REVISED

Dynamis Energy, LLC

Hidden Hollow Landfill WTE Facility
Air Quality Modeling Report

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1.0 PURPOSE

In April 2012, Dynamis Energy, LLC (Dynamis) submitted a 15-Day Pre-Permit Construction (15-Day) application and concurrent 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). An air quality modeling report was submitted as part of the application to document and report the methods and techniques used to perform the modeling in support of Dynamis' 15-Day and PTC applications. Since that time, based on discussions between JBR and DEQ as outlined in various letters and responses, the modeling has gone through several iterations. This revised modeling report is intended to fully replace all previous documents related to air dispersion modeling that have been submitted in support of the project. This report will fully document and report updated methods and techniques used to perform the most recent and up-to-date modeling, which supersedes all previous modeling submitted to DEQ.

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. 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 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 20 to 50 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 superheated 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 superheated 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 mass) 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 superheated steam. The high pressure superheated steam generated from the boiler is directed through a power generation turbine creating electrical power.

Per the Power Purchase Agreement (PPA) between Dynamis and Idaho Power, one hour of ramp-up/start-up and one hour of slowdown/shutdown are included within the16 hour peak power delivery period (7am to 11pm). A primary operation time chart, reflecting the 1-hour shoulder period within the ends of the peak start and stop period, is included in Appendix B. The system will continue to run between the hours of 11pm and 7am; material throughput and flow rates will be reduced such power generated during these hours will be used to power the facility.

During initial cold startup, a purge of the secondary chambers with ambient occurs to verify fan operation and proper flow. The turbulent air blowers and induced draft fans must run at 100% flow (approximately 150,000 scfm) for a minimum of 2 minutes during this test. This airflow provides five air exchanges within the secondary chamber, boiler, scrubber and ducting. These air exchanges insure only ambient air is present in these chambers prior to ignition. The secondary chamber is then pre-heated using low NOx natural gas burners. Once the secondary reaches a minimum of 1800F the primary chamber and ducting between primary and secondary

combustion chambers must be purged to remove possible un-combusted gases. The un-combusted purge gases are vented into the secondary chamber to be combusted. Any un-combusted purge gases will be of a similar composition as the syngas that is combusted during normal operations, therefore purging emissions are expected to be equivalent to emission during normal peak operation.

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 as discussed in Section 6. 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 in 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, several TAPs exceed the 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, and TAPs. 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)	5.71 (15.9)	4.70 (13.3)	25.0 (64.1)	2.23 (2.93)	4.41 (9.91)	51.8
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	Controlled Emission Rates (lb/hr)	Screening Emission Level (lb/hr)	Modeling Required?
Acenaphthalene	3.39E-04	9.10E-05	Yes
Acenaphthene	4.90E-04	9.10E-05	Yes
Anthracene	3.12E-04	9.10E-05	Yes
Benzene	1.15E-03	8.00E-04	Yes
1,3-Butadiene	4.78E-05	2.40E-05	Yes
Fluoranthene	3.60E-04	9.10E-05	Yes
Fluorene	4.82E-04	9.10E-05	Yes
Formaldehyde	1.79E-03	5.10E-04	Yes
2-Methylnaphthalene	1.04E-03	9.10E-05	Yes
Naphthalene	2.14E-03	9.10E-05	Yes
Nickel	5.76E-03	2.70E-05	Yes
Phenanthrene	1.09E-03	9.10E-05	Yes
Pyrene	2.64E-04	9.10E-05	Yes
Total POM (7-PAH)	3.37E-04	2.00E-06	Yes

4.1 Emissions Sources

Emissions sources at the facility include the following:

Thermal Conversion Units

Dynamis will operate one 408 tpd thermal conversion unit at the facility. The unit consists of the primary gasification chambers, 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, 374 tpd, will be processed between the hours of 7am and 11pm (16 hours). The remaining MSW, 28 tpd, and the total amount of tires, 6.12 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. Emissions estimates are based on 408 tpd of as received material (374 tpd peak, 34 tpd off-peak).

Initial submissions of emissions calculations were determined using the combustible fraction of fuel (MSW + tires) as contributing to the potential emissions. The assumption was that non-combustibles did not contribute to gases exiting the thermal conversion system and therefore were not part of the potential emissions. This assumption resulted in a discrepancy of total daily throughput and heating value of the fuel used by DEQ and Dynamis. After discussion with DEQ engineers it is Dynamis' understanding that DEQ requests that "as received" fuel mass should be used to determine flow and potential emission outputs. This approach will provide the most straightforward method of measuring and permitting daily fuel throughput regardless of non-combustible content.

Maximum system flow conditions will occur during peak operation if the incoming MSW is very energetic due to very dry conditions and very little non-combustible material. The facility has the capacity to process 374 tons MSW/daily peak and 28 tons MSW/daily off peak + 6.1 tons tires/daily off peak with MSW having a maximum LHV of 7000 btu/lb. This fuel mix results in combustion conditions that require significant amount of excess air to maintain proper temperatures.

Additional flow conditions were calculated for fuel streams with heating values more typical of MSW. System flows were calculated for MSW typical of Ada County with a LHV of 5800 btu/lb (moisture content of 20% and un-combustible content of 13%). Overall excess air requirements are lower than the max flow case due to lower temperatures during combustion.

Additionally, Dynamis has determined that maximum system flows occur during the facility's maximum processing capacity (maximum heating value fuel, approximately 7000 Btu/lb, maximum throughput, peak flow rate = 150,863 acfm, offpeak flow rate = 39,130 acfm). These flows result in the maximum pound per hour (lb/hr) and ton per year (tpy) emissions. However, preliminary modeling analyses showed that maximum-modeled impacts would occur during typical/design processing conditions when stack flow is reduced (typical conditions include a MSW fuel heating value of approximately 5800 Btu/lb, maximum throughput, peak flow rate =120,725 acfm, offpeak flow rate = 33,894 acfm). Fuel heating value and F-Factor Flow calculations were documented in a letter dated December 3, 2012 from Dynamis to Mr. Mike Simon, DEQ. This letter is also included as Appendix C.

To estimate worst-case conditions for both waste throughput and modeled impacts, Dynamis asserts that maximum system processing emission values (typical of a 7000 Btu/lb waste) should be used to calculate facility hourly and annual PTE values and as the inputs to model ambient impacts. Typical/design processing flow conditions (typical of a 5800 Btu/lb waste) should be used as the stack exhaust conditions to model ambient impacts. This worst-case approach results in the highest system lb/hr emission values with the lowest stack flow; however, it is used only as a predictor of emissions due to the fact that the system cannot run with these conditions. If maximum capacity fuel is used then air input requirements will be large, resulting in stack flow rate higher than typical flow rates and increased plume dispersion (resulting in lower ambient impacts).

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 factors were developed for both peak operating conditions and offpeak conditions. The peak emission factors are based on data from MSW only (or MSW mixed with very small amount of other material such as wood pallets) test burns. The offpeak emissions factors are based on a waste stream representative of 82% MSW and 18% tires, as all of the total throughput of tires is planned to occur at night, and were developed using the MSW only/MSW mixed test data and tire test burn data. Emission factor development spreadsheets are included in Appendix D).

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 41% control of $PM_{2.5.}$ Metals emissions (with the exception of mercury) from the thermal unit (including primary ignition system) will be in particulate form. Data from AP-42 indicate particulate emissions from municipal waste combustion will have a cumulative weight percentage of 54% for $PM_{2.5}$ and 67.1% for PM_{10}. Metals emissions are based on this speciation of particulate size and associated $PM_{2.5}$ and PM_{10} control efficiencies provided by the scrubber manufacturer. Manufacturer guarantee information sheets are included in Appendix E.

In addition, the thermal conversion unit will be equipped with a urea-based Selective Non-Catalytic Reduction (SNCR) device to reduce NO_x. The SNCR manufacturer has guaranteed NO_x reduction of at least 40%, based on incoming loading of up to 50 lb/hr NO_x. Manufacturer guarantee information is included in Appendix E.

All control equipment will be situated downstream of the secondary combustion chamber. The SNCR will be situated between stages of the boiler and upstream of the caustic wet scrubber. The caustic wet scrubber control equipment will be immediately upstream of the exhaust stack.

Emissions from the thermal conversion unit were modeled using the Hour of Day (HROFDY) factor in AERMOD; therefore the thermal unit lb/hr emissions rates were input into the model for both short term and annual standards.

Primary Gasification Chamber Ignition System

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 and SNCR). 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.

Cooling Towers

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.

The exhaust stack for the ash baghouse will be fabricated by one of Dynamis' contractors. The system will be operating between 12 and 16 inches WC static pressure. The blower discharge points are rectangular and have larger area than the 1.5-foot diameter stack, so there will be a transition from rectangular to round and likely a nozzle on the stack top to accelerate the air. The stack will not be equipped with a raincap or downturned outlet. Specifications on the baghouse, baghouse exhaust stack, and fan curves are included in Appendix E.

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 generator will sit on a skid approximately five feet off the ground; the as-delivered stack height of the generator is five feet, therefore the total stack height will be 10 feet above the ground surface. 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. For annual $PM_{2.5}$, NO_x and SO_2, the MHRDOW7 was not used; the calculated ton per year emissions based on 500 hours of operation per year were input into the model. 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 E.

Emissions factors for the thermal conversion unit and ash handling system used to develop the emissions inventory are based on multiple source tests conducted by the Western Research Institute (WRI) on similar thermal conversion units installed in Laramie, Wyoming and Anchorage, Alaska. The source test data is summarized in the emission factor development spreadsheets in Appendix D. Electronic copies of the source test reports were previously provided to DEQ.

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 D of this report. DEQ forms are provided in Appendix F.

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}, 1-hr and Annual NO_x and 1-hr 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 G.

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 H) 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 9.26 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. Access to the area south of the facility is also limited by terrain. 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 50 kilometers past the ambient air boundary. The receptor network ensures that all impacts above the respective SILs were captured. In addition, receptors were added near locations of maximum impacts to ensure the true maximum impacts were

captured. These receptors were added by constructing a 200 meter by 200 meter grid surrounding the area of maximum impact, with receptor spacing of 20 meters within the grid. 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

Receptor elevations were initially calculated from USGS 1/3 arc second NED data using the Bee-Line BEEST preprocessing system. The QUADDATE (the most recent revision date) of the NED data for the areas covering the receptor network ranges from 1999 to 2002. Based on a review of historical images in Google Earth, significant grading, road construction and topographical changes occurred at the landfill between 2002 and the present. Imagery shown in Google Earth is from 2011; however, elevations given by Google Earth appear to be consistent with the 2002 NED data elevations.

JBR used the Dynamis site grading plan to manually adjust receptor elevations where data is available in the immediate vicinity of the Dynamis property, as shown on the plan. Updated grading information for the landfill property is not available; therefore, the NED elevations were not adjusted for receptors outside of the extent of the Dynamis grading plan. The exception to this is where the NED receptor elevation of a receptor adjacent to an adjusted Dynamis receptor differed by more than 25 feet. These instances were addressed on a case-by-case basis, and the NED elevation was adjusted in order to ‘smooth’ the transition between receptors. This was done to ensure that no plume impacts were missed due to a large discrete receptor elevation change.

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.

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 criteria
	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 MODEL RESULTS AND DISCUSSION

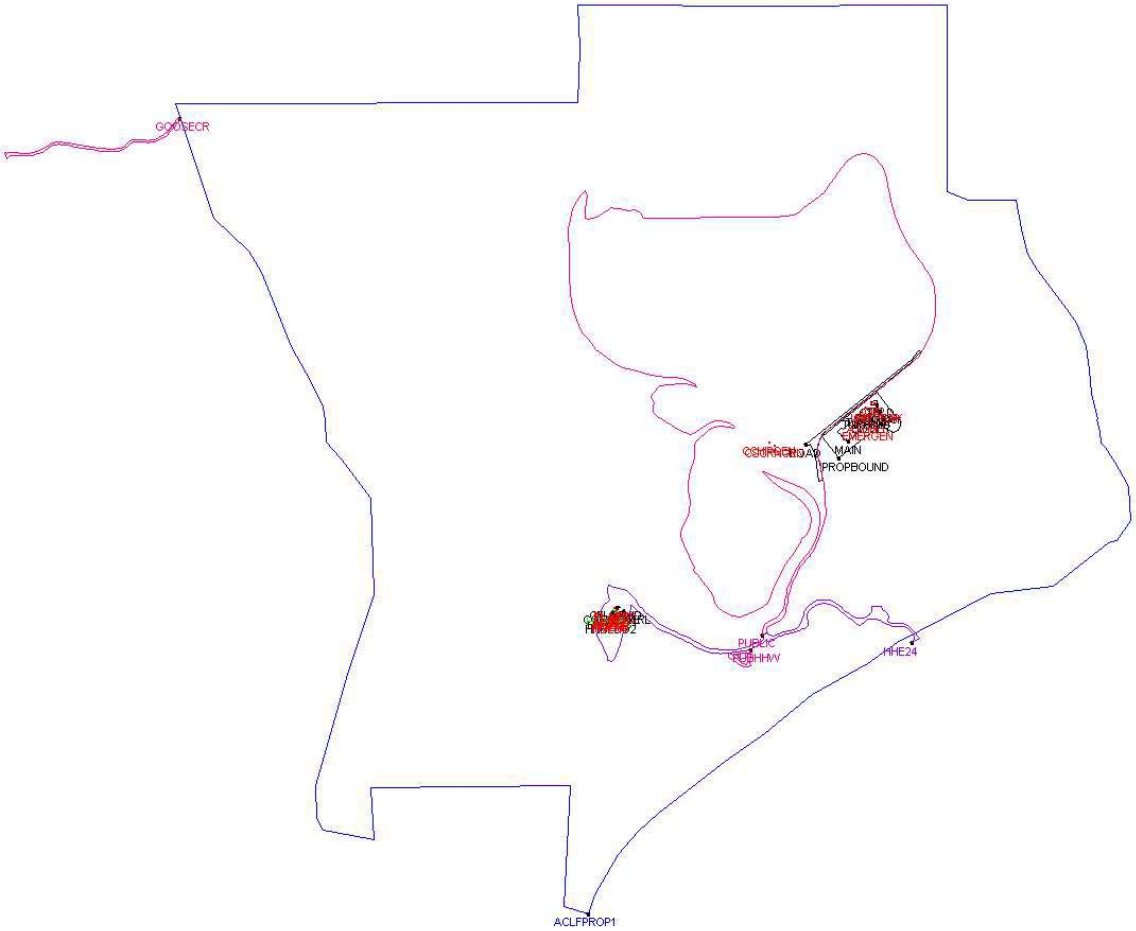
As stated above, JBR performed both a SIL analysis for the Dynamis facility and full impact analysis including the HHE facility and ACLF as co-contributing sources. Results of the SIL analysis are shown in Table 4. Per DEQ guidance, the 1st high output value and a concatenated 5-year met file were used 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	15.8	5.0	150	1st high	5-yr concatenated
$PM_{2.5}$	24-hr	11.1	1.2	35	1st high	5-yr concatenated
	Annual	1.77	0.3	15	1st high	5-yr concatenated
NO_2	1-hr	171.3	7.5	188	1st high	5-yr concatenated
	Annual	8.87	1.0	100	1st high	One met file for each year of data
SO_2	1-hr	93.7	7.9	196	1st high	5-yr concatenated
	Annual	0.78	1.0	80	1st high	One met file for each year of data
Pb	Rolling 3-month average	0.04	n/a	0.15	1st high	5-yr concatenated
Benzene	Annual	8.3E-04	n/a	1.2E-01	1st high	5-yr concatenated
Formaldehyde	Annual	1.1E-03	n/a	7.7E-02	1st high	5-yr concatenated
Nickel	Annual	3.2E-03	n/a	4.2E-03	1st high	5-yr concatenated
Acenaphthalene	Annual	1.8E-04	n/a	1.4E-02	1st high	5-yr concatenated
Acenaphthene	Annual	2.6E-04	n/a	1.4E-02	1st high	5-yr concatenated
Anthracene	Annual	1.6E-04	n/a	1.4E-02	1st high	5-yr concatenated
1,3-Butadiene	Annual	3.0E-05	n/a	3.6E-03	1st high	5-yr concatenated
Fluoranthene	Annual	1.8E-04	n/a	1.4E-02	1st high	5-yr concatenated
Fluorene	Annual	2.4E-04	n/a	1.4E-02	1st high	5-yr concatenated
2-Methylnaphthalene	Annual	5.4E-04	n/a	1.4E-02	1st high	5-yr concatenated
Naphthalene	Annual	1.1E-03	n/a	1.4E-02	1st high	5-yr concatenated
Phenanthrene	Annual	5.5E-04	n/a	1.4E-02	1st high	5-yr concatenated
Pyrene	Annual	1.4E-04	n/a	1.4E-02	1st high	5-yr concatenated
Total POM	Annual	1.8E-04	n/a	3.0E-04	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

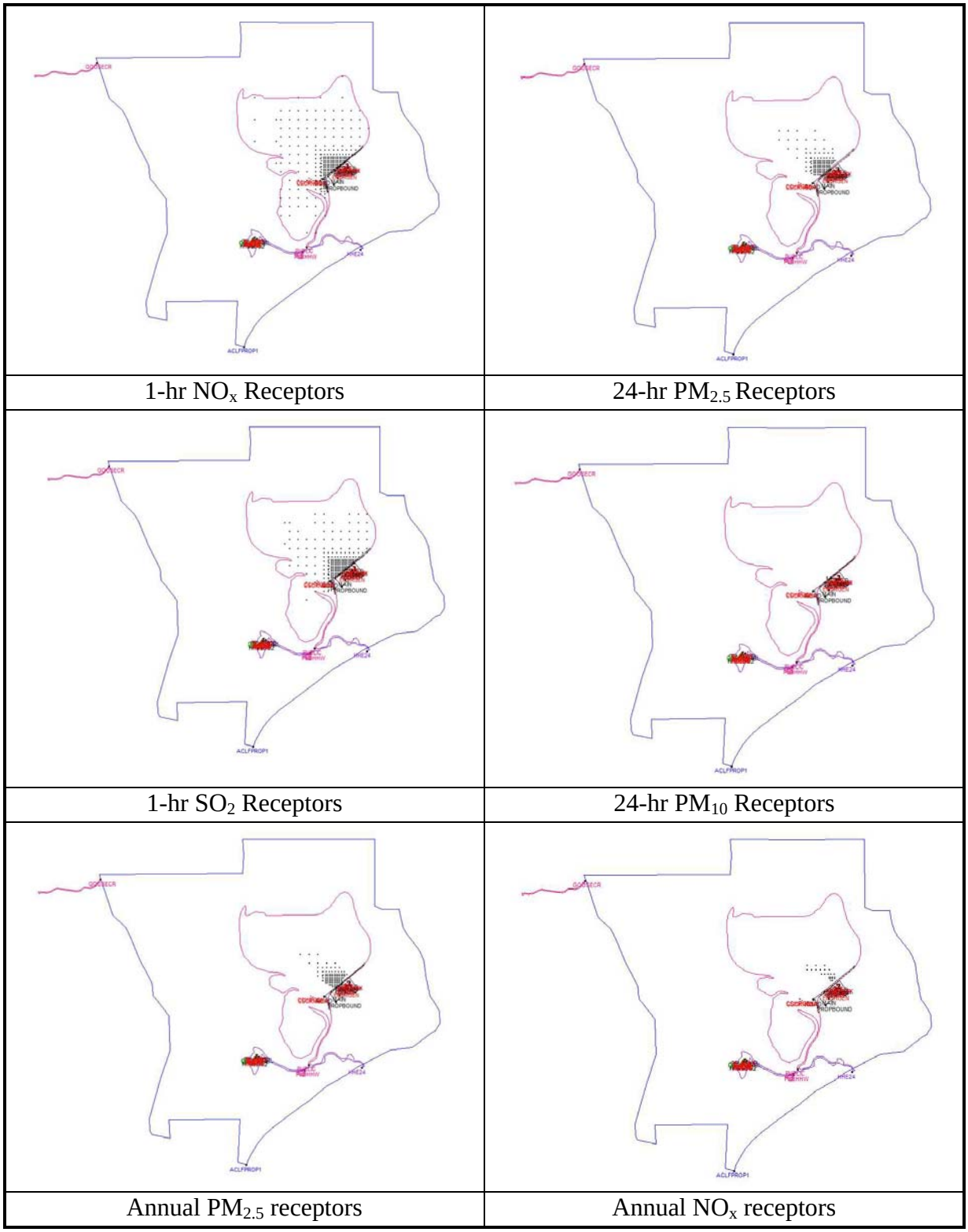
10.3 Full Impact Analysis Model Ambient Boundaries and Receptors

A total of 16 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. The HROFDY factor and lb/hr emission rates were used for the ACLF sources in these modeling runs.
- "Night" in which the public does not have access to any areas with the ACLF boundary (7pm to 7am) and therefore ACLF sources cannot contribute to a NAAQs exceedance anywhere within the ACLF property boundary. Only Dynamis and HHE sources can contribute to a NAAQs exceedance within this boundary. The HROFDY factor is also used for ACLF sources for these model runs, however emissions rates are set to zero.
- "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.

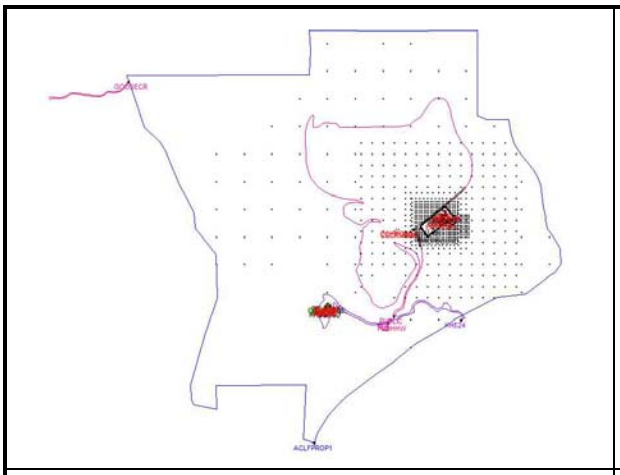
It should be noted that there were no Dynamis receptors above the SIL for any pollutant or averaging period located within the HHE property boundary. Receptors above the SIL for each pollutant and averaging period and ambient air boundary are shown in Figures 2 to 4 below.

