Dynamis Energy, LLC

Hidden Hollow Landfill WTE Facility
Air Quality Modeling Report

REVISED INFORMATION

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1.0 PURPOSE

This air quality modeling report documents the methodology used to prepare an air quality analyses in support of an Idaho Department of Environmental Quality (IDEQ) 15-Day Pre-Permit Construction (15-Day) application and subsequent Permit to Construct (PTC) application for the Dynamis Energy, LLC (Dynamis) Waste-To-Energy (WTE) facility at the Ada County Landfill in Ada County, ID (Appendix A). This report seeks to fully document and report the methods and techniques used to perform the modeling in support of Dynamis' 15-Day and PTC applications.

2.0 PROCESS DESCRIPTION

The Dynamis WTE facility uses a proprietary thermal conversion technology process to convert municipal solid waste (MSW), including automobile tires, to energy. Dynamis' technology utilizes a controlled (starved) air gasification process which thermally converts waste products to combustible gas. The two-stage process provides complete conversion of carbon to an inert ash and a controlled heat output for efficient energy recovery.

2.1 General Process Overview

The two-stage waste to energy process uses batch waste gasification and thermal combustion/oxidation. MSW is initially loaded into a primary chamber where it is thermally reacted under air controlled (starved) conditions and transformed into burnable gases and ash. Unlike typical thermal treatment methods, the gasification reactions occur at relatively low temperatures under controlled conditions. This minimizes the production of airborne 'fly ash' particulates, carryover of toxic metals, and NO_x. The gasification process ensures nearly 100% destruction (burn-out) of the combustible waste and the by-product of ash is sterile with minimal residual carbon. Metals and glass in the waste stay with the ash in inert forms and can be recovered by conventional recycling methods. To complete the process, the gases from the primary gasification chamber enter the secondary combustion chamber where they are mixed with oxygen (taken from ambient air) and oxidized at high temperature to complete the process. The energy from the hot gas effluent can then be recaptured for local heat, power or other forms of energy recovery.

Tipping Floor/Conveyor to Primary

The process begins by loading MSW, directly from garbage trucks, onto the tipping floor. Next the MSW is moved by conveyer into the primary gasification chamber. Waste materials can be accepted loose, bagged, baled, or on pallets. The system can also accept a wide range of bulky items such as vehicle tires, mattresses, furniture, and construction debris.

The Primary Gasification Chamber (PGC)

The MSW is then bulk-loaded into the primary gasification chamber (PGC) through a hydraulically operated door at the top or front of the chamber and a carefully controlled flow of air is introduced. Only enough air is provided to allow sufficient burning for heating to occur, typically 70 to 80 percent of the stoichiometric air requirement is introduced into the PGC. Due to the air controlled (starved) environment, the MSW gasifies and is converted to a super rich gas. Gasification occurs in the PGC at relatively low temperatures of 450-550°C (800-1000°F), converting the waste into gas and ash. The hot gases are then passed to the secondary combustion system.

The Secondary Combustion System (SCS)

Once the hot gas is passed into the secondary combustion system (SCS) they are actively mixed with oxygen (taken from the ambient air). This process is achieved by the use of a turbulent air ring which flashes (combusts) the mixture at temperatures of 1,800-2,000°F. The turbulent air ring and temperature assure that a rapid and thorough mixture of the super rich gas and oxygen is achieved. Combustion gases are maintained at temperatures of 1,800-2,000F for an extended retention time prior to entering a heat recovery steam generator. This insures all combustible gases are consumed.

Boiler/Steam Production

The flame created by the super rich gas/oxygen combustion is directed through a high temperature power boiler where water is converted into high pressure steam. The boiler has an extended retention time design that provides maximum furnace volume without excessive refractory, plus increased radiant surface for maximum heat absorption.

Energy Production

This high pressure steam generated from the boiler is directed through a power generation turbine creating electrical power that can be routed to the local electrical grid.

Process Logic Control System

All aspects of combustion and fuel feed are monitored and controlled by state-of-the-art logic, 3 times per second. This is especially important with the ever-changing combustion conditions of biomass and waste fuels. The microprocessor analyzes data from various inputs such as switches, thermocouples, RTDs and an oxygen sensor to continually monitor exhaust and optimize air-to-fuel mixture, and signal when anything needs attention.

Ash Handling

Recyclables and ash from the process are collected for reclamation. After each gasification cycle in the PGC the remaining material (approximately 10% of the original volume) will be moved by conveyor belt to the ash handling system, where all recyclables are sorted and retained automatically. The end by-product of the gasification process is inert ash, which will be collected and possibly sold as an important additive in concrete and cement based building materials.

2.2 Hidden Hollow WTE Facility

The Dynamis WTE facility at the Hidden Hollow Landfill will consist of one thermal conversion unit, capable of processing up to 408 tons per day (tpd) of MSW, including automobile tires. The MSW will be delivered to the facility and dumped on the tipping floor inside the facility building. The waste is then conveyed to one of twelve primary gasification chambers in the thermal conversion unit. The system will operate as a batch process with each primary gasification chamber being loaded in succession. The super rich gas created in each of the primary gasification chambers is passed into the secondary combustion chamber where it is mixed with oxygen creating a flame. The flame is directed through a high temperature power boiler where water is converted into high pressure steam. The high pressure steam generated from the boiler is directed through a power generation turbine creating electrical power.

Ash produced in the primary gasification chamber is collected in bins beneath the chambers. The ash is moved by conveyor belt to the ash handling system, where the material is conveyed through a roller drum magnet to separate ferrous metals from the ash. Ferrous metals collected in the roller drum magnet are collected in the ferrous metals storage bin. The remaining ash material then passes through an eddy current pulse separator, which removes any aluminum from the ash. Aluminum material then travels via conveyor to the aluminum storage bin; clean ash material is transferred via conveyor to the clean ash storage bin. The ash handling system is completely enclosed. In addition, a baghouse is used to control particulate emissions during material separation and handling in the ash handling room.

3.0 MODEL DESCRIPTION/JUSTIFICATION

The model used for this application is AERMOD (version 12060), the USEPA–approved model for near-field new source review. Based on EPA guidance AERMOD is the most appropriate of the EPA-approved models given the site's physical characteristics and the facility emission sources. AERMOD was applied as recommended in EPA's Guideline on Air Quality Models and consistent with guidance in IDEQ's Dispersion Modeling Guidelines. Non-regulatory default options were employed; specifically the Ozone Limiting Method (OLM) was employed for modeling 1-hr NO_2 impacts. This is discussed further below.

The Prime building downwash algorithm was applied for the facility. Terrain data was processed consistent with the modeling protocol submitted to DEQ and EPA guidance for AERMAP. Meteorological data recommended for this analysis was provided by IDEQ. IDEQ requires modeling of criteria pollutants if emissions from the proposed source exceed the modeling thresholds set forth the IDEQ Dispersion Modeling Guidelines.

