffer, cause, or permit the burning of materials which emit toxic contaminants or large volumes of smoke, particulate or odors deemed a public nuisance; such prohibited materials consist of , but are not limited to, the following: garbage, tires or any other rubber materials, plastics, heavy petroleum products, dead animals or parts thereof, treated lumber, tree stumps, trash, wet or green vegetation, trade waste, commercial waste, roofing materials or any other asphaltic materials, drywall, sheetrock, tarpaper, floor underlayment, insulation, chemicals, household garbage, motor vehicles or parts thereof whether junked or not, insulated wire, pathogenic wastes, hazardous wastes, etc.

D. No person shall operate a residential solid fuel burning device or fireplace if the visible emissions exceed 20% opacity as measured by EPA method 9, except as follows:

1. During an initial fifteen minute start-up period, or

2. During refueling operations which many not exceed a fifteen minute period in any three hour period.

E. Notwithstanding the provisions of any section of this ordinance, no person shall allow, suffer, cause or permit the burning of any materials when the AQI as forecasted by the DEQ reaches (75) or higher for any air pollutant within the Cache Valley Airshed.

Section 6: *Solid Fuel Heating Appliance Restrictions and Permits*:

A. From the date that this ordinance is effective, no person may sell or offer for sale within the city limits of Weston any solid fuel heating appliance which is not listed ad certified by the EPA as a clean burning appliance.

B. No person shall install any solid fuel heating appliance in any new or existing building without first having obtained a permit to do so from the City. In order for such a permit to be granted, all such appliances shall be listed and certified by the EPA as clean burning appliances. Installations shall be in accordance with the Uniform Fire Code and manufacturer's instructions.

C. From the date the ordinance is effective; no person shall construct, or attempt to construct, any building for which a solid fuel burning appliance will be the sole source of heat.

Section 7: *Exemptions from Restrictions*:

A. All solid fuel burning appliances classified by the EPA as a clean burning appliance may be operated during an air quality alert.

B. A three hour burn down period shall be allowed for solid fuel heating appliances or fireplaces whose operation was commenced prior to the air quality alert.

C. The City may grant exemptions from this ordinance if it is determined that:

1. A solid fuel heating appliance is the sole source of heat for the structure in which is situated or

2. Using alternative heating would cause an unreasonable economic hardship.

D. Any building constructed after the effective date of this ordinance shall not be eligible for an exemption under subsections C1 and C2 of this section.

Section 8: *Minimum Standards For Clean Burning Appliances*:

A. Appliances shall meet the requirements of the code of federal regulations title 40, part 60, subpart AAA, "standards of performance for new residential wood heaters".

Section 9: *Penalty:*

A violation of any of the provisions of this ordinance shall constitute a misdemeanor punishable by a fine up to $1,000.00 and by confinement in the county jail for a period not to exceed six (6) months or by both such fine and imprisonment.

Section 10: The rule requiring that this ordinance be read on three separate occasions is hereby waived.

Section 11: All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed.

Section 12: This ordinance shall be in full force and effect from and after its passage, approval, and publication according to law.

PASSED AND APPROVED by the Mayor and City Council of the City of Weston, Idaho, this 1st day of August, 2012.

CITY OF WESTON, IDAHO

By: Camille Larsen
Camille Larsen, Mayor

ATTEST:

Sallie Dance
Sallie Dance, Clerk

Air Quality Index Program

Franklin County RESIDENTS

Air Quality Monitoring

Three Ways To Check Every Day!

24-Hour Hotline (208) 239-5028

Real-Time http://airquality.deq.idaho.gov

Forecasts www.deq.idaho.gov/air-quality/monitoring/daily-reports-and-forecasts

Franklin County residents can now check local air pollution levels on the Idaho Department of Environmental Quality's (DEQ) website, or by calling a 24-hour hotline at (208) 239-5028.

Idaho Department of Environmental Quality

Contact person: Melissa Gibbs
Phone: (208) 236-6160

The Franklin County area currently does not meet the 24-hour $PM_{2.5}$ air quality standard.

To notify the public, the Air Quality Index will be posted on DEQ's website each weekday morning and, if an air pollution episode is predicted or present, on Saturday and Sunday mornings as well. The hotline is updated every Monday through Friday during the spring, summer, and fall months, and will be extended to weekends and holidays between November and February.

Residents can receive daily updates via email by subscribing to DEQ's Daily Air Quality Reports and Forecasts page, clicking on the "Subscribe to this page" link, selecting a location and entering an email address.

www.deq.idaho.gov/air-quality/monitoring/daily-reports-and-forecasts

For the latest data check out the real time Air Quality Website:
http://airquality.deq.idaho.gov

Appendix F. Public Involvement

- **Cache Valley Airshed Advisory Group**
- **Public Notice**
- **Public Hearing with Transcript**
- **Response to Public Comment**

This page intentionally left blank for correct double-sided printing.

Cache Valley Airshed Advisory Group

NewsRelease

DEQ invites citizens to participate in local air quality involvement group

MEDIA CONTACT

- **Melissa Gibbs**
  DEQ Pocatello
  Regional Office
  (208) 236-6160

POCATELLO — The Idaho Department of Environmental Quality (DEQ) is seeking citizens to participate in a local air quality public involvement group.

The purpose of the group is to help DEQ identify ways to properly manage air quality on the Idaho side of the Cache Valley.

"The Cache Valley experiences poor air quality events during stagnant wintertime conditions due to temperature inversions that trap pollution by acting as a lid on the bowl-like topography of the valley," explained DEQ Airshed Coordinator Melissa Gibbs. "As a result, pollution in the valley exceeds federal health-based air quality standards."

Participants will work with DEQ to develop an air quality improvement plan known as a SIP or State Implementation Plan aimed at helping the area attain compliance with air quality standards.

"Serving on this group will provide participants with an opportunity to learn more about local air quality issues and how air quality decisions are made and to contribute to the process of identifying potential control measures for the area," Gibbs said.

"We would like to engage a broad cross-section of stakeholders—citizens, elected officials, agriculture and industry representatives, and others—in this process," Gibbs said.

Persons interested in serving on the group are invited to attend a public meeting at 7 p.m., Monday, January 23, at the Franklin County Extension Office, 561 W. Oneida, Preston. The meeting will focus on how to engage citizen involvement and participation in the Cache Valley area.

For more information, contact Melissa Gibbs at (208) 236-6160 or *melissa.gibbs @deq.idaho.gov.*

End

NewsRelease

Cache Valley citizens air quality group to meet Feb. 29, seeks new members

MEDIA CONTACT

- **Melissa Gibbs**
  DEQ Pocatello
  Regional Office
  (208) 236-6160

POCATELLO — Concerned about air quality in the Cache Valley?

You can help!

Join a group of local citizens who are working with the Idaho Department of Environmental Quality (DEQ) to identify ways to properly manage air quality on the Idaho side of the Cache Valley.

The Cache Valley local air quality involvement group will meet at 7 p.m., Wednesday, February 29, at the Franklin County Extension Office, 561 W. Oneida, Preston.

"We need people," said DEQ Airshed Coordinator Melissa Gibbs. "Air pollution affects everyone. If we pull together, we can have a positive impact on air quality in the valley."

DEQ is looking for a broad cross-section of stakeholders—citizens, elected officials, agriculture and industry representatives, and others—to join the group.

Participants will work with DEQ to develop an air quality improvement plan known as a SIP or State Implementation Plan aimed at helping the area attain compliance with air quality standards.

For more information, contact Melissa Gibbs at (208) 236-6160 or *melissa.gibbs @deq.idaho.gov.*

End

Cache Valley Airshed Advisory Group 3/21/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Establishing operating procedures for future meetings
3. Discuss roles, responsibilities, and activities of the Group
4. Discuss roles, responsibilities, and activities of DEQ
5. Topic Discussion
6. Control Measures
7. Re-cap of Action Items
8. Set agenda for next meeting

1. Group introductions

2. Establish operating procedures for future meetings
   - Regular meetings (every 3 weeks, monthly, bi-monthly)
   - Time of meetings
   - Day of the week for meetings
   - Notification of meetings (email, or regular mail)
   - Notification on DEQ webpage (calendar of events)
   - Establish leadership of group (rotating chair or yearlong chair)
   - General Public's role during the meetings

3. Groups roles, responsibilities and activities
   - Provide input on air quality issues facing the Cache Valley
   - Provide feedback to DEQ
   - Provide feedback/information to stakeholder groups
   - Assist DEQ in public outreach activities

4. DEQ's roles, responsibilities and activities

   DEQ is working towards the development and submittal of SIP or State Implementation Plan for the Idaho side of the Cache Valley. DEQ needs input from the Cache Valley Advisory group on the SIP as a whole and the development of the control measures for the portion of the nonattainment area while lies in Idaho. The CVAAG input into this process particularly in developing a vision for what air quality should be like in the future ad developing specific goals, is especially important.

   DEQ can:

   - Provide facilities and technical information about agency activities
   - Suggest items of interest
   - Publicize meetings
   - Provide summary of the meetings

5. Discussion of Topic ideas to strengthen the group's understanding of air quality issues.

   Documents provided tonight:

   - DEQ presentation from last meeting
   - $PM_{2.5}$ Idaho Area Designations
   - Randy Martin Special AQ studies (University of Utah)
   - Randy Martin AQ presentation
   - Examples of potential control strategies
   - Timeline / Schedule
   - Project Links/Resources
   - Source Definitions

6. Control Measures

   As part of the SIP, Idaho will need to identify and implement control measures. To date no specific controls have been implemented in Idaho.

   Utah control measures already implemented:

   - Synchronized traffic lights in Logan City.
   - Free Logan Rapid Transit Bus during red and yellow air quality days.
   - Replacement of USU coal-fired heating plant with a modern natural gas plant.
   - Natural gas fueled buses for USU campus shuttles.
   - Conversion of the municipal power plant from diesel to natural gas.
   - Red-yellow-green wood-burning control program.
   - Smoking vehicle program.
   - Stage 1 vapor recovery.