Figure 2 "7AM -7PM" Receptors

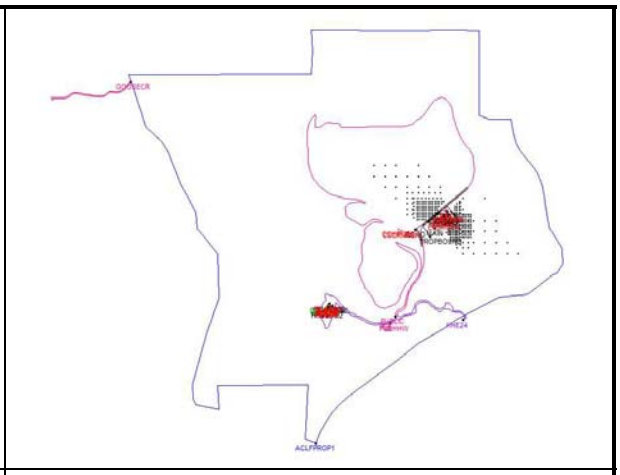


1-hr NO_x Receptors	24-hr $PM_{2.5}$ Receptors
1-hr SO_2 Receptors	24-hr PM_{10} Receptors
Annual $PM_{2.5}$ receptors	Annual NO_x receptors

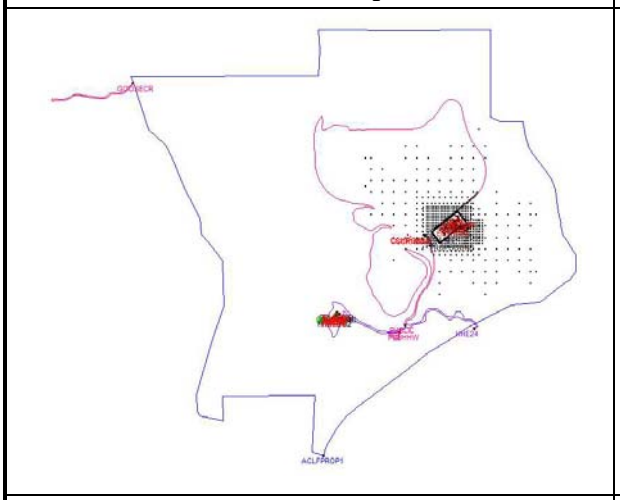
Figure 3 "Night" Receptors



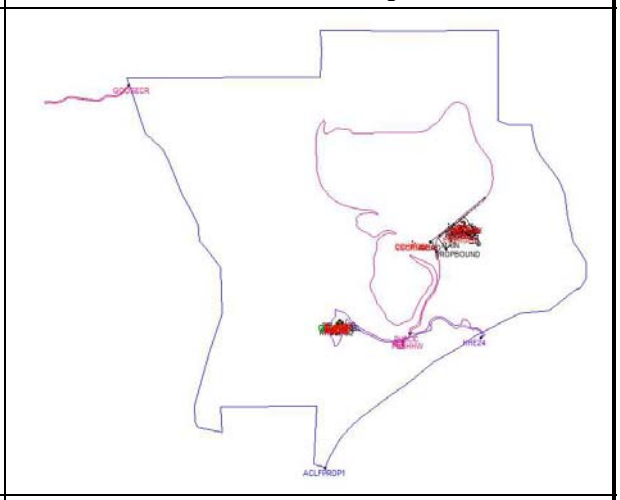
1-hr NO_x Receptors



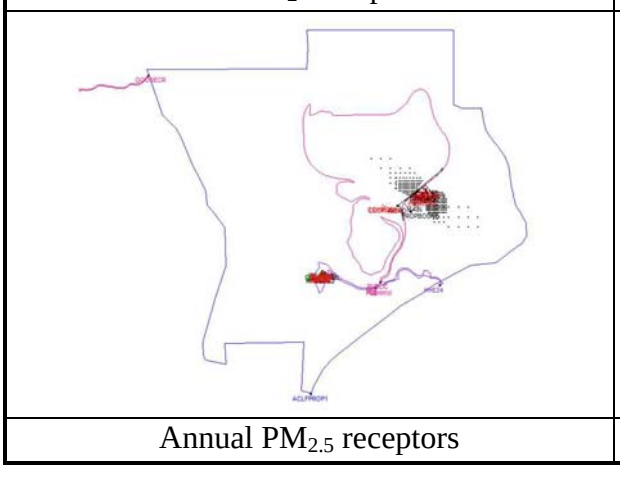
24-hr $PM_{2.5}$ Receptors



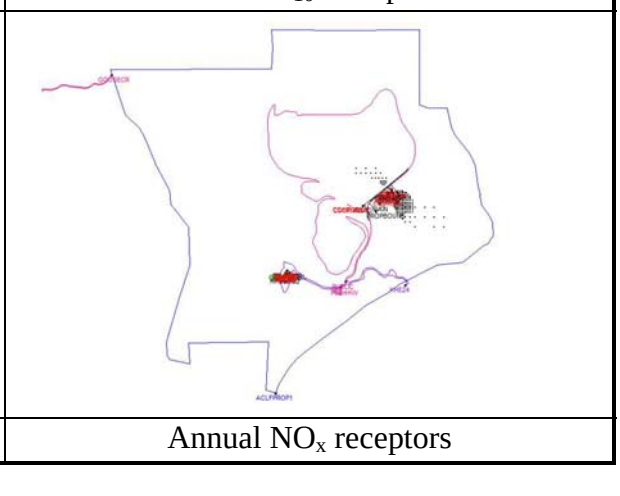
1-hr SO_2 Receptors



24-hr PM_{10} Receptors

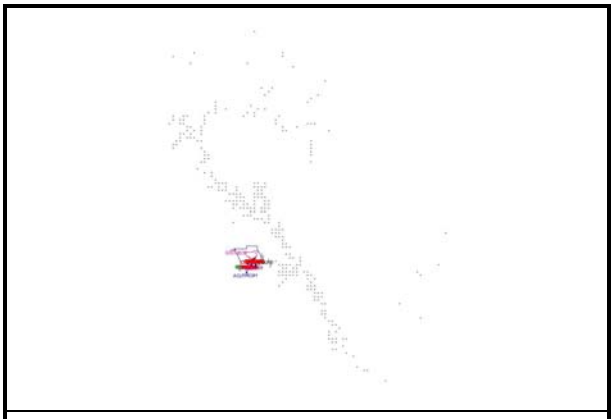


Annual $PM_{2.5}$ receptors



Annual NO_x receptors

Figure 4 "Out" Receptors



1-hr NO_x Receptors

10.4 Full Impact Analysis Model Runs

A total of 13 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 Full Impact Analysis Model Run Summary

Operating Scenario	Pollutant	Averaging Period	Model Name	Description
Scenario 1	NOx	1-hr	ALL_S1_NO2_7058_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_7058_NIGHT	Receptors exceeding 1-hr NOx SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
	NOx	1-hr	ALL_S1_NO2_7058_OUT	Receptors exceeding 1-hr NOx SIL outside the ACLF boundary. Sources include Dynamis HHE, and ACLF.
	SO_2	1-hr	ALL_S1_SO2_7058_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_7058_NIGHT	Receptors exceeding 1-hr SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
	$PM_{2.5}$	24-hr	ALL_S1_PM2.5_7058_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_7058_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_7058_7AP	Receptors exceeding 24-hr PM_{10} 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_{10}	24-hr	ALL_S1_PM10_7058_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_PMANN_7058_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_PMANN_7058_Night	Receptors exceeding Annual $PM_{2.5}$ SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE
	NO_x	Annual	ALL_S1_NOANN_7058_7AP	Receptors exceeding Annual NO_x 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	Annual	ALL_S1_NOANN_7058_NIGHT	Receptors exceeding Annual NO_x SIL within the ACLF boundary (blue outline). Sources include Dynamis and HHE.
Scenario 2	NOx	1-hr	ALL_S2_NOx_7058_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_7058_NIGHT	Receptors exceeding 1-hr NOx SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	NOx	1-hr	ALL_S2_NOx_7058_OUT	Receptors exceeding 1-hr NOx SIL outside the ACLF boundary. Sources include Dynamis and ACLF.
	SO_2	1-hr	ALL_S2_SO2_7058_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_7058_NIGHT	Receptors exceeding 1-hr SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	$PM_{2.5}$	24-hr	ALL_S2_PM2.5_7058_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_7058_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_7058_7AP	Receptors exceeding 24-hr PM_{10} 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_{10}	24-hr	ALL_S2_PM10_7058_NIGHT	Receptors exceeding 24-hr PM_{10} SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	$PM_{2.5}$	Annual	ALL_S2_PMANN_7058_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_PMANN_7058_Night	Receptors exceeding Annual $PM_{2.5}$ SIL within the ACLF boundary (blue outline). Sources include Dynamis.
	NO_x	Annual	ALL_S2_NOANN_7058_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	Annual	ALL_S2_NOANN_7058_NIGHT	Receptors exceeding Annual NO_x and SO_2 SIL within the ACLF boundary (blue outline). Sources include Dynamis.

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

Table 8 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	13.3	73	86.3	150	6th highest
$PM_{2.5}$	24-hr	11.1	19.3	30.4	35	Average 1st high for all meteorological years
	Annual	1.79	6.3	8.09	15	Average 1st high for all meteorological years
NO_2	1-hr	229.3	Background included in modeled impact	229.3	188	Max8th highest maximum daily 1-hr value for each year averaged for all years
	Annual	8.89	40	48.9	100	1st highest
SO_2	1-hr	46.2	33.1	79.3	196	Max 4th highest maximum daily 1-hr value for each year averaged for all years

Table 9 Full Impact Analysis Model Results - Scenario 2

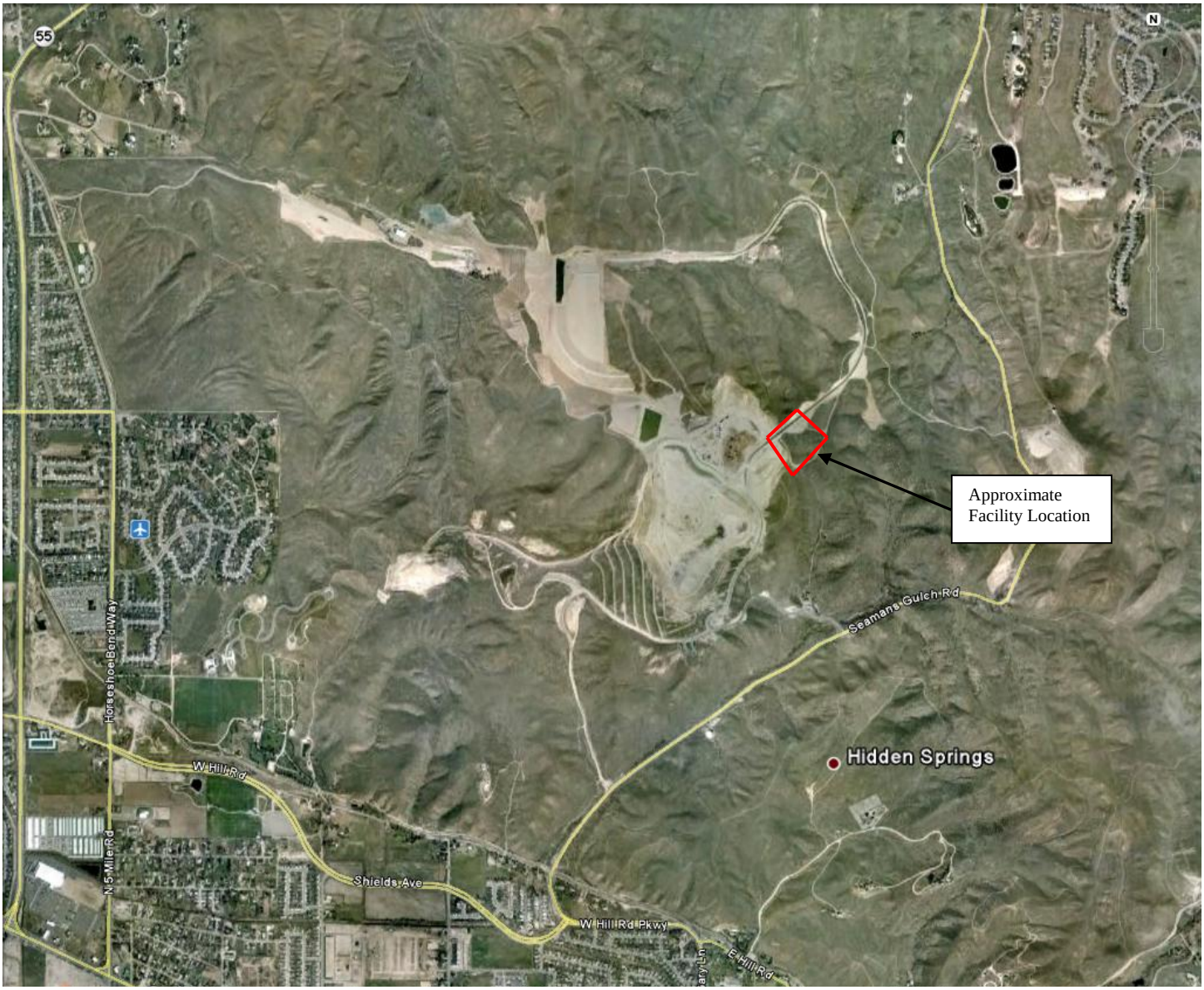
Pollutant	Averaging Period	Modeled Impact (ug/m^3)	Background Concentration (ug/m^3)	Total Concentration (ug/m^3)	NAAQS/ AAC/AACC (ug/m^3)	Modeled Value Used (5 years met data)
PM_{10}	24-hour	13.3	73	86.3	150	6th highest
$PM_{2.5}$	24-hr	11.1	19.3	30.4	35	Average 1st high for all meteorological years
	Annual	1.78	6.3	8.08	15	Average 1st high for all meteorological years
NO_2	1-hr	229.3	Background included in modeled impact	229.3	188	Max8th highest maximum daily 1-hr value for each year averaged for all years
	Annual	8.87	40	48.9	100	1st highest
SO_2	1-hr	46.2	33.1	79.3	196	Max 4th highest maximum daily 1-hr value for each year averaged for all years

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" model runs for Scenario 1 and Scenario 2 and the "Night" model run for Scenario 1. 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 55th 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 46th high. For the Scenario 1 "Night" model run, the 1-hr NOx standard was exceed 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 I. 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

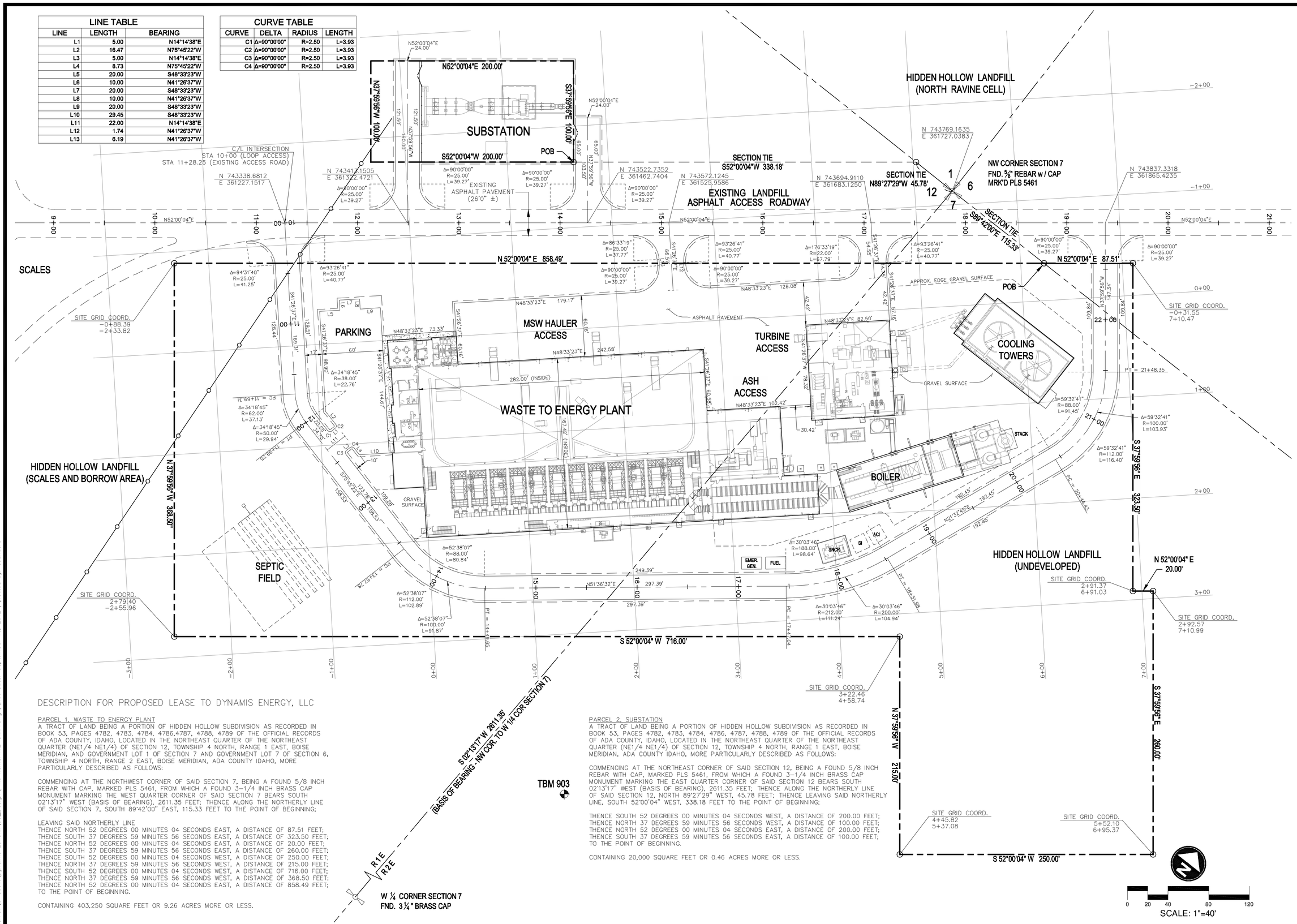


Dynamis Energry, LLC
Ada County Landfill WTE Facility

Figure 1 – Site Location

LINE TABLE		
LINE	LENGTH	BEARING
L1	5.00	N14°14'38"E
L2	16.47	N75°45'22"W
L3	5.00	N14°14'38"E
L4	8.73	N75°45'22"W
L5	20.00	S48°33'23"W
L6	10.00	N41°26'37"W
L7	20.00	S48°33'23"W
L8	10.00	N41°26'37"W
L9	20.00	S48°33'23"W
L10	29.45	S48°33'23"W
L11	22.00	N14°14'38"E
L12	1.74	N41°26'37"W
L13	6.19	N41°26'37"W

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	Δ=90°00'00"	R=2.50	L=3.93
C2	Δ=90°00'00"	R=2.50	L=3.93
C3	Δ=90°00'00"	R=2.50	L=3.93
C4	Δ=90°00'00"	R=2.50	L=3.93



DESCRIPTION FOR PROPOSED LEASE TO DYNAMIS ENERGY, LLC

PARCEL 1, WASTE TO ENERGY PLANT
A TRACT OF LAND BEING A PORTION OF HIDDEN HOLLOW SUBDIVISION AS RECORDED IN BOOK 53, PAGES 4782, 4783, 4784, 4786,4787, 4788, 4789 OF THE OFFICIAL RECORDS OF ADA COUNTY, IDAHO, LOCATED IN THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER (NE1/4 NE1/4) OF SECTION 12, TOWNSHIP 4 NORTH, RANGE 1 EAST, BOISE MERIDIAN, AND GOVERNMENT LOT 1 OF SECTION 7 AND GOVERNMENT LOT 7 OF SECTION 6, TOWNSHIP 4 NORTH, RANGE 2 EAST, BOISE MERIDIAN, ADA COUNTY IDAHO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SECTION 7, BEING A FOUND 5/8 INCH REBAR WITH CAP, MARKED PLS 5461, FROM WHICH A FOUND 3-1/4 INCH BRASS CAP MONUMENT MARKING THE WEST QUARTER CORNER OF SAID SECTION 7 BEARS SOUTH 02°13'17" WEST (BASIS OF BEARING), 2611.35 FEET; THENCE ALONG THE NORTHERLY LINE OF SAID SECTION 7, SOUTH 89°42'00" EAST, 115.33 FEET TO THE POINT OF BEGINNING;

LEAVING SAID NORTHERLY LINE
THENCE NORTH 52 DEGREES 00 MINUTES 04 SECONDS EAST, A DISTANCE OF 87.51 FEET;
THENCE SOUTH 37 DEGREES 59 MINUTES 56 SECONDS EAST, A DISTANCE OF 323.50 FEET;
THENCE NORTH 52 DEGREES 00 MINUTES 04 SECONDS EAST, A DISTANCE OF 20.00 FEET;
THENCE SOUTH 37 DEGREES 59 MINUTES 56 SECONDS EAST, A DISTANCE OF 260.00 FEET;
THENCE SOUTH 52 DEGREES 00 MINUTES 04 SECONDS WEST, A DISTANCE OF 250.00 FEET;
THENCE NORTH 37 DEGREES 59 MINUTES 56 SECONDS WEST, A DISTANCE OF 215.00 FEET;
THENCE SOUTH 52 DEGREES 00 MINUTES 04 SECONDS WEST, A DISTANCE OF 716.00 FEET;
THENCE NORTH 37 DEGREES 59 MINUTES 56 SECONDS WEST, A DISTANCE OF 368.50 FEET;
THENCE NORTH 52 DEGREES 00 MINUTES 04 SECONDS EAST, A DISTANCE OF 858.49 FEET;
TO THE POINT OF BEGINNING.

CONTAINING 403,250 SQUARE FEET OR 9.26 ACRES MORE OR LESS.

PARCEL 2, SUBSTATION
A TRACT OF LAND BEING A PORTION OF HIDDEN HOLLOW SUBDIVISION AS RECORDED IN BOOK 53, PAGES 4782, 4783, 4784, 4786, 4787, 4788, 4789 OF THE OFFICIAL RECORDS OF ADA COUNTY, IDAHO, LOCATED IN THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER (NE1/4 NE1/4) OF SECTION 12, TOWNSHIP 4 NORTH, RANGE 1 EAST, BOISE MERIDIAN, ADA COUNTY IDAHO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 12, BEING A FOUND 5/8 INCH REBAR WITH CAP, MARKED PLS 5461, FROM WHICH A FOUND 3-1/4 INCH BRASS CAP MONUMENT MARKING THE EAST QUARTER CORNER OF SAID SECTION 12 BEARS SOUTH 02°13'17" WEST (BASIS OF BEARING), 2611.35 FEET; THENCE ALONG THE NORTHERLY LINE OF SAID SECTION 12, NORTH 89°27'29" WEST, 45.78 FEET; THENCE LEAVING SAID NORTHERLY LINE, SOUTH 52°00'04" WEST, 338.18 FEET TO THE POINT OF BEGINNING;

THENCE SOUTH 52 DEGREES 00 MINUTES 04 SECONDS WEST, A DISTANCE OF 200.00 FEET;
THENCE NORTH 37 DEGREES 59 MINUTES 56 SECONDS WEST, A DISTANCE OF 100.00 FEET;
THENCE NORTH 52 DEGREES 00 MINUTES 04 SECONDS EAST, A DISTANCE OF 200.00 FEET;
THENCE SOUTH 37 DEGREES 59 MINUTES 56 SECONDS EAST, A DISTANCE OF 100.00 FEET;
TO THE POINT OF BEGINNING.

CONTAINING 20,000 SQUARE FEET OR 0.46 ACRES MORE OR LESS.