The criteria pollutants which exceed the modeling threshold at the Dynamis WTE facility are PM_{10}, $PM_{2.5}$, NO_x, SO_2 and Pb. In addition, benzene, cadmium, dioxin, formaldehyde, hydrogen chloride, mercury and nickel exceed the TAPs screening emission levels (ELs) in IDAPA 58.01.01.585 and 586. The Dynamis facility will be subject to 40 CFR Part 60 Subpart Eb - Standards of Performance for Large Municipal Waste Combustors for Which Construction is Commenced After September 20, 1994 or for Which Modification or Reconstruction is Commenced After June 19, 1996. Emissions of dioxin, cadmium, hydrochloric acid and mercury are regulated under NSPS Subpart Eb. IDAPA 58.010.01, Subsection 210.20 (a) states the following:

> *"If the owner or operator demonstrates that the toxic air pollutant from the source or modification is regulated by the Department at the time or permit issuance under 40 CFR Part 60, 40 CFR Part 61, or 40 CFR Part 63, no further procedures for demonstrating preconstruction compliance will be required under Section 210 for that toxic air pollutant as part of the application process."*

Therefore, dioxin, cadmium, hydrochloric acid and mercury were not included in the modeling analysis.

In general, the AERMOD model application used model source data consistent with the permit emission inventory. The model receptor network and model domain proposed meet all EPA and IDEQ recommendations, and ensure a complete dispersion analysis that captured maximum potential impacts.

3.1 Non-Regulatory Defaults

As discussed above, the Ozone Limiting Method (OLM) was used to demonstrate compliance with 1-hr NO_2 impacts. The OLM was employed as recommended in the June 28, 2010 Memorandum to EPA Regional Air Division Directors from Stephen D. Page, Director EPA Office of Air Quality Planning and Standards, titled “Guidance Concerning the Implementation of the 1-hr NO_2 NAAQS for the Prevention of Significant Deterioration Program” and IDEQ modeling protocol approval. The OLM requires in-stack ratios of NO_2/NO_x emissions as well as hourly monitored background ozone (O_3) concentrations. The NO_2/NO_x in-stack ratio of 0.15 for the thermal conversion unit was conservatively based on a blend of in-stack ratios for natural gas and diesel generator emissions as found in “Assessment of Non-Regulatory Options in AERMOD, Specifically OLM and PVMRM” from the San Joaquin Valley Air Pollution Control District In reality, the thermal conversion unit functions in a similar manner to a thermal oxidizer. Thermal oxidizers are routinely used to enhance destruction of NO_x, CO and SO_x emissions at other facilities. As a result, it is reasonable to assume that the thermal conversion unit will serve to help promote NO_x destruction during operation which would result in lower NO_2/NO_x ratios than modeled. An in-stack NO_2/NO_x ratio of 0.20 was used for the Dynamis emergency diesel generator (San Joaquin Valley Air Pollution Control District guidance). Per DEQ and EPA guidance, 0.90 was used as the default equilibrium NO_2/NO_x ratio for the 1-hr NO_2 standard. For modeling runs including co-contributing sources, an in-stack NO_2/NO_x ratio of 0.15 was used for the thermal conversion unit, an in-stack ratio of 0.20 was used for the Dynamis emergency generator and ACLF generators (based on in-stack ratios for diesel internal combustion engines found in the San Joaquin Valley guidance document), and the default ratio of 0.50 was used for all other sources. Also as recommended in EPA guidance, the OLMGROUP ALL option was employed.

In addition to the NO_2/NO_x ratio, hourly background O_3 concentrations are required for the OLM analysis. Hourly ozone data was provided by DEQ. The ozone backgrounds were developed using the 98th percentile value of hourly monitoring data from 2009, 2010, and 2011 from the White Pine site, in southeastern Boise, near the intersection of Boise Avenue and Apple Street.

4.0 EMISSION AND SOURCE DATA

Modeled emissions include all sources of PM_{10}, $PM_{2.5}$, NO_x SO_2, Pb, Benzene, Formaldehyde, HF, and Ni. Emission rates represent the maximum anticipated operating rates for the averaging period modeled, taking into account the maximum daily hours of operation and throughputs requested in the application for all averaging periods.

Table 1 below compares the facility's Potential to Emit (PTE) for all criteria pollutants against IDEQ Modeling Thresholds. Table 2 compares the facility's PTE for those Toxic Air Pollutants (TAPs) that exceed the emissions screening levels in IDAPA 58.01.01.585 and 586. Emission summaries are documented in more detail in the facility's emission inventory.

Table 1 Project Potential Criteria Pollutant Emissions vs. IDEQ Modeling Thresholds

Criteria Modeling Check	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	Pb*
Controlled Emission Rates, lb/hr (tpy)	4.72 (13.6)	4.72 (13.6)	36.1 (96.2)	10.8 (27.0)	13.2 (34.2)	26.2
Modeling Threshold, lb/hr (tpy)	0.22 (n/a)	0.054 (0.35)	0.2 (1.2)	0.21 (1.2)	15 (n/a)	14
Modeling Required:	YES	YES	YES	YES	NO	YES

*Pb emission rate and modeling threshold are in lb/month

Table 2 Project Potential TAPs Emissions vs. IDEQ Modeling Thresholds

TAPs Modeling Check	Benzene	Formaldehyde	Nickel
Controlled Emission Rates (lb/hr)	1.2E-03	1.8E-03	1.5E-2
Screening Emission Level (lb/hr)	8.0E-04	5.1E-04	2.7E-05
Modeling Required:	YES	YES	YES

4.1 Emissions Sources

Emissions sources at the facility include the following:

<u>Thermal Conversion Units</u>

Dynamis will operate one 408 tpd thermal conversion unit at the facility. The unit consists of the primary gasification chamber, secondary combustion chamber, and boiler. Steam generated in the boiler is used to power a power generation turbine. Emissions from the primary gasification chambers and secondary combustion chambers are exhausted through the boiler stack. The boilers will be custom made for the facility by Victory Energy. The majority of MSW, 380 tpd, will be processed between the hours of 7am and 11pm (16 hours). The remaining MSW, 28 tpd, will be processed between 11pm and 7am. Emissions rates and model sources used in the modeling analysis will reflect both the peak and off-peak operation, for those pollutants with averaging periods less than 24 hrs (1-hr NO_x and 1-hr SO_2). The facility will process 408 total tons of MSW per day. The MSW is expected to contain moisture as well as un-combustible materials such as glass and metal. It is conservatively assumed that 90% of the MSW received will be combustible materials; therefore, emissions estimates are based on 367 tpd of combustible material (342 tpd peak, 25 tpd off-peak).