7. Action Items

8. Agenda/Date & Time for next meeting

Cache Valley Airshed Advisory Group 5/3/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Meeting Schedule (dates)
3. Westside Bus Route discussion
4. School Bus Retrofits
5. Utah most recent proposed control measures for Cache County
6. CNG
7. American Lung Association Report
8. News Articles
9. Residential Wood Combustion Ordinances
10. City Meetings

Cache Valley Airshed Advisory Group
Thursday May 3, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
X	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
X	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
X	Lloyd Harris	Citizen	Franklin
X	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
X	Rebecca Giles	Citizen/Public Health	Preston
Not able to make mtg	Jeremy Jensen	Citizen/ HOA	Preston
X	Susan West	Citizen	Preston
	Ralph West	Citizen	Preston
	Lyla Dettner	Franklin Soil and Water District	Preston
X	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
X	Doug Rallison	Farming/citizen	Franklin
X	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group
(non members)
May 3, 2012

Please Print

Name	Address	Phone Number	Email Address
Richard Westerberg			
Kevin Blanch			
Josh Greer			
Ken Holt			
Chris Peirsol			

Cache Valley Airshed Advisory Group Meeting Schedule

May 3, 2012	Franklin County Ag Extension Office
May 24, 2012	Franklin County Ag Extension Office
June 7, 2012	Preston Library
July 26, 2012	Franklin County Ag Extension Office
August 16, 2012	Preston Library
September 13, 2012	Franklin County Ag Extension Office
September 27, 2012	Franklin County Ag Extension Office
October 18, 2012	Franklin County Ag Extension Office
November 15, 2012	Franklin County Ag Extension Office
November 29, 2012	Franklin County Ag Extension Office
December 20, 2012	Franklin County Ag Extension Office
January 10, 2013	Franklin County Ag Extension Office

Cache Valley Airshed Advisory Group 5/24/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Monitoring
   - New Monitor FDMS Filter Dynamics Measurement System
   - DEQ list serve (email updates on AQ) & AQ hotline – after July
   - Show- n-Tell
3. Grant updates
   - DERP funding – retro fitting generators at irrigation pumps
   - Stage 1 vapor recovery
4. Westside Bus Route - survey
   - Getting the survey out to the community
     - Possibility to send with water bill in Dayton, Weston and Clifton
     - Website locations
       - GBPA
       - DEQ
       - KACH
       - Preston Citizen
       - Franklin County
       - PRT and CVTD
     - Other?
5. RWC ordinance - Franklin City Letter
6. Clean Air Act - Controls and Emission Reductions to be used in the Idaho SIP (some of these do not result in much control/credit for the SIP)
   - Diesel Retrofits (Westside and Preston School Districts)
   - Commuter Bus Service (2 morning, 1 afternoon, and 2 evening routes) (this only covers a small percentage of the estimated 1700 daily commuters to the Logan, Utah area)
   - Emissions Reductions: 2 woodstove changeouts (2006-2007 76 woodstoves & 2012-2012 76 woodstoves) (Estimated reduction of direct PM from RWC by 8 tons)
   - Agricultural Control Measures - The Food Security Act and the Farm Bill - BMP's for agricultural operations
   - Air Pollution emergency episode Rule
   - Tier 2 Federal Motor Vehicle Emissions Requirements
   - **Road Sanding Agreements** – Franklin County and ITD (needs to be completed& is enforceable)
7. Enforceable Control Measure Options
   - RWC - Residential Wood Combustion Ordinance
   - Inspection and Maintenance Program (I/M - vehicle testing)
   - Other?
8. Other controls?
   - Stage 1 vapor recovery
   - Expanding commuter bus service to west side of valley
   - Other?
9. Items for next meeting
10. Next meeting June 7, 2012 Preston Library

Cache Valley Airshed Advisory Group
Thursday May 24, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
X	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
X	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
X	Jennifer Mott	Citizen	Weston
X	Lloyd Harris	Citizen	Franklin
X	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
	Rebecca Giles	Citizen/Public Health	Preston
X	Jeremy Jensen	Citizen/ HOA	Preston
X	Susan West	Citizen	Preston
	Ralph West	Citizen	Preston
X	Lyla Dettner	Franklin Soil and Water District	Preston
X	Alan White	GPBA/ business owner/media	Preston
	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group 6/7/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Open Burning Rules
3. Logan and Franklin Air Quality Monitoring Graph
4. Emissions Inventory
5. Items for next meeting
6. Next meeting June 28, 2012 Franklin County Ag Extension Office

Cache Valley Airshed Advisory Group
Thursday June 7, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
—	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
—	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
—	Lloyd Harris	Citizen	Franklin
X	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
X	Rebecca Giles	Citizen/Public Health	Preston
—	Jeremy Jensen	Citizen/ HOA	Preston
—	Susan West	Citizen	Preston
—	Ralph West	Citizen	Preston
X	Lyla Dettner	Franklin Soil and Water District	Preston
—	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
X	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group
(non members)
June 7, 2012

Please Print

Name	Address	Phone Number	Email Address
Chris Persol	ITD		

Cache Valley Airshed Advisory Group 7/26/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Diesel Emission Reduction Program
3. RWC ordinances
    - City of Preston – Adopted Ordinance 2012-1 (6/20/2012)
    - City of Franklin - Voted Against Adopting
    - City of Weston –
    - City of Dayton –
    - City of Clifton –
    - City of Oxford –
    - Franklin County - Adopted Ordinance 2012-6-25 (6/25/2012)
4. Road Sanding Agreements
    - Franklin Count Road and Bridge – Complete
    - Idaho Transportation Department – In progress
5. Other
6. Items for next meeting
7. Next meeting August 16, 2012 Preston Library

Cache Valley Airshed Advisory Group
Thursday July 26, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
X	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
	Gary Leak	Agriculture	Weston
X	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
	Lloyd Harris	Citizen	Franklin
	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
	Rebecca Giles	Citizen/Public Health	Preston
X	Jeremy Jensen	Citizen/ HOA	Preston
	Susan West	Citizen	Preston
	Ralph West	Citizen	Preston
X	Lyla Dettner	Franklin Soil and Water District	Preston
	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group
(non members)
July 26, 2012

Please Print

Name	Address	Phone Number	Email Address
Josh Greer			
Kevin Black			

Cache Valley Airshed Advisory Group 8/16/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Status of RWC Ordinances
    - Franklin County – Adopted Ordinance 2012-6-25 (6/25/2012)
    - Preston City – Adopted Ordinance 2012-1 (6/20/2012)
    - Franklin City
    - Weston City - Adopted Ordinance 8/1/2012
    - Dayton City
    - Clifton City – Adopted Ordinance 8/1/2012
    - Oxford City
3. Road Sanding Agreements
    - Franklin County – Complete
    - ITD – In progress
4. Cache County Vehicle Emissions Testing – Herald Journal
5. Other
6. Items for next meeting
7. Next meeting September 13, 2012 Franklin County Ag Extension Office

Cache Valley Airshed Advisory Group
Thursday August 16, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
X	Lloyd Harris	Citizen	Franklin
	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
X	Rebecca Giles	Citizen/Public Health	Preston
	Jeremy Jensen	Citizen/ HOA	Preston
/	Susan West	Citizen	Preston
	Ralph West	Citizen	Preston
X	Lyla Dettner	Franklin Soil and Water District	Preston
/	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group 9/13/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Status of Website upgrades for AQ updates for Franklin
    - AQI hotline
    - Site for list serve for Franklin real time air quality data
3. New Air quality Monitor (installation) (Late October)
4. Utah Draft SIP
    - Cache County I/M Program
5. Idaho Draft SIP
    - Idaho Controls (11) 2 are enforceable (RWC ordinance and Road Sanding Agreements)
    - Review and Comment by next meeting (9/27/2012)
    - Public Comment Period (October- November Timeframe)
    - Public Hearing (within the public comment period)
6. Herald Journal articles
7. Other
8. Items for next meeting
9. Next meeting September 27, 2012 Franklin County Ag Extension Office

Cache Valley Airshed Advisory Group
Thursday September 13, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
X	Lloyd Harris	Citizen	Franklin
	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
	Rebecca Giles	Citizen/Public Health	Preston
	Jeremy Jensen	Citizen/ HOA	Preston
X	Susan West	Citizen	Preston
	~~Ralph West~~	Citizen	Preston
	Lyla Dettner	Franklin Soil and Water District	Preston
X	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
✓	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
X	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group
(non members)
September 13, 2012

Please Print

Name	Address	Phone Number	Email Address
Kevin Blank	42 w 1st S Preston	852-0478	

Cache Valley Airshed Advisory Group 9/27/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. Status of Website upgrades for AQ updates for Franklin
    - AQI hotline 208-239-5028
    - Site for list serve for Franklin real time air quality data

http://www.deq.idaho.gov/air-quality/monitoring/daily-reports-and-forecasts.aspx

3. Sign up for Email Updates for AQI
4. Idaho Draft SIP – Comments
5. Other
6. Items for next meeting
7. Next meeting October 18, 2012 Franklin County Ag Extension Office

Cache Valley Airshed Advisory Group
Thursday September 27, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
	Lloyd Harris	Citizen	Franklin
X	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
X	Rebecca Giles	Citizen/Public Health	Preston
X	Jeremy Jensen	Citizen/ HOA	Preston
X	Susan West	Citizen	Preston
	~~Ralph West~~	Citizen	Preston
	Lyla Dettner	Franklin Soil and Water District	Preston
X	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group
(non members)
September 27, 2012

Please Print

Name	Address	Phone Number	Email Address
Kevin Blanch			

Cache Valley Airshed Advisory Group 10/18/2012

Purpose: To provide the public with a forum to understand and provide input on air quality issues facing the Cache Valley, to provide feedback to DEQ as representatives of various stakeholder groups, and to assist DEQ in public outreach activities.

AGENDA

1. Introductions
2. POSTCARDS
    - AQI hotline 208-239-5028
    - Real-Time http://airquality.deq.idaho.gov
    - Site for list serve for Franklin real time air quality data

http://www.deq.idaho.gov/air-quality/monitoring/daily-reports-and-forecasts.aspx

3. Latest Draft Idaho SIP
4. Link to AQI on External Websites
5. AQI Daily updates start November for weekends and Holidays
6. FDMS Schedule
7. 30 Day Public Comment Period (should start November 1, 2012)
8. Formal Public Hearing (will be near the end of the comment period)
9. Other
10. Items for next meeting
11. Next meeting November 15, 2012 Franklin County Ag Extension Office

Cache Valley Airshed Advisory Group
Thursday October 18, 2012

Please mark an X by your name if present

ATTENDANCE	MEMBER	REPRESENTS	City
X	Tyler Olson	Citizen/Farm Bureau/Farming	Weston
	Gary Leak	Agriculture	Weston
	Ivan Mott	Citizen	Weston
	Jennifer Mott	Citizen	Weston
	Lloyd Harris	Citizen	Franklin
	Stanley Parker	Citizen	Franklin
	Duke Mumford	Elected Official/Dairy & Ag	Clifton
	Rebecca Giles	Citizen/Public Health	Preston
	Jeremy Jensen	Citizen/ HOA	Preston
X	Susan West	Citizen	Preston
	Ralph West	Citizen	Preston
X	Lyla Dettner	Franklin Soil and Water District	Preston
X	Alan White	GPBA/ business owner/media	Preston
X	Jessi Holt	Citizen	Preston
X	Steven Aust	Citizen/Chemistry	Preston
	Timothy Moosman	Citizen	Preston
	Doug Rallison	Farming/citizen	Franklin
X	Glen Seamons	Citizen	Franklin

Cache Valley Airshed Advisory Group
(non members)
October 18, 2012

Please Print

Name	Address	Phone Number	Email Address
Dee Vinle Christensen	77 South Hwy 36 Weston	747-3710	deeliz@plmw
Kevin Blanch			Southeast Idaho Public Health
Elma Atkinson	PO Box 11 Dayton 83232	760-7623	dayton city@plmw.com
Susan Hatch	5202 W 900 N Dayton ID.	208-851-2223	Susan747@Hotmail.com
Brent Hatch	"	"	"
Boyd Henderson	24 S Hwy 36 Weston	970 396 6940	Boydthebuilder@msn.com
Dan Sharp	1135 N. Westside Hwy	716-3634	cottontop3634@Yahoo.com
Dwain Weeks	2951 W Hwy 36	852-2307	
Craig Campbell	386 N 2200 W		
Sandra Weeks	2951 W. Hwy 36	852-2307	
Kevin Blanch	42 W 1215 Preston	852-0478	
JARED HATCH	Dayton ID.	760-1336	HATCH JARED@yahoo.com
Jared Ray	5577 Square Creek rd	852-3094	jaredray@plmw.com
Dallen Jolley	879 N. 4900 W.	747-3669	Jolleydayton@yahoo.com

Public Notice

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE STATE IMPLEMENTATION PLAN FOR $PM_{2.5}$ (fine particulate matter) IN CACHE VALLEY, IDAHO (PORTIONS OF FRANKLIN COUNTY)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through November 30, 2012. DEQ will conduct a public hearing on Thursday, November 29, 2012 at 6:30 p.m. in the Franklin County Agricultural Extension Office located at 561 W. Oneida, Preston, Idaho.