PROFESSIONAL ENGINEER
LICENSED
P-7141
STATE OF IDAHO
DOYLE PERGANDE

DATE:	AUGUST 23, 2012
DESIGNED BY:	STAFF
DRAWN BY:	STAFF
REVIEWED BY:	
PROJECT:	BOUNDARY REVISION
ISSUE:	

REVISIONS

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DYNAMIS ENERGY, LLC
ADA COUNTY LANDFILL WASTE TO ENERGY PLANT
PLAN SHEET
DIMENSIONING PLAN

DYNAMIS ENERGY

C4

SHEET 4 OF 8

V. 10 R. 9

path: C:\0-Scott\Dynamis Landfill\03_Design\ file name: WTE-DIMN.dwg | plot date: September 10, 2012 | plotted by: ssanders

APPENDIX B

Operation Time Schedule

Burn Schedule-6 Primaries/Super Peak Hour (12.5 lb/ft^3 MSW Density ~5800 BTU/lb MSW Heat Content)

	Off Peak No power to Grid hours										Peak Start-up Shoulder		Peak Power Production									
Chamber Number	**2:00**	**2:30**	**3:00**	**3:30**	**4:00**	**4:30**	**5:00**	**5:30**	**6:00**	**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**
1	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												
2	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												
3	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												
4	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production											
5	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production											
6	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Dwell	Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production											
7	Off Peak Syn-Gas Production										Syn-Gas Slow Down	Burn out					Cool Down		Cool Down		Cool Down		De-ash	
8	Off Peak Syn-Gas Production										Syn-Gas Slow Down	Burn out					Cool Down		Cool Down		Cool Down		De-ash	
9	Off Peak Syn-Gas Production										Syn-Gas Slow Down	Burn out					Cool Down		Cool Down		Cool Down		De-ash	
10	Off Peak Syn-Gas Production											Syn-Gas Slow Down	Burn out					Cool Down		Cool Down		Cool Down		De-ash
11	Off Peak Syn-Gas Production											Syn-Gas Slow Down	Burn out					Cool Down		Cool Down		Cool Down		De-ash
12	Off Peak Syn-Gas Production											Syn-Gas Slow Down	Burn out					Cool Down		Cool Down		Cool Down		De-ash

																Peak Shut-down Shoulder		Off Peak Period-No power to Grid					
14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30	21:00	21:30	22:00	22:30	23:00	23:30	0:00	0:30	1:00	1:30
			Syn-Gas Slow Down	Burn out		Burn out		Burn out		Cool Down		Cool Down		Cool Down		De-ash		Load		Dwell	Dwell	Dwell	Dwell
			Syn-Gas Slow Down	Burn out		Burn out		Burn out		Cool Down		Cool Down		Cool Down		De-ash		Load		Dwell	Dwell	Dwell	Dwell
			Syn-Gas Slow Down	Burn out		Burn out		Burn out		Cool Down		Cool Down		Cool Down		De-ash		Load		Dwell	Dwell	Dwell	Dwell
				Syn-Gas Slow Down	Burn out		Burn out		Burn out		Cool Down		Cool Down		Cool Down		De-ash		Load		Dwell	Dwell	Dwell
				Syn-Gas Slow Down	Burn out		Burn out		Burn out		Cool Down		Cool Down		Cool Down		De-ash		Load		Dwell	Dwell	Dwell
				Syn-Gas Slow Down	Burn out		Burn out		Burn out		Cool Down		Cool Down		Cool Down		De-ash		Load		Dwell	Dwell	Dwell
Load		Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												Rampdown to off peak load	Off Peak Syn-Gas Production						
Load		Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												Rampdown to off peak load	Off Peak Syn-Gas Production						
Load		Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												Rampdown to off peak load	Off Peak Syn-Gas Production						
	Load		Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												Rampdown	Off Peak Syn-Gas Production					
	Load		Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												Rampdown	Off Peak Syn-Gas Production					
	Load		Prep to Fire	Fire/Ramp up	Peak Syn-Gas Production												Rampdown	Off Peak Syn-Gas Production					

APPENDIX C

F-Factor Flow Calculation Memo

December 3, 2012

Mr. Mike Simon
Stationary Source Manager
Air Quality Division
State of Idaho
Department of Environmental Quality
1410 North Hilton
Boise, ID 83706

Dear Mr. Simon:

This letter is in response to your letter dated November 16, 2012. Issues concerning mercury emissions and MBACT analysis were discussed in a previous letter. This letter covers issues concerning F-factor flow calculations and dioxin/furan emission calculations and references. The discussion of F-factor calculations is somewhat lengthy and may be best discussed in person. The dioxin/furan discussion is rather straightforward but the references are dense in content so you may determine they also require further in person discussion.

F-Factor Flow Calculations

Initial submissions of emission calculations were determined using the combustible mass fraction of fuel (MSW+tires) as contributing to the potential emissions. The assumption was that non-combustibles did not contribute to gases exiting the thermal conversion system and therefore were not part of the potential emissions. This assumption resulted in a discrepancy of total daily throughput and heating value of the fuel used by DEQ and Dynamis. After discussion with DEQ engineers it is our understanding that DEQ requests that "as received" fuel mass should be used to determine flow and potential emission outputs. This approach will provide the most straightforward method of measuring and permitting daily fuel throughput regardless of non-combustible content. Additionally, Dynamis has determined that maximum system flows occur during facility's maximum processing capacity (maximum heating value fuel and throughput). These flows result in the maximum pound per hour (lb/hr) emissions. However, maximum-modeled impacts occur during typical/design processing conditions when stack flow is reduced. To estimate worst-case

conditions for both waste throughput and modeled impacts, Dynamis asserts that maximum system processing emission values should be used to calculate facility annual PTE values and as the inputs to model ambient impacts. Typical/design processing flow conditions should be used as the stack exhaust conditions to model ambient impacts. This worst-case approach results in the highest system lb/hr emission values with the lowest stack flow; however, it is used only as a predictor of emissions considering the system cannot run at these conditions. If maximum capacity fuel is used then air input requirements will be large resulting in a stack flow rate higher than typical flow rates and dispersion will improve. Such a condition resulted in one other discrepancy between the initial flow calculation submitted by Dynamis and the value indicated in your letter. The excess air requirements used by DEQ in the calculations of system flow were greatly underestimated resulting in very high combustion temperatures and possible system damage. Calculations of both peak capacity and design capacity flow have been outlined below to explain these discrepancies.

Although, "as received" fuel weights will be used for purposes of waste input measurements, EPA Method 19 Section 12.3.2 indicates that F-factor calculations must be calculated using a dry basis due to the fact that the system includes a wet scrubber. Therefore, a mass balance method is preferred to account for the addition or removal of water mass in the scrubber. Although, the mass balance method is used by Dynamis for system design the dry F-factor approach is also valid if corrections are made to account for the saturation of the flue gas in the scrubber. The key correction is to calculate the dry F-factor volumetric flow rate then calculate the mass flow using dry STP gas density. This mass flow rate is then used to calculate the actual/wet volumetric flow at saturation using the saturated density at the stack exit temperature and pressure. Please see Table 1 for additional clarity to the F-factor approach used by Dynamis.

Table 1: Flow calculations using dry F-Factor

	Peak Flow w/max HV fuel	Off-Peak Flow w/max HV fuel
MSW Used (ton/hr)	23.38	3.50
Tires Used (tons/hr)	0.00	0.77
MSW Heating Value (btu/lb)	7,000.00	7,000.00
Final fuel heating value-btu/lb (MSW+Tire+CNG)	7,100.00	9,980.00
F-Factor SCF/MMBTU (MSW+tire)-*see calcs in table 2*	9,757.50	9,728.21
Excess Air (to maintain combustion temp at 2000F)	120%	149%
F-Factor calculated Flow Rate (dscfm)	118,680.00	28,151.83
Flue gas density at 68F dry (lbm/ft^3)	0.0750	0.0750
Mass Flow (lbm/min)	8,901.00	2,111.39
Flue Gas Temp @ Saturation (F)	125.40	134.50
Flue gas density saturated with H20 @3000ft (lbm/ft^3)	0.0590	0.0540
Peak stack flow rate (acfm)	**150,864.40**	**39,099.77**

Maximum system flow conditions will occur during peak operation if the incoming MSW is very energetic due to very dry conditions and very little non-combustible material. See Table 2 for a breakdown of this type of waste heating value and Table 3 for an ultimate analysis. The facility has the capacity to process 374 tons MSW/daily peak and 28 tons MSW/daily off peak + 6.1 tons tires/daily off peak with MSW having a maximum LHV of 7000 btu/lb. This fuel mix results in combustion conditions that require significant amounts of excess air to maintain proper temperatures. Approximately 120% excess air will be used, opposed to the 50% used in the previous calculations by DEQ. The F-factor for this type of waste is also different from waste more typical of WTE facilities. The F-factor was calculated using the ultimate analysis indicated in Table 3 and EPA Method 19 Section 12.3.2.1. The F-factor calculated here is higher than the value of 9570 dscf/MMBTU suggested in your letter but this is to be expected given the high hydrocarbon content of this potential waste.

Table 2: High Energy Value MSW

Maximum "as received" LHV System can utilize at full capacity	7000	btu/lb
Percentage water in waste	11.0%	
Heat lost to vaporize water in LHV	113.30	btu/lb
High Heating Value (HHV)	7113.30	btu/lb
Maximum System Capacity during peak	374	ton fuel as received
Operation Hours	16	
Hourly Heat Input	327,250,000.00	MMBTU/hr
	Percentage by mass	**Weight (tons)**
Waste Moisture	11%	41.14
Dry Feed		332.86
Non-combustible portion (by weight-glass, metal, ceramic, etc.)	9.0%	29.96
Combustible Portion of Waste		302.90
Combustible Portion Heating Value	8,643.04	BTU/lb

The off peak fuel mix is overall more energetic than the peak fuel due to the addition of tires. About 150% excess air will be required to keep temperatures at optimal levels. The off peak F-factor is slightly lower than peak due to that the factor is the result of both an MSW F-factor and tire F-factor. The tires have a higher carbon content and lower hydrogen content then the MSW so the overall F-factor is decreased slightly. Tables 4 and 5 show the calculations used for the tire F-factor.

Table 3: Combustible MSW Portion-Ultimate Analysis [1]

	C%	H2%	O2%	S%	N2%
Percent of combusted material (by mass)	51.5	6.5	40.18	0.25	1.57
F-Factor Conversion (scf/lb/%)	1.53	3.64	0.46	0.57	0.14
Products of combustion/pound of compound (dscf/lb of waste)	78.795	23.66	18.48	0.1425	0.2198

Btu to MMBTU conversion	1.00E+06
F-Factor (DSCF combustion products/MMBTU)	9,757.50

Table 4: Tire Fuel-Used during Off Peak		
Maximum "as received" LHV System can utilize at full capacity	13,628	btu/lb
Percentage water in waste	5.0%	
Heat lost to vaporize water in LHV	51.50	btu/lb
HHV	13,679.50	btu/lb
Maximum System Capacity during off peak	6.1	ton fuel as received
Operation Hours	8	hr
Hourly Heat Input	20,782,700	MMBTU/hr
	Percentage by mass	**Weight (tons)**
Waste Moisture	5%	0.305
Dry Feed		5.795
Non-combustible portion (metal belts, wire beads, nylon fibers, dirt, etc.)	12%	0.70
Combustible Portion of Waste		5.10
Combustible Portion Heating Value	16,301.44	BTU/lb

Table 5: Combustible Tire portion-Ultimate Analysis [1]

	C%	H2%	O2%	S%	N2%
Percent of combusted material (by mass)	89.29	5.6	2.17	2.7	0.24
F-Factor Conversion (scf/lb/%)	1.53	3.64	0.46	0.57	0.14
Products of combustion/pound of compound (dscf/lb of waste)	136.61	20.38	0.998	1.539	0.034

Btu to MMBTU conversion	1.00E+06
F-Factor (DSCF combustion products/MMBTU)	9,666.15

Additional flow conditions were calculated for fuel streams with heating values more typical of MSW. These conditions resulted in lower system flows and higher modeled ambient impacts due to reduced dispersion. System flows were calculated for MSW typical of Ada County with a LHV of 5800 btu/lb (moisture content of 20% and incombustible content of 13%). See Table 6 for peak and off peak stack flows and Table 8 for MSW F-factor calculations. The F-factor used for tires in off peak is the same as the previous condition. Overall excess air requirements are lower than the max flow case due to lower temperatures during combustion.

Table 6: Flow calculations using dry F-Factor

	Peak Flow w/typical heating value fuel	Off-Peak Flow w/typical heating value fuel
MSW Used (ton/hr)	23.1875	3.9
Tires Used (tons/hr)	0.00	0.77
MSW Heating Value (btu/lb)	5,871	5,871
Final fuel heating value-btu/lb (MSW+Tire+CNG)	5,936	8,867
F-Factor SCF/MMBTU (MSW+tire combined)-*see calcs in table 2*	9,320	9,426
Excess Air (to maintain combustion temp at 2000F)	121%	130%
F-Factor calculated Flow Rate (dscfm)	94,439.50	24,855.65
Flue gas density at 68F dry (lbm/ft^3)	0.0750	0.0750
Mass Flow (lbm/min)	7,082.96	1,864.17
Flue Gas Temp @ Saturation (F)	125.40	135.00
Flue gas density saturated with H20 @3000ft (lbm/ft^3)	0.0590	0.0550
Peak stack flow rate (acfm)	**120,725**	**33,894**

Table 7: Moderate Heating Value MSW		
Typical "as received" LHV fuel	5871	btu/lb
Percentage water in waste	20.0%	
Heat lost to vaporize water in LHV	206.0	btu/lb
HHV	6077.0	btu/lb
Maximum System Capacity during off peak	371	ton fuel as received
Operation Hours	16	hr
Hourly Heat Input	272,267,625	MMBTU/hr
	Percentage by mass	**Weight (tons)**
Waste Moisture	20%	74.2
Dry Feed		296.8
Non-combustible portion (glass, metal, ceramic, dirt, etc.)	9%	26.71
Combustible Portion of Waste		270.09
Combustible Portion Heating Value	8,064.56	BTU/lb

Table 8: Combustible MSW Portion-Ultimate Analysis [1]

	C%	H2%	O2%	S%	N2%
Percent of combusted material (by mass)	49.36	5.29	43.45	0.25	1.65
F-Factor Conversion (scf/lb/%)	1.53	3.64	0.46	0.57	0.14
Products of combustion/pound of compound (dscf/lb of waste)	75.52	19.26	19.99	0.143	0.231

Btu to MMBTU conversion	1.00E+06
F-Factor (DSCF combustion products/MMBTU)	9,320

Dioxin/Furan Emission Calculations

Initial dioxin and furan emissions calculations were based on source test data from the April-May 1993 Entech Model TOS-80 system in Anchorage, Alaska. After this data was made public, members of the general public expressed concern regard de novo synthesis (reformation) – a process by which PCDD/PCDF which was destroyed by the high combustion temperatures in the thermal unit may reform on fly ash as the exhaust gasses pass through the steam generator and are cooled prior to exhaust to the atmosphere. It is safe to say that determining exact dioxin/furan destruction and reformation in a combustion system is a complex area of science requiring significant knowledge of the fuel, gasification/combustion process, flue gas composition and system temperatures. The Dynamis technology to be installed

at the Ada County facility has been fully supported by industry experts as a system with very low dioxin/furan emission. Dr. John Nordin personally evaluated the base technology that Dynamis designs use and stated:

> "Western Research Institute [WRI] believes that this Entech Model TOS-80, as tested lends itself to low dioxin/furan formation. The particulate emissions are low, and flue gas mixing in the secondary combustion chamber allows for excellent destruction of products of incomplete combustion. Dioxin/furan emissions from MSW incinerators have been evaluated by a number of researchers (Hoffman et al. 1990: Acharya et al. 1991; Shaub and Tsang 1983). Hydrogen chloride or chlorine in the flue gas reacted with products of incomplete combustion (PIC's: phenols, chlorobenzene, chlorophenols, polyaromatics), which are absorbed onto fly ash particulates. These PIC's, in turn form dioxin/furans."

The general public has also raised questions regarding variations in the source test data. The data variation is well documented and explained in the source test reports. During operation of the TOS-80 in 1993 dioxin/furan measurements were collected from nine tests with varying waste streams. During test 1 an upset condition (a condition well understood in the emissions monitoring industry to be a momentary rare occurrence) occurred causing elevated dioxin/furan measurements. Reference to this upset condition can be found in Volume I—Text April-May 1993 Entech, Inc., Model TOS-80 Emissions Monitoring in Anchorage, Alaska in the Summary section on page V in the second paragraph. The authors of the report state, "One exception occurred during the early part of burn 1, when the operator's experiment with system capabilities resulted in visible emissions of black, particulate-laden smoke from the stack." Additionally on page VI, the author mentions, "The high dioxin and furan levels were barely distinguishable from the field blank for most burns." A further description of the upset condition is described in the "Organics" section on page 35, "The organic sampling for burn 1 occurred when the series of smoke puffs were observed. This was because forced air was fed to the primary combustion chamber at the same time that the exhaust gas was constricted…The result was an average of 1.51 ng/dscm of dioxins/furans collected, which were weighted heavily toward trichlorinated dibenzo furans and pentachlorinated dibenzofurans or octachlorinated dibenzo furans… For all other burns, total dioxins and furans were very low, and barely distinguishable from the field blank." See the attached charts of dioxin and furan cogeners from these tests for further clarity. These elevated measurements clearly represent outlying data that justify removal from the emissions calculations.

The Entech Model TOS-80 system did not include a heat recovery steam generator (HRSG), and therefore, exhaust from that unit did not go through the cooling process known to cause de novo synthesis. In response to this, Dynamis reviewed various references regarding PCDD/PCDF emission pathways including initial formation as well as de novo synthesis; some of these references are listed in this letter for your convenience. A major complicating factor in the calculation of reformation of

PCDD/PCDF, is that the exact amount of PCDD/PCDF reformation is dependent on many very complex reactions including, but not limited to the presence of chlorinated compounds in the exhaust gas, as well as the concentration of fly ash in the exhaust. Therefore the references included with this letter have been used only as an estimate of possible PCDD/PCDF reformation emissions. The calculated reformation emissions have been added to the source test data to develop a 'total' (formation + reformation) emission factor (see Table 9 for the calculation methodology used). The emissions calculations likely provide an overestimate of the actual Dynamis Ada County facility PCDD/PCDF emissions, however due to the complexity of the chemical reactions involved in the formation and reformation of PCDD/PCDF, source tests conducted at the Dynamis Ada County facility will provide the most accurate measure (and demonstration of compliance with NSPS limits) of PCDD/PCDF emissions from the facility.

Table 9: Estimation of De Novo Synthesis through Ada County WTE Heat Recovery Steam Generator (HRSG)

	De Novo Synthesis (Reformation)-w/150 ug/m^3 chlorophenol precursor**	Source Test Emission Factor (emission prior to HRSG)	Total Emission Factor (TM-17 + De Novo Synthesis)
Typical Reformation Rate (ng/g/min)	3300		
PM2.5 emission from secondary chamber (lb/hr)	6.5		
PM2.5 emission from secondary chamber (g/min)	49.14		
HRSG length between 500-200C* (ft)	48		
Minimum flue gas velocity through HRSG (ft/sec)	37		
Time in Reformation temp. Region (min)	0.0167		
Min. Flow Rate through Reformation Region (m^3/min)	5.47E+03		
Estimated TM-17 reformed concentration (ng/m^3)	4.95E-01	1.56E+00	**2.06E+00**
Conversion ratio (TM-17:TEQ from above table)	1.06E+02		
Toxicity Equivalent (TEQ)-ng/m3	4.68E-03	1.48E-02	**1.94E-02**

*Data shows the most critical temperature range for De Novo Synthesis to occur is 250-500C [2]
**The reformation rate used is from report summarizing experimental tests on dioxin De Novo Synthesis [3]. Source tests show chlorophenol concentrations as "non-detect" so this estimation is considered 'worst-case.'

In summary, the F-factor method of estimating system flows is in close agreement with the mass balance approach used by Dynamis as long as excess air requirements and added scrubber water are correctly accounted for. The F-factors calculated for the various heating value wastes are reasonably close to the F-factor used in AP-42. This indicates the waste ultimate analysis used by Dynamis and supported by industry publications is similar to the ultimate analysis used to generate the AP-42 F-factor of 9570 DSCF/MMBTU. References to the cause of the upset condition and an explanation of elevated dioxin/furan measurements from the 1993 test 1 of the TOS-80 system are included. These elevated measurements clearly represent outlying data that justify removal from the emissions calculations. Estimation of dioxin reformation through the system HRSG has been calculated to account for the difference between the pilot plant and the Ada County facility. The system shows compliance with the NSPS limit of 13 ng/dscm and source tests will occur to verify this compliance. Please contact me with any further questions or clarifications regarding these issues.

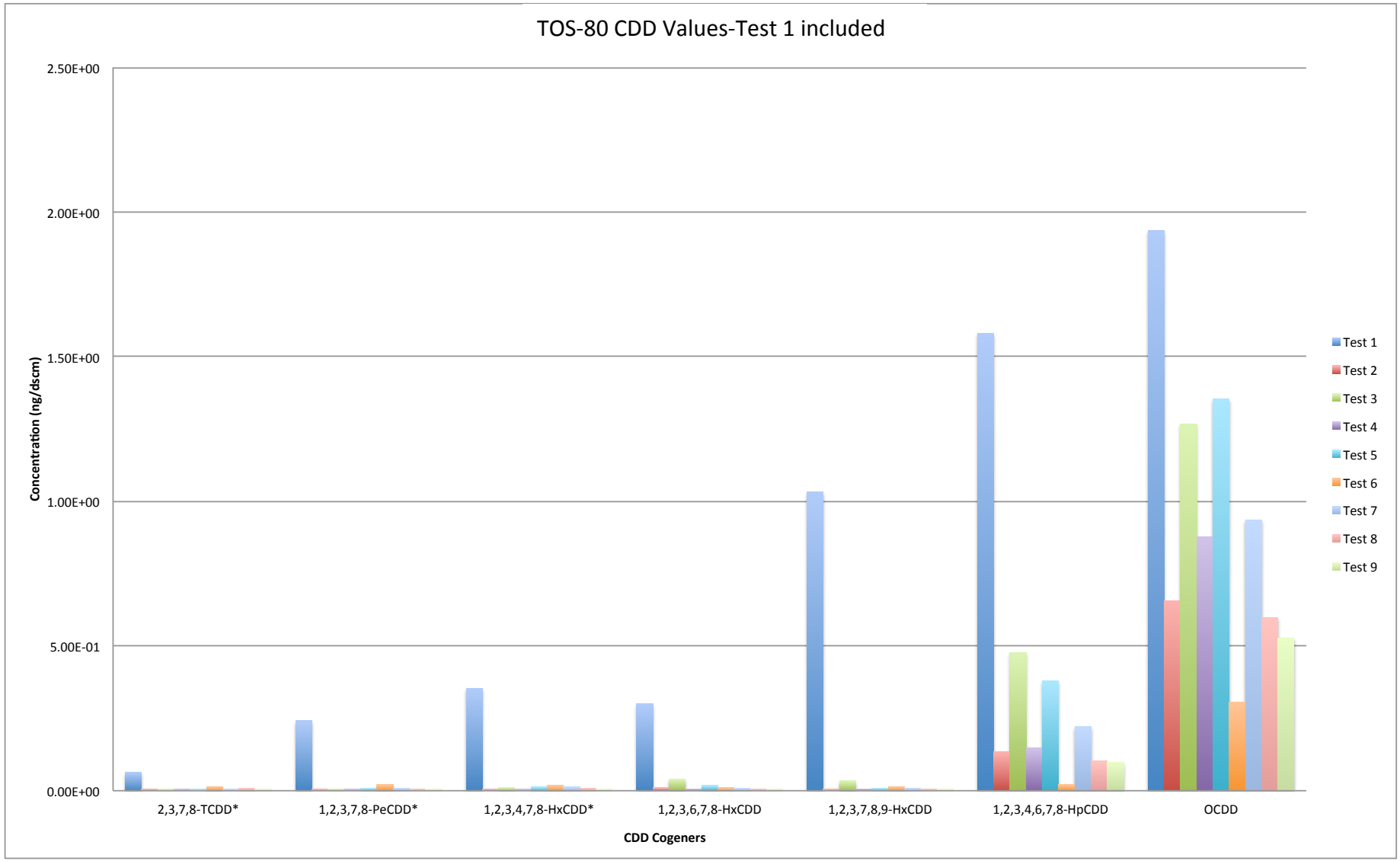
Dynamis Energy, LLC

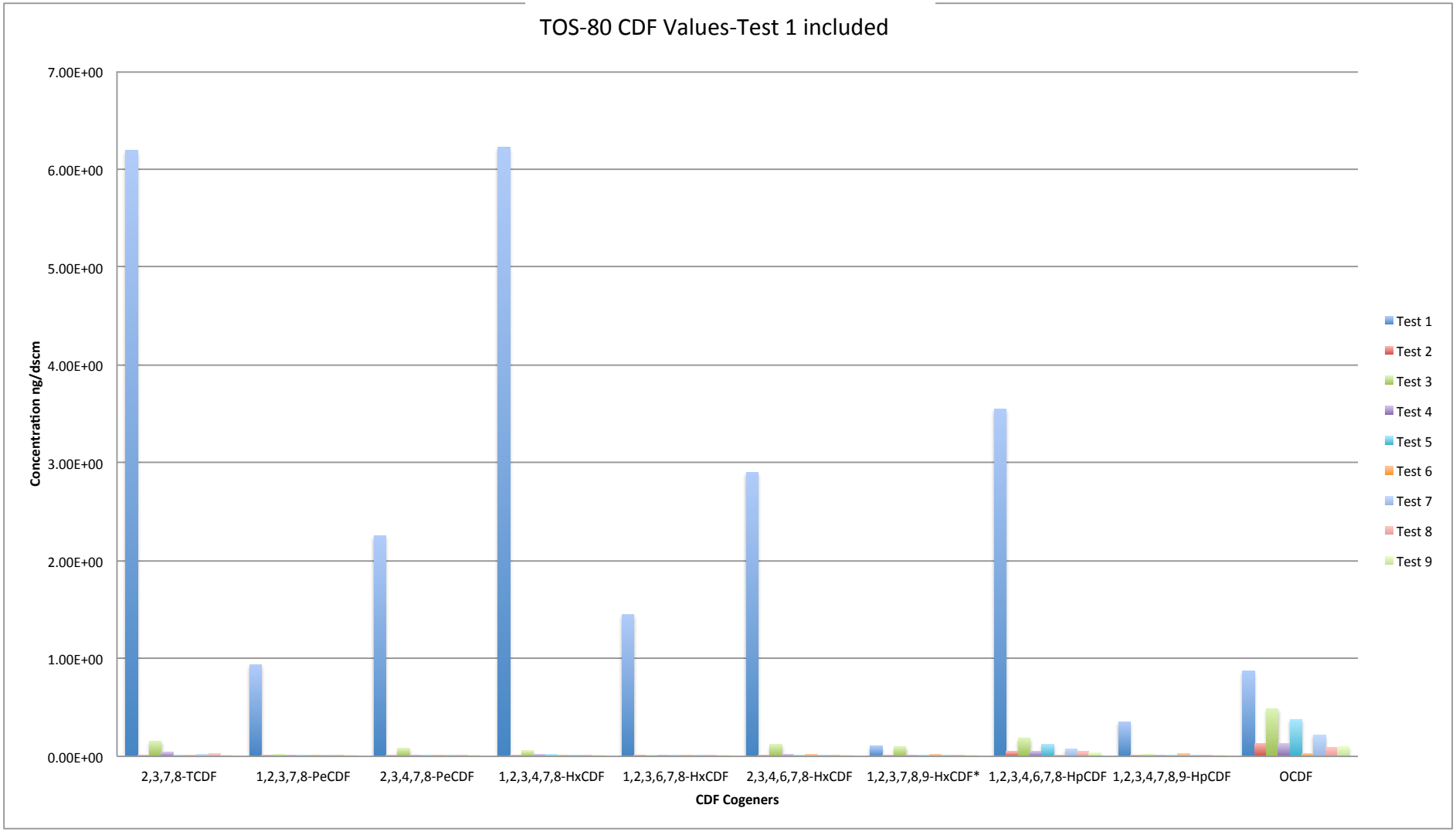
Christopher Durand, P.E.
Senior Mechanical Engineer

cc: Shannon Manoulian, JBR
C. Lloyd Mahaffey, CEO
Wade Thomas, SVP, Legal and Finance
Michael Bogert, Parson Behle