The thermal conversion unit is a source of PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO, Lead, and TAPs. Emission factors for the thermal conversion unit were developed using source test data from similar units installed at other facilities in the United States. Emissions from the thermal unit (including primary chamber ignition system natural gas combustion) will be controlled by a scrubber located between the boiler and exhaust stack. The scrubber has a manufacturer guaranteed emission rate 0.595 lb/hr HCl, 71.25% control of SO_2, 99% control of PM_{10}, and 90% control of particulate sized 1.5 to 2.5 micron (this equates to approximately 41% control of $PM_{2.5}$; it is estimated that particulates sized 1.5 to 2.5 micron comprise approximately 46% of $PM_{2.5}$ from gasification). The scrubber manufacturer guarantees 41% control of $PM_{2.5}$ and smaller, with higher control efficiency expected for larger particulates. Metals emissions (with the exception of Mercury) from the thermal unit (including primary ignition system) will be in particulate form. Metals emissions estimates include a conservative 20% control of particulate metals. Manufacturer guarantee information sheets are included in Appendix B.

<u>Primary Gasification Chamber Ignition System</u>

Each time waste is loaded into the primary gasification chamber and the chamber is lit, a small amount of fuel is required to ignite the chamber burner. The ignition system will be fueled by natural gas. A total of 112,000 scf/day of natural gas will be used for all ignition systems. The primary gasification chamber ignition system will exhaust through the primary and secondary chambers and out of the boiler exhaust stack (and will be controlled by the scrubber). The ignition system is a source of PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO, VOCs, and TAPs. Emission factors from AP-42, Section 1.4 were used to calculate natural gas combustion emissions.

<u>Cooling Towers</u>

Steam exiting the turbine will be exhausted through a condenser that is cooled with water from two cooling towers. Water used in the cooling towers will be supplied by United Water. The cooling towers are a source of PM_{10} and $PM_{2.5}$. Emissions factors from AP-42 Section 13.4 and input water analysis TDS content were used to calculate cooling tower particulate emissions.

Ash Handling System

As discussed above, the ash collection system consists of various conveyors, ferrous and aluminum material separators and collection bins. A total of five dust collection units will control PM_{10}/$PM_{2.5}$ emissions from the ash handling system. The dust collectors are centrally located in the ash handling room above the roller drum magnet and eddy current pulse separator to collect any dust generated during ash material separation and above the ferrous material, aluminum material and clean ash bins. The dust collectors will discharge to the ash system baghouse, which has a manufacturer guaranteed emission rate of 0.005 grains/dscf for particles size 10 micron and smaller. The baghouse will exhaust through a stack outside of the ash handling room, and will exhaust for approximately 45 minutes every hour. The ash handling system is a source of PM_{10}, $PM_{2.5}$ and TAPs. Ash testing data (TCLP mg/L results) was converted to an approximate mg/kg concentration to develop emission factors for pollutant emissions from the ash system. Specifications on the baghouse are included in Appendix B.

Emergency Generator

The facility will be powered by electric line power. However, a 300 kW emergency diesel generator will be installed at the facility. The proposed generator will be an EPA Tier III certified Caterpillar C9 ACERT (or similar), and will run no more than 500 hours per year. The generator will only be tested once per quarter and testing will occur between 7 am and 7 pm. The MHRDOW7 – Monthly by Hour by Day of Week emission rate factor was employed for the generator in AERMOD. One day each quarter was randomly selected for testing. However, the MHRDOW7 simulates testing on every selected day that occurs in the month selected. Therefore, air dispersion modeling results represent impacts that would occur as if the generator was tested 4 days per quarter. This results in conservative estimates of impacts from the generator. The emergency generator is a source of PM_{10}, $PM_{2.5}$, NO_x, SO_2 CO, VOCs, and TAPs. Manufacturer data and emission factors from AP-42 Section 3.3 were used to calculate generator emissions estimates. Manufacturer data is included in Appendix B.

Emissions factors for the thermal conversion unit and ash handling system used to develop the emissions inventory are based on multiple source tests of similar thermal conversion units installed at various facilities over the past 15 years. Source tests were previously provided to DEQ, but will be provided again if requested.

Cooling tower, emergency generator, and primary gasification ignition system fuel combustion emissions estimates were developed using manufacturer data and AP-42. A detailed emissions inventory for each emissions source is provided with the permit application and in Appendix C of this report. DEQ forms are provided in Appendix D.

JBR performed an initial Significant Impact Level (SIL) analysis which included only sources from the Dynamis facility and the lease boundary as the ambient air boundary. Impacts from the Dynamis WTE facility exceed the IDEQ SILs for 24-hr and annual $PM_{2.5}$, 24-hr PM_{10}, and 1-hr and Annual NO_x and SO_2. SIL model results are shown in Table 4 below. Receptors for each pollutant and averaging period exceeding the SIL were used to perform a full impact analysis, including co-contributing sources. Excel files containing the coordinates and elevations of receptors above the SILs are included in Appendix E.

As part of the modeling protocol JBR requested, and DEQ provided, exhaust parameters and emission rates for neighboring facilities that DEQ deemed to be co-contributing sources. DEQ determined that the Hidden Hollow Energy, LLC (HHE) facility and Ada County Landfill (ACLF) are co-contributing sources for the Dynamis facility. Emissions points at the Hidden Hollow Energy facility include four internal combustion generator engines; emissions points at the Ada County Landfill include two generators and two landfill gas flares. In the modeling protocol approval received from DEQ (included as Appendix F) DEQ provided exhaust parameters and emission rates for two operating scenarios for the HHE engines and ACLF sources. Ambient air boundary information for the HHE facility and ACLF were provided via email from Cheryl Robinson, DEQ.

5.0 RECEPTOR NETWORK

The Dynamis WTE facility is located just outside of the city of Boise and is bordered by residential development to the east and west. The property covers approximately 8.0 acres. Consistent with IDEQ guidance the ambient air boundary used in this analysis is the lease boundary, which also serves as the public access boundary. Dynamis will control access to the leased property through posting of signage and by training facility personnel to patrol and prevent public access. In addition, Dynamis will ensure that Ada County Landfill employees understand that the facility is property of Dynamis, and access is restricted to anyone other than Dynamis personnel or invited guests.

Receptor density was set at a spacing of 10 meters along the ambient air boundary, 20 meter spacing for the first 30 meters past the boundary, then receptors were set at a density of one per 35 meters out to 60 meters away from the property boundary, 50 meters out to 100 meters from the boundary, 100 meters to 500 meters, 250 meters out to 2,000 meters from the ambient air boundary, and 500 meters out to 5 kilometers past the ambient air boundary. The receptor network was extended to 10 kilometers to the north and east, past the ambient air boundary, with receptors spacing of 500 meters for 1-hr SO_2 modeling analyses, and to 50 kilometers to the north and east, past the ambient air boundary with receptor spacing of 500 meters for 1-hr NO_x modeling analyses, to ensure that all impacts above the respective 1-hr SO_2 and 1-hr NO_x SIL were captured. In addition, discrete receptors were added near locations of maximum impacts to ensure the true maximum impacts were captured. The receptor network used ensures that the analysis meets or exceeds EPA receptor network requirements and captures the maximum impact from the facility. The receptor networks used for the full impact analyses are discussed in detail in Section 10.3.