PROPOSED ACTION: DEQ is proposing to submit a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$ (fine particulate matter) in the Logan (UT-ID) Area to the U.S. Environmental Protection Agency, for inclusion in the (SIP), as required by Section 110 of the Clean Air Act. The intent of the SIP is to demonstrate how attainment with the NAAQS will be achieved by the attainment date of January 1, 2015.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan is available for public review on the DEQ website at *www.deq.idaho.gov/public-comment-opportunities.*

Printed materials will be made available at the Larsen-Sant Public Library located at 109 South 1st East, Preston, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 5:30 p.m. mountain time.

A public hearing will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 6:30 p.m. mountain time. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS–ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process, or technical assistance should be directed to Melissa Gibbs, Department of Environmental Quality, 444 Hospital Way #300, Pocatello, Idaho 83201, melissa.gibbs@deq.idaho.gov, or (208) 236-6160. Please reference "Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan" when sending comments or requesting information.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MST/MDT, November 30, 2012.

DATED this 30th day of October, 2012.

Melissa Gibbs
Airshed Coordinator

NewsRelease

DEQ seeks comment on draft Cache Valley air quality improvement plan; public hearing scheduled

MEDIA CONTACT

- **Melissa Gibbs**
  DEQ Pocatello
  Regional Office
  (208) 373-0550

POCATELLO — The Idaho Department of Environmental Quality (DEQ) is seeking public comment on a draft plan to improve air quality in the Cache Valley.

The plan, entitled *Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan*, demonstrates how the area will comply with the national ambient air quality standard for fine particulate matter (referred to as PM2.5) by January 1, 2015.

Exposure to fine particles is linked to a variety of serious health problems, including decreased lung function, aggravated asthma, chronic bronchitis, irregular heartbeat, non-fatal heart attacks, and premature death in people with heart or lung disease.

Based on monitoring data, it was determined that the Cache Valley, spanning Idaho and Utah, had failed to meet the 24-hour standard for PM2.5. Contributing sources include emissions from wood stoves, vehicles, and mobile dust.

The draft plan outlines a variety of control strategies and contingency measures to improve air quality. Key elements include:

- implement residential wood stove combustion ordinances to control burning during air quality alerts
- keep the public informed of air quality conditions and associated protective actions through DEQ's Air Quality Index Program
- reduce the amount of wintertime road sanding material

A public informational meeting on the draft plan will be held at 5:30 p.m., Thursday, November 29, 2012, at the Franklin County Agricultural Extension Office, 561 W. Oneida, Preston, Idaho, followed by a public hearing at the same location at 6:30 p.m. Oral and written comments will be accepted at the hearing.

The document is available for review at DEQ's Pocatello Regional Office, 444 Hospital Way, and on DEQ's website at *www.deq.idaho.gov/public-comment-opportunities.*

The deadline for submitting comments is 5 p.m. MST, Friday, November 30, 2012.

Submit written comments on DEQ's website or by mail or email to:

Melissa Gibbs
SIP/Airshed Coordinator
DEQ Pocatello Regional Office
4440 Hospital Way, #300
Pocatello, ID 83201
melissa.gibbs@deq.idaho.gov

Public Hearing with Transcript

Proof of Publication

Cache Valley Publishing
P.O. Box 487, Logan, Utah 84323-0487
Telephone 435-752-2121
The Herald Journal - Preston Citizen
Tremonton Leader - News Examiner
Fax 435-753-6642

Advertising Memo Bill

1 Memo Bill Period	2 Advertiser/Client Name		
11/2012	IDAHO DEPT. OF ENVIRONMENTAL Q		
22 Total Amount Due	*Unapplied Amount	3 Terms of Payment	
120.44			

21 Current Net Amount Due	29 30 Days	60 Days	Over 90 Days
.00	.00	.00	.00

4 Page Number	5 Memo Bill Date	6 Billed Account Number	7 Advertiser/Client Number
1	11/01/12	192430	192430

8 Billed Account Name and Address

IDAHO DEPT. OF ENVIRONMENTAL Q
1410 NORTH HILTON
BOISE ID 83706

DEQ
NOV 07 2012
Financial Management

fec

Amount Paid:

Comments:

Ad #: 782031

Please Return Upper Portion With Payment

10 Date	11 Newspaper Reference	12 13 14 Description-Other Comments/Charges	15 16 SAU Size Billed Units	17 18 Times Run Rate	19 Gross Amount	20 Net Amount
10/31/12	782031 LEGAL	LEGAL #7317 10/31 PCZN	1X 74.00 74.00	1 0.00	120.44	120.44

Statement of Account - Aging of Past Due Amounts

21 Current Net Amount Due	29 30 Days	60 Days	Over 90 Days	*Unapplied Amount	22 Total Amount Due
0.00	0.00	0.00	0.00		120.44

CACHE VALLEY PUBLISHING
(435) 752-2121

* UNAPPLIED AMOUNTS ARE INCLUDED IN TOTAL AMOUNT DUE

24 Invoice	Advertiser Information			
	1 Billing Period	6 Billed Account Number	7 Advertiser/Client Number	2 Advertiser/Client Name
782031	11/2012	192430	192430	IDAHO DEPT. OF ENVIRONM

№ 7317

AFFIDAVIT OF PUBLICATION

STATE OF IDAHO,
County of Franklin } ss.

Rodney Boam
being duly sworn,

deposes and says:

That he is the Editor of THE PRESTON CITIZEN, a weekly newspaper published at Preston, in the County of Franklin and State of Idaho; that said paper has been and is in general circulation in the county aforesaid, and in the vicinity of Preston; that the advertisement, a copy of which is attached hereto, was published in said newspaper once a week for 1 consecutive weeks in the regular and entire issue of said paper during the period of time of publication, and was published in the newspaper proper and not a supplement; that said paper has been established and regularly published for more than seventy-eight consecutive weeks prior to the date of first publication of said advertisement.

Such notice was published in the issue beginning with Oct. 31, 20 12 and ending with the issue of Oct. 31, 20 12

TK Boam

Fee $ 120.44

Subscribed and sworn to before me this 31st day of Oct., 20 12.

Ann Rawlings

Notary Public, Residing at Preston, Idaho

My Commission Expires 10/26, 20 18.

ANN RAWLINGS NOTARY PUBLIC STATE OF IDAHO

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE STATE IMPLEMENTATION PLAN FOR $PM_{2.5}$ (fine particulate matter) IN CACHE VALLEY, IDAHO (PORTIONS OF FRANKLIN COUNTY)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through November 30, 2012. DEQ will conduct a public hearing on Thursday, November 29, 2012 at 6:30 p.m. in the Franklin County Agricultural Extension Office located at 561 W. Oneida, Preston, Idaho.

PROPOSED ACTION: DEQ is proposing to submit a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$ (fine particulate matter) in the Logan (UT-ID) Area to the U.S. Environmental Protection Agency, for inclusion in the (SIP), as required by Section 110 of the Clean Air Act. The intent of the SIP is to demonstrate how attainment with the NAAQS will be achieved by the attainment date of January 1, 2015.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan is available for public review on the DEQ website at *www.deq.idaho.gov/public-comment-opportunities.*

Printed materials will be made available at the Larsen-Sant Public Library located at 109 South 1st East, Preston, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 5:30 p.m. mountain time.

A public hearing will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 6:30 p.m. mountain time. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS–ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process, or technical assistance should be directed to Melissa Gibbs, Department of Environmental Quality, 444 Hospital Way #300, Pocatello, Idaho 83201, melissa.gibbs@deq.idaho.gov, or (208) 236-6160. Please reference "Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan" when sending comments or requesting information.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MST/MDT, November 30, 2012.

DATED this 30th day of October, 2012.

Melissa Gibbs
Airshed Coordinator

Legal No. 7317 - Publish October 31, 2012.

IDAHO STATE PUBLISHING
PO BOX 431
POCATELLO ID 83204

(208) 232-4161

Fax(208) 233-1642

Advertising Invoice

1 Billing Period	3 Advertiser/Client Name
10/2012	STATE OF IDAHO, DEQ

23 Total Amount Due	*Unapplied Amount	3 Terms of Payment
106.93		

31 Current Net Amount Due	32 30 Days	60 Days	Over 90 Days
N/A	N/A	N/A	N/A

4 Page Number	5 Billing Date	6 Billed Account Number	7 Advertiser/Client Number
1	10/30/12 672453	113710 .	113710

8 Billed Account Name and Address

STATE OF IDAHO, DEQ
1410 NORTH HILTON
BOISE ID 83706

Amount Paid:

DEQ Comments:

NOV 02 2012
Financial Management

poc

Please Return Upper Portion With Payment

10 Date	11 Newspaper Reference	12 13 14 Description-Other Comments/Charges	15 SAU Size 16 Billed Units	17 Times Run 18 Rate	19 Gross Amount	20 Net Amount
10/30/12	778883 L2	LN20101 NOTICE OF 30- NOTICE OF 30-DAY PUBLI 10/30 ISJ	2X 92.00 184.00	1 95.68	106.93	106.93

RECEIVED
NOV 13 2012
IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY

Due date: 11/14/12

Statement of Account - Aging of Past Due Amounts

31 Current Net Amount Due	32 30 Days	60 Days	Over 90 Days	*Unapplied Amount	23 Total Amount Due
N/A	N/A	N/A	N/A		106.93

IDAHO STATE PUBLISHING
(208) 232-4161

* UNAPPLIED AMOUNTS ARE INCLUDED IN TOTAL AMOUNT DUE

24 Invoice Number	Advertiser Information			
	1 Billing Period	6 Billed Account Number	7 Advertiser/Client Number	3 Advertiser/Client Name
672453	10/2012	113710	113710	STATE OF IDAHO, DEQ

PROOF OF PUBLICATION

STATE OF IDAHO
County of Bannock

LN20101 **KAREN MASON**

being first duly sworn on oath deposes and says: that SHE was at all times herein mention a citizen of the United States of America more than 21 years of age, and the Principal Clerk of the Idaho State Journal, a daily newspaper, printed and published at Pocatello, Bannock County Idaho and having a general circulation therein.
That the document or notice, a true copy of which is attached, was published in the said IDAHO STATE JOURNAL, on the following dates, to-wit:

Oct. 30	2012		2012
	2012		2012
	2012		2012
	2012		2012

That said paper has been continuously and uninterruptedly published in said County for a period of seventy-eight weeks prior to the publication of said notice of advertisement and is a newspaper within the meaning of the laws of Idaho.

K Mason

STATE OF IDAHO
COUNTY OF BANNOCK
On this 30th. of Oct. in the year of 2012, before me, a Notary Public, personally appeared KAREN MASON Known or identified to me to be the person whose name subscribed to the within instrument, and being by me first duly sworn, declared that the statements therein are true, and acknowledge to me that he executed the same.

Notary of Public
Lori A. Sekot
Residing at Arimo exp. 3/3/15

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE STATE IMPLEMENTATION PLAN FOR PM2.5 (fine particulate matter) IN CACHE VALLEY, IDAHO (PORTIONS OF FRANKLIN COUNTY)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through November 30, 2012. DEQ will conduct a public hearing on Thursday, November 29, 2012 at 6:30 p.m. in the Franklin County Agricultural Extension Office located at 561 W. Oneida, Preston, Idaho.