References:

1. Handbook of solid waste management: George Tchobanoglous, co-editor; Frank Kreith, co-editor.-2nd ed. (2002) 13.60
2. U.S. Environmental Protection Agency. (2006) "An inventory of sources and environmental releases of dioxin-like compounds in the United States for the years 1987, 1995, and 2000. National Center for Environmental Assessment, Washington, DC; EPA
3. Dioxin characterization, formation and minimization during municipal solid waste (MSW) incineration: review; Gordon McKay; Department of Chemical Engineering, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong; Chemical Engineering Journal 86 (2002) 343-368


TOS-80 CDD Values-Test 1 included
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
Concentration (ng/dscm)
2,3,7,8-TCDD*
1,2,3,7,8-PeCDD*
1,2,3,4,7,8-HxCDD*
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
CDD Cogeners
Test 1
Test 2
Test 3
Test 4
Test 5
Test 6
Test 7
Test 8
Test 9


TOS-80 CDF Values-Test 1 included
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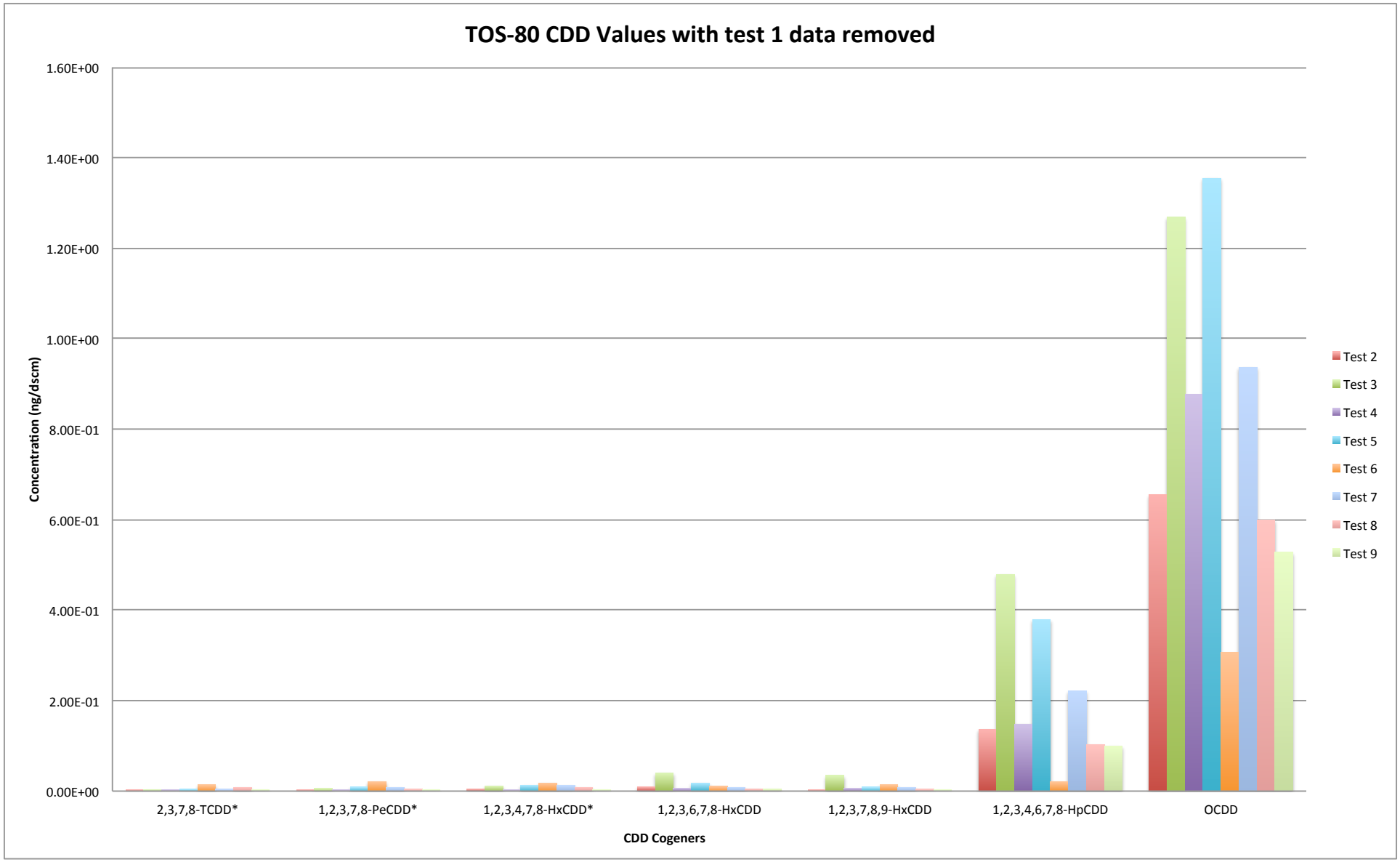
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
Concentration ng/dscm
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF*
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
CDF Cogeners
Test 1
Test 2
Test 3
Test 4
Test 5
Test 6
Test 7
Test 8
Test 9


TOS-80 CDD Values with test 1 data removed
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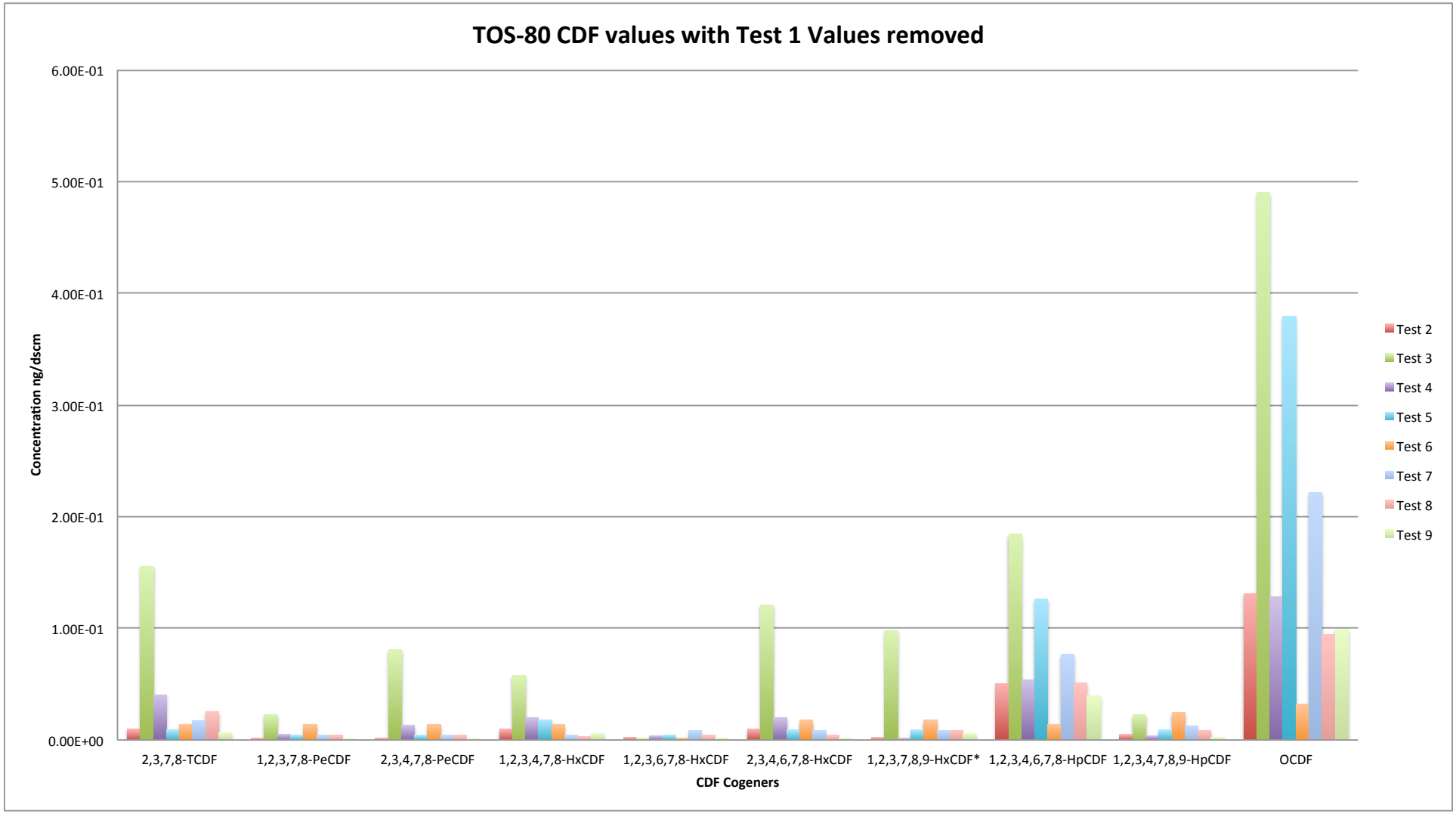
1.40E+00
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Concentration (ng/dscm)
2,3,7,8-TCDD*
1,2,3,7,8-PeCDD*
1,2,3,4,7,8-HxCDD*
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
CDD Cogeners
Test 2
Test 3
Test 4
Test 5
Test 6
Test 7
Test 8
Test 9


TOS-80 CDF values with Test 1 Values removed
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Concentration ng/dscm
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF*
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
CDF Cogeners
Test 2
Test 3
Test 4
Test 5
Test 6
Test 7
Test 8
Test 9

APPENDIX D

Emissions Inventory and Emissions Factor Development
(also included on CD)

Emission Inventory

FACILITY POTENTIAL TO EMIT - CRITERIA POLLUTANTS

	Criteria Pollutants													
	NOx Emissions		CO Emissions		PM10 Emissions		PM2.5 Emissions		SOx Emissions		VOC Emissions		Lead Emissions	
Description	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Thermal Conversion Unit - Peak	19.46	56.82	2.66	7.77	4.22	12.32	3.40	9.92	0.58	1.71	0.02	0.07	0.06	0.18
Thermal Conversion Unit - OffPeak	3.91	5.71	1.10	0.37	0.95	1.39	0.77	1.12	0.66	0.97	0.004	0.001	0.01	0.01
Cooling Tower					0.04	0.16	0.04	0.16						
Ash System					0.45	1.97	0.45	1.97					5.96E-04	2.61E-03
Emergency Generator	1.30	0.33	0.26	0.07	0.03	0.01	0.03	0.01	0.98	0.25	1.19	0.30		
Ignition Systems	0.28	1.23	0.39	1.72	0.02	0.09	0.02	0.09	0.00	0.00	0.03	0.11	2.33E-06	1.02E-05
Total	**24.955**	**64.088**	**4.412**	**9.913**	**5.713**	**15.944**	**4.704**	**13.267**	**2.233**	**2.926**	**1.240**	**0.482**	**0.0707**	**0.194**

FACILITY POTENTIAL TO EMIT - TAPS

NON-CARCINOGENS (POUNDS PER HOUR)

		Emissions (lb/hr)						
Pollutant	CAS #	Thermal Unit	Ignition System	Emergency Generator	Ash System	TAP Emissions (tpy)	Screening Level (lb/hr)	Modeling? (Y/N)
Acrolein	107-02-8	n/a	n/a	1.12E-04	n/a	2.81E-05	1.70E-02	No
Aluminum	7429-90-5	4.37E-03	n/a	n/a	1.84E-01	8.23E-01	6.67E-01	No
Antimony	7440-36-0	2.58E-05	n/a	n/a	n/a	1.13E-04	3.30E-02	No
Barium	7440-39-3	1.03E-04	1.64E-05	n/a	9.52E-04	4.69E-03	3.30E-02	No
Chromium	7440-47-3	1.93E-03	5.22E-06	n/a	2.77E-04	8.41E-04	3.30E-02	No
Cobalt	7440-48-4	6.20E-07	3.13E-07	n/a	8.29E-05	3.19E-05	3.30E-03	No
Copper	7440-50-8	1.43E-04	3.17E-06	n/a	7.04E-04	3.23E-04	6.70E-02	No
1,4-Dichlorobenzene	106-46-7	6.49E-04	n/a	n/a	n/a	2.84E-03	3.00E+01	No
Diethylphthalate	84-66-2	1.04E-03	n/a	n/a	n/a	4.54E-03	3.33E-01	No
Dimethylphthalate	131-11-3	7.13E-04	n/a	n/a	n/a	3.12E-03	3.33E-01	No
Di-n-butylphthalate	84-74-2	1.85E-03	n/a	n/a	n/a	8.11E-03	3.33E-01	No
Fluoride (as F) (Hydrogen Fl)	16984-48-8	2.27E-03	n/a	n/a	n/a	9.95E-03	1.67E-01	No
Hexane	110-54-3	n/a	8.40E-03	n/a	n/a	3.68E-02	1.20E+01	No
Hydrogen Chloride	7647-01-0	5.95E-01	n/a	n/a	n/a	2.61E+00	5.00E-02	See Footnote 1
Manganese	7439-96-5	9.47E-04	1.42E-06	n/a	2.12E-03	1.35E-02	3.33E-01	No
Mercury*	7439-97-6	2.08E-03	1.21E-06	n/a	n/a	9.13E-03	N/A	*
2-Methylphenol (o-Cresol)	95-48-7	1.27E-03	n/a	n/a	n/a	5.56E-03	1.47E+00	No
3/4-Methylphenol (m,p-Cresol)	108-39-4, 106-44-5	1.88E-03	n/a	n/a	n/a	8.22E-03	1.47E+00	No
Molybdenum	7439-98-7	3.61E-04	4.10E-06	n/a	5.50E-07	1.60E-03	3.33E-01	No
Naphthalene**	91-20-3	2.03E-03	2.85E-06	1.04E-04	n/a	8.94E-03	9.10E-05	Yes
Nitrobenzene	98-95-3	6.85E-04	n/a	n/a	n/a	3.00E-03	3.33E-01	No
Pentane	109-66-0	n/a	1.21E-02	n/a	n/a	5.31E-02	1.18E+02	No
Phenol	108-95-2	2.43E-03	n/a	n/a	n/a	1.06E-02	1.27E+00	No
Phosphorous	7723-14-0	n/a	n/a	n/a	2.41E-03	1.05E-02	7.00E-03	No
Selenium	7782-49-2	3.10E-06	8.96E-08	n/a	n/a	1.40E-05	1.30E-02	No
Silver	7440-22-4	n/a	n/a	n/a	7.59E-06	3.32E-05	7.00E-03	No
Toluene	108-88-3	n/a	1.59E-05	5.00E-04	n/a	1.94E-04	2.50E+01	No
o-Xylene	1330-20-7	n/a	n/a	3.48E-04	n/a	1.99E-05	2.90E+01	No
Zinc	7440-66-6	3.45E-02	1.08E-04	n/a	1.59E-02	2.21E-01	6.67E-01	No

*Mercury is not listed under IDAPA 58.01.01 Section 585 as a TAP. However, it is listed here to show compliance with the MBACT rule under Section 215.

**Although listed as a noncarcinogen in the Rules, DEQ has determined that naphthalene is a possible/probable carcinogen. Compliance for naphthalene emissions should be based on the EL or AACC listed in Section 586 for PAH.

1. Regulated under NSPS Subpart Eb, excluded from modeling under IDAPA 58.01.01 210.20.

CARCINOGENS (POUNDS PER HOUR)

		Emissions (lb/hr)						
Pollutant	CAS #	Thermal Unit	Ignition System	Emergency Generator	Ash System	TAP Emissions (tpy)	Screening Level (lb/hr)	Modeling? (Y/N)
Acenaphthalene	208-96-8	3.32E-04	8.40E-09	6.18E-06	n/a	1.46E-03	9.10E-05	Yes
Acenaphthene	83-32-9	4.89E-04	8.40E-09	1.73E-06	n/a	2.14E-03	9.10E-05	Yes
Acetaldehyde	75-07-0	n/a	n/a	9.37E-04	n/a	2.34E-04	3.00E-03	No
Anthracene	120-12-7	3.09E-04	1.12E-08	2.28E-06	n/a	1.36E-03	9.10E-05	Yes
Aroclor, all (PCB)	n/a	4.32E-06	n/a	n/a	n/a	1.89E-05	6.60E-05	No
Arsenic	7440-38-2	n/a	7.46E-07	n/a	n/a	3.27E-06	1.50E-06	No
Benzene	71-43-2	n/a	9.80E-06	1.14E-03	n/a	3.28E-04	8.00E-04	Yes
Benzo(g,h,i)perylene	191-24-2	ND	5.60E-09	5.97E-07	n/a	1.74E-07	9.10E-05	No
Beryllium	7440-41-7	n/a	4.48E-08	n/a	n/a	1.96E-07	2.80E-05	No
bis(2-Ethylhexyl)phthalate	117-81-7	5.50E-04	n/a	n/a	n/a	2.41E-03	2.80E-02	No
1,3-Butadiene	106-99-0	n/a	n/a	4.78E-05	n/a	1.19E-05	2.40E-05	Yes
Cadmium	7440-43-9	2.18E-03	4.10E-06	n/a	1.42E-05	9.62E-03	3.70E-06	See Footnote 1
Dichlorobenzene	25321-22-6	n/a	5.60E-06	n/a	n/a	2.45E-05	9.10E-05	No
Dioxin/Furan	1746-01-6	3.71E-09	n/a	n/a	n/a	1.62E-08	1.50E-10	See Footnote 1
Fluoranthene	206-44-0	3.50E-04	1.40E-08	9.30E-06	n/a	1.54E-03	9.10E-05	Yes
Fluorene	86-73-7	4.46E-04	1.31E-08	3.57E-05	n/a	1.96E-03	9.10E-05	Yes
Formaldehyde	50-00-0	n/a	3.50E-04	1.44E-03	n/a	1.89E-03	5.10E-04	Yes
2-Methylnaphthalene	91-57-6	1.04E-03	1.12E-07	n/a	n/a	4.56E-03	9.10E-05	Yes
3-Methylchloranthene	56-49-5	n/a	8.40E-09	n/a	n/a	3.68E-08	9.10E-05	No
Nickel	7440-02-0	5.69E-03	7.84E-06	n/a	6.30E-05	2.52E-02	2.70E-05	Yes
Phenanthrene	85-01-8	1.05E-03	7.93E-08	3.59E-05	n/a	4.63E-03	9.10E-05	Yes
Pyrene	129-00-0	2.58E-04	2.33E-08	5.84E-06	n/a	1.13E-03	9.10E-05	Yes
Benzo(a)pyrene	50-32-8	ND	5.60E-09	2.30E-07	n/a	8.19E-08	2.00E-06	No
Benz(a)anthracene	56-55-3	ND	8.40E-09	2.05E-06	n/a	5.50E-07	n/a	No
Benzo(b)fluoranthene	205-82-3	ND	8.40E-09	1.21E-07	n/a	6.70E-08	n/a	No
Benzo(k)fluoranthene	205-99-2	ND	8.40E-09	1.89E-07	n/a	8.41E-08	n/a	No
Chrysene	218-01-9	3.33E-04	8.40E-09	4.31E-07	n/a	1.46E-03	n/a	No
Dibenzo(a,h)anthracene	53-70-3	ND	5.60E-09	7.12E-07	n/a	2.03E-07	n/a	No
Indeno(1,2,3-cd)pyrene	193-39-5	ND	8.40E-09	4.58E-07	n/a	1.51E-07	n/a	No
Total POM (7-PAH)		3.33E-04	5.32E-08	4.19E-06	n/a	1.46E-03	2.00E-06	Yes

1. Regulated under NSPS Subpart Eb, excluded from modeling under IDAPA 58.01.01 210.20.

Dynamis Energy, LLC
Ada County WTE Facility

Dynamis Energy WTE Facility
Thermal Conversion System
Thermal Conversion Unit

Total MSW Throughput =	408 tpd
Total MSW Throughput =	17.00 ton/hr
Total MSW Throughput =	34000 lb/hr
Peak Operating Hours =	5840 hr/yr
Off-Peak Operating Hours =	2920 hr/yr
Peak Exhaust Flow =	150,865 acfm @ 125.4F
Off-Peak Exhaust Flow =	39,100 acfm @ 134.5F

Hours	7am - 11pm	11pm-7am
Throughput (tpc	374	34
Throughput (tpl	23.375	4.25
Percent of day	0.67	0.33

	PM10	SO2	NOx	CO	Lead
Pollutant Emission Factors	**lb/ton**	**lb/ton**	**lb/ton**	**lb/ton**	**lb/ton**
Thermal Conversion Unit Exhaust - Peak	0.306	0.087	1.388	0.114	0.003
Thermal Conversion Unit Exhaust - OffPeak	0.379	0.543	1.534	0.258	0.002

AP-42 Appendix B.1

Cummulative wt % <stated size	**PM2.5**	**PM10**
Mass Burn Facilities	26	38
Modular Incinerator	54	67.1
Section 2.3 Med Waste Incinerator	43.3	65

PM, NOx, CO, SO2, Lead Emission factor from source test averages

*SO2 Emission rate based on scrubber manufacturer guarantee of 71.25% control. PM10 emission rate based on scrubber manufacturer guarantee of 99%. PM2.5 emission rate based on scrubber manufacturer guarantee of 41%.
*NOx Emission rate based on SNCR manufacturer guarantee of 40% control.