6.0 ELEVATION DATA

All source base elevations were calculated based on the site grading plan and finished floor elevations for the property. All stack heights were referenced to re-graded ground surface elevations. Receptor elevations were initially calculated from USGS 1/3 arc second NED data using the Bee-Line BEEST preprocessing system. Receptor elevations along the Dynamis fenceline were adjusted to an elevation of 3175 ft (967.74 m) per re-graded elevation as shown in the site grading plan (Appendix A). In addition, receptor elevations between the facility's western property boundary and the access road running from southwest to northeast along the boundary, as well as receptors located within the access road, were adjusted per the site grading plan.

7.0 METEOROLOGICAL DATA

Preprocessed AERMOD ready meteorological files were provided upon request from Darrin Mehr of IDEQ. The data was processed by ENVIRON, using National Weather Service surface data observations and upper air data observations from the Boise, Idaho Airport for the period 2005-2009. In addition to the hourly NWS data, 1-minute wind speed and wind direction data from Boise Airport were used to resolve calm and variable wind conditions using the AERMINUTE preprocessor. The data files cover the years 2005 through 2009. The data presented by IDEQ is model-ready, and was used without alteration or processing.

8.0 LAND USE CLASSIFICATION

AERMOD includes rural and urban algorithm options. These options affect the wind speed profile, dispersion rates, and mixing-height formula used in calculating ground-level pollutant concentrations. A protocol was developed by USEPA to classify an area as either rural or urban for dispersion modeling purposes. The classification is based on average heat flux, land use, or population density within a three-km radius from the plant site. Of these techniques, the USEPA has specified that land use is the most definitive criterion (USEPA, 1987). The urban/rural classification scheme based on land use is as follows:

> *The land use within the total area, A_0, circumscribed by a 3-km circle about the source, is classified using the meteorological land use typing scheme proposed by Auer (1978). The classification scheme requires that more than 50% of the area, A_0, be from the following land use types in order to be considered urban for dispersion modeling purposes: heavy industrial (I1); light-moderate industrial (I2); commercial (C1); single-family compact residential (R2); and multi-family compact residential (R3). Otherwise, the use of rural dispersion coefficients is appropriate.*

The Dynamis WTE facility is located just outside of the city of Boise and is bordered by residential development to the east and west. Although the immediate vicinity of the site is residential, site and map reconnaissance showed that the area A_0 within a 3-km circle of the source is below the 50% urban land use criteria necessary for use of urban dispersion coefficients. Rural dispersion coefficients were therefore used in the air quality dispersion modeling.

9.0 BACKGROUND CONCENTRATIONS

Background concentrations for criteria pollutants as provided by IDEQ are shown in Table 3 below. Background values for TAPs are zero.

Table 3 Background Concentrations

Pollutant	Averaging Period	Background Concentration (ug/m3)	Source
PM_{10}	24-hour	73	Historical DEQ airshed modeling for the Boise Area; intended to represent the background at the landfill.
$PM_{2.5}$	24-hr	19.3	Meridian, Idaho monitor 2008,2009, and 2010 finalized data from the U.S. EPA AirData website. The 24-hr average background is the 3-year average of each year's 98th percentile value.
	Annual	6.3	Meridian, Idaho monitor 2008,2009, and 2010 finalized data from the U.S. EPA AirData website. The annual average background is the 3-year average of the weighted mean value for each year.
NO_2	1-hr	Variable	Hourly background concentrations based on 2007 and 2010 data from the ITD monitoring site in Boise. Values are the 98th percentile values for each hour during a day.
	Annual	40	Boise monitoring data
SO_2	1-hr	33.1	Fargo ND/Moorhead MN monitoring data, 2006-2008, 1st high value plus one standard deviation of values meeting 75% completeness critieria
	Annual	2.6	Fargo ND/Moorhead MN monitoring data, 2004-2008, all non-zero values meeting 75% completeness criteria are 0.001ppm = 2.6 ug/m^3
Pb	Rolling 3-month average	0.04	Default: Urban>45,000

10.0 REVISED MODEL RESULTS AND DISCUSSION

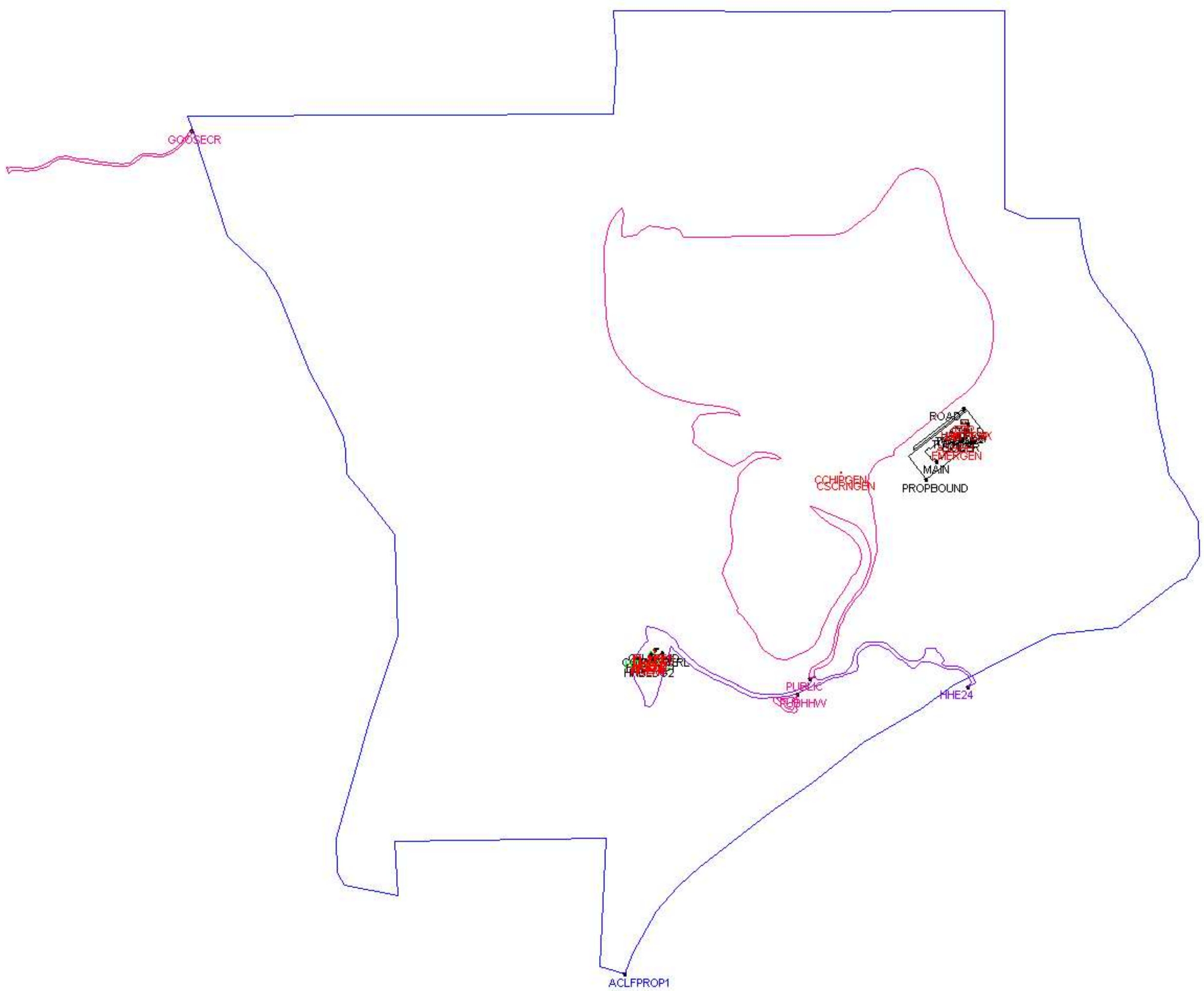
As stated above, JBR performed both a SIL analysis for the Dynamis facility and full impact analysis including the HHE facility and ACLF as co-contributing sources. Results of the SIL analysis are shown in Table 4. Per DEQ guidance, the 1st high output value and a concatenated 5-year met file were used for 24-hr PM_{10}, 24-hr $PM_{2.5}$, annual $PM_{2.5}$, 1-hr NO_2, 1-hr SO_2, 24-hr TAPs and annual TAPs. The highest 1st high output value from five separate meteorological year runs was used for annual NO_2 and annual SO_2.