PROPOSED ACTION: DEQ is proposing to submit a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standard (NAAQS) for PM2.5 (fine particulate matter) in the Logan (UT-ID) Area to the U.S. Environmental Protection Agency, for inclusion in the (SIP), as required by Section 110 of the Clean Air Act. The intent of the SIP is to demonstrate how attainment with the NAAQS will be achieved by the attainment date of January 1, 2015.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan is available for public review on the DEQ website at www.deq.idaho.gov/public-comment-opportunities.

Printed materials will be made available at the Larsen-Sant Public Library located at 109 South 1st East, Preston, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 5:30 p.m. mountain time.

A public hearing will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 6:30 p.m. mountain time. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS-ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process, or technical assistance should be directed to Melissa Gibbs, Department of Environmental Quality, 444 Hospital Way #300, Pocatello, Idaho 83201, melissa.gibbs@deq.idaho.gov, or (208) 236-6160. Please reference "Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan" when sending comments or requesting information.

All written comments concerning this proposal must be directed to and received

County of Bannock

LN20101

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE STATE IMPLEMENTATION PLAN FOR PM2.5 (fine particulate matter) IN CACHE VALLEY, IDAHO (PORTIONS OF FRANKLIN COUNTY)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through November 30, 2012. DEQ will conduct a public hearing on Thursday, November 29, 2012 at 6:30 p.m. in the Franklin County Agricultural Extension Office located at 561 W. Oneida, Preston, Idaho.

PROPOSED ACTION: DEQ is proposing to submit a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standard (NAAQS) for PM2.5 (fine particulate matter) in the Logan (UT-ID) Area to the U.S. Environmental Protection Agency, for inclusion in the (SIP), as required by Section 110 of the Clean Air Act. The intent of the SIP is to demonstrate how attainment with the NAAQS will be achieved by the attainment date of January 1, 2015.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan is available for public review on the DEQ website at www.deq.idaho.gov/public-comment-opportunities.

Printed materials will be made available at the Larsen-Sant Public Library located at 109 South 1st East, Preston, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 5:30 p.m. mountain time.

A public hearing will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 6:30 p.m. mountain time. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS-ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process, or technical assistance should be directed to Melissa Gibbs, Department of Environmental Quality, 444 Hospital Way #300, Pocatello, Idaho 83201, melissa.gibbs@deq.idaho.gov, or (208) 236-6160. Please reference "Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan" when sending comments or requesting information.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MST/MDT, November 30, 2012.

DATED this 30th day of October, 2012.

Melissa Gibbs, Airshed Coordinator

October 30, 2012

LN20101

KAREN MASON

being first duly sworn on oath deposes and says: that SHE was at all times herein mention a citizen of the United States of America more than 21 years of age, and the Principal Clerk of the Idaho State Journal, a daily newspaper, printed and published at Pocatello, Bannock County Idaho and having a general circulation therein.

That the document or notice, a true copy of which is attached, was published in the said IDAHO STATE JOURNAL, on the following dates, to-wit:

Oct. 30 2012 _____ 2012
_____ 2012 _____ 2012
_____ 2012 _____ 2012
_____ 2012 _____ 2012

That said paper has been continuously and uninterruptedly published in said County for a period of seventy-eight weeks prior to the publication of said notice of advertisement and is a newspaper within the meaning of the laws of Idaho.

K Mason

STATE OF IDAHO
COUNTY OF BANNOCK

On this 30th. of Oct. in the year of 2012, before me, a Notary Public, personally appeared KAREN MASON Known or identified to me to be the person whose name subscribed to the within instrument, and being by me first duly sworn, declared that the statements therein are true, and acknowledge to me that he executed the same.

Notary of Public
Lori A. Sekot
Residing at Arimo exp. 3/3/15

Cache Valley Publishing

P.O. Box 487, Logan, Utah 84323-0487
Telephone 435-752-2121
The Herald Journal - Preston Citizen
Tremonton Leader - News Examiner
Fax 435-753-6642

Advertising Memo Bill

Memo Bill Period	Advertiser/Client Name
10/2012	IDAHO DEPT OF ENVIRO QUALITY

Total Amount Due	*Unapplied Amount	Terms of Payment
154.77		

Current Net Amount Due	30 Days	60 Days	Over 90 Days
.00	.00	.00	.00

Page Number	Memo Bill Date	Billed Account Number	Advertiser/Client Number
1	10/30/12	193691 NANCY.	193691

Billed Account Name and Address	
IDAHO DEPT OF ENVIRO QUALITY 1410 NORTH HILTON BOISE ID 83706	DEQ Poc NOV 02 2012 Financial Management Amount Paid: Comments: Ad #: 779312

Please Return Upper Portion With Payment

Date	Newspaper Reference	Description-Other Comments/Charges	SAU Size / Billed Units	Times Run / Rate	Gross Amount	Net Amount
10/30/12	779312 LG	MELISSA GIBBS * + 10/30 WEB HJ	3X 46.00 138.00	1 10.32	129.77	154.77

RECEIVED
NOV 13 2012
IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY

Statement of Account - Aging of Past Due Amounts

Current Net Amount Due	30 Days	60 Days	Over 90 Days	*Unapplied Amount	Total Amount Due
0.00	0.00	0.00	0.00		154.77

CACHE VALLEY PUBLISHING
(435) 752-2121

* UNAPPLIED AMOUNTS ARE INCLUDED IN TOTAL AMOUNT DUE

Invoice	Billing Period	Billed Account Number	Advertiser/Client Number	Advertiser/Client Name
779312	10/2012	193691	193691	IDAHO DEPT OF ENVIRO QU

Civil
PROOF OF PUBLICATION

STATE OF UTAH
COUNTY OF CACHE, ss

On this 30th day of October , A.D. 2012 personally appeared
before me Monica Christensen who being first being duly sworn, deposes and says that
she is the Assistant to the Finance Director of the Cache Valley Publishing Co., publishers of The Herald Journal
a daily newspaper published in Logan City, Cache County Utah, and that the
Legal Notice, a copy of which is hereto attached was published in said
newspaper for 1 issue(s) and that said notice also published on utahlegals.com
on the same days(s) as publication in said newspaper

Commencing on the following days:
10/30/2012

Monica Christensen, Assistant to the Finance Director

Subscribed and sworn to before me on this30th day of October , A.D. 2012

Amanda Marie Nye, Notary Public
Commissioned in the State of Utah
My Commission expires August 1, 2015

NOTARY PUBLIC
AMANDA MARIE NYE
600362
COMMISSION EXPIRES
AUGUST 18, 2014
STATE OF UTAH

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE STATE IMPLEMENTATION PLAN FOR PM2.5 (fine particulate matter) IN CACHE VALLEY, IDAHO (PORTIONS OF FRANKLIN COUNTY)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through November 30, 2012. DEQ will conduct a public hearing on Thursday, November 29, 2012 at 6:30 p.m. in the Franklin County Agricultural Extension Office located at 561 W. Oneida, Preston, Idaho.

PROPOSED ACTION: DEQ is proposing to submit a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standard (NAAQS) for PM2.5 (fine particulate matter) in the Logan (UT-ID) Area to the U.S. Environmental Protection Agency, for inclusion in the (SIP), as required by Section 110 of the Clean Air Act. The intent of the SIP is to demonstrate how attainment with the NAAQS will be achieved by the attainment date of January 1, 2015.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan is available for public review on the DEQ website at www.deq.idaho.gov/public-comment-opportunities.

Printed materials will be made available at the Larsen-Sant Public Library located at 109 South 1st East, Preston, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the Franklin County Agricultural Extension Office on November 29, 2012 at 5:30 p.m. mountain time.

newspaper for 1 issue(s) and that said notice also published on utahlegals.com
on the same days(s) as publication in said newspaper

Commencing on the following days:
10/30/2012

Marica Cline, Assistant to the Finance Director

Subscribed and sworn to before me on this30th day of October , A.D. 2012

Amanda Marie Nye, Notary Public
Commissioned in the State of Utah

My Commission expires August 1, 2015

NOTARY PUBLIC
AMANDA MARIE NYE
600382
COMMISSION EXPIRES
AUGUST 18, 2014
STATE OF UTAH

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING THE STATE IMPLEMENTATION PLAN FOR PM2.5 (fine particulate matter) IN CACHE VALLEY, IDAHO (PORTIONS OF FRANKLIN COUNTY)

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through November 30, 2012. DEQ will conduct a public hearing on Thursday, November 29, 2012 at 6:30 p.m. in the Franklin County Agricultural Extension Office located at 561 W. Oneida, Preston, Idaho.

PROPOSED ACTION: DEQ is proposing to submit a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standard (NAAQS) for PM2.5 (fine particulate matter) in the Logan (UT-ID) Area to the U.S. Environmental Protection Agency, for inclusion in the (SIP), as required by Section 110 of the Clean Air Act. The intent of the SIP is to demonstrate how attainment with the NAAQS will be achieved by the attainment date of January 1, 2015.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan is available for public review on the DEQ website at www.deq.idaho.gov/public-comment-opportunities.

Printed materials will be made available at the Larsen-Sant Public Library located at 109 South 1st East, Preston, Idaho, and the DEQ Regional Office in Pocatello located at 444 Hospital Way #300.

An informational meeting will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 5:30 p.m. mountain time.

A public hearing will be held at the Franklin County Agricultural Extension Office on November 29, 2012, at 6:30 p.m. mountain time. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTSASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process, or technical assistance should be directed to Melissa Gibbs, Department of Environmental Quality, 444 Hospital Way #300, Pocatello, Idaho 83201, melissa.gibbs@deq.idaho.gov, or (208) 236-6160. Please reference "Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan" when sending comments or requesting information.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MST/MDT, November 30, 2012.

Melissa Gibbs
Airshed Coordinator

Publication date: October 30th, 2012

Sign-in Roster

SIGN-IN ROSTER FOR PUBLIC HEARING

Public Hearing on Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan

LOCATION: Franklin County Agricultural Extension Office, Preston, Idaho

DATE: November 29, 2012

NAME (PLEASE PRINT)	EMAIL ADDRESS AND/OR MAILING ADDRESS	ORGANIZATION REPRESENTED (IF ANY)	DO YOU WISH TO TESTIFY? (YES/NO)
SAUNDRA Hubbard	302momhub@gmail.com	City of Preston	no
Stanley Packer	1288 E 3200 N Preston Idaho		no
Neal Larson	57 S 1st E	City of Preston	No
Jessi Holt	83 n 5th W 10 Preston	—	no
Steve Aust	6367 E. Cub Riv Preston.		NO.
Dee Virile Christensen	deeliz@pl.mw	City of Dayton	No
Todd Thomas	ZZTODD@AOL.com	Preston City Council	yes
[illegible]		Committee	?
Chris Peirsol		ITD D-5	NO
Kevin Blanch		SIPH	No
Tyler Olson			no
Derek Steadman	derek@idu.net		no
Susan West	sandrwest@dcdi.net	—	no

NAME (PLEASE PRINT)	EMAIL ADDRESS AND/OR MAILING ADDRESS	ORGANIZATION REPRESENTED (IF ANY)	DO YOU WISH TO TESTIFY? (YES/NO)
R. Merrill		citizen	NO
D Bowles	dp bowles @ Plnw.com	county	No
Elva Atkinson	PO Box 115 Dayton, ID 83232	Dayton City	No

SIGN-IN ROSTER FOR PUBLIC HEARING

Public Hearing on Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan

LOCATION: Franklin County Agricultural Extension Office, Preston, Idaho

DATE: November 29, 2012

NAME (PLEASE PRINT)	EMAIL ADDRESS AND/OR MAILING ADDRESS	ORGANIZATION REPRESENTED (IF ANY)	DO YOU WISH TO TESTIFY? (YES/NO)
Lyla Dettmer	FSWCA@earthlink.net	Franklin SWCD	No
Alan White	Kach@plmw.com	KACH	written
Dan Sharp	cottontop3634@yahoo		Yes
Dan Comeau	demcom45@yahoo.com	myself	yes
Dwain Weeks	2951 W. Hwy 36 Weston, Idaho	self	yes
Mike Lowe		self	yes

Official Public Hearing Transcript

PUBLIC HEARING FOR COMMENTS ON THE

CACHE VALLEY IDAHO PM2.5 NONATTAINMENT AREA

STATE IMPLEMENTATION PLAN

*****

November 29, 2012

Franklin County Agricultural Extension Office

Preston, Idaho

*****

Mark Petersen, Hearing Officer.