7am-11pm - PEAK

	PM10		PM2.5		SO_2		NOx		CO		VOC		Lead	
Pollutant	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**
Thermal Conversion Unit Exhaust - Uncontrolled	7.15	20.88	5.76	16.81	2.03	5.94	32.43	94.71	2.66	7.77	0.02	0.07	0.06	0.18
Thermal Conversion Unit Exhaust - Controlled	4.22	12.32	3.40	9.92	0.58	1.71	19.46	56.82	2.66	7.77	0.02	0.07	0.06	0.18
Controlled Boiler Stack Emissions (Thermal Unit + Ignition System)	4.24	12.38	3.42	9.99	0.59	1.71	19.74	57.64	3.05	8.91	0.05	0.15	0.06	0.18

11pm-7am - OFF PEAK

	PM10		PM2.5		SO_2		NOx		CO		VOC		Lead	
Pollutant	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**
Thermal Conversion Unit Exhaust - Uncontrolled	1.61	2.35	1.30	1.89	2.31	3.37	6.52	9.52	1.10	0.37	0.004	0.001	0.01	0.01
Thermal Conversion Unit Exhaust - Controlled	0.95	1.39	0.77	1.12	0.66	0.97	3.91	5.71	1.10	0.37	0.004	0.001	0.01	0.01
Controlled Boiler Stack Emissions (Thermal Unit + Ignition System)	0.97	1.42	0.79	1.15	0.66	0.97	4.19	6.12	1.49	0.94	0.03	0.04	0.009	0.01

Dynamis Energy, LLC
Ada County WTE Facility

TOXIC AIR POLLUTANTS (TAPs) CALCULATIONS

NON-CARCINOGENS									Stack Emissions (Thermal Unit + Ignition System)			
									PEAK		OFF PEAK	
Pollutant	**CAS #**	**Peak TAP Emission Factor (lb/ton)**	**Off-Peak TAP Emission Factor (lb/ton)**	**Peak TAP Emissions (lb/hr)**	**Off-Peak TAP Emissions (lb/hr)**	**Average TAP Emissions (lb/hr)**	**Screening Level (lb/hr)**	**Modeling? (Y/N)**	lb/hr	tpy	lb/hr	tpy
Aluminium	7429-90-5	8.02E-04	7.29E-04	6.06E-03	1.00E-03	4.37E-03	6.67E-01	No				
Antimony	7440-36-0	0.00E+00	5.64E-05	0.00E+00	7.75E-05	2.58E-05	3.30E-02	No				
Barium	7440-39-3	1.88E-05	1.77E-05	1.42E-04	2.43E-05	1.03E-04	3.30E-02	No				
2-Chlorophenol	95-57-8	ND	ND	ND	ND	ND	3.30E-02	No				
Chromium	7440-47-3	3.53E-04	3.34E-04	2.67E-03	4.59E-04	1.93E-03	3.30E-02	No				
Copper	7440-50-8	2.51E-05	3.59E-05	1.89E-04	4.93E-05	1.43E-04	6.70E-02	No				
Cobalt	7440-48-4	0.00E+00	1.35E-06	0.00E+00	1.86E-06	6.20E-07	3.30E-03	No				
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	ND	ND	ND	ND	ND	2.00E+01	No				
1,4-Dichlorobenzene	106-46-7	3.82E-05	3.83E-05	8.92E-04	1.63E-04	6.49E-04	3.00E+01	No				
Diethylphthalate	84-66-2	6.16E-05	5.45E-05	1.44E-03	2.32E-04	1.04E-03	3.33E-01	No				
Dimethylphthalate	131-11-3	4.22E-05	3.90E-05	9.86E-04	1.66E-04	7.13E-04	3.33E-01	No				
Di-n-butylphthalate	84-74-2	1.08E-04	1.16E-04	2.53E-03	4.93E-04	1.85E-03	3.33E-01	No				
Di-n-octylphthalate	117-84-0	ND	ND	ND	ND	ND	3.33E-01	No				
Hexachlorocyclopentadiene	77-47-4	ND	ND	ND	ND	ND	7.00E-03	No				
Hydrogen Chloride	7647-01-0	See Note 1 Below	See Note 1 Below	5.95E-01	5.95E-01	5.95E-01	5.00E-02					
Hydrogen Flouride	NA	1.34E-04	1.34E-04	3.12E-03	5.68E-04	2.27E-03	1.67E-01	No				
Isophorone	78-59-1	ND	ND	ND	ND	ND	1.87E+00	No				
Manganese	7439-96-5	1.53E-04	3.91E-04	1.15E-03	5.38E-04	9.47E-04	3.33E-01	No				
Mercury	7439-97-6	3.94E-04	3.23E-04	2.91E-03	4.33E-04	2.08E-03	N/A					
2-Methylphenol (o-Cresol)	95-48-7	7.51E-05	7.06E-05	1.75E-03	3.00E-04	1.27E-03	1.47E+00	No				
3/4-Methylphenol (m,p-Cresol)	108-39-4, 106-44-5	1.11E-04	9.99E-05	2.60E-03	4.24E-04	1.88E-03	1.47E+00	No				
Molybdenum	7439-98-7	6.27E-05	9.95E-05	4.74E-04	1.37E-04	3.61E-04	3.33E-01	No				
Naphthalene	91-20-3	1.21E-04	1.05E-04	2.83E-03	4.44E-04	2.03E-03	9.10E-05	Yes	2.83E-03		4.47E-04	
4-Nitroaniline (p-nitroaniline)	100-01-6	ND	ND	ND	ND	ND	2.00E-01	No				
Nitrobenzene	98-95-3	4.03E-05	3.98E-05	9.43E-04	1.69E-04	6.85E-04	3.33E-01	No				
Pentachlorophenol	87-86-5	ND	ND	ND	ND	ND	3.33E-01	No				
Phenol	108-95-2	1.45E-04	1.25E-04	3.38E-03	5.32E-04	2.43E-03	1.3E+00	No				
Selenium	7782-49-2	0.00E+00	6.77E-06	0.00E+00	9.30E-06	3.10E-06	1.30E-02	No				
1,2,4-Trichlorobenzene	120-82-1	ND	ND	ND	ND	ND	2.47E+00	No				
Zinc	7440-66-6	6.24E-03	6.84E-03	4.71E-02	9.39E-03	3.45E-02	6.67E-01	No				

TAPs Emission factor from source test averages.
1. HCl emission rate of 0.595 lb/hr based on scrubber manufacturer guarantee

2. Mercury is not listed under IDAPA 58.01.01 Section 585 as a TAP. However, it is listed here to show compliance with the MBACT rule under Section 215

The scrubber manufacturer guarantees 41% control of PM2.5 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 speciation into particulate size, with 41% control of the PM2.5 portion and 99% control of the portion larger than PM2.5.

Mercury emissions factors were reduced from information (various literature sources) regarding the reduction in incoming waste stream/untreated flue gas mercury content. The average from the data sources indicate a 66% reduction in mercury content of incoming waste, therefore the peak and off-peak emision factors for mercury were reduced by 66%. Wet scrubber technology has been shown to reduce Hg emissions by up to 99% from municipal waste combustion. Peak and off peak emissions shown above include a 60% control by the scrubber.

CARCINOGENS									Stack Emissions (Thermal Unit + Ignition System)			
									PEAK		OFF PEAK	
Pollutant	**CAS #**	**Peak TAP Emission Factor (lb/ton)**	**Off-Peak TAP Emission Factor (lb/ton)**	**Peak TAP Emissions (lb/hr)**	**Off-Peak TAP Emissions (lb/hr)**	**Average TAP Emissions (lb/hr)**	**Screening Level (lb/hr)**	**Modeling (based on Average)? (Y/N)**	lb/hr	tpy	lb/hr	tpy
Acenaphthalene	208-96-8	1.96E-05	1.90E-05	4.58E-04	8.09E-05	3.32E-04	9.10E-05	Yes	4.58E-04		8.09E-05	
Acenaphthene	83-32-9	2.88E-05	2.85E-05	6.72E-04	1.21E-04	4.89E-04	9.10E-05	Yes	6.72E-04		1.21E-04	
Anthracene	120-12-7	1.82E-05	1.80E-05	4.26E-04	7.65E-05	3.09E-04	9.10E-05	Yes	4.26E-04		7.66E-05	
Aroclor, all (PCB)	---	2.56E-07	2.39E-07	5.98E-06	1.02E-06	4.32E-06	6.60E-05	No				
Benzo(g,h,i)perylene	191-24-2	ND	ND	ND	ND	ND	9.10E-05	No				
bis(2-Chlorethyl)ether	111-44-4	ND	ND	ND	ND	ND	2.00E+00	No				
bis(2-Ethylhexyl)phthalate	117-81-7	3.26E-05	2.89E-05	7.63E-04	1.23E-04	5.50E-04	2.80E-02	No				
2,2'-oxybis (1-Chloropropane) (Bis(2-chloro-1-	108-60-1	ND	ND	ND	ND	ND	3.30E-04	No				
Cadmium	7440-43-9	4.02E-04	3.38E-04	3.03E-03	4.64E-04	2.18E-03	3.7E-06	Modeling not required (IDAPA 58.01.01 210.20)				
Dioxin/Furan		2.16E-10	2.45E-10	5.04E-09	1.04E-09	3.71E-09	1.50E-10	Modeling not required (IDAPA 58.01.01 210.20)				
Fluoranthene	206-44-0	2.08E-05	1.90E-05	4.85E-04	8.07E-05	3.50E-04	9.10E-05	Yes	4.85E-04		8.08E-05	
Fluorene	86-73-7	2.63E-05	2.58E-05	6.14E-04	1.09E-04	4.46E-04	9.10E-05	Yes	6.14E-04		1.10E-04	
Hexachlorobenzene	118-74-1	ND	ND	ND	ND	ND	1.30E-05	No				
Hexachlorobutadiene	87-68-3	ND	ND	ND	ND	ND	3.30E-04	No				
Hexachloroethane	67-72-1	ND	ND	ND	ND	ND	1.70E-03	No				
2-Methylnaphthalene	91-57-6	6.18E-05	5.51E-05	1.44E-03	2.34E-04	1.04E-03	9.10E-05	Yes	1.44E-03		2.34E-04	
Nickel	7440-02-0	9.91E-04	1.53E-03	7.49E-03	2.10E-03	5.69E-03	2.70E-05	Yes	7.50E-03		2.11E-03	
Phenanthrene	85-01-8	6.27E-05	5.44E-05	1.47E-03	2.31E-04	1.05E-03	9.10E-05	Yes	1.47E-03		2.31E-04	
Pyrene	129-00-0	1.53E-05	1.41E-05	3.57E-04	5.98E-05	2.58E-04	9.10E-05	Yes	3.57E-04		5.98E-05	
2,4,6-Trichlorophenol	88-06-2	ND	ND	ND	ND	ND	1.20E-03	No				
Benzo(a)pyrene	50-32-8	ND	ND	ND	ND	ND	2.00E-06	No				
Benzo(a)anthracene	56-55-3	ND	ND	ND	ND	ND	n/a	n/a				
Benzo(b)fluoranthene	205-99-2	ND	ND	ND	ND	ND	n/a	n/a				
Benzo(k)fluoranthene	207-08-9	ND	ND	ND	ND	ND	n/a	n/a				
Chrysene	218-01-9	1.97E-05	1.82E-05	4.61E-04	7.72E-05	3.33E-04	n/a	No				
Dibenz(a,h)anthracene	53-70-3	ND	ND	ND	ND	ND	n/a	n/a				
Indeno(1,2,3-cd)pyrene	193-39-5	ND	ND	ND	ND	ND	n/a	n/a				
Total POM (7-PAH)	---	---	---	4.61E-04	7.72E-05	3.33E-04	2.00E-06	Yes	4.61E-04		7.73E-05	

TAPs Emission factor from source test averages.
The scrubber manufacturer guarantees 41% control of PM2.5 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 speciation into particulate size, with 41% control of the PM2.5 portion and 99% control of the portion larger than PM2.5.

Dynamis Energy WTE Facility
Thermal Conversion System - Hidden Hollow Landfill
Thermal Conversion Units - Ignition Systems Criteria Pollutants

Primary gasification ignition systems will operate on natural gas. Primary chamber ignition will be evenly distributed throughout the day; independent of MSW throughput and peak/off-peak operation.

CRITERIA POLLUTANT COMBUSTION CALCULATIONS
NATURAL GAS

Emission Unit	Fuel Usage		Conversions	
Primary Chamber Ignition (total)	111,953	scf/day	40862845	1020 MMBtu/10^6 scf
Primary Chamber Ignition (total)	4.76	MMBtu/hr		

Emission Factors

NOx	100	lb/10^6 scf	AP-42, Table 1.4-1, 1998
CO	84	lb/10^6 scf	AP-42, Table 1.4-1, 1998
PM-10	7.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
SOx	0.6	lb/10^6 scf	AP-42, Table 1.4-2, 1998
VOC	5.5	lb/10^6 scf	AP-42, Table 1.4-2, 1998
Lead	0.0005	lb/10^6 scf	AP-42, Table 1.4-2, 1998

Description	Capacity (MMBtu/hr)	Throughput (scf/hr)	Pounds per Hour					
			NOx Emissions (lb/hr)	CO Emissions (lb/hr)	PM-10/PM-2.5 Emissions (lb/hr)	SOx Emissions (lb/hr)	VOC Emissions (lb/hr)	Lead Emissions (lb/hr)
Primary Chamber Ignitions - Uncontrolled	4.76	4,665	0.4665	0.3918	0.0355	0.0028	0.0257	0.0000023
Primary Chamber Ignitions - Controlled	4.76	4,665	0.2799	0.3918	0.0209	0.0008	0.0257	0.0000023

*SO2 Emission rate based on scrubber manufacturer guarantee of 71.25% control. PM10 emission rate based on scrubber manufacturer guarantee of 99%. PM2.5 emission rate based on scrubber manufacturer guarantee of 41%.

*NOx Emission rate based on SNCR manufacturer guarantee of 40% control.

Description	Capacity (MMBtu/hr)	Throughput (scf/yr)	Ton per Year					
			Emissions (T/yr)	Emissions (T/yr)	Emissions (T/yr)	Emissions (T/yr)	Emissions (T/yr)	Emissions (T/yr)
Primary Chamber Ignitions - Uncontrolled	4.76	4,665	2.04	1.72	0.16	0.01	0.11	1.02E-05
Primary Chamber Ignitions - Controlled (Peak)	4.76	4,665	0.82	1.14	0.06	0.00	0.07	0.00
Primary Chamber Ignitions - Controlled (Off-Peak)	4.76	4,665	0.41	0.57	0.03	0.00	0.04	0.00

Dynamis Energy WTE Facility
Thermal Conversion System - Hidden Hollow Landfill
Thermal Conversion Units - Ignition Systems HAPs

TOXIC AIR POLLUTANTS (TAPs) COMBUSTION CALCULATIONS
NATURAL GAS

Emission Unit	Fuel Usage
Primary Chamber Ignition	4,664.71 scf/hr

NON-CARCINOGENS (POUNDS PER HOUR)

Pollutant	CAS #	EF for NG Combustion ($lb/10^6$ scf)[a]	TAP Emissions (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Barium	7440-39-3	4.4E-03	1.64E-05	3.3E-02	No
Chromium	7440-47-3	1.4E-03	5.22E-06	3.3E-02	No
Cobalt	7440-48-4	8.4E-05	3.13E-07	3.3E-03	No
Copper	7440-50-8	8.5E-04	3.17E-06	6.7E-02	No
Hexane	110-54-3	1.8E+00	8.40E-03	1.2E+01	No
Manganese	7439-96-5	3.8E-04	1.42E-06	3.33E-01	No
Mercury	7439-97-6	2.6E-04	1.21E-06	N/A	See Note 1 Below
Molybdenum	7439-98-7	1.1E-03	4.10E-06	3.33E-01	No
Naphthalene*	91-20-3	6.1E-04	2.85E-06	3.33E+00	No
Pentane	109-66-0	2.6E+00	1.21E-02	1.18E+02	No
Selenium	7782-49-2	2.4E-05	8.96E-08	1.3E-02	No
Toluene	108-88-3	3.4E-03	1.59E-05	2.5E+01	No
Zinc	7440-66-6	2.9E-02	1.08E-04	6.67E-01	No

1. Mercury is not listed under IDAPA 58.01.01 Section 585 as a TAP. However, it is listed here to show compliance with the MBACT rule under Section 215

*Although listed as a noncarcinogen in the Rules, DEQ has determined that naphthalene is a possible/probable carcinogen. Compliance for naphthalene emissions should be based on the EL or AACC listed in Section 586 for PAH.

The scrubber manufacturer guarantees 41% control of PM2.5 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.

CARCINOGENS (POUNDS PER HOUR)

Pollutant	CAS #	EF for Natural Gas Combustion ($lb/10^6$ scf)[a]	TAP Emissions (lb/hr)	Screening Level (lb/hr)	Modeling? (Y/N)
Acenaphthene	83-32-9	1.80E-06	8.40E-09	9.10E-05	No
Acenaphthylene	203-96-8	1.80E-06	8.40E-09	9.10E-05	No
Anthracene	120-12-7	2.40E-06	1.12E-08	9.10E-05	No
Arsenic	7440-38-2	2.0E-04	7.46E-07	1.5E-06	No
Benzene	71-43-2	2.1E-03	9.80E-06	8.0E-04	No
Benzo(g,h,i)perylene	191-24-2	1.2E-06	5.60E-09	9.1E-05	No
Beryllium	7440-41-7	1.2E-05	4.48E-08	2.8E-05	No
Cadmium	7440-43-9	1.1E-03	4.10E-06	3.7E-06	Modeling not required (IDAPA 58.01.01 210.20)
Dichlorobenzene	25321-22-6	1.2E-03	5.60E-06	9.1E-05	No
Fluoranthene	206-44-0	3.0E-06	1.40E-08	9.1E-05	No
Fluorene	86-73-7	2.8E-06	1.31E-08	9.1E-05	No
Formaldehyde	50-00-0	7.5E-02	3.50E-04	5.1E-04	No
2-Methylnaphthalene	91-57-6	2.4E-05	1.12E-07	9.1E-05	No
3-Methylchloranthene	56-49-5	1.8E-06	8.40E-09	9.1E-05	No
Nickel	7440-02-0	2.1E-03	7.8E-06	2.7E-05	No
Phenanthrene	85-01-8	1.7E-05	7.9E-08	9.1E-05	No
Pyrene	129-00-0	5.0E-06	2.3E-08	9.1E-05	No
Benzo(a)pyrene	50-32-8	1.2E-06	5.60E-09	2.0E-06	No
Benz(a)anthracene	56-55-3	1.8E-06	8.40E-09	NA	No
Benzo(b)fluoranthene	205-82-3	1.8E-06	8.40E-09	NA	No
Benzo(k)fluoranthene	205-99-2	1.8E-06	8.40E-09	NA	No
Chrysene	218-01-9	1.8E-06	8.40E-09	NA	No
Dibenzo(a,h)anthracene	53-70-3	1.2E-06	5.60E-09	NA	No
Indeno(1,2,3-cd)pyrene	193-39-5	1.8E-06	8.4E-09	NA	No
Total POM (7-PAH)		1.1E-05	5.32E-08	2.00E-06	No

[a]EFs from AP-42, Tables 1.4-3 and 1.4-4, 7/98
[b]EFs from AP-42, Table 1.3-10, 9/98

The scrubber manufacturer guarantees 41% control of PM2.5 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.

Dynamis Energy WTE Facility
Thermal Conversion System - Hidden Hollow Landfill
Ash Handling System

Total Ash Throughput = 10% of total waste throughput
Total Ash Throughput = 40.8 tpd
Total Ash Throughput = 3400 lb/hr
Baghouse Flow Rate = 14,000 cfm

Baghouse Control System
Manufacturer guarantee of PM2.5 Emissions = 0.005 grain/cf

Assume 5% of ash becomes airborne particulate (rest is glass, metal pieces, or large non airborne ash particles collected for use). Assume PM2.5=PM10=0.75PM

Ash System Emissions	**PM10/PM2.5**	
	lb/hr	**tpy**
Uncontrolled	127.50	558.45
Controlled	0.45	1.97

TCLP Results	MSW **(mg/kg)**	Tires **(mg/kg)**	Average **(mg/kg)**	**Emissions %**	**(lb/ton)**	**lb/hr**	**tpy**
Ag	3.57333333	0.42	3.53	0%	0.001	7.59E-06	3.32E-05
Al	86000	37250	85268.75	41%	75	1.84E-01	8.04E-01
As	ND	0.00	ND	NA	NA	NA	NA
B	450	161	445.66	0%	0.32	9.59E-04	4.20E-03
Ba	447.463333	96	442.18	0%	0.19	9.52E-04	4.17E-03
Be	ND	ND	ND	NA	NA	NA	NA
Bi	ND	ND	ND	NA	NA	NA	NA
Ca	79000	20425	78121.38	37%	40.9	1.68E-01	7.36E-01
Cd	6.52	10.56	6.58	0%	0.021	1.42E-05	6.20E-05
Co	12	1780	38.52	0%	3.57	8.29E-05	3.63E-04
Cr	130	33.0	128.55	0%	0.066	2.77E-04	1.21E-03
Cu	330	149	327.29	0%	0.299	7.04E-04	3.09E-03
Fe	24000	7325	23749.88	11%	14.7	5.11E-02	2.24E-01
Hg	ND	ND	ND	NA	NA	NA	NA
K	ND	ND	ND	NA	NA	NA	NA
Li	39	61	39.33	0%	0.122	8.46E-05	3.71E-04
Mg	7700	4850	7657.25	4%	9.7	1.65E-02	7.22E-02
Mn	1000	115	986.73	0%	0.230	2.12E-03	9.30E-03
Mo	ND	17.1	0.26	0%	0.034	5.50E-07	2.41E-06
Na	2800	5725	2843.88	1%	11.47	6.12E-03	2.68E-02
Ni	29	46.5	29.26	0%	0.093	6.30E-05	2.76E-04
p	1100	2300	1118.00	1%	4.61	2.41E-03	1.05E-02
Pb	277.13	251	276.74	0%	0.503	5.96E-04	2.61E-03
Sb	ND	ND	ND	NA	NA	NA	NA
Se	ND	ND	ND	NA	NA	NA	NA
Sr	210	91	208.22	0%	0.183	4.48E-04	1.96E-03
Th	ND	ND	ND	NA	NA	NA	NA
V	36	41.8	36.09	0%	0.084	7.77E-05	3.40E-04
Zn	3100	287500	7366.00	4%	576	1.59E-02	6.94E-02
Total	206670.687	368227	209094	100%		4.50E-01	1.97E+00

Dynamis Energy WTE Facility
Thermal Conversion System - Hidden Hollow Landfill
Emergency Generator

Caterpillar 300 kW Standby C9 Tier 3 Certified Generator

Combustion Source	kW	hp	Hours of Operation	Emission Factors (g/hp-hr)					
				PM[1]	NOx[1]	SO_2[2]	CO[1]	VOC[3]	HC[1]
300 kW Gen	300	480.00	500	0.033	4.110	0.0021	0.250	0.0025	0.06

1. Manufacturer specific emisions factors. Generator is EPA Certified Tier 3. Horsepower shown in manufacturer specified max horsepower.
2. Emission Factor Reference for SO2: AP-42, 5th Edition, Table 3.3-1, 0.5% sulfur fuel, units are lb/hp-hr
3. Emission Factor Reference for VOC: AP-42, 5th Edition, Table 3.3-1, units are lb/hp-hr

Combustion Source	kW	hp	Hours of Operation	Emission Rates											
				$PM/ PM_{10}/ PM_{2.5}$		NOx		SO_2		CO		VOC		HC	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
300 kW Gen	300	480.00	500	0.035	0.01	1.302	0.33	0.984	0.25	0.264	0.07	1.186	0.30	0.063	0.016
			Total	***0.035***	***0.009***	***1.302***	***0.326***	***0.984***	***0.246***	***0.264***	***0.066***	***1.186***	***0.296***	***0.063***	***0.016***

HAPS

Generator Capacity = 1.2216 MMBtu/hr

Pollutant	Emission Factor (lb/MMBtu)	Emission Rate (lb/hr)	Emission Rate (tpy)
NON-CARCINOGENS			
Acrolein[b]	<9.25E-05	1.12E-04	2.81E-05
Naphthalene[b]	8.48E-05	1.04E-04	2.59E-05
Toluene[b]	4.09E-04	5.00E-04	1.25E-04
Xylenes[b]	2.85E-04	3.48E-04	8.70E-05
CARCINOGENS			
Acenaphthene	<1.42E-06	1.73E-06	4.34E-07
Acenaphthylene	<5.06E-06	6.18E-06	1.55E-06
Acetaldehyde[b]	7.67E-04	9.37E-04	2.34E-04
Anthracene	1.87E-06	2.28E-06	5.71E-07
Benzene[b]	9.33E-04	1.14E-03	2.85E-04
Benzo(g,h,l)perylene	<4.89E-07	5.97E-07	1.49E-07
1,3-Butadiene[b,c]	<3.91E-05	4.78E-05	1.19E-05
Fluoranthene	7.61E-06	9.30E-06	2.32E-06
Fluorene	2.92E-05	3.57E-05	8.92E-06
Formaldehyde[b]	1.18E-03	1.44E-03	3.60E-04
Phenanthrene	2.94E-05	3.59E-05	8.98E-06
Pyrene	4.78E-06	5.84E-06	1.46E-06
Benzo(a)anthracene	1.68E-06	2.05E-06	5.13E-07
Benzo(b)fluoranthene	<9.91E-08	1.21E-07	3.03E-08
Benzo(k)fluoranthene	<1.55E-07	1.89E-07	4.73E-08
Chrysene	3.53E-07	4.31E-07	1.08E-07
Dibenz(a,h)anthracene	<5.83E-07	7.12E-07	1.78E-07
Indeno(1,2,3-cd)pyrene	<3.75E-07	4.58E-07	1.15E-07
Benzo(a)pyrene	<1.88E-07	2.30E-07	5.74E-08
POM (7-PAH)		4.19E-06	1.05E-06

Emissions factors from AP-42, Table 3.3-2 (10/96)
[b] Hazardous air pollutant listed in the Clean Air Act.
[c] Based on data from 1 engine.