Table 4 SIL Model Predicted Impacts – Dynamis Facility SIL Analysis

Pollutant	Averaging Period	Modeled Impact (ug/m^3)	SIL (ug/m^3)	NAAQS/ AAC/AACC (ug/m^3)	Modeled Output Value Used (5 years met data)	Met Data Used
PM_{10}	24-hour	9.09	5.0	150	1st high	5-yr concatenated
$PM_{2.5}$	24-hr	7.79	1.2	35	1st high	5-yr concatenated
	Annual	1.56	0.3	15	1st high	5-yr concatenated
NO_2	1-hr	166.7	7.5	188	1st high	5-yr concatenated
	Annual	10.2	1.0	100	1st high	One met file for each year of data
SO_2	1-hr	137.8	7.9	196	1st high	5-yr concatenated
	Annual	2.70	1.0	80	1st high	One met file for each year of data
Pb	Rolling 3-month average	0.02	n/a	0.15	1st high	5-yr concatenated
Benzene	Annual	2.0E-05	n/a	1.2E-01	1st high	5-yr concatenated
Formaldehyde	Annual	1.6E-04	n/a	7.7E-02	1st high	5-yr concatenated
Nickel	Annual	2.9E-03	n/a	4.2E-03	1st high	5-yr concatenated

Receptors exceeding the SIL for each pollutant and averaging period were used as the receptors for the full impact analysis. Annual NO_x values from the SIL analysis were multiplied by 0.75 and then compared to the SIL to determine receptors to use for the full impact analysis. DEQ provided exhaust parameters and emission rates for two operating scenarios for the HHE facility and ACLF sources. Ambient air boundaries for HHE and the ACLF were also provided by DEQ and are shown in Figure 1.

Figure 1 Ambient Air Boundaries - Dynamis, HHE Facility and ACLF



Pink lines define areas where the general public will have access when the landfill is open (typically 7 am to 7 pm). Purple lines define areas where Hidden Hollow Energy employees (members of the public for Dynamis modeling) will typically have access 24 hours per day. Blue lines define the outer boundary of the ACLF property. Black lines (not including the road outlined in black) define the Dynamis property boundary. Ambient impacts caused by each of the three facilities with each facility's ambient air boundary are not evaluated for compliance with the NAAQs; a facility cannot cause or contribute to a NAAQs exceedance within its own ambient air boundary.

10.1 Operating Scenario 1

HHE will be assumed to operate four generator engines with 2,400 standard cubic feet per minute (scfm) of landfill gas limited to an H2S content of 180 parts per million by volume (ppmv). The HHE generators each operate 24 hours per day and 8760 hours per year. The ACLF flaring operations will be assumed to operate at 950 scfm of landfill gas combusted in one flare. The ACLF flare will operate 24 hours a day, 8760 hours per year. The ACLF Wood Chipper and Power Screen Engines were assumed to both operate 24 hours per day and 3,300 hours per year. Emission rates for HHE and ACLF sources for operating scenario 1 are shown in Table 5 below.

Table 5 Co-Contributing Source Emission Rates: Scenario 1

Emission Rates: Scenario 1						
Source	**$PM_{10}/PM_{2.5}$**		**SO_2**		**NO_x**	
	(lb/hr)	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
Hidden Hollow Energy Sources						
Generator Engine 1	0.78	3.42	1.09	4.77	2.46	10.77
Generator Engine 2	0.78	3.42	1.09	4.77	2.46	10.77
Generator Engine 3	0.78	3.42	1.09	4.77	2.46	10.77
Generator Engine 4	0.78	3.42	1.09	4.77	2.46	10.77
Ada County Landfill Sources						
Flare 1	0.92	4.02	5.78	25.30	1.75	7.65
Chipper Engine	0.30	0.50	0.008	0.01	5.36	8.84
Power Screen Engine	0.27	0.44	0.001	0.002	3.79	6.25

10.2 Operating Scenario 2

Operating scenario 2 assumes that the HHE generators are non-operational and ACLF is combusting 3,350 scfm of landfill gas at 600 ppmv of H_2S. The landfill gas is split evenly between the two flares, which are assumed to each operate 24 hours per day, 8760 hours per year. The Wood Chipper and Power Screen engines are assume to operate at full capacity 24 hours per day, 3,300 hours per year. Emission rates for ACLF sources for operating scenario 2 are shown in Table 6 below.