Melissa Gibbs, Airshed Coordinator, Idaho DEQ.

ORIGINAL

HEARING OFFICER: Let the record show that I'm Mark Petersen, the hearing officer appointed to conduct this proceeding. It is 6:30 p.m. on the 29th day of November, 2012. This is the time and place set to receive oral comments on the Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan. Written comments will also be accepted at this hearing. The written comment deadline is November 30th, 2012. Please limit the comments to air quality concerns relating to the Cache Valley Idaho PM2.5 Nonattainment Area State Implementation Plan.

We are in the Franklin County Agricultural Extension Office in Preston, Idaho. Notice of this hearing appeared in the Idaho State Journal and the Herald Journal on October 30, 2012, and the Preston Citizen on October 31st, 2012.

All those interested persons attending this proceeding are asked to sign in on the roster by the entrance, indicating a desire, if any, to make oral presentation. Each person will be given an opportunity to provide comment. Since these proceedings are being recorded, I ask that those who make oral presentations state their name and provide the spelling if necessary.

At this time the DEQ will make its statement and then I will call upon persons who indicated on the

1 roster that they would like to comment.

2 MS. GIBBS: Mr. Hearing Officer, ladies and

3 gentlemen, my name is Melissa Gibbs, Airshed Coordinator

4 for the Idaho Department of Environmental Quality,

5 Pocatello Regional Office. In 2009, the Environmental

6 Protection Agency designated the Logan Utah-Idaho, also

7 known as the Cache Valley, as a nonattainment area for the

8 24-hour PM2.5 National Ambient Air Quality Standard.

9 PM2.5 is airborne particulate matter less than or equal to

10 2.5 micrometers in aerodynamic diameter. This

11 nonattainment area presents unique challenges with respect

12 to topographical features and jurisdictional issues of

13 authority -- a nonattainment area that spans two states,

14 Utah and Idaho, and two EPA regions, Region 8 and Region

15 10.

16 The Clean Air Act requires the state to submit

17 a State Implementation Plan, or SIP, that lays out the

18 state's authorities and programs to monitor, enforce, and

19 develop control measures in order to attain and maintain

20 specific National Ambient Air Quality Standards. Since

21 the Logan, Utah-Idaho nonattainment area spans two states,

22 each state is required to submit their own SIP. The

23 purpose of the SIP is to show that the area will attain

24 the 24-hour standard for PM2.5 of 35 micrograms per cubic

25 meter.

The Cache Valley Idaho PM2.5 State Implementation Plan, now out for public comment, is the subject of this public hearing.

DEQ is very interested in receiving input on this PM2.5 SIP. The DEQ takes public input very seriously and your comments are appreciated. We are constrained in this hearing to consider only comments relative to the State Implementation Plan itself.

Following consideration of all public comments, DEQ will submit this required plan with a request that EPA approve the plan and incorporate the Cache Valley, Idaho PM2.5 SIP into Idaho's statewide implementation plan.

HEARING OFFICER: Thank you. I'll now call upon those who indicated that they would like to comment on the State Implementation Plan. Once I call on you, if you would please come up here so that the court reporter can hear you better and is able to record your comments.

We'll start with Todd Thomas. You have indicated you would like to comment. If you would come up, that would be great. Thank you.

MR. THOMAS: My name is Todd, T-o-d-d. Thomas, T-h-o-m-a-s. I'm here as a Preston citizen and as a member of the Preston City council.

First of all, I'll preface any remarks that I think you'll hear from me, or anyone else here, I'm sure

you people know not to take those things personally. We respect your job and the effort you have to make. I'm impressed with the materials that Melissa has presented to us.

My question of you earlier kind of answered one of the statements I was going to make in regards to how many monitors we have in Franklin County. Your answer was we have one in Franklin and then there's one in Logan. One of the thoughts I had, one of my doubts about this whole process, is I question the efficacy of some of the data collection, wondering how it followed scientific methods, which I understood to be that anytime you do a study you want random, you want a large population size of your subject, and you want to control as many of the compounding variables as possible. So in my mind one station here, one station there, is not a very large sample size.

I do understand your explanation that in Franklin there's three different types, and so your explanation did calm me a little bit on that. But I at least wanted to make my point that I would love to see more monitoring sites that are in the far reaches of the county.

And I can recall from a previous statement that we didn't have a red air day in 2011. Am I correct? I think it was from a previous meeting.

HEARING OFFICER: We can't answer questions now.

MR. THOMAS: All right. I guess I'll ask it rhetorically. But when we went back to 2009 and 2008 and 2010, a statement earlier was that we averaged those years and that made you nonattaintment. If we're going to average years off data collection that way, it would make sense to me to follow the averaging idea of having several monitoring sites, average the data, and then determine if we're nonattainment, because I know you'll get a different method in Franklin than in Thatcher or the north areas due to elevation. And I would say that would apply to Cache County as well. I think just one site is a little bit skewed in my opinion.

The other comment I have, as I understand it from the SIP, we want to eliminate more use of road sanding materials. So, again, if I understand that clearly, they would rather we use salt or some other chemical. My concern there is you don't get the grip from salt that you do with sand. You end up having more damage to roads, cars, and roadside vegetation and wildlife due to the salt melting and running off. So I would like us to consider that aspect, the expense to the county of that.

Melissa made the comment too, that I appreciate her saying, that Idaho, out of the whole

hundred percent pie, I think, if I understood you right, Idaho could maybe be accounted for 10 percent and Utah 90, based on population and that. It makes me think of an example of here in Preston City we had an ordinance that said you can't have dog poop on your lawn. My neighbor has a dog and he throws 90 percent of his poop on my lawn so I get the ticket for it, is that fair? In a way is that what is happening here, that we're getting pollution from somewhere else, but yet we're being held accountable for it?

I appreciate all of your work and efforts. Thank you.

HEARING OFFICER: Thank you, Todd. It looks like Glenn. You put a question mark?

GLENN: I wasn't certain if I wanted to make a statement or not. I don't.

HEARING OFFICER: Other than that, Alan, who just came in, you said you do by written?

MR. WHITE: I have a written thing that I'll submit.

MS. GIBBS: And we can take that now if you have it ready.

HEARING OFFICER: Yeah, we can take that now. Let the record show that I've received a written comment from Alan J. White. It will be part of the record.

1 Other than that, I don't see anybody that has
2 indicated that they are going to have any comments
3 tonight. Is there anyone out there that has changed their
4 mind and would like to comment at this time? Let the
5 record show nobody has indicated that they are going to
6 submit any oral comments tonight.
7 We'll go ahead and go off the record at this
8 time and then if somebody comes in later we'll reopen the
9 record.
10 (Off the record.)
11 HEARING OFFICER: We're going to reopen the record
12 here for some additional comments. It looks like Dan and
13 Dan, both of you, is that Dan for both first names?
14 MR. DAN COMEAU: Yes.
15 HEARING OFFICER: Just so you know, I'm Mark
16 Petersen, the Hearing Officer here tonight. You guys both
17 indicated on the sign-in sheet that you would like to give
18 comments?
19 MR. DAN COMEAU: Possibly.
20 HEARING OFFICER: We would ask you to come up here
21 by the court reporter so he can hear you better. Spell
22 your names if you want to make comment. And the comments
23 are to be focused on the plan, the State Implementation
24 Plan, that is being presented tonight. So if you would
25 like to make a comment, you can come up here and state

your name and spell it and then make the comment that you have. Would you guys like to do that? That's where we are right now.

MR. DAN COMEAU: Where are all the people at, like the county commissioners?

HEARING OFFICER: Some people left.

MR. DAN COMEAU: What I wanted to say, I wanted to say to them too.

HEARING OFFICER: Well, this will all become part of the record and they'll be able to access it later. It's just up to you guys what you would like to do.

MR. DAN COMEAU: Can you give me a few minutes to think about it?

HEARING OFFICER: Sure. We'll close the record for now and then if we do have some additional comments we'll reopen at that time.

(Off the record.)

HEARING OFFICER: We're going to reopen the record for a comment. Dwain, it looks like you indicated that you would like to comment. Just so you know, I'm Mark Petersen, the Hearing Officer for this hearing tonight.

We're focusing our comments -- our comments are focused on the Cache Valley, Idaho State Implementation Plan. If you would like to make comments, oral comments, tonight, if you would come up here by the

1 court reporter so he can hear you better. And please
2 spell your name for him. We'll go ahead and take your
3 comment now if you would like.
4 MR. WEEKS: Dwain Weeks. W-e-e-k-s. D-w-a-i-n.
5 I'm here to comment on the regulations and whatnot that
6 has not been imposed yet, but I feel like they will be. I
7 have some great concerns over the -- what we're being told
8 about it. And I have some questions that I might ask this
9 man behind me.
10 I live right over here on the west side. I
11 can get up almost every day and I can look south towards
12 Utah. Sunday was a good example. I pointed it out to the
13 wife. You could look south and see, on Sunday, clear to
14 Smithfield. We could see north clear to McCammon, as far
15 as we could see, as far as the mountains will let us. We
16 can see east as far as we can see the mountains. We can
17 see west as far as we can see the mountains. We can see
18 east as far as we can see the mountains.
19 Sunday there was a curtain hanging from about
20 Smithfield south, a brown curtain. I have noticed this on
21 many days. Some days it will be the Trenton/Richmond
22 area, some days it will be the Lewiston area. Quite often
23 it's about the border, the Idaho/Utah border. Very seldom
24 does it come into Idaho.
25 At least some days I end up going to Logan or

through Logan. Today I went through Logan, for instance. As I was traveling south I could see clear to Logan, clear from here. I don't know what the reading was on the scale, you know, on your little instruments, but I could see clear to Logan today.

When I got to Logan I couldn't quite see through Logan. I went clear to Hyrum and when I got to Hyrum I could look back and I could see to Logan, but I couldn't see through Logan. Right around Logan was a polluted spot, I guess is what I'm saying.

On your parts per million thing, and I watched this since you guys were here about two months ago, I have watched the skies. I've watched it for years, actually, but since you guys were here I've paid particularly close attention to it. I've watched those skies.

I'm proposing, or I'm suggesting, that possibly your machines that you measure with in Logan and Franklin are not correct. Or they might need to be switched possibly. Or possibly what you see in the air is not what you necessarily are measuring.