Dynamis Energy WTE Facility
Thermal Conversion System - Hidden Hollow Landfill
Cooling Towers

Induced Draft Cooling Towers

Total Make-up to Unit:	470 gpm	
Evaporation Loss:	372 gpm	Cooling towers will operate at the same rates for both peak and off-peak thermal unit/boiler operation
Drift Loss:	0.26 gpm	
Blowdown:	92 gpm	

Cooling Tower Emissions

	Total Liquid Drift Factor (lb/1000 gal)[b]	TDS Content Fraction	Emission Factor (lb/1000 gal)	Evaporation Rate (gal/hr)	PM/PM-10[a] Emission Rate lb/hr (lb/hr)	PM/PM-10[a] Emission Rate tpy[b] (tpy)
Cooling Tower	1.7	0.000975	0.001658	22,320	0.04	0.16
Total					**0.04**	**0.16**

[a]PM-10 emission factor assumed to be equal to PM emission factor. Assume PM2.5 = PM10.
[b]AP-42 Table 13.4-1 Total liquid drift for induced draft tower
TDS content in water from water analysis of makeup water.

GHG EMISSIONS

For MSW Combustion Calculation Method- Tier 2

CH4 or N2O = $1x10^3$ * Steam * B * EF (Equation C-9b)

For primary ignition system NG Combustion and Emergency Generator Calculation Method - Tier 1

CO_2 = $1x10^3$ * Fuel * HHV * EF

CH4 or N2O = $1x10^3$ * Fuel * HHV * EF

NG Emission Factors

CO_2	53.02	kg/MMBtu	40 CFR 98 Table C-1
CH_4	0.001	kg/MMBtu	40 CFR 98 Table C-2
N_2O	0.0001	kg/MMBtu	40 CFR 98 Table C-2

#2 Fuel Oil Emission Factors

CO_2	73.96	kg/MMBtu	40 CFR 98 Table C-1
CH_4	3.00E-03	kg/MMBtu	40 CFR 98 Table C-2
N_2O	6.00E-04	kg/MMBtu	40 CFR 98 Table C-2

MSW Emission Factors

CO_2	1.33E+03	lb/ton	Source Test Average
CH_4	3.20E-02	kg/MMBtu	40 CFR 98 Table C-2
N_2O	4.20E-03	kg/MMBtu	40 CFR 98 Table C-2

High Heating Value

NG HHV	1.028E-03	MMBtu/scf	40 CFR 98 Table C-1
#2 Fuel Oil	1.380E-01	MMBtu/gal	40 CFR 98 Table C-1

Combustion Source	Capacity (MMBtu/hr)	Fuel	Steam Generated (lb steam)	B Ratio (MMBtu/lb steam)	Throughput (scf/yr)	CO_2 (tonne/yr)	CO_2 (ton/yr)	CH_4 (tonne/yr)	CH_4 (ton/yr)	N_2O (tonne/yr)	N_2O (ton/yr)	CO_2e (tonne/yr)	CO_2e (ton/yr)
Thermal Conversion Unit - MSW	320	MSW	1.416E+09	0.001979381	---	80,840	89,129	89.70	98.90	11.77	12.98	86,373.2	95,229.5
Primary ignition system	4.76	NG	---	---	40,862,845.0	2,227	2,456	0.04	0.04	0.004	0.005	2,229.4	2,458.0
Emergency Generator	22.7	Diesel			11,350.0	116	128	0.00	0.00	0.001	0.001	116.2	128.2
					Total	83,183	91,712	90	99	12	13	88,719	97,816

*Generator capacity is in gal/hr, throughput is gal/yr

Dynamis Energy WTE Facility
Thermal Conversion System
Thermal Conversion Unit - SNCR

			Hours	7am - 11pm	11pm-7am
Peak Exhaust Flow =	120,725	acfm @ 125.4F	Percent of day	0.67	0.33
Off-Peak Exhaust Flow =	33,894	acfm @ 134.5F			

			Conversions	1 ft3 =	0.028 m3
				1 g =	1000 mg
Maximum estimated ammonia slip (peak and off peak) =	10	ppmv		1 lb =	453.59 g
Maximum estimated ammonia slip @ peak flow =	6.39	mg/m3		1 hr =	60 min
Maximum estimated ammonia slip @ peak flow =	2.86	lb/hr			
Maximum estimated ammonia slip @ off-peak flow =	6.30	mg/m3			
Maximum estimated ammonia slip @ off-peak flow =	0.79	lb/hr			

Scrubber manufacturer guarantees 82% control of ammonia for incoming concentrations up to 3.57 lb/hr

Incoming concentration (lb/hr) =	2.86	lb/hr	
Estimated controlled ammonia emissions (lb/hr) =	0.51	lb/hr	
IDAPA 585 EL (lb/hr)	1.2	lb/hr	Therefore, no modeling required.
Estimated controlled ammonia emissions (mg/m3) =	1.150789	mg/m3	
Estimated controlled ammonia emissions (ppmv) =	1.802114	ppmv	

Dynamis Energy WTE Facility
Thermal Conversion System - Hidden Hollow Landfill
Thermal Conversion Unit - Tire Throughput

Scenario	MSW Throughput, tpd (wet basis)	MSW Throughput, tph (wet basis)	If Total Requested Tire Throughput Processed in Either Peak or Off-peak Period (1.5% x 408 tpd = 6.12 tpd)		
			Amount of tires processed, tpd (wet basis)	Amount of tires processed per hour, tph (wet basis)	% of tires as amount of total waste stream processed
Peak Operating Hours	374	23.375	6.12	0.3825	2%
Off- Peak Operating Hours	34	4.25	6.12	0.765	18%

IDEQ PTC Forms
Ambient Impact Assessment Emission Inventory
for New Minor Facilities and Minor Modifications

Table 2 Proposed Emissions

Emissions Unit	Stack or Emissions Point ID[a]	PM_{10}	$PM_{2.5}$		SO_2		NO_x		CO		Lead	
		lb/hr 24-hr Avg.	lb/hr 24-hr Avg.	lb/hr Annual Avg.	lb/hr Max.	lb/hr Annual Avg.	lb/hr Max.	lb/hr Annual Avg.	lb/hr Max.	lb/hr 8-hr Avg.	lb/hr monthly Avg.	lb/hr 1/4ly Avg.
Point Sources												
Thermal Conversion Unit (Peak Operation)	UNITPEAK	4.220	3.396	3.396	0.585	0.585	19.460	19.460	2.659	2.659	0.061	0.061
Thermal Conversion Unit (OffPeak Operation)	UNIT1OP	0.951	0.765	0.765	0.663	0.663	3.913	3.913	1.097	1.097	0.009	0.009
Cooling Tower #1	CT1	0.018	0.081	0.018	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cooling Tower #2	CT2	0.018	0.081	0.018	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ash Handling System/Baghouse	ASHBH	0.450	0.450	0.450	n/a	n/a	n/a	n/a	n/a	n/a	0.001	0.001
Emergency Generator	EMERGEN	0.035	0.035	0.035	0.984	0.984	1.302	1.302	0.264	0.026	n/a	n/a
Primary Ignition System	UNITPEAK/UNIT1OP	0.021	0.021	0.021	0.001	0.001	0.280	0.280	0.392	0.392	2.33E-06	2.33E-06

Primary Ingnition System emissions exhaust through the thermal conversion unit stack.

IDEQ PTC Forms
Toxic Air Pollutant Emissions Inventory

Table 1. PRE- AND POST PROJECT NON-CARCINOGENIC TAP EMISSIONS SUMMARY POTENTIAL TO EMIT

Non-Carcinogenic Toxic Air Pollutants (sum of all emissions)	Pre-Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Post Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Change in 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Non-Carcinogenic Screening Emission Level (lb/hr)	Exceeds Screening Level? (Y/N)
Acrolein	0.00E+00	1.12E-04	1.12E-04	1.70E-02	No
Aluminum	0.00E+00	1.88E-01	1.88E-01	6.67E-01	No
Antimony	0.00E+00	2.58E-05	2.58E-05	3.30E-02	No
Barium	0.00E+00	1.07E-03	1.07E-03	3.30E-02	No
2-Chlorophenol	0.00E+00	0.00E+00	0.00E+00	3.30E-02	No
Chromium	0.00E+00	2.21E-03	2.21E-03	3.30E-02	No
Cobalt	0.00E+00	8.38E-05	8.38E-05	3.30E-03	No
Copper	0.00E+00	8.50E-04	8.50E-04	6.70E-02	No
1,2-Dichlorobenzene (o-Dichlorobenzene)	0.00E+00	0.00E+00	0.00E+00	2.00E+01	No
1,4-Dichlorobenzene	0.00E+00	6.49E-04	6.49E-04	3.00E+01	No
Diethylphthalate	0.00E+00	1.04E-03	1.04E-03	3.33E-01	No
Dimethylphthalate	0.00E+00	7.13E-04	7.13E-04	3.33E-01	No
Di-n-butylphthalate	0.00E+00	1.85E-03	1.85E-03	3.33E-01	No
Di-n-octylphthalate	0.00E+00	0.00E+00	0.00E+00	3.33E-01	No
Fluoride (as F) (Hydrogen Fl)	0.00E+00	2.27E-03	2.27E-03	1.67E-01	No
Hexachlorocyclopentadiene	0.00E+00	0.00E+00	0.00E+00	7.00E-03	No
Hexane	0.00E+00	8.40E-03	8.40E-03	1.20E+01	No
Hydrogen Chloride	0.00E+00	5.95E-01	5.95E-01	5.00E-02	See Note 1
Isophorone	0.00E+00	0.00E+00	0.00E+00	1.87E+00	No
Manganese	0.00E+00	3.07E-03	3.07E-03	3.33E-01	No
2-Methylphenol (o-Cresol)	0.00E+00	1.27E-03	1.27E-03	1.47E+00	No
3/4-Methylphenol (m,p-Cresol)	0.00E+00	1.88E-03	1.88E-03	1.47E+00	No
Molybdenum	0.00E+00	3.66E-04	3.66E-04	3.33E-01	No
Naphthalene**	0.00E+00	2.14E-03	2.14E-03	9.10E-05	Yes
4-Nitroaniline (p-nitroaniline)	0.00E+00	0.00E+00	0.00E+00	2.00E-01	No
Nitrobenzene	0.00E+00	6.85E-04	6.85E-04	3.33E-01	No
Pentane	0.00E+00	1.21E-02	1.21E-02	1.18E+02	No
Pentachlorophenol	0.00E+00	0.00E+00	0.00E+00	3.30E-02	No
Phenol	0.00E+00	2.43E-03	2.43E-03	1.27E+00	No
Phosphorous	0.00E+00	2.41E-03	2.41E-03	7.00E-03	No
Selenium	0.00E+00	3.19E-06	3.19E-06	1.30E-02	No
Silver	0.00E+00	7.59E-06	7.59E-06	7.00E-03	No
Toluene	0.00E+00	5.15E-04	5.15E-04	2.50E+01	No
1,2,4-Trichlorobenzene	0.00E+00	0.00E+00	0.00E+00	2.47E+00	No
o-Xylene	0.00E+00	3.48E-04	3.48E-04	2.90E+01	No
Zinc	0.00E+00	5.05E-02	5.05E-02	6.67E-01	No

See spreadsheets prepared by JBR (included in Appendix F of the permit application for further information regarding emission factors and calculation assumptions.
1. Regulated under NSPS Subpart Eb, excluded from modeling under IDAPA 58.01.01 210.20.

**Although listed as a noncarcinogen in the Rules, DEQ has determined that naphthalene is a possible/probable carcinogen. Compliance for naphthalene emissions should be based on the EL or AACC listed in Section 586 for PAH.

Table 2. PRE- AND POST PROJECT CARCINOGENIC TAP EMISSIONS SUMMARY POTENTIAL TO EMIT

Carcinogenic Toxic Air Pollutants (sum of all emissions)	Pre-Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Post Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Change in Annual Average Emissions Rates for Units at the Facility (lb/hr)	Carcinogenic Screening Emission Level (lb/hr)	Exceeds Screening Level? (Y/N)
Acenaphthalene	0.00E+00	3.39E-04	3.39E-04	9.10E-05	Yes
Acenaphthene	0.00E+00	4.90E-04	4.90E-04	9.10E-05	Yes
Acetaldehyde	0.00E+00	9.37E-04	9.37E-04	3.00E-03	No
Anthracene	0.00E+00	3.12E-04	3.12E-04	9.10E-05	Yes
Aroclor, all (PCB)	0.00E+00	4.32E-06	4.32E-06	6.60E-05	No
Arsenic	0.00E+00	7.46E-07	7.46E-07	1.50E-06	No
Benzene	0.00E+00	1.15E-03	1.15E-03	8.00E-04	Yes
Benzo(g,h,i)perylene	0.00E+00	6.03E-07	6.03E-07	9.10E-05	No
Beryllium	0.00E+00	4.48E-08	4.48E-08	2.80E-05	No
bis(2-Chlorethyl)ether	0.00E+00	0.00E+00	0.00E+00	2.00E-05	No
bis(2-Ethylhexyl)phthalate	0.00E+00	5.50E-04	5.50E-04	2.80E-02	No
-oxybis (1-Chloropropane) (Bis(2-chloro-1-methylethyl) et	0.00E+00	0.00E+00	0.00E+00	3.30E-04	No
1,3-Butadiene	0.00E+00	4.78E-05	4.78E-05	2.40E-05	Yes
Cadmium	0.00E+00	2.20E-03	2.20E-03	3.70E-06	See Note 1
Dichlorobenzene	0.00E+00	5.60E-06	5.60E-06	9.10E-05	No
Dioxin/Furan	0.00E+00	3.71E-09	3.71E-09	1.50E-10	See Note 1
Fluoranthene	0.00E+00	3.60E-04	3.60E-04	9.10E-05	Yes
Fluorene	0.00E+00	4.82E-04	4.82E-04	9.10E-05	Yes
Formaldehyde	0.00E+00	1.79E-03	1.79E-03	5.10E-04	Yes
Hexachlorobenzene	0.00E+00	0.00E+00	0.00E+00	1.30E-05	No
Hexachlorobutadiene	0.00E+00	0.00E+00	0.00E+00	3.30E-04	No
Hexachloroethane	0.00E+00	0.00E+00	0.00E+00	1.70E-03	No
2-Methylnaphthalene	0.00E+00	1.04E-03	1.04E-03	9.10E-05	Yes
3-Methylchloranthene	0.00E+00	8.40E-09	8.40E-09	9.10E-05	No
Nickel	0.00E+00	5.76E-03	5.76E-03	2.70E-05	Yes
Phenanthrene	0.00E+00	1.09E-03	1.09E-03	9.10E-05	Yes
Pyrene	0.00E+00	2.64E-04	2.64E-04	9.10E-05	Yes
2,4,6-Trichlorophenol	0.00E+00	0.00E+00	0.00E+00	1.20E-03	No
Benzo(a)pyrene	0.00E+00	2.35E-07	2.35E-07	2.00E-06	No
Benz(a)anthracene	0.00E+00	2.06E-06	2.06E-06	n/a	No
Benzo(b)fluoranthene	0.00E+00	1.29E-07	1.29E-07	n/a	No
Benzo(k)fluoranthene	0.00E+00	1.98E-07	1.98E-07	n/a	No
Chrysene	0.00E+00	3.34E-04	3.34E-04	n/a	No
Dibenzo(a,h)anthracene	0.00E+00	7.18E-07	7.18E-07	n/a	No
Indeno(1,2,3-cd)pyrene	0.00E+00	4.66E-07	4.66E-07	n/a	No
Total POM (7-PAH)	0.00E+00	3.37E-04	3.37E-04	2.00E-06	Yes

1. Regulated under NSPS Subpart Eb, excluded from modeling under IDAPA 58.01.01 210.20.
See spreadsheets prepared by JBR (included in Appendix F of the permit application for further information regarding emission factors and calculation assumptions.

IDEQ PTC Forms
Facility Wide Potential to Emit Emission Inventory

Table 1. POTENTIAL TO EMIT FOR NSR REGULATED POLLUTANTS

Emissions Unit	EU ID #	NSR Pollutant[a]							
		PM	PM-10	PM2.5	CO	Pb	NOx	VOC	SO2
		T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]	T/yr[b]
Point Sources									
Thermal Conversion Unit/Scrubber	**EU1/EU8**	13.71	13.71	11.03	8.13	1.91E-01	62.54	0.07	2.68
Primary Ignition System/Scrubbe	**EU2/EU8**	0.09	0.09	0.09	1.72	1.02E-05	1.23	0.11	0.00
Cooling Tower #1	**EU3**	0.08	0.08	0.08	n/a	n/a	n/a	n/a	n/a
Cooling Tower #2	**EU4**	0.08	0.08	0.08	n/a	n/a	n/a	n/a	n/a
Ash Handling System/Baghouse	**EU4/EU7**	1.97	1.97	1.97	n/a	0.00	n/a	n/a	n/a
Emergency Generato	**EU5**	0.01	0.01	0.01	0.07	n/a	0.33	0.30	0.25
Totals		**15.94**	**15.94**	**13.27**	**9.91**	**1.94E-01**	**64.09**	**0.48**	**2.93**

a) NSR Regulated air Pollutants are defined[1] as: Particulate Matter (PM, PM-10, PM-2.5), Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone (VOC), Sulfur Dioxide, all pollutants regulated by NSPS (40 CFR 60)(i.e. TRS, fluoride, sulfuric acid mist) & Class I & Class II Ozone Depleting Substances (40 CFR 82)(i.e. CFC, HCFC, Halon, etc.) The Dynamis facility is not a source of any pollutants regualted by NSPS other than NSR regulated air pollutants, nor is the facility a source of Class I or Class II Ozone Depleting Substances

b)Ton per year emissions based on 8760 hours/year operation.

** See spreadsheets prepared by JBR (included in Appendix F of the permit application for further information regarding emission factors and calculation assumptions).

IDEQ PTC Forms
Facility Wide Hazardous Air Pollutant Potential to Emit

Table 1 HAP POTENTIAL TO EMIT EMISSIONS SUMMARY

HAP Pollutants	PTE (T/yr)
Acrolein	2.81E-05
Antimony	1.13E-04
Chromium	8.41E-04
Cobalt	3.19E-05
1,4-Dichlorobenzene	2.84E-03
Dimethylphthalate	3.12E-03
Di-n-butylphthalate	8.11E-03
Fluoride (as F) (Hydrogen Fl)	9.95E-03
Hexane	3.68E-02
Hydrogen Chloride*	2.61E+00
Manganese	1.35E-02
2-Methylphenol (o-Cresol)	5.56E-03
3/4-Methylphenol (m,p-Cresol)	8.22E-03
Naphthalene	8.94E-03
Nitrobenzene	3.00E-03
Phenol	1.06E-02
Phosphorous	1.05E-02
Selenium	1.40E-05
Toluene	1.94E-04
o-Xylene	1.99E-05
Acetaldehyde	2.34E-04
Aroclor, all (PCB)	1.89E-05
Arsenic	3.27E-06
Benzene	3.28E-04
Beryllium	1.96E-07
bis(2-Ethylhexyl)phthalate	2.41E-03
1,3-Butadiene	1.19E-05
Cadmium	9.62E-03
Dioxin/Furan	1.62E-08
Formaldehyde	1.89E-03
Nickel	2.52E-02
Total POM (7-PAH)	1.46E-03
Total	2.77E+00

* Maximum Individual HAP

** See spreadsheets prepared by JBR (included in Appendix F of the permit application for further information regarding emission factors and calculation assumptions.

Emission Factor Development

Source Test References

Test Reference Number	Report Title	Author(s)	Additional Information	Data Included in Tests
1A	April - May 1993 Entech, Inc. Model TOS-80 Emissions Monitoring in Anchorage, Alaska. June 1993. For: NATCHIQ, Anchorage, Alaska	John Nordin, Steve Lindblom	Burn 1: 4/20/1993, 18 yd^3 MSW	CO2, NOx, FH PM, BH PM, HCl, Metals, Dioxin/Furan, Ash
1B	April - May 1993 Entech, Inc. Model TOS-80 Emissions Monitoring in Anchorage, Alaska. June 1993. For: NATCHIQ, Anchorage, Alaska	John Nordin, Steve Lindblom	Burn 2: 4/22/1993, 16.5 yd3 MSW, 4 yd3 tires, oil waste	CO2, NOx, FH PM, BH PM, HCl, Metals, Dioxin/Furan, Ash
1C	April - May 1993 Entech, Inc. Model TOS-80 Emissions Monitoring in Anchorage, Alaska. June 1993. For: NATCHIQ, Anchorage, Alaska	John Nordin, Steve Lindblom	Burn 4: 4/26/1993, 23 Auto Tires, 2 truck tires, whole	CO2, NOx, FH PM, BH PM, HCl, Metals, Dioxin/Furan, Ash
1D	April - May 1993 Entech, Inc. Model TOS-80 Emissions Monitoring in Anchorage, Alaska. June 1993. For: NATCHIQ, Anchorage, Alaska	John Nordin, Steve Lindblom	Burn 5: 4/28/1993, 18 yd3 MSW, 200 lb wooden pallets	CO2, NOx, FH PM, BH PM, HCl, Metals, Dioxin/Furan, Ash
2	December 1990 Municipal Solid Waste Burn Test in an Entech Thermal Oxidation Demonstation Plant at Western Research Institute. February 1991, revised April 1991. For: Entech, Inc., Anchorage, Alaska	John Nordin, George Huntington	December 3 Burn	CO2, NOx, FH PM, BH PM, HCl, Metals, Dioxin/Furan, SO2, CO, Ash
3	December 1990 Tire Burn Test in an Entech Thermal Oxidation Demonstation Plant at Western Research Institute. February 1991. For: Entech, Inc., Anchorage, Alaska	John Nordin, George Huntington	December 5 and December 7 Burns	CO2, NOx, FH PM, BH PM, HCl, Metals, SO2, CO, Ash
4	September 1991 Tire Burn Test in an Entech Thermal Oxidation Demonstration Plant at Western Research Institute. January 1992. For: Entech, Inc., Anchorage, Alaska.	John Nordin	September 17 Burn	CO2, NOx, SO2, CO

Important Notes:

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average

If all samples are non-detect (less than), average will be zero.