Table 6 Co-Contributing Source Emission Rates: Scenario 2

Emission Rates: Scenario 2						
Source	**$PM_{10}/PM_{2.5}$**		**SO_2**		**NO_x**	
	(lb/hr)	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
Ada County Landfill Sources						
Flare 1	1.62	7.08	10.19	44.61	3.08	13.49
Flare 2	1.62	7.08	10.19	44.61	3.08	13.49
Chipper Engine	0.30	0.50	0.008	0.01	5.36	8.84
Power Screen Engine	0.27	0.44	0.001	0.002	3.79	6.25

10.3 Full Impact Analysis Model Ambient Boundaries and Receptors

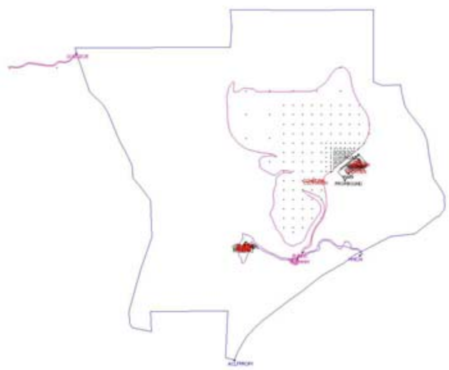
A total of 13 model runs were setup for each of the two co-contributing source operating scenarios. The model runs were based on the receptors above the SIL for each pollutant and averaging period above the SIL within each of the three ambient air boundary scenarios. The three ambient air boundary scenarios include the following:

- "7AM to 7PM" in which the public has access to certain areas of the landfill, and therefore ACLF sources can contribute to a NAAQs exceedance within the public access boundary inside the larger ACLF property boundary. Dynamis and HHE sources can also contribute to a NAAQs exceedance within this boundary.
- "Night" in which the public does not have access to any areas with the ACFL boundary and therefore ACLF sources cannot contribute to a NAAQs exceedance anywhere within the ACLF property boundary. Only Dynamis and HEE sources can contribute to a NAAQs exceedance within this boundary.
- "Out" scenario includes all receptors outside the larger ACLF property boundary. Dynamis, HHE and ACLF sources can contribute to a NAAQs exceedance outside of this property boundary.

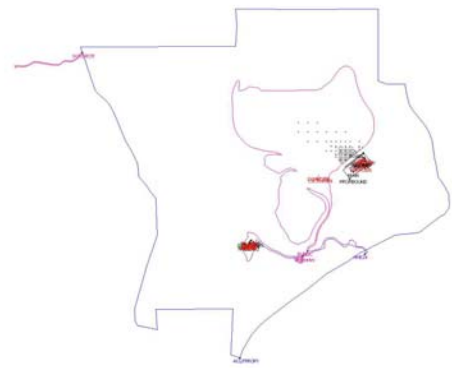
It should be noted that there were no Dynamis receptors above the SIL for any pollutant or averaging period located within the HHE property boundary.

Receptors above the SIL for each pollutant and averaging period and ambient air boundary are shown in Figures 2 to 4 below.