Also, I've watched several days that you can watch -- it's just like a cloud of dry ice coming over -- you can see it just like smoke coming over that mountain from Petersboro. Sometimes you can see it come out of Sardine Canyon. But as I drive to Logan I can watch that,

1 because I can see down here. On many days I get into
2 Logan and I can't see only to Smithfield. When I get to
3 Smithfield I can usually see pretty well the rest of the
4 valley, or at least clear to Preston or farther. When I
5 get up to about as far as Richmond I can see clear to
6 McCammon. That happens, I would daresay, probably 95
7 percent of the time.
8 But there is a curtain from roughly the Utah state
9 line to Smithfield, generally speaking. Not every day,
10 but generally speaking there is a curtain, and you can see
11 that difference there.
12 Now, from what this man has told me here, there's
13 usually only one or two numbers difference, or I don't
14 know exactly, you know, on his measurements, between Logan
15 and Franklin where they measure it. I'm suggesting that
16 that might be wrong. Here again, I've explained why,
17 because there's definitely more pollution down there than
18 there is here up here.
19 Now, I've also been told that, and I can't remember
20 the exact numbers you gave me, but the EPA used to say it
21 was 10 parts per million was bad for you, and then it was,
22 I think, 50 parts per million. And they keep changing it
23 and changing it, until now it's two and a half parts per
24 million, which is supposed to be the little teeny ones
25 that is harmful.

1 I don't buy all of that. I don't buy the amount of
2 so-called pollution. Melissa, when she was -- that's her
3 name, right, the lady that is here? She brought some
4 little bottles of stuff that actually had sand in them.
5 It wasn't smoke or anything else. And she said this is
6 supposed to represent what the new clean burning stoves is
7 supposed to put out, what the old wood burning stoves put
8 out, and what the fireplaces is supposed to put out. And
9 she had different, you know, quantities of sand in those
10 little bottles. She says that's what it's supposed to
11 represent.
12 Now, I don't know where she got her information
13 from. Somebody has told her to put X amount of sand in
14 there to supposedly represent it. I'd like to know, in
15 other words, where she's getting that information from.
16 Where she knows how much quantity of sand to put in there,
17 who is telling her this?
18 I'm extremely leery when it comes from the
19 government, especially the federal government. I've seen
20 too many examples of them telling us all sorts of bull
21 crap and five years later they totally reverse it. I can
22 name you several examples. Global warming is one. Al
23 Gore has really pounded it to us about how bad global
24 warming is. When I was a young man, about so tall, I
25 remember the newsman coming on and we was all in an ice

1 age because of all the pollution in the world, especially
2 in the big cities. Pollution, pollution, pollution. We
3 was all going to be in an ice age. And they showed
4 pictures on T.V. about that. That was in my lifetime. I
5 can remember that. And I was scared to death at that
6 time. Man, we've got to clean up the air, do something.
7 It was government people telling us to do this.
8 Now all of a sudden Gore comes around in the last
9 few years and it's all of a sudden -- it's still
10 pollution, but it is called global warming now and we're
11 getting warmer and warmer and warmer.
12 I find out, the more I study and the more I read on
13 that, all of their science -- well, not all, but about 96
14 percent, from what I've heard lately, of their scientists,
15 all of their highly educated people, all of the people
16 that they've hired to do all of these studies and whatnot,
17 the government has taken these statistics and they've put
18 them together and complied them the way they want. And
19 they've come out and told us fraudulent information. The
20 information they're telling us now on that sort of stuff
21 is ridiculous.
22 They have a hockey stick chart, a real common
23 thing, that tells us how pollution and greenhouse gases
24 and all that sort of stuff is going up and getting worse
25 and worse. It isn't. They tell us the temperature is

1 rising on all of the different weather stations they have
2 around. It isn't. They have hand picked particular
3 weather stations and particular hot spots and particular
4 times of day and they don't give you the full data, or
5 they manipulate the data. I've seen it countless,
6 countless, times.
7 So I'm really leery about what Melissa and these
8 people are doing, you know. I'm not saying they're wrong,
9 but I'm saying where they are getting their information
10 from I'm extremely leery of, especially if it's coming
11 from the EPA, federal regulations, federal government,
12 whatever.
13 I'm a little bit from Missouri, I don't believe it.
14 I have to be shown. And here again, like I said about
15 this air quality, you know, if those two and a half parts
16 per million is what you see when you look through the
17 valley or whatnot, I don't buy it. Either the instruments
18 are wrong or -- well, I don't buy it. If those two and a
19 half parts per million don't measure the smog or the brown
20 haze, or whatever you can see as you go down there, I'd
21 like to know a little more about it.
22 Also, they're kind of picking out wood burning
23 stoves, if you will, or fireplaces or whatever. There was
24 some charts here last time that showed that traffic, cars,
25 is the main source of the pollution. I will buy that.

1 There's far more cars than there is woodstoves. Also, I
2 think livestock and manufacturing. I can't remember just
3 how it was, but, as I recall, cars and traffic and whatnot
4 was the number one cause of the pollution. And then I
5 think about 20 percent, or 25, and I may be wrong, I'm
6 just going by memory, was woodstoves, fireplaces, stuff
7 like that.
8 The next group was livestock. How are we going to
9 control the livestock? I mean, even if we have everybody
10 kill their cows, their horses, whatever other animals they
11 have, we still have deer and elk. We breathe that oxygen
12 too. We put out carbon monoxide. People do, everything
13 does.
14 When I went to school we learned that animals,
15 people included, that breathe air, they breathe oxygen.
16 They use oxygen and they kick out carbon dioxide. They
17 taught us in school that plants take in carbon dioxide,
18 that's what they use, and they release oxygen.
19 If we look at the scheme of things, this old world
20 is balanced. God created it and he balanced it. If we
21 get a lot of animals in one place, we definitely get a
22 bunch of plants in the other place. There has never been
23 more oxygen in the earth, or around the earth, at any
24 particular time, because if it gets a little more oxygen
25 then the plants grow and they take it out and balance it.

1 There's always a balance. The earth has been going for
2 thousands, or millions, of years, whatever you like. Man
3 has not destroyed it. I mean, he's been here for several
4 thousands of years. I just don't think that all of a
5 sudden in these last 10, 20, years, whatever, man is doing
6 all they say he is.
7 There's a lot of natural causes. They found out
8 that a lot of this global warming, so-called global
9 warming, is due to the sun and the sun spots we're having,
10 solar flares and whatnot on the sun. It isn't all people.
11 It isn't animals, it isn't industry whatsoever. Hardly at
12 all. It's mostly due to the sun spots. We know the sun
13 goes in cycles. Here again, it's government manipulation
14 of data or supposedly true facts.
15 I really get off -- I really get peeved at the
16 government telling somebody what they've got to do all the
17 time. We're losing our rights day in and day out. I
18 mean, I can name you a bunch of things. Obamacare,
19 education, Social Security.
20 HEARING OFFICER: Just keep the comments focused on
21 the State Implementation Plan, please.
22 MR. WEEKS: Okay. I understand that. But I get
23 really irritated at that. I'd like to suggest that maybe
24 we switch those instruments, you know, the one in Logan
25 and the one in Franklin, and see if they read the same.

1 And I would like to find out more on what exactly these
2 two and a half parts per million are.
3 I've made several comments here. I'm a
4 welder. I weld quite often. I can get in a room this
5 size right here and it's so smoky that you can't hardly
6 see across it, or it's hard to see across it. All of
7 those have got to be far worse, and cigarette smoking is
8 another one, got to be far worse on your health than this
9 particulate matter in the air.
10 Years ago the government actually come out and
11 said cigarette smoking is just a harmless pastime. A pack
12 a day is nothing. It's been proven of that. Now all of a
13 sudden, you know, Joseph Smith, hundreds of years ago,
14 said that tobacco is not good.
15 HEARING OFFICER: Okay. Do you have any more
16 comments about the State Implementation Plan?
17 MR. WEEKS: That's basically all I have on the
18 smoke and stuff. I'm just real irritated at government
19 and the regulations. It seems like they put regulations
20 in place and stick the bait out there. You stick your
21 neck through a loop to get to the bait and then they stick
22 it out a little farther with another loop and another
23 bait.
24 It's all because of money. You got to do this
25 or we'll cut your funding. You got to have this

regulation or we'll cut your funding. Then they come along and say, oh, yeah, we've had this regulation for ten or 20 years and now we're going to start enforcing it. Or we're going to change it or going to re-evaluate it every five years or whatever. It's just one more loop around our necks that we don't need.

We can handle it here in the county. If people don't like how dirty the air gets here in the wintertime, move to Rock Springs, Wyoming where the wind blows all the time. Move to Idaho Falls where the wind blows all the time. Move to St. George or somewhere else.

We all live here because we figure the advantages outweigh the disadvantages, no matter what they may be. If we don't like it here, nobody is forcing us to live here. We live here because of jobs, because of the climate, whatever, you know. We can move. We have the free choice to do that still. We don't need the government to come in here and say you can't have a woodstove or it has to be this type or whatever.

I sell fire wood to a lot of people. I know several of them have come along and claimed that they have taken out their old woodstove and put in these new high efficient ones. Some of them have come in complaining, saying that we put in the new woodstove and it only heats half as much. We need two of them now to burn -- to heat

the house like we used to with the other one. Some people like them. Since I've been in the last meeting I've talked to a lot people about it and some people say it's great for us, it works. Some people don't.

If it's a good idea it will catch on and everybody will have it. If it's doing that much good, you don't have to regulate people buying them or getting them or trying to trick them into getting them. It will happen itself. It will be a better product than the old woodstove, will be a better product than the fireplace, and people will do it, will get it.

So what I'm suggesting is that we educate, we get more information, not regulate. That's about all I got to say.

HEARING OFFICER: All right. Thank you, Mr. Weeks.

Did either of the Dan's back there decide if you want to comment?

MR. DAN COMEAU: I'll pass. I pretty much agree with Dwain there.

HEARING OFFICER: Okay. Mr. Lowe just came in and signed the sheet. Sir, I'm Mark Petersen, the Hearing Officer here tonight. We have been conducting a formal hearing on the State Implementation Plan for the Cache Valley Idaho PM2.5 nonattainment area.

You indicated on the sign-in sheet that you

would like to make a comment. If that's what you would like to do, I'll have you come up here by the court reporter so he can hear you clearly. Please state your name, spell the last name, and keep your comments focused on the implementation plan that we're dealing with tonight.

MR. LOWE: My name is Mike Lowe. I live in Preston. I'm not really -- well, okay, focus on the implementation plan. I have some questions about it.

HEARING OFFICER: This is only the time for comments. If you have questions and not a comment, we will close the record and then Melissa can address your questions.

MR. LOWE: I'll put it in a comment form. It would appear to me that this has been going on for years and years and years, these implementation plans. Yesterday I was in Salt Lake City and there was smog all over the place.

It would appear to me that you have no goals set as to what your program is. I'm an electrical contractor. I've been a contractor all my life. When I do things I have to set goals. I have to set a goal on the progress of a job, for instance. If that goal is not met, then I have to try something else because I'm not meeting my goals.