All data available in the source tests listed above was used to develop the emissions factors.

Dynamis Energy, LLC
Ada County WTE Facility

Conversion Factor Calculations

Volume conversion =	35.31	cu ft/cu m
Mass conversion =	1000000	ug/g
Mass conversion =	454	g/lb
Mass conversion =	2000	lb/ton
Time conversion =	60	min/hr
F-Factor =	9570	dscf/10^6 Btu
MSW Heating Value =	7000	Btu/lb

Metals/Organics Conversion Factor

1.25365E-05 1 µg/dscm (at 7% O2)*[(21-0)/(21-7)]*(m3/35.31 ft3)*[g/(106 µg)]*(lb/454 g)*(9570 dscf/106 Btu)*(7000 Btu/lb)*(2000 lb/ton)

PM Conversion Factor

1.25E-02 1 mg/dscm (at 7% O2)*[(21-0)/(21-7)]*(m3/35.31 ft3)*(g/103 mg)*(lb/454 g)*(9570 dscf/106 Btu)*(7000 Btu/lb)*(2000 lb/ton)

HCl Conversion Factor

1.91E-02

$$\frac{1 \text{ ppmv HCl (at 7\% } O_2) \times 36.5 \text{ lb/lb-mole}}{385 \text{ ft}^3\text{/lb-mole} \times 10^6} * [(21-0)/(21-7)] * (9570 \text{ dscf}/10^6 \text{ Btu}) * (4500 \text{ Btu/lb}) * (2000 \text{ lb/ton})$$

SO2 Conversion Factor

3.34E-02

$$\frac{1 \text{ ppmv } SO_2 \text{ (at 7\% } O_2) * 64 \text{ lb/lb-mole}}{385 \text{ ft}^3\text{/lb-mole} \times 10^6} * [(21-0)/(21-7)] * (9570 \text{ dscf}/10^6 \text{ Btu}) * (4500 \text{ Btu/lb}) * (2000 \text{ lb/ton})$$

NOx Conversion Factor

2.40E-02

$$\frac{1 \text{ ppmv } NO_2 \text{ (at 7\% } O_2) * 46 \text{ lb/lb-mole}}{385 \text{ ft}^3\text{/lb-mole} \times 10^6} * [(21-0)/(21-7)] * (9570 \text{ dscf}/10^6 \text{ Btu}) * (4500 \text{ Btu/lb}) * (2000 \text{ lb/ton})$$

CO Conversion Factor

1.46E-02

$$\frac{1 \text{ ppmv CO (at 7\% } O_2) * 28 \text{ lb/lb-mole}}{385 \text{ ft}^3\text{/lb-mole} \times 10^6} * [(21-0)/(21-7)] * (9570 \text{ dscf}/10^6 \text{ Btu}) * (4500 \text{ Btu/lb}) * (2000 \text{ lb/ton})$$

Source Test Result Summary

Test	Summary								
	NOx (ppm)	FH PM (mg/m^3)	BH PM (mg/m^3)	Total PM (mg/m^3)	HCl (ppm)	Dioxins/Furans-TEQ (ng/m^3)	SO2 (ppmv)	CO (ppmv)	CO2 (%)
Test 1A,1B, 1D: April-May 1993 Entech Model TOS-80	82	31	16	46	44	1.72E-02	n/a	n/a	10
Test 1C: April-May 1993 Entech Model TOS-81	100	52	33	85	41	3.03E-02	n/a	n/a	10
Test 2: December 1990 MSW Burn Test	33	1.5	<1.157	3	17	n/a	2.6	7.8	6.8
Test 3: December 1990 Tire Burn Test	70	19	9.9	29	7.8	n/a	138	103	11
Test 4: September 1991 Tire Burn Test	105	n/a	n/a	n/a	n/a	n/a	19	22	8.6
MSW Average	*58*	*16*	*16*	*24*	*31*	*1.72E-02*	*3*	*8*	*8*
Tires Average	*92*	*35*	*21*	*57*	*25*	*3.03E-02*	*78*	*63*	*10*
Average	***78***	***26***	***15***	***41***	***28***	***2.38E-02***	***53***	***44***	***9.1***

Metals	Test 1A,1B,1D: April-May 1993 Entech Model TOS-80 MSW (mg/m^3)	Test 1C: April-May 1993 Entech Model TOS-80 Tires (mg/m3)	Test 2: December 1990 MSW Burn Test (mg/m^3)	Test 3: December 1990 Tire Burn Test (mg/m^3)	MSW Average (mg/m3)	Tires Average (mg/m3)	Average (mg/m^3)
Ag	no data	no data	<0.0003	0.000	0.000	0.000	0
Al	no data	no data	0.064	0.031	0.064	0.031	0.048
As	ND	<0.04	<0.004	0	0.000	0.000	0.000
B	no data	no data	0.012	0.015	0.012	0.015	0.014
Ba	no data	no data	0.0015	0.001	0.002	0.001	0.001
Be	ND	<0.0007	<0.00008	0	0.000	0.000	0.000
Bi	no data	no data	<0.004	0.010	0.000	0.010	0.007
Ca	no data	no data	0.31	0.128	0.310	0.128	0.219
Cd	0.058	0.004	0.0059	0.004	0.032	0.004	0.018
Co	no data	no data	<0.0003	0.001	0.000	0.001	0.002
Cr	0.056	0.036	0.0003	0.003	0.028	0.020	0.024
Cu	no data	no data	0.002	0.007	0.002	0.007	0.004
Fe	no data	no data	0.037	0.043	0.037	0.043	0.040
K	no data	no data	<2	0	0.000	0.000	0.000
Li	no data	no data	0.0007	0.001	0.001	0.001	0.001
Mg	no data	no data	0.029	0.056	0.029	0.056	0.042
Mn	0.023	0.206	0.001	0.030	0.012	0.118	0.065
Mo	no data	no data	0.005	0.021	0.005	0.021	0.013
Na	no data	no data	0.25	0.418	0.250	0.418	0.334
Ni	0.157	0.600	<0.0008	0.033	0.079	0.317	0.200
P	no data	no data	<0.04	0	0.000	0.000	0.000
Pb	0.374	0.014	0.04	0.072	0.207	0.043	0.125
Sb	ND	<0.04	<0.004	0.01	0.000	0.025	0.018
Se	no data	no data	<0.004	0.003	0.000	0.003	0.004
Sr	no data	no data	0.001	0.001	0.001	0.001	0.001
Th	no data	no data	<0.002	0	0.000	0.000	0.000
V	no data	no data	<0.0003	0	0.000	0.000	0.000
Zn	0.885	0.252	0.11	1.27	0.498	0.763	0.630
Hg*	0.092	<0.001	no data	no data	0.092	0.000	0.047

Hg - reduced from information (various literature sources) regarding the reduction in incoming waste stream/untreated flue gas mercury content.
Conservatively estimate a 66% reduction in mercury content of incoming waste, therefore reduce source test average concentration by 66%.

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Emission Factor Calculation

Pollutant	MSW Test Average	Tire Test Average	AP-42 Conversion Factor	Peak lb/ton Emission Factor	Off-Peak lb/ton Emission Factor
PM (mg/m^3)	24	57	1.25E-02	3.06E-01	3.79E-01
NOx (ppm)	58	92	2.40E-02	1.39E+00	1.53E+00
SO2 (ppm)	3	78	3.34E-02	8.70E-02	5.43E-01
CO (ppm)	8	63	1.46E-02	1.14E-01	2.58E-01
HCl (ppm)	31	25	1.91E-02	5.87E-01	5.66E-01
CDD/CDF (ug/m^3)	1.72E-05	3.03E-05	1.25E-05	2.16E-10	2.45E-10
CO2 (ppm)	8	10		0.00E+00	0.00E+00
Metals (ug/m^3):					
Ag	0	0	1.25E-05	0.00E+00	0.00E+00
Al	64	31.33333333	1.25E-05	8.02E-04	7.29E-04
As	0	0	1.25E-05	0.00E+00	0.00E+00
B	12	15.33333333	1.25E-05	1.50E-04	1.58E-04
Ba	1.5	1	1.25E-05	1.88E-05	1.77E-05
Be	0	0	1.25E-05	0.00E+00	0.00E+00
Bi	0	10.33333333	1.25E-05	0.00E+00	2.33E-05
Ca	310	128	1.25E-05	3.89E-03	3.48E-03
Cd	32.03333333	3.683333333	1.25E-05	4.02E-04	3.38E-04
Co	0	0.6	1.25E-05	0.00E+00	1.35E-06
Cr	28.15	19.71666667	1.25E-05	3.53E-04	3.34E-04
Cu	2	6.8	1.25E-05	2.51E-05	3.59E-05
Fe	37	43.13333333	1.25E-05	4.64E-04	4.78E-04
K	0	0	1.25E-05	0.00E+00	0.00E+00
Li	0.7	1.133333333	1.25E-05	8.78E-06	9.75E-06
Mg	29	55.66666667	1.25E-05	3.64E-04	4.24E-04
Mn	12.16666667	118	1.25E-05	1.53E-04	3.91E-04
Mo	5	21.33333333	1.25E-05	6.27E-05	9.95E-05
Na	250	418.3333333	1.25E-05	3.13E-03	3.51E-03
Ni	79.06666667	316.5	1.25E-05	9.91E-04	1.53E-03
P	0	0	1.25E-05	0.00E+00	0.00E+00
Pb	207	43	1.25E-05	2.60E-03	2.22E-03
Sb	0	25	1.25E-05	0.00E+00	5.64E-05
Se	0	3	1.25E-05	0.00E+00	6.77E-06
Sr	1	0.666666667	1.25E-05	1.25E-05	1.18E-05
Th	0	0	1.25E-05	0.00E+00	0.00E+00
V	0	0	1.25E-05	0.00E+00	0.00E+00
Zn	497.5	763.1666667	1.25E-05	6.24E-03	6.84E-03
Hg	92.33333333	0	1.25E-05	1.16E-03	9.49E-04

AP-42 conversion factor calculated from formual in Chapter 2 background document.

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Ash Analysis

Constituent	Test 1A, 1B, 1D: April-May 1993 Entech Model TOS-80 (mg/kg)	Test 1C: April-May 1993 Entech Model TOS-80 (mg/kg)	Test 2: December 1990 MSW Burn Test (mg/kg)	Test 3: December 1990 Tire Burn Test (mg/kg)	MSW Average (mg/kg)	Tires Average (mg/kg)
Ag	0.15	0.84	<7	0	3.57	0.42
Al	no data	no data	86000	37250	86000.00	37250.00
As	ND	ND	<100	0.0000	ND	0.00
B	no data	no data	450	160.5	450.00	160.50
Ba	4.93	1.58	890	189.5	447.46	95.54
Be	no data	no data	<2	0.000	ND	ND
Bi	no data	no data	<100	0.000	ND	ND
Ca	no data	no data	79000	20425	79000.00	20425.00
Cd	3.04	7.40	<10	13.725	6.52	10.56
Co	no data	no data	12	1780	12.00	1780.00
Cr	no data	ND	130	33	130.00	33.00
Cu	no data	no data	330	149	330.00	149.00
Fe	no data	no data	24000	7325	24000.00	7325.00
Hg	ND	ND	na	0	ND	ND
K	no data	no data	<49,000	0	ND	ND
Li	no data	no data	39	61	39.00	61.00
Mg	no data	no data	7700	4850	7700.00	4850.00
Mn	no data	no data	1000	115	1000.00	115.00
Mo	no data	no data	<10	17.05	ND	17.05
Na	no data	no data	2800	5725	2800.00	5725.00
Ni	no data	no data	29	46.5	29.00	46.50
p	no data	no data	1100	2300	1100.00	2300.00
Pb	64.26	26.60	490	475	277.13	250.80
Sb	no data	no data	<100	0	ND	ND
Se	ND	ND	<100	0	ND	ND
Sr	no data	no data	210	91.25	210.00	91.25
Th	no data	no data	<50	0	ND	ND
V	no data	no data	36	41.75	36.00	41.75
Zn	no data	no data	3100	287500	3100.00	287500.00

AP-42 conversion factor calculated from formual in Chapter 2 background document.

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Organics

Pollutant (ug/m3)	MSW Test Average	Tire Test Average	AP-42 Conversion Factor	Peak lb/ton Emission Factor	Off-peak lb/ton Emission Factor
Phenol	11.53	3.00	1.25E-05	1.45E-04	1.25E-04
bis(2-Chlorethyl)ether	ND	ND	1.25E-05	ND	ND
2-Chlorophenol	ND	ND	1.25E-05	ND	ND
1,3-Dichlorobenzene	ND	ND	1.25E-05	ND	ND
1,4-Dichlorobenzene	3.04	3.10	1.25E-05	3.82E-05	3.83E-05
1,2-Dichlorobenzene	ND	ND	1.25E-05	ND	ND
Benzyl alcohol	ND	ND	1.25E-05	ND	ND
2,2'-oxybis (1-Chloropropane)	ND	ND	1.25E-05	ND	ND
2-Methylphenol	5.99	4.01	1.25E-05	7.51E-05	7.06E-05
3/4-Methylphenol	8.89	3.78	1.25E-05	1.11E-04	9.99E-05
N-Nitroso-di-n-propylamine	ND	ND	1.25E-05	ND	ND
Hexachloroethane	ND	ND	1.25E-05	ND	ND
Nitrobenzene	3.22	2.96	1.25E-05	4.03E-05	3.98E-05
Isophorone	ND	ND	1.25E-05	ND	ND
2-Nitrophenol	ND	ND	1.25E-05	ND	ND
2,4-Dimethylphenol	ND	ND	1.25E-05	ND	ND
bis(2-Chlorethoxy)methane	ND	ND	1.25E-05	ND	ND
Benzoic acid	201.36	8.14	1.25E-05	2.52E-03	2.09E-03
2,4-Dichlorophenol	ND	ND	1.25E-05	ND	ND
1,2,4-Trichlorobenzene	ND	ND	1.25E-05	ND	ND
Naphthalene	9.64	2.39	1.25E-05	1.21E-04	1.05E-04
4-Chloroaniline	ND	ND	1.25E-05	ND	ND
Hexachlorobutadiene	ND	ND	1.25E-05	ND	ND
4-Chloro-3-methylphenol	ND	ND	1.25E-05	ND	ND
2-Methylnaphthalene	4.93	1.97	1.25E-05	6.18E-05	5.51E-05
Hexachlorocyclopentadiene	ND	ND	1.25E-05	ND	ND
2,4,6-Trichlorophenol	ND	ND	1.25E-05	ND	ND
2,4,5-Trichlorophenol	ND	ND	1.25E-05	ND	ND
2-Chloronaphthalene	1.92	1.38	1.25E-05	2.40E-05	2.28E-05
2-Nitroanaline	ND	ND	1.25E-05	ND	ND
Dimethylphthalate	3.36	1.94	1.25E-05	4.22E-05	3.90E-05
2,6-Dinitrotoluene	ND	ND	1.25E-05	ND	ND
2,4-Dinitrotoluene	ND	ND	1.25E-05	ND	ND
Acenaphthalene	1.56	1.31	1.25E-05	1.96E-05	1.90E-05
3-Nitroanaline	ND	ND	1.25E-05	ND	ND
Acenaphthene	2.29	2.18	1.25E-05	2.88E-05	2.85E-05
2,4-Dinitrophenol	ND	ND	1.25E-05	ND	ND
4-Nitrophenol	ND	ND	1.25E-05	ND	ND
Dibenzofuran	1.92	1.50	1.25E-05	2.40E-05	2.31E-05
Diethylphthalate	4.91	1.76	1.25E-05	6.16E-05	5.45E-05
4-Chlorophenyl-phenylether	ND	ND	1.25E-05	ND	ND
Fluorene	2.10	1.87	1.25E-05	2.63E-05	2.58E-05
4-Nitroaniline	ND	ND	1.25E-05	ND	ND
4,6-Dinitro-2-methylphenol	ND	ND	1.25E-05	ND	ND
N-Nitrosodiphenylamine	ND	ND	1.25E-05	ND	ND
4-Bromophenyl-phenylether	ND	ND	1.25E-05	ND	ND
Hexachlorobenzene	ND	ND	1.25E-05	ND	ND
Pentachlorophenol	ND	ND	1.25E-05	ND	ND
Phenanthrene	5.00	1.31	1.25E-05	6.27E-05	5.44E-05
Anthracene	1.45	1.36	1.25E-05	1.82E-05	1.80E-05
Di-n-butylphthalate	8.63	12.04	1.25E-05	1.08E-04	1.16E-04
Fluoranthene	1.66	0.88	1.25E-05	2.08E-05	1.90E-05
Pyrene	1.22	0.68	1.25E-05	1.53E-05	1.41E-05
Butylbenzylphthalate	ND	ND	1.25E-05	ND	ND
3,3'-Dichlorobenzidine	ND	ND	1.25E-05	ND	ND
bis(2-Ethylhexyl)phthalate	2.60	0.93	1.25E-05	3.26E-05	2.89E-05
Benzo(a)anthracene	ND	ND	1.25E-05	ND	ND
Chrysene	1.57	0.88	1.25E-05	1.97E-05	1.82E-05
Di-n-octylphthalate	ND	ND	1.25E-05	ND	ND
Benzo(b)fluoranthene	ND	ND	1.25E-05	ND	ND
Benzo(k)fluoranthene	ND	ND	1.25E-05	ND	ND
Benzo(a)pyrene	ND	ND	1.25E-05	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	1.25E-05	ND	ND
Dibenz(a,h)anthracene	ND	ND	1.25E-05	ND	ND
Benzo(g,h,i)perylene	ND	ND	1.25E-05	ND	ND
PCB	0.02	0.01	1.25E-05	2.56E-07	2.39E-07

AP-42 conversion factor calculated from formual in Chapter 2 background document.

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the ave
If all samples are non-detect (less than), average will be zero.

Front Half Particulate

Test 1A-1C: April-May 1993 Entech Model TOS-80

Table 5. Front Half Particulates Corrected to 7% O2 Basis

Burn	Sample	% O2	Part. @ 7% O2 (gr/dscf)	Part. @ 7% O2 (mg/m^3)
1	A	8.8	0.57	1310
	B	8.8	<0.001	<2
	C	12	0.028	63
2	A	3	0.018	41
	B	4	0.009	20
	C	8.9	0.005	10.5
4	A	5.1	0.012	26.7
	B	7.4	0.019	42.4
	C	13	0.038	86.9
5	A	9.7	0.032	73.7
	B	6.3	0.007	15.1
	C	8.3	0.013	20.2
MSW Average =				30.6875
Tire Average =				52
Average=				36.6

*Do not use Burn 1, Sample A (shaded gray cells). Operator was experimenting with operating parameters during test, not typical operation of unit.

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 5. Particulate Emissions from Secondary Combustion Unit, December 3, 1990

Fronthalf particulates; mg/m3	3-Dec
As collected	1.12
7% O2 basis	1.46
Backhalf particulates; mg/m3	
As collected	<0.926
7% O2 basis	<1.157

Test 3: December 1990 Tire Burn Test

Table 5. Particulate Emissions from Secondary Combustion Unit, December 3, 1990

Date	5-Dec	7-Dec	7-Dec	Average
Fronthalf particulates; mg/m3				
As collected	19.11	74.97	19.16	
7% O2 basis	18.07	76.36	19.67	18.87
Backhalf particulates; mg/m3				
As collected	<0.69	18.74	18.74	
7% O2 basis	<0.69	19.21	19.21	9.95

*December 7 first sample - do not use (shaded gray cells). Upset conditions caused considerable soot on the filter.

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average

If all samples are non-detect (less than), average will be zero.

Back Half Particulate

Test 1A-1C: April-May 1993 Entech Model TOS-80

Table 6. Back Half Particulates Corrected to 7% O2

Burn	Sample	% O2	Part. @ 7% O2 (gr/dscf)	Part. @ 7% O2 (mg/m^3)
1	A	8.8	0.042	96.8
	B	8.8	0.0057	13.1
	C	12	0.015	34.1
2	A	3	0.0005	1.2
	B	4	0.002	5.3
	C	8.9	0.007	16.6
4	A	5.1	0.003	7.4
	B	7.4	0.016	35.6
	C	13	0.024	55.6
5	A	9.7	0.009	21.1
	B	6.3	0.005	11.3
	C	8.3	0.009	21.4
MSW Average =				15.5
Tire Average =				32.9
Average				21.1

*Do not use Burn 1, Sample A (shown in shaded gray cells). Operator was

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 5. Particulate Emissions from Secondary Combustion Unit, December 3, 1990

Fronthalf particulates; mg/m3	3-Dec
As collected	1.12
7% O2 basis	1.46
Backhalf particulates; mg/m3	
As collected	<0.926
7% O2 basis	<1.157

Test 3: December 1990 Tire Burn Test

Table 5. Particulate Emissions from Secondary Combustion Unit, December 3, 1990

	5-Dec	7-Dec	7-Dec	Average
Fronthalf particulates; mg/m3				
As collected	19.11	74.97	19.16	
7% O2 basis	18.07	76.36	19.67	18.87
Backhalf particulates; mg/m3				
As collected	<0.69	18.74	18.74	
7% O2 basis	<0.69	19.21	19.21	9.95

*December 7 first sample - do not use (shaded gray cells). Upset conditions caused considerable soot on the filter.