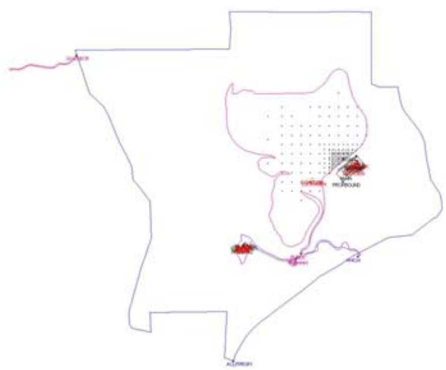
Figure 2 "7AM -7PM" Receptors



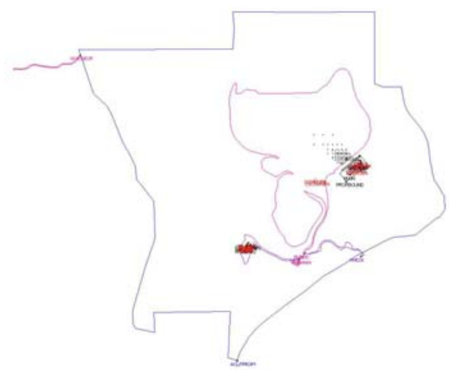
1-hr NO_x Receptors



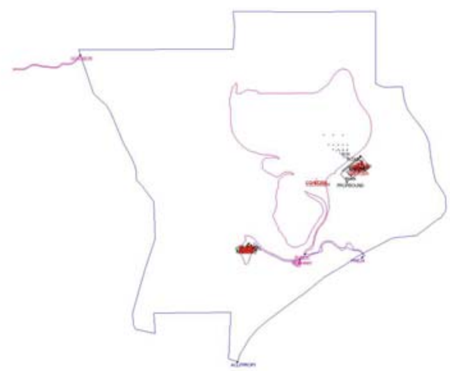
24-hr $PM_{2.5}$ Receptors



1-hr SO_2 Receptors



Annual $PM_{2.5}$ Receptors



Annual SO_2 and NO_x receptors

Figure 3 "Night" Receptors

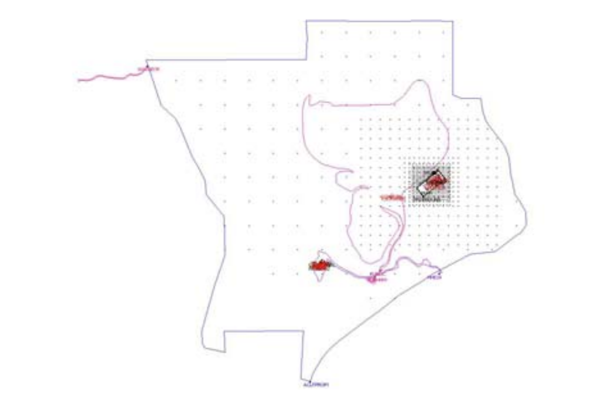
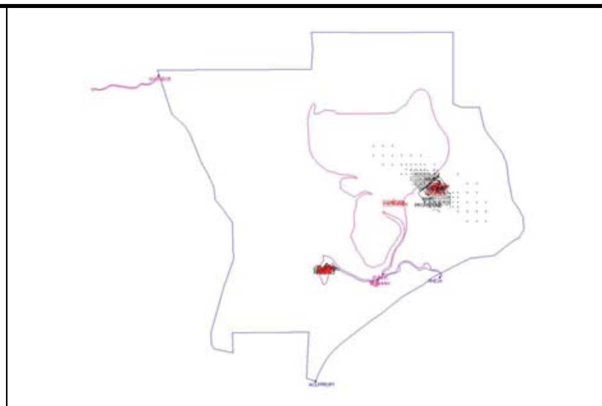
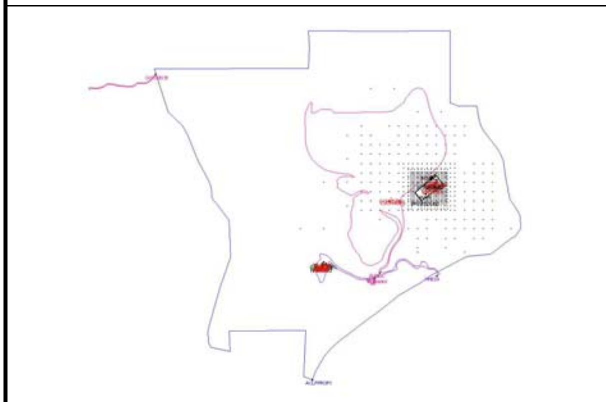
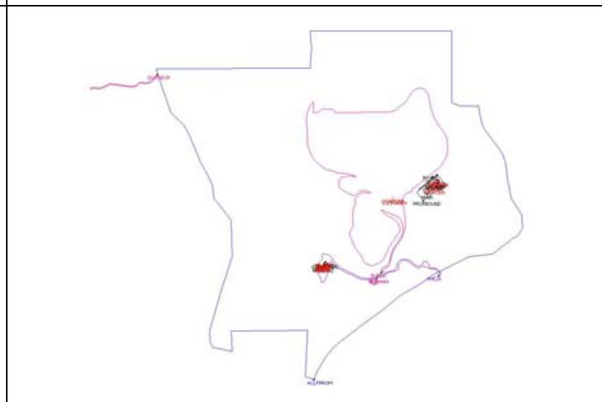
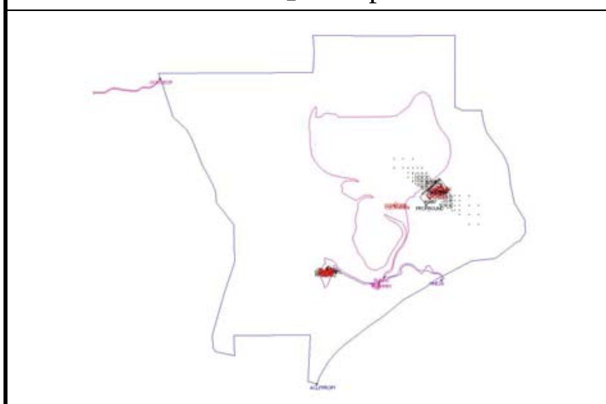
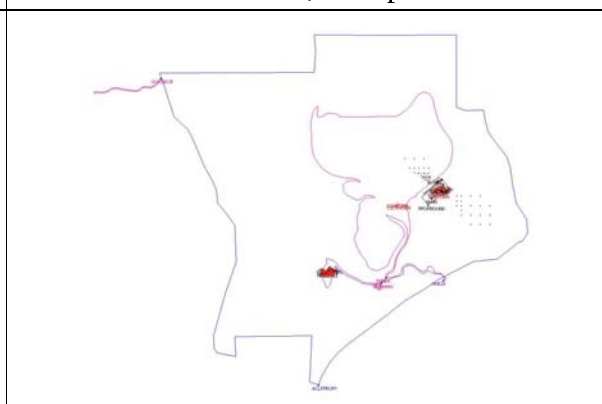
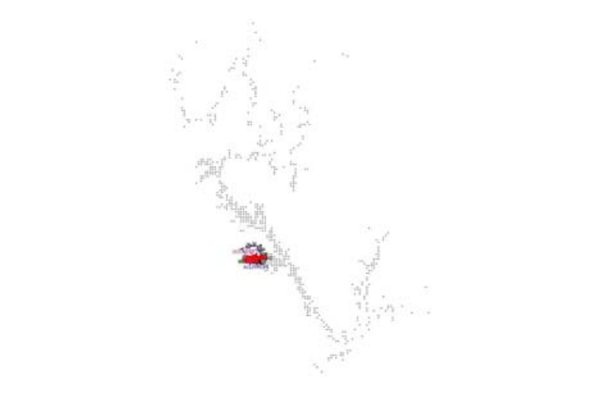
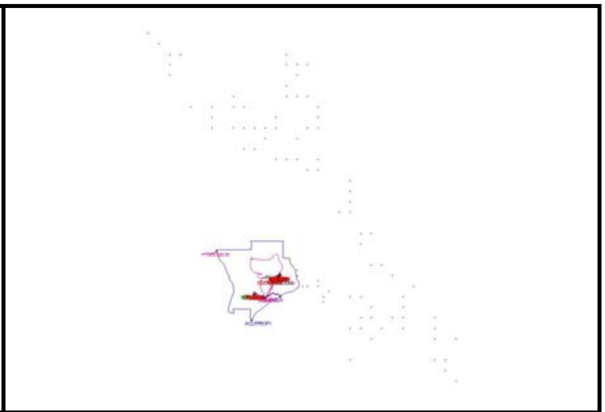
	
1-hr NO_x Receptors	24-hr $PM_{2.5}$ Receptors
	
1-hr SO_2 Receptors	24-hr PM_{10} Receptors
	
Annual $PM_{2.5}$ receptors	Annual SO_2 and NO_x receptors

Figure 4 "Out" Receptors

	
1-hr NO_x Receptors	1-hr SO_2 Receptors

10.4 REVISED Full Impact Analysis Model Runs

A total of five model runs were setup for each of the two co-contributing source operating scenarios, based on the combination of ambient air boundaries listed above, receptors above the SIL within those boundaries, and sources which could contribute to an exceedance of the NAAQs at those receptors. The model runs are summarized in Table 7 below.