1 Okay. I've seen these implementation plans go
2 on for years and years and years. We still have smog
3 hanging all over the place. So you have no goals,
4 apparently. You claim to want to -- you claim that your
5 goal is to clean up the air. That's what you claim to do.
6 Okay. If you set goals and you reach those goals,
7 eventually you'll have some results, won't you? I'm
8 sorry, that was a question.
9 HEARING OFFICER: I can't respond to questions.
10 MR. LOWE: This whole situation is rather
11 intimidating, and I believe it's set up that way on
12 purpose. But, if you have some goals you would eventually
13 have results. Okay. Obviously you have no results,
14 because you can drive through Salt Lake, you drive through
15 Preston on an inversion day, you drive through Cache
16 Valley, there's smog all over the place. So obviously
17 you're not doing your job. You're either not doing your
18 job or the goals you claim to have are not the goals that
19 you're telling us you have. The goals that you claim to
20 have are not the goals that you are telling us you have.
21 Let me word that differently. The goals that
22 you claim to have, that you're telling to us, you're not
23 attaining those goals. If you were attaining your goals
24 our air would be getting cleaner every year, not dirtier.
25 So the only thing I can assume is your goals are different

than what you're telling us. Your goals are not to clean up the air, your goals are to control the people here. You've been doing this for years and years and years. That's y-e-a-r-s. Years and years and we still have smog hanging over the valleys. So it would appear to me that we need to try something else.

The solution would be you guys back off and let private enterprise take care of this. Nobody in this room, nobody in this room, pollutes on purpose. What we are doing, what the people in this room are doing, is enjoying the wonderful life that we have now. We jump in our air conditioned cars and we go anywhere we want. We jump on an airplane and we go anywhere we want. If we want to light a fire in a wood burning stove, we do that. We have a wonderful life here just the way it is.

There isn't anybody in this room that would jump in the -- that don't look at the air quality and it enters their mind maybe I better do something different today, and without you people.

The point that I want to make is you are not reaching your goals and you're not getting results with what you're doing. The only thing that us here can assume is that your goals are not to clean up the air. Your goals are to control people. That's it.

HEARING OFFICER: Thank you, Mike. It is now 7:41

p.m. We do not have anybody else here that has indicated they want to make comments tonight. Oh, okay. Dan Sharp.

MR. DAN SHARP: Dan Sharp, S-h-a-r-p. I would just like to go on the record that I oppose the implementation plan because I believe it's up to the citizens that live here to decide whether or not they want cleaner air. I do not feel the government has any place here. Educate us if you want, but don't force us. So I just want to go on record with that, my two bits. That's how I feel about it.

I'm not going to preach to you guys because you're probably not going to listen anyway. Even if you did, you don't have the power to stop it. But the government somewhere may read this and the people do not want it. The people that live here, the people that you are supposedly trying to help, do not want your help. Thank you.

HEARING OFFICER: Thank you, Dan. It is now 7:42 p.m. We do not have any additional comments that are pending. The hearing is now closed. We'll go off the record.

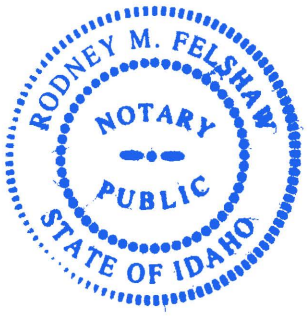
(Hearing concluded.)

REPORTER'S CERTIFICATE

I, Rodney M. Felshaw, CSR No. SRT-99, Certified Shorthand Reporter, certify:

That the public hearing was reported stenographically by and transcribed by me; and that the foregoing is a true and correct record of the public hearing to the best of my ability.

IN WITNESS WHEREOF, I set my hand and seal this 10th day of December, 2012.



Rodney M. Felshaw

Rodney M. Felshaw, C.S.R.; R.P.R.

Notary Public

My commission expires March 31, 2015.

Written Comment Letter

1633 No. Radio Station Road
Preston, ID 83263-5813
208-852-1340
Thursday, November 29, 2012

Idaho Department of Environmental Quality
Public Comments
Re: Cache Valley Idaho Air Quality State Implementation Plan

Thank you for the opportunity to offer comments regarding the proposed plan for reducing the levels of PM 2.5 particulates in the air covering the Franklin County portion of the Cache Valley Airshed non-attainment area.

At first glance, one may wonder why an effort is even necessary to improve the air quality in what many consider to be a "pristine" mountain valley. We recognize that the most significant problems with air quality in Cache Valley occur during the winter months when temperature inversions trap pollutants close to the valley floor. Since that is a creation of nature, why do we as humans think we can influence Mother Nature?

It is my contention that while some steps are possible to reduce pollutant levels during periods of poor air circulation, the greatest need is in educating the public as to the nature and causes of the problem, and what can be done to limit impacts on the most sensitive members of our community during times when air quality does not the standards of the federal Clean Air Act or of the air quality standards established by the states of Idaho and Utah.

It was because of my belief in the importance of public education and information that I expressed an interest in serving as a member of the citizen advisory committee that assisted DEQ in the drafting of the State Implementation Plan.

Data shows that the greatest contributors to increased PM 2.5 levels are in the populated areas of Logan and Cache County in Utah. That means that action must be taken by the residents and local governments in that part of the valley to achieve the improved levels that we seek. It is incumbent upon Idaho, and the communities of Franklin County to do our part to deal with these issues as well. It is my belief that the SIP as drafted and proposed, deals with those issues without placing undue burdens on the people and local governments of Franklin County.

I support the Residential Wood Combustion Ordinances that have been adopted by local cities and by Franklin County. The Wood-Burning Stove Change-Out program has helped take over a hundred non compliant stoves out of use. With ordinances in place, local residents who burn wood for heat will be asked to use alternate sources of heat during times of poor air quality.

As the operator of Franklin County's only local broadcasting station, I see my role as vital in spreading information to local residents to let them know when the air monitoring station operated in Franklin County by DEQ is showing elevated levels of harmful

particulates. DEQ has already done a good job of informing the public about the monitoring system and how individuals can check those levels themselves. I am making an effort during morning "drive time" on KACH to mention the air quality index, and will certainly make it an issue on days when we rise into the orange and red categories. While there is a certain percentage of the population who resist any effort on the part of regulatory agencies to dictate what they consider to be "private" activity, it is my belief that an informed populace will respond positively if they are given correct information and asked to assist with an effort that serves the good of the entire community.

I am not sure what impact a change or reduction in the type or amount of sanding material placed on local roads and highways during the winter months will have on air quality, but I suppose there is an issue there of increased dust after the roads dry and the material is either stirred up by traffic or by the removal process. Since my home and business are located on an unpaved road, I am aware of the problems created by dust stirred up by passing vehicles. Therefore, I support any effort to minimize those impacts.

As a member of the citizen committee, I have been impressed with the work of DEQ Air Quality Specialist Melissa Gibbs in considering the input from the committee, directing the work of the committee, and drafting the State Implementation Plan. Air Monitoring Technician Marshall Magee has also provided valuable input to this process.

I urge the State of Idaho to adopt the State Implementation Plan for the Idaho portion of Cache Valley as it is presently drafted.

Thank you,

Alan J. White
1633 North Radio Station Road
Preston, ID 83263
208 852-1340

Response to Public Comment

Response to Comment

The Idaho Department of Environmental Quality (DEQ) received a number of comments during the public hearing held on November 29, 2012. None of the comments received raised substantive issues requiring modification to the proposed *Cache Valley Idaho $PM_{2.5}$ Nonattainment Area State Implementation Plan* (SIP). DEQ, however, feels that a response to number of the comments will aid in understanding DEQ's action. The comments in their entirety can be found in Appendix F "Public Hearing with Transcript." DEQ paraphrased the questions below for the ease of response.

Comments from the Public Hearing

Comment 1—Todd Thomas:...I question the efficacy of some of the data collection, wondering how it followed scientific methods, which I understood to be that anytime you do a study you want random, you want a large population size of your subject, and you want to control as many of the compounding variables as possible. So in my mind one station here, one station there, is not a very large sample size. …But I at least wanted to make my point that I would love to see more monitoring sites that are in the far reaches of the county.

Response to Comment 1—The Clean Air Act requires every state to establish a network of air monitoring stations for criteria pollutants using criteria set by the United States Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards (OAQPS) for their location and operation. The states must provide EPA with an annual summary of monitoring results at each monitor. Ambient air monitoring networks must be designed to meet three basic monitoring objectives:

1. Provide air pollution data to the general public in a timely manner.
2. Provide support for determining compliance with ambient air quality standards and developing emissions control strategies.
3. Provide support for air pollution research studies.

Federal regulations require that states follow specific guidelines for locating air quality monitors to minimize the amount of variables that can interfere with collecting good high quality data that meet all quality assurance and quality control standards. Typically the monitors are located at an elevation where DEQ would expect the highest possible concentrations and/or population exposure.

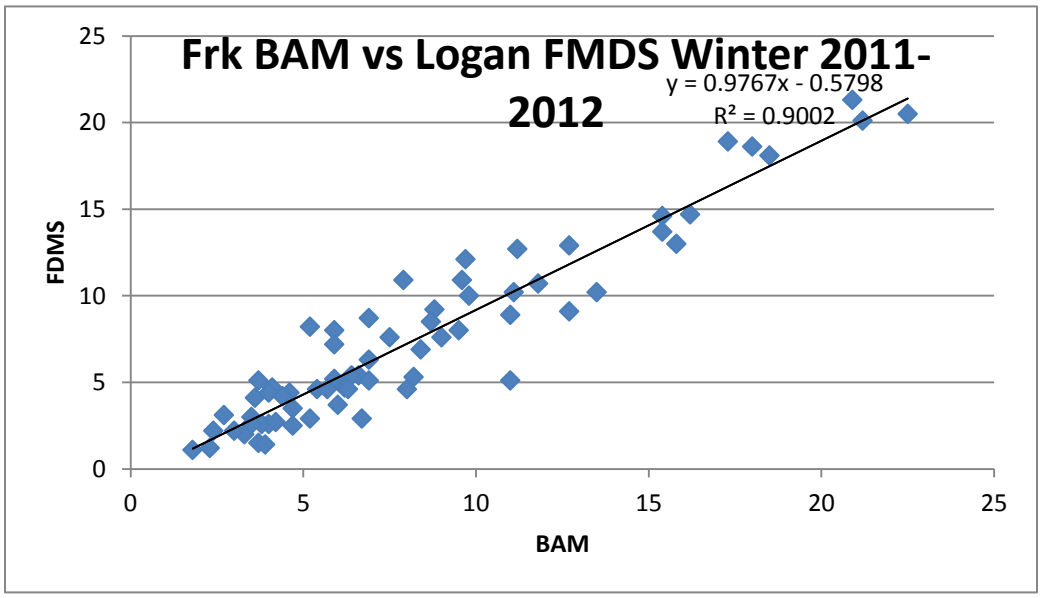
DEQ did operate two different monitoring sites on the Idaho side of the Cache Valley: one in Preston and the current site, which is located in Franklin. The monitor in Preston was eliminated in 2006. In review of the data collected at the two locations within Franklin County, it was determined that there was no statistical difference between the data. The correlation of the data was so close that it met the EPA definition of redundant data, and therefore, the Preston monitor was removed.

Elevated 24-hour particulate matter 2.5 ($PM_{2.5}$) concentrations in the Cache Valley have been observed during the wintertime, typically from November through February, throughout the airshed. Analysis of the $PM_{2.5}$ air quality data suggests local meteorological conditions often played a significant role during these episodes by providing adverse dispersion conditions or

favoring the formation of secondary aerosols. During these periods, the stable layer above the ground is much deeper than a typical nocturnal inversion. Cold air is trapped in the basins, and the air mass stabilizes as high pressure aloft overtakes the region. Under such circumstances, a prolonged strong inversion layer (or layers) limits vertical mixing, trapping local pollutants in a thin layer against the valley floor. The low sun angle, short length of the days during winter months, and strong likelihood of snow cover to reflect the solar radiation are all factors that limit daytime surface heating and aggravate the situation. As a result, some inversions may not break for many days.