Table 7 REVISED Full Impact Analysis Model Run Summary

Operating Scenario	Pollutant	Averaging Period	Model Name	Description
Scenario 1	NOx	1-hr	ALL_S1_NO2_r3_7AP	Receptors exceeding 1-hr NOx SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis, HHE and ACLF (ACLF sources operating 7am to 7pm only).
	NOx	1-hr	ALL_S1_NO2_r3_NIGHT	Receptors exceeding 1-hr NOx SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
	NOx	1-hr	ALL_S1_NO2_r3_OUT	Receptors exceeding 1-hr NOx SIL outside the ACLF boundary. Sources include Dynamis HHE, and ACLF.
	SO_2	1-hr	ALL_S1_SO2_r3_7AP	Receptors exceeding 1-hr SO_2 SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis, HHE and ACLF (ACLF sources operating 7am to 7pm only).
	SO_2	1-hr	ALL_S1_SO2_r3_NIGHT	Receptors exceeding 1-hr SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
	SO_2	1-hr	ALL_S1_SO2_r3_OUT	Receptors exceeding 1-hr SO_x SIL outside the ACLF boundary. Sources include Dynamis HHE, and ACLF.
	$PM_{2.5}$	24-hr	ALL_S1_PM2.5_r3_7AP	Receptors exceeding 24-hr $PM_{2.5}$ SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis, HHE and ACLF (ACLF sources operating 7am to 7pm only)
	$PM_{2.5}$	24-hr	ALL_S1_PM2.5_r3_NIGHT	Receptors exceeding 24-hr $PM_{2.5}$ SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE
	PM_{10}	24-hr	ALL_S1_PM10_r3_NIGHT	Receptors exceeding 24-hr PM_{10} SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
	$PM_{2.5}$	Annual	ALL_S1_PM2.5ANN_r3_7AP	Receptors exceeding Annual $PM_{2.5}$ SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis, HHE and ACLF (ACLF sources operating 7am to 7pm only)
	$PM_{2.5}$	Annual	ALL_S1_PM2.5ANN_r3_Night	Receptors exceeding Annual $PM_{2.5}$ SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE
	NO_x, SO_2	Annual	ALL_S1_NOSOAN_r3_7AP	Receptors exceeding Annual NO_x and SO_2 SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis, HHE and ACLF (ACLF sources operating 7am to 7pm only).
	NO_x, SO_2	Annual	ALL_S1_NOSOAN_r3_NIGHT	Receptors exceeding Annual NO_x and SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
Scenario 2	NOx	1-hr	ALL_S2_NOx_r3_7AP	Receptors exceeding 1-hr NOx SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis and ACLF (ACLF sources operating 7am to 7pm only).
	NOx	1-hr	ALL_S2_NOx_r3_NIGHT	Receptors exceeding 1-hr NOx SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	NOx	1-hr	ALL_S2_NOx_r3_OUT	Receptors exceeding 1-hr NOx SIL outside the ACLF boundary. Sources include Dynamis and ACLF.
	SO_2	1-hr	ALL_S2_SO2_r3_7AP	Receptors exceeding 1-hr SO_2 SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis and ACLF (ACLF sources operating 7am to 7pm only).
	SO_2	1-hr	ALL_S2_SO2_r3_NIGHT	Receptors exceeding 1-hr SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	SO_2	1-hr	ALL_S2_SO2_r3_OUT	Receptors exceeding 1-hr SO_x SIL outside the ACLF boundary. Sources include Dynamis and ACLF.
	$PM_{2.5}$	24-hr	ALL_S2_PM2.5_r3_7AP	Receptors exceeding 24-hr $PM_{2.5}$ SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis and ACLF (ACLF sources operating 7am to 7pm only)
	$PM_{2.5}$	24-hr	ALL_S2_PM2.5_r3_NIGHT	Receptors exceeding 24-hr $PM_{2.5}$ SIL within the ACLF boundary (blue outline). Sources include Dynamis.

	PM_{10}	24-hr	ALL_S2_PM10_r3_NIGHT	Receptors exceeding 24-hr PM_{10} SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	$PM_{2.5}$	Annual	ALL_S2_PM2.5ANN_r3_7AP	Receptors exceeding Annual $PM_{2.5}$ SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis and ACLF (ACLF sources operating 7am to 7pm only)
	$PM_{2.5}$	Annual	ALL_S2_PM2.5ANN_r3_Night	Receptors exceeding Annual $PM_{2.5}$ SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	NO_x, SO_2	Annual	ALL_S2_NOSOAN_r3_7AP	Receptors exceeding Annual NO_x and SO_2 SIL within the 7am to 7pm public access area at the ACLF. Sources include Dynamis and ACLF (ACLF sources operating 7am to 7pm only).
	NO_x, SO_2	Annual	ALL_S2_NOSOAN_r3_NIGHT	Receptors exceeding Annual NO_x and SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis.

The results of the revised full impact analysis for Scenario 1 and Scenario 2 are shown in Table 8 and Table 9, respectively.

Table 8 REVISED Full Impact Analysis Model Results - Scenario 1

Pollutant	Averaging Period	Modeled Impact (ug/m^3)	Background Concentration (ug/m^3)	Total Concentration (ug/m^3)	NAAQS/ AAC/AACC (ug/m^3)	Modeled Value Used (5 years met data)
PM_{10}	24-hour	6.06	73	79.1	150	6th highest
$PM_{2.5}$	24-hr	7.79	19.3	27.1	35	Average 1st high for all meteorological years
	Annual	1.57	6.3	7.9	15	Average 1st high for all meteorological years
NO_2	1-hr	213.4	Background included in modeled impact	213.4	188	Max8th highest maximum daily 1-hr value for each year averaged for all years
	Annual	10.2	40	50.2	100	1st highest
SO_2	1-hr	56.6	33.1	89.7	196	Max 4th highest maximum daily 1-hr value for each year averaged for all years
	Annual	2.71	2.6	5.31	80	1st highest

Table 9 REVISED Full Impact Analysis Model Results - Scenario 2

Pollutant	Averaging Period	Modeled Impact (ug/m^3)	Background Concentration (ug/m^3)	Total Concentration (ug/m^3)	NAAQS/ AAC/AACC (ug/m^3)	Modeled Value Used (5 years met data)
PM_{10}	24-hour	6.06	73	79.1	150	6th highest
$PM_{2.5}$	24-hr	7.79	19.3	27.1	35	Average 1st high for all meteorological years
	Annual	1.56	6.3	7.9	15	Average 1st high for all meteorological years
NO_2	1-hr	213.4	Background included in modeled impact	213.4	188	Max8th highest maximum daily 1-hr value for each year averaged for all years
	Annual	10.2	40	50.2	100	1st highest
SO_2	1-hr	56.6	33.1	89.7	196	Max 4th highest maximum daily 1-hr value for each year averaged for all years
	Annual	2.70	2.6	5.30	80	1st highest

As shown in Table 8 and 9 above, maximum impacts of 1-hr NO_x exceed the NAAQs. These exceedances occur during the “7AM-7PM” and “Night” model runs for Scenario 1 and “7AM-7PM” model run for Scenario 2. The MAXDAYCONT output option in AERMOD was used to determine if impacts from the Dynamis facility exceed the SIL at the receptors where exceedances of the 1-hr NOx NAAQS occur. A range of values from 8th high to 30th high was specified for the generated AERMOD MAXDAYCONT tables to adequately demonstrate the facility does not have a significant contribution to any modeled exceedance. For both Scenario 1 and Scenario 2 “7AM-7PM” model runs, the 1-hr NO_x standard was exceeded at at-least one receptor through the 26th high. For the Scenario 1 “NIGHT” model run, the standard was exceeded at at-least one receptor through the 18th high. The maximum contribution from Dynamis at each receptor where a NAAQS exceedance occurs is below the SIL. MAXDAYCONT output files are included in Appendix G. Dynamis sources are shown in the output files as PEAK, OFFPEAK and EMERGEN.

Electronic copies of all input, output, and support modeling files necessary to duplicate the model results accompany this submittal to IDEQ.

APPENDIX A

Site Location Map and Site Plans

APPENDIX B

Scrubber, Ash System Baghouse and Emergency Generator Specifications

APPENDIX C

Emissions Inventory (also included on CD)

APPENDIX D

DEQ Modeling Forms

APPENDIX E

SIL Receptor List (on CD)

APPENDIX F

Model Protocol Approval

APPENDIX G

MAXDAYCONT Output Files (on CD)