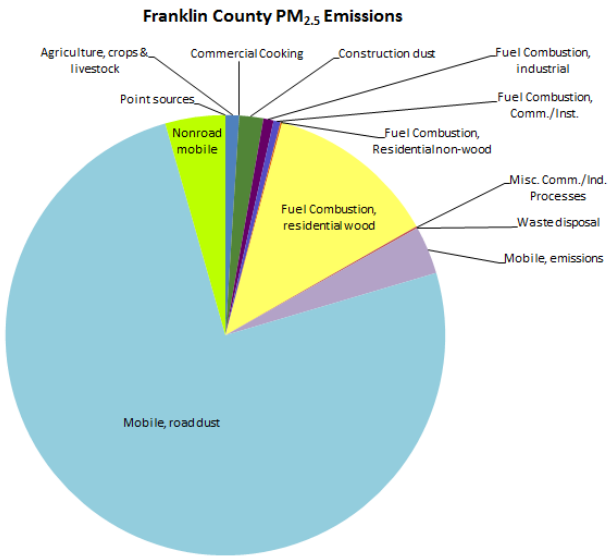
Utah State University conducted a study of the homogeneity of PM_{10} in Cache Valley in 2002-2003 and a study of the homogeneity of $PM_{2.5}$ in 2003–2004 (Appendix A of the SIP). In addition to the permanent Utah Division of Air Quality (UDAQ) air quality monitoring site in Logan, 17 sites measuring $PM_{2.5}$ concentrations were established in Cache Valley. Measurements of $PM_{2.5}$ concentrations were made every 6 days from November 2003 to February 2004. Several temperature inversions developed during the course of the study with $PM_{2.5}$ concentrations in Logan ranging from 3 micrograms per cubic meter ($\mu g/m^3$) to 128 $\mu g/m^3$. In general, the study found that $PM_{2.5}$ concentrations were homogenous throughout the Cache Valley.

The following figure shows the correlation between the Logan, Utah, and Franklin, Idaho, monitors. These monitors are used to forecast the Air Quality Index (AQI) for both sides of the Cache Valley. The correlation coefficient, R^2, of 0.9002 shows good correlation between the two continuous monitors during the winter months.



Comment 2—Todd Thomas: The other comment I have, as I understand it from the SIP, we want to eliminate more use of road sanding materials. So, again, if I understand that clearly, they would rather we use salt or some other chemical. My concern there is you don't get the grip from salt that you do with sand. You end up having more damage to roads, cars, and roadside vegetation and wildlife due to the salt melting and running off. So I would like us to consider that aspect, the expense to the county of that.

Response to Comment 2—The following figure is from the Cache Valley SIP and details the $PM_{2.5}$ emissions from all source types on the Idaho side of the Cache Valley. In rural Idaho, mobile dust from road sanding accounts for 70% of all directly emitted $PM_{2.5}$, while residential wood combustion accounts for 14%, and mobile emissions account for only 6%.



Looking at these top three categories, it makes sense to target the largest contributing sources for the $PM_{2.5}$ emission reductions needed for the valley. When developing the road sanding agreements, DEQ looked to both Franklin County and Idaho Transportation Department (ITD) to determine what sanding practices would be best for the roadways of the county. ITD already was using straight salt on the roadways that they are responsible for in the county, and it was merely a matter of documenting their current practices. With regard to Franklin County, it was determined that they did need to use a combination of both salt and sand depending on the roadway concerns. Franklin County Road and Bridge has been moving away from using so much sand. In the past, they used a 10-to-1 ratio (10 parts sand to 1 part salt); in recent years, they have shifted to a ratio of 5 to 1. As a control measure for the SIP, Franklin County agreed to reduce their sand to a 4-to-1 ratio to help reduce the $PM_{2.5}$ emissions from road dust.

Comment 3—Todd Thomas:...Idaho, out of the whole hundred percent pie, I think, if I understood you right , Idaho could maybe be accounted for 10 percent and Utah 90, based on population and that. …In a way is that what is happening here, that we're getting pollution from somewhere else, but yet we're being held accountable for it?

Response to Comment 3—In the Cache Valley when determining $PM_{2.5}$ designations, DEQ looks at an airshed approach. Air pollution does not stop just because it crosses a state line. When inversions set up in this valley, the air essentially becomes homogenous from one end of the valley to the other. The topography and meteorology in this valley lend itself to the formation of strong inversions. To work on bringing the area back into attainment, we need to consider all of the emissions from both sides of the valley. It is true that approximately 90% of the population resides on the Utah side of the valley and with it comes most of the $PM_{2.5}$ pollutants, except ammonia. To solve the air quality issues, each side of the valley is responsible for emission

resides on the Utah side of the valley and with it comes most of the $PM_{2.5}$ pollutants, except ammonia. To solve the air quality issues, each side of the valley is responsible for emission reductions, with Utah carrying more of the reduction responsibility due to sources and sheer population. Ultimately, the goal of this SIP is to protect public health and bring the area back in to attainment status with the $PM_{2.5}$ 24-hour standard.

Comment 4—Dwain Weeks: When I got to Logan I couldn't see through Logan. I went clear to Hyrum and when I got to Hyrum I could look back and I could see to Logan, but I couldn't see through Logan. Right around Logan was a polluted spot, I guess is what I'm saying.

Response to Comment 4—It is true that more of the pollution comes from the Utah side of the valley; this is evident on the good air quality days when the Logan monitor typically registers higher in $PM_{2.5}$ concentrations. It is important to note that on the days when an inversion sets up over the valley, the air quality is homogenous from one end of the valley to the other. $PM_{2.5}$ is sometimes referred to as the regional haze pollutant because the particles are so small that they can refract and reflect light making it difficult to see across the valley due to the haze that it produces. Refer to response to comment 3.

Comment 5—Dwain Weeks: I'm proposing, or I'm suggesting, that possibly your machines that you measure with in Logan and Franklin are not correct. Or they might need to be switched possibly. Or possibly what you see in the air is not what you necessarily are measuring.

Response to Comment 5—The air quality monitors operated by each state are maintained as per specific maintenance guidelines from the manufacturer, EPA, and corresponding states. Quality assurance checks are completed as per these guidelines. Additional audits are provided by the Idaho Bureau of Laboratories twice a year and on an annual basis by EPA. For the EPA audit, EPA sets up an additional monitor at the site adjacent to the state monitor to confirm that the measured concentrations fall within the EPA tolerance limits. The monitors on the both sides of the valley are collecting accurate $PM_{2.5}$ data. These data provide the public with a clear picture of the $PM_{2.5}$ concentrations.

Comment 6—Dwain Weeks: Now, from what this man has told me here, there's usually only one or two numbers difference, or I don't know exactly, you know, on his measurements, between Logan and Franklin where they measure it. I'm suggesting that that might be wrong. Here again, I've explained why, because there's definitely more pollution down there than there is up here.

Response to Comment 6—This comment is similar to other comments previously addressed; refer to response to comments 1, 3, 4, and 5.

Comment 7—Dwain Weeks: How are we going to control the livestock?

Response to Comment 7—The Idaho side of the Cache Valley SIP does not address or impose any controls to livestock within Franklin County. Most of the secondary particulate matter collected during cold-air pool conditions is ammonium nitrate. Studies performed at Utah State University have shown NH_3 to be in abundance in the Cache Valley and that the limiting reagent in the formation of ammonium nitrate is nitric acid (HNO_3). Sensitivity runs with the air quality model indicate that significant reductions in the NH_3 inventories have little to no effect on

Comment 8—Dwain Weeks: I'd like to suggest that maybe we switch those instruments, you know, the one in Logan and the one in Franklin, and see if they read the same.

Response to Comment 8—This comment is similar to other comments previously addressed; refer to response to comments 1 and 5.

Comment 9—Mike Lowe: If you were attaining your goals, our air would be getting cleaner every year, not dirtier. So the only thing I can assume is your goals are different than what you're telling us. Your goals are not to clean up the air, your goals are to control the people here. You've been doing this for years and years and years.

Response to Comment 9—Ultimately, the goal of this plan is to protect public health and bring the area back in to attainment status with the $PM_{2.5}$ 24-hour standard. Fine particles consist of a complex mixture of extremely small particles and liquid droplets. Exposure to fine particles has been linked to a variety of health effects and is known to cause or contribute to respiratory disease, asthma attacks, and heart conditions. An area in violation of the $PM_{2.5}$ standard (based on the most recent 3 years of federal reference method [FRM] monitoring data) is designated as a nonattainment area (NAA).

EPA is required to evaluate National Ambient Air Quality Standards (NAAQS) for criteria air pollutants every 5 years. EPA promulgated the current NAAQS for $PM_{2.5}$ in 2006 to protect human health. These standards require that concentrations of $PM_{2.5}$ in the air not exceed 35 $\mu g/m^3$ on a daily basis and 15 $\mu g/m^3$ on an annual basis. Based on monitoring data, the Cache Valley, spanning Utah and Idaho, did not meet the 35 $\mu g/m^3$ standard and was designated an NAA for the 24-hour $PM_{2.5}$ NAAQS in 2011. The previous 24-hour $PM_{2.5}$ standard, promulgated in 1997, was 65 $\mu g/m^3$. Prior to that standard, EPA promulgated NAAQS for PM_{10}. These changes in NAAQS for particulate matter do mean that air quality goals have changed over time. These changes have also led to overall air quality improvement in the United States.

The Clean Air Act further requires states to submit an air quality improvement plan, known as a SIP, to EPA for concurrence when an area has been designated NAA. The SIP must demonstrate that sufficient measures have been put into place to return the area to attainment and to maintain that attainment into the future. After the area attains the NAAQS, states are required to submit two 10-year maintenance plans to ensure compliance with the NAAQS well into the future.

Comment 10—Dan Sharp: I oppose the implementation plan because I believe it's up to the citizens that live here to decide whether or not they want cleaner air.

Response to Comment 10—DEQ understands that you are opposed to the SIP, and that you feel it should be up to the citizens to decide if they want clean air. Congress, duly elected by the citizens of the United States, has enacted the Clean Air Act. Once an area demonstrates that it does not meet an air quality standard (through 3 years of monitored data) and is designated as an NAA, the Clean Air Act requirements are implemented and a time clock is started requiring the state to submit an air quality improvement plan or SIP designed to bring the area back into attainment.

Exposure to fine particles has been linked to a variety of health effects and is known to cause or contribute to respiratory disease, asthma attacks, and heart conditions. The purpose of the SIP is to show that the area will attain the 24-hour standard for airborne particulate matter less than or

equal to 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) by the attainment date January 1, 2015. The Cache Valley SIP includes all of the necessary components to demonstrate timely attainment within the Cache Valley airshed.

Written Comments from the Public Hearing

Comment 1—Alan White: It was because of my belief in the importance of public education and information that I expressed an interest in serving as a member of the citizen advisory committee that assisted DEQ in drafting of the State Implementation Plan. …I support the Residential Wood Combustion Ordinances that have been adopted by local cities and by Franklin County. …As the operator of Franklin County's only local broadcasting station, I see my role as vital in spreading information to local residents to let them know when the air monitoring station operated in Franklin County by DEQ is showing elevated levels of harmful particulates.

Response to Comment 1—Thank you for your endorsement of the ordinances and SIP and for your participation in the citizen advisory committee. DEQ agrees that a robust public information program is vital to ensure the SIP is successful. DEQ is committed to providing ongoing education, information, and forecasts through a number of means (website, e-mails, air quality hotline, and media).