SO2

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 3. Secondary Combustion Emissions, December 3 Burn

Time	%O2	ppm SO2	SO2 (ppm) corrected to 7% O2
8:35	10.3	<2	2.62
8:55	no reading	no reading	no reading
9:22	10.2	<2	2.60
9:50	11.7	<2	3.02
10:15	7.6	<2	2.09
10:45	7.8	<2	2.12
11:15	2.9	<2	1.54
11:40	5.4	<2	1.79
12:15	6.4	<2	1.92
12:40	6.8	<2	1.97
13:20	8.1	<2	2.17
13:40	7.6	<2	2.09
14:15	10.4	<2	2.65
14:40	9.9	<2	2.53
15:00	10.8	<2	2.75
15:20	11.6	<2	2.99
15:40	13.9	no reading	3.97
16:00	no reading	no reading	no reading
16:15	15.8	<2	5.45
Average			2.60

Test 3: December 1990 Tire Burn Test

Table 3. Secondary Combustion Chamber Sulfur Dioxide Emissions

Date	Average SO2 (ppm)
5-Dec	199
7-Dec	76
Average	137.5

Test 4: September 1991 Tire Burn Test

Table 2. Secondary Combustion Chamber Emissions

Time	%O2	ppm SO2	SO2 (ppm) corrected to 7% O2
9:55	3.7	15	12.1
10:25	4.3	22	18.4
10:55	4.2	15	12.5
11:25	4.9	25	21.7
11:55	4.5	37	31.4
12:25	5.6	13	11.8
13:20	3.8	30	24.4
13:50	9.7	18	22.3
14:20	10.4	Not taken	Not taken
14:20	Shutdown		
Average			19.3

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

NOx

Test 1A-1C: April-May 1993 Entech Model TOS-80

Table 4. Enerac 2000 NOx Readings

Burn	Time	NOx (ppm)
1	12:06	105
2	7:19	71
	7:55	138
	8:43	177
	9:14	109
	10:48	60
	11:35	47
	12:04	30
	14:43	53
	15:24	57
	16:30	60
4	7:17	71
	8:17	87
	8:20	89
	8:45	141
	9:40	161
	9:47	171
	10:00	67
	15:16	15
5	No measurements taken	
MSW Average =		82.45454545
Tire Average =		100.25
Average =		89.9

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 3. Secondary Combustion Emissions, December 3 Burn

Time	%O2	NOx (ppm)	NOx (ppm) correct to 7% O2
8:35	10.3	11	14.4
8:55	no reading	no reading	---
9:22	10.2	19	24.7
9:50	11.7	30	45.3
10:15	7.6	45	47.0
10:45	7.8	40	42.4
11:15	2.9	76	58.7
11:40	5.4	33	29.6
12:15	6.4	31	29.7
12:40	6.8	22	21.7
13:20	8.1	19	20.6
13:40	7.6	19	19.9
14:15	10.4	22	29.1
14:40	9.9	25	31.6
15:00	10.8	22	30.3
15:20	11.6	19	28.4
15:40	13.9	19	37.7
16:00	no reading	no reading	---
16:15	15.8	19	51.8
Average =			33.1

Test 3: December 1990 Tire Burn Test

Table 2. Secondary Combustion Emissions, December 5 Burn

Time	%O2	NOx (ppm)	NOx (ppm) correct to 7% O2
11:55	8.6	21	23.7
12:12	7	42	42.0
12:50	11.3	71	102.8
13:05	7.6	130	135.9
13:15	2.5	191	144.3
13:18	1.5	no data	---
0:13	0.7	no data	---
13:57	2.3	no data	---
14:08	5.5	145	130.9
14:11	no data	no data	---
14:20	9.7	112	139.0
14:55	2.8	59	45.3
15:35	6.1	30	28.2
15:55	9.3	20	24.0
16:20	no data	no data	---
16:45	11.5	22	32.5
17:00	11.4	22	32.2
17:15	10.9	22	30.6
Average=			70.1

Test 4: September 1991 Tire Burn Test

Table 2. Secondary Combustion Chamber Emissions

Time	%O2	NOx (ppm)	NOx (ppm) correct to 7% O2
9:55	3.7	140	113
10:25	4.3	172	144
10:55	4.2	172	143
11:25	4.9	130	113
11:55	4.5	126	107
12:25	5.6	95	86
13:20	3.8	107	87
13:50	9.7	65	81
14:20	10.4	53	70
14:20	Shutdown		
Average=			105

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

CO

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 3. Secondary Combustion Emissions, December 3 Burn

Time	%O2	ppm CO	CO (ppm) corrected to 7% O2
8:35	10.3	5	6.6
8:55	no reading	no reading	no reading
9:22	10.2	13	16.9
9:50	11.7	3	4.5
10:15	7.6	3	3.1
10:45	7.8	5	5.3
11:15	2.9	65	50.2
11:40	5.4	3	2.7
12:15	6.4	13	12.5
12:40	6.8	<2	2.0
13:20	8.1	<2	2.2
13:40	7.6	<2	2.1
14:15	10.4	<2	2.6
14:40	9.9	3	3.8
15:00	10.8	<2	2.8
15:20	11.6	<2	3.0
15:40	13.9	<2	4.0
16:00	no reading	no reading	no reading
16:15	15.8	3	8.2
Average			7.8

Test 3: December 1990 Tire Burn Test

Table 2. Secondary Combustion Emissions, December 5 Burn

Time	%O2	ppm CO	CO (ppm) corrected to 7% O2
11:55	8.6	8	9.0
12:12	7	3	3.0
12:50	11.3	33	47.8
13:05	7.6	10	10.5
13:15	2.5	47	35.5
13:18	1.5	220	158
0:13	0.7	200	138
13:57	2.3	1500	1121
14:08	5.5	35	31.6
14:11	no data	47	no data
14:20	9.7	45	55.8
14:55	2.8	28	21.5
15:35	6.1	13	12.2
15:55	9.3	<2	2.4
16:20	no data	no data	no data
16:45	11.5	<2	3.0
17:00	11.4	<2	2.9
17:15	10.9	<2	2.8
Average			103.4

Test 4: September 1991 Tire Burn Test

Table 2. Secondary Combustion Chamber Emissions

Time	%O2	ppm CO	CO (ppm) corrected to 7% O2
9:55	3.7	39	31.5
10:25	4.3	30	25.1
10:55	4.2	28	23.3
11:25	4.9	20	17.4
11:55	4.5	23	19.5
12:25	5.6	21	19.1
13:20	3.8	21	17.1
13:50	9.7	18	22.3
14:20	10.4	16	21.2
14:20	Shutdown		
Average			21.8

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

CO2

Test 1A-1C: April-May 1993 Entech Model TOS-80

Volume 2- Table A2

Burn	Sample	% CO2
1	A	9.5
	B	9.5
	C	6.3
	organics	9.5
	metals	9.5
2	A	13.2
	B	12.6
	C	10.4
	organics	12.4
	metals	10.4
4	A	12.7
	B	10.9
	C	6
	organics	10.9
	metals	8
5	A	8.2
	B	10.8
	C	9
	organics	8.9
	metals	9.3
MSW Average		9.9666667
Tires Average		9.7
Average		9.9

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 3 - December 3 Burn NOx and SO2 measurement

Time	%CO2
8:35	6.1
9:22	6.4
9:50	5.6
10:15	7.6
10:45	7.5
11:15	10.1
11:40	8.6
12:15	8.2
12:40	8.1
13:20	7.3
13:40	7.5
14:15	5.8
14:40	6.2
15:00	5.7
15:20	5.3
15:40	4.1
16:15	3.2
Average	6.45

*Upset condition at 11:15, do not use in average (shaded gray cells)

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 5 - Particulate and HCl Measurement

Average CO2%	6.08

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 7 - Dioxin/Furan Measurement

Average CO2%	7.9

Test 3: December 1990 Tire Burn Test

Table 2 - December 5 Burn CO and NOx measurement

Time	% CO2
11:55	9.3
12:12	10.5
12:50	7
13:05	10.1
13:15	14.1
14:08	11.6
14:20	8.5
14:55	13.5
15:35	11.1
15:55	8.7
16:45	7.1
17:00	7.1
17:15	7.5
Average	9.7

Test 3: December 1990 Tire Burn Test

Table 8 - Particulate and HCL Measurement

5-Dec Avg CO2%	11.2
7-Dec Avg CO2%	10.9

Test 4: September 1991 Tire Burn Test

Table 2 - Secondary Chamber Emissions

Time	%CO2
9:55	9.8
10:25	9.4
10:55	9.5
11:25	9.3
11:55	9.2
12:25	8.7
13:20	9.5
13:50	6.4
14:20	5.9
Average	8.6

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Metals

Test 1A-1C: April-May 1993 Entech Model TOS-80

Table 9. Metal Emissions Corrected to a 7% Oxygen Basis, mg/m^3

Burn	1	2	4	5	MSW Average	Tire Average	Average
% O2	8.7	6.8	10.3	7.8	7.766667	10.3	8.40
As	<0.3	<0.25	<0.04	<0.3	ND	<0.04	0.00
Be	<0.0006	<0.0005	<0.0007	<0.0005	ND	<0.0007	0.00
Cd	0.0025	0.15	0.0037	0.022	0.058167	0.0037	0.05
Cr	<0.001	0.046	0.036	0.121	0.056	0.036	0.03
Hg	0.014	0.132	<0.001	0.131	0.092333	<0.001	0.05
Mn	<0.01	0.016	0.206	0.044	0.023333	0.206	0.08
Ni	0.014	0.068	0.6	0.39	0.157333	0.6	0.23
Pb	0.042	0.922	0.014	0.158	0.374	0.014	0.33
Sb	<0.02	<0.02	<0.04	<0.03	ND	<0.04	0.00
Tl	<0.01	<0.01	<0.02	<0.02	ND	<0.02	0.00
Zn	1	0.7	0.252	0.955	0.885	0.252	0.65

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 6. Fronthalf Particulate Elemental Analysis

Element	Conc. Corrected to 7% O2 Basis (mg/m3)
Ag	<0.0003
Al	0.064
As	<0.004
B	0.012
Ba	0.0015
Be	<0.00008
Bi	<0.004
Ca	0.31
Cd	0.0059
Co	<0.0003
Cr	0.0003
Cu	0.002
Fe	0.037
K	<2
Li	0.0007
Mg	0.029
No	0.001
Mo	0.005
Na	0.25
Ni	<0.0008
P	<0.04
Pb	0.04
Sb	<0.004
Se	<0.004
Sr	0.001
Th	<0.002
V	<0.0003
Zn	0.11

Test 3: December 1990 Tire Burn Test

Table 9. Fronthalf Particulate Elemental Analysis, December 5 Burn

Element	Conc. Corrected to 7% O2 Basis (mg/m3)
Ag	<0.0002
Al	0.04
As	<0.003
B	0.03
Ba	0.001
Be	<0.0001
Bi	<0.003
Ca	0.134
Cd	0.002
Co	0.001
Cr	0.0043
Cu	0.0064
Fe	0.0124
K	<2
Li	0.001
Mg	0.052
Mn	0.03
Mo	0.032
Na	0.355
Ni	0.033
P	<0.003
Pb	0.037
Sb	<0.003
Se	<0.003
Sr	0.0005
Th	<0.002
V	<0.0003
Zn	0.143

Test 3: December 1990 Tire Burn Test

Table 10. Fronthalf Particulate Elemental Analysis, December 7 Burn

Element	Sample 1 Conc. Corrected to 7% O2 Basis (mg/m3)	Sample 2 Conc. Corrected to 7% O2 Basis (mg/m3)	Average of Dec-5 and Dec-7 Burns
Ag	<0.0004	<0.0004	0.000
Al	0.048	0.006	0.031
As	<0.005	<0.005	0.000
B	0.014	0.002	0.015
Ba	0.001	0.001	0.001
Be	no data	no data	0.000
Bi	0.023	<0.005	0.010
Ca	0.18	0.07	0.128
Cd	0.008	0.001	0.004
Co	<0.0004	<0.0004	0.001
Cr	0.003	0.003	0.003
Cu	0.007	0.007	0.007
Fe	0.062	0.055	0.043
K	<3	<3	0.000
Li	0.0014	<0.001	0.001
Mg	0.06	0.055	0.056
Mn	0.03	0.03	0.030
Mo	0.016	0.016	0.021
Na	0.466	0.434	0.418
Ni	no data	no data	0.033
P	<0.06	<0.06	0.000
Pb	0.14	0.039	0.072
Sb	0.024	0.003	0.010
Se	0.003	0.003	0.003
Sr	0.001	<0.0005	0.001
Th	<0.002	<0.002	0.000
V	<0.0005	<0.0005	0.000
Zn	3.05	0.63	1.274

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

HCl

Test 1A-1C: April-May 1993 Entech Model TOS-80

Table 7. Hydrogen Chloride Emissions

Burn	Sample	%O2	ppm HCl, as measured	ppm HCl @ 7% O2
1	A	8.8	50.0	57.4
	B	8.8	61.5	70.6
	C	12	55.3	35.6
2	A	3	101.6	78.6
	B	4	18.3	14.9
	C	8.9	26.8	30.9
4	A	5.1	68.5	60.4
	B	7.4	6.0	6.2
	C	13	12.7	22.2
5	A	9.7	63.5	78.7
	B	6.3	11.4	10.8
	C	8.3	19.5	21.5
MSW Average =				44.3
Tire Average =				41.5
Average				40.7

Test 2: December 1990 Municipal Solid Waste Burn Test

Table 5. HCl Emissions from Secondary Combustion Unit, December 3, 1990

Date	3-Dec
HCl, ppm by volume (dry basis)	17.3

Test 3: December 1990 Tire Burn Test

Table 8. HCl Emissions from Secondary Combustion Unit

Date	5-Dec	7-Dec	7-Dec	Average
HCl, ppm by volume (dry basis)	3.4	10	10	7.8

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Organics (HAP and non-HAP)

Test 1A-1D: April-May 1993 Entech Model TOS-80

Organics, ug				
Burn	**1**	**2**	**4**	**5**
Flow Rate (dscm)	**2.0624**	**1.673**	**1.5147**	**1.293**
Phenol	57.71	3.8	<4.55	<5.6
bis(2-Chlorethyl)ether	<9.32	<5.94	<5.6	<6.89
2-Chlorophenol	<8.89	<5.67	<5.35	<6.57
1,3-Dichlorobenzene	<8.05	<5.14	<4.84	<5.95
1,4-Dichlorobenzene	<7.82	1.46	<4.7	<5.78
1,2-Dichlorobenzene	<8.58	<5.47	<5.16	<6.34
Benzyl alcohol	<14.74	<9.41	<8.86	<10.9
2,2'-oxybis (1-Chloropropane)	<8.13	<5.19	<4.89	<6.01
2-Methylphenol	17.21	<6.44	<6.07	<7.46
3/4-Methylphenol	36.29	<6.07	<5.72	<7.03
N-Nitroso-di-n-propylamine	<11.58	<7.39	<6.96	<8.56
Hexachloroethane	<13.01	<8.30	<7.82	<9.62
Nitrobenzene	4.53	<5.19	<4.48	<5.63
Isophorone	<3.46	<2.77	<2.39	<3.0
2-Nitrophenol	<14.23	<11.41	<9.85	<12.36
2,4-Dimethylphenol	<6.82	<5.47	<4.72	<5.92
bis(2-Chlorethoxy)methane	<6.07	<4.87	<4.2	<5.27
Benzoic acid	816.04	249.62	<12.33	76.55
2,4-Dichlorophenol	<9.13	<7.32	<6.31	<7.93
1,2,4-Trichlorobenzene	<7.48	<6.0	<5.17	<6.49
Naphthalene	32.08	6.26	3.62	12.45
4-Chloroaniline	<5.82	<4.67	<4.03	<5.06
Hexachlorobutadiene	<11.24	<9.02	<7.78	<9.76
4-Chloro-3-methylphenol	<7.78	<6.24	<5.38	<6.75
2-Methylnaphthalene	20.25	<3.46	<2.98	<3.74
Hexachlorocyclopentadiene	<6.87	<10.81	<8.46	<10.34
2,4,6-Trichlorophenol	<7.18	<11.30	<8.84	<10.81
2,4,5-Trichlorophenol	<7.09	<11.16	<8.73	<10.68
2-Chloronaphthalene	<2.7	4	2.09	2.65
2-Nitroanaline	<8.17	<12.86	<10.06	<12.31
Dimethylphthalate	10.44	<3.76	<2.94	<3.6
2,6-Dinitrotoluene	<10.32	<16.25	<12.71	<15.55
2,4-Dinitrotoluene	<7.01	<11.03	<8.63	<10.55
Acenaphthalene	2.64	<2.55	<1.99	<2.44
3-Nitroanaline	<10.64	<16.74	<13.10	<16.02
Acenaphthene	2.55	<4.22	<3.3	<4.04
2,4-Dinitrophenol	<27.47	<43.24	<33.83	<41.38
4-Nitrophenol	<14.85	<23.37	<18.28	<22.36
Dibenzofuran	3.86	<2.90	<2.27	<2.77
Diethylphthalate	14.38	<3.4	<2.66	7.42
4-Chlorophenyl-phenylether	<4.5	<7.09	<5.54	<6.78
Fluorene	3	<3.61	<2.83	<3.46
4-Nitroaniline	<7.16	<11.28	<8.82	<10.79
4,6-Dinitro-2-methylphenol	<6.76	<22.38	<16.13	<20.33
N-Nitrosodiphenylamine	<2.16	<7.15	<5.15	<6.5
4-Bromophenyl-phenylether	<4.36	<14.43	<10.40	<13.11
Hexachlorobenzene	<2.88	<9.54	<6.87	<8.66
Pentachlorophenol	<5.55	<18.38	<13.25	<16.69
Phenanthrene	23.54	<2.76	<1.99	<2.51
Anthracene	1.32	<2.86	<2.06	<2.60
Di-n-butylphthalate	30.77	3.52	18.23	11.48
Fluoranthene	5.31	<1.84	<1.33	<1.67
Pyrene	3.88	<1.26	<1.03	<1.32
Butylbenzylphthalate	<1.19	<2.37	<1.93	<2.49
3,3'-Dichlorobenzidine	<2.38	<4.75	<3.86	<4.98
bis(2-Ethylhexyl)phthalate	11.06	<1.74	<1.41	<1.82
Benzo(a)anthracene	<0.73	<1.46	<1.19	<1.54
Chrysene	4.94	<1.65	<1.34	<1.73
Di-n-octylphthalate	<1.19	<0.97	<0.98	<1.08
Benzo(b)fluoranthene	<1.47	<1.19	<1.21	<1.33
Benzo(k)fluoranthene	<1.48	<1.20	<1.21	<1.33
Benzo(a)pyrene	<1.51	<1.22	<1.24	<1.36
Indeno(1,2,3-cd)pyrene	<1.23	<1.0	<1.01	<1.11
Dibenz(a,h)anthracene	<1.57	<1.27	<1.29	<1.41
Benzo(g,h,i)perylene	<1.42	<1.16	<1.17	<1.28
Total PCB	ND	0.01	0.02	0.045

Test 1A-1C: April-May 1993 Entech Model TOS-80

Organics, ug/dscm						
Burn	**1**	**2**	**4**	**5**	**MSW Average**	**Tires Average**
Flow Rate (dscm)	**2.0624**	**1.673**	**1.5147**	**1.293**		
Phenol	27.98196	2.271369	3.003895	4.331013	11.52811	3.003895
bis(2-Chlorethyl)ether	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2-Chlorophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
1,3-Dichlorobenzene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
1,4-Dichlorobenzene	3.791699	0.872684	3.102925	4.470224	3.044869	3.102925
1,2-Dichlorobenzene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Benzyl alcohol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2,2'-oxybis (1-Chloropropane)	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2-Methylphenol	8.344647	3.849372	4.007394	5.769528	5.987849	4.007394
3/4-Methylphenol	17.596	3.628213	3.776325	5.436968	8.887062	3.776325
N-Nitroso-di-n-propylamine	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Hexachloroethane	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Nitrobenzene	2.19647	3.102212	2.957681	4.354215	3.217632	2.957681
Isophorone	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2-Nitrophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2,4-Dimethylphenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
bis(2-Chlorethoxy)methane	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Benzoic acid	395.6749	149.205	8.140226	59.2034	201.3611	8.140226
2,4-Dichlorophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
1,2,4-Trichlorobenzene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Naphthalene	15.55469	3.741781	2.389912	9.62877	9.641748	2.389912
4-Chloroaniline	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Hexachlorobutadiene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
4-Chloro-3-methylphenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2-Methylnaphthalene	9.818658	2.068141	1.967386	2.892498	4.926432	1.967386
Hexachlorocyclopentadiene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2,4,6-Trichlorophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2,4,5-Trichlorophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2-Chloronaphthalene	1.309154	2.390915	1.379811	2.049497	1.916522	1.379811
2-Nitroanaline	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Dimethylphthalate	5.062064	2.24746	1.940978	2.784223	3.364582	1.940978
2,6-Dinitrotoluene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2,4-Dinitrotoluene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Acenaphthalene	1.280062	1.524208	1.313792	1.887084	1.563785	1.313792
3-Nitroanaline	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Acenaphthene	1.236424	2.522415	2.178649	3.124517	2.294452	2.178649
2,4-Dinitrophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
4-Nitrophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Dibenzofuran	1.871606	1.733413	1.498647	2.142305	1.915775	1.498647
Diethylphthalate	6.972459	2.032277	1.756123	5.738592	4.914443	1.756123
4-Chlorophenyl-phenylether	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Fluorene	1.454616	2.1578	1.868357	2.675947	2.096121	1.868357
4-Nitroaniline	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
4,6-Dinitro-2-methylphenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
N-Nitrosodiphenylamine	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
4-Bromophenyl-phenylether	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Hexachlorobenzene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Pentachlorophenol	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Phenanthrene	11.41389	1.649731	1.313792	1.941222	5.001613	1.313792
Anthracene	0.640031	1.709504	1.360005	2.010828	1.453454	1.360005
Di-n-butylphthalate	14.91951	2.104005	12.03539	8.878577	8.634031	12.03539
Fluoranthene	2.57467	1.099821	0.878062	1.29157	1.655354	0.878062
Pyrene	1.881303	0.753138	0.680003	1.020882	1.218441	0.680003
Butylbenzylphthalate	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
3,3'-Dichlorobenzidine	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
bis(2-Ethylhexyl)phthalate	5.362684	1.040048	0.930877	1.407579	2.603437	0.930877
Benzo(a)anthracene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Chrysene	2.395268	0.986252	0.884664	1.337974	1.573165	0.884664
Di-n-octylphthalate	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Benzo(b)fluoranthene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Benzo(k)fluoranthene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Benzo(a)pyrene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Indeno(1,2,3-cd)pyrene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Dibenz(a,h)anthracene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Benzo(g,h,i)perylene	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Total PCB	ND	0.005977	0.013204	0.034803	0.02039	0.013204

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Hydrogen Fluoride

Dynamis Energy LLC	12/6/2010	**Model 250 TOS**	
Ada County Landfill		Combustion, Particulate Discharge Calculations:	
Waste Reduction & Thermal Recycle		3.0 Standard TOS System	
	Assume the Following		
MSW Receiving Per Day Max	Without Lime Inject.	408	Tons Per Day
Days Per Week		7	Days Receiving
Tons Per Week		2856	Tons Per Week
Hours Per Week of Operation		168	Hours of Operation per Week
Pounds Per Ton		2,000	

Discharge

HF. @	0.005	MG/Nm3	0.0001	0.0000005	PPH / lb
Grains per lb / hr	27.6	0.00018116 PPH / lb		12.510753	PPH
Discharge PPH	0.00227	Lbs / Hour		8760	Hours Yr
Total lbs Year Discharge	19.85	lbs Year discharge			
Total Tons per Year	0.01	Tons per Year Discharge of Particulate			
Emission Factor	1.34E-04	lb/ton			

*Emissions estimates for HF were developed by Roger Kolb, Dynamis. The original source of the data could not be located. However, asuuming emissions of HF from the thermal conversion unit is conservative due to the fact that emissions compiled by EPA and used to develop emissions factors for AP-42 do not consider HF as an emission from MSW starved air combustion.

Dioxin/Furan - MSW

Test 1B-1D: April-May 1993 Entech Model TOS-80											
Table 11. Dioxins/Furans ng/m3, corrected to 7% O2											
Burn	**B**	**C**	**D**	Average		**Compound**	**Concentration**		**Toxicity Equivalency Factor (TEF)**		**Toxicity Equivalent (TEQ)**
Flow rate (m^3)	1.67E+00		1.29E+00	1.48E+00		Units:	ng/m3				ng/m3
% O2	4.40E+00		9.00E+00	6.70E+00							
2,3,7,8-TCDD	*2.02E-03*		*4.52E-03*	0.00E+00		2,3,7,8-TCDD	0.00E+00	X	1	=	0.00E+00
1,2,3,7,8-PeCDD	*2.52E-03*		*9.03E-03*	0.00E+00		1,2,3,7,8-PeCDD	0.00E+00	X	0.5	=	0.00E+00
1,2,3,6,7,8-HxCDD	1.01E-02		1.81E-02	1.41E-02		1,2,3,6,7,8-HxCDD	1.41E-02	X	0.1	=	1.41E-03
1,2,3,4,7,8-HxCDD	*5.04E-03*		*1.36E-02*	0.00E+00		1,2,3,4,7,8-HxCDD	0.00E+00	X	0.1	=	0.00E+00
1,2,3,7,8,9-HxCDD	*2.52E-03*		*9.03E-03*	5.78E-03		1,2,3,7,8,9-HxCDD	5.78E-03	X	0.1	=	5.78E-04
1,2,3,4,6,7,8-HpCDD	1.36E-01		3.79E-01	2.58E-01		1,2,3,4,6,7,8-HpCDD	2.58E-01	X	0.01	=	2.58E-03
OCDD	6.56E-01		1.36E+00	1.01E+00		OCDD	1.01E+00	X	0.001	=	1.01E-03
									CDD Subtotal	=	5.57E-03
2,3,7,8-TCDF	1.01E-02		9.03E-03	9.56E-03		2,3,7,8-TCDF	9.56E-03	X	0.1	=	9.56E-04
1,2,3,7,8-PeCDF	*1.77E-03*		*4.52E-03*	3.14E-03		1,2,3,7,8-PeCDF	3.14E-03	X	0.05	=	1.57E-04
2,3,4,7,8-PeCDF	*1.77E-03*		*4.52E-03*	3.14E-03		2,3,4,7,8-PeCDF	3.14E-03	X	0.5	=	1.57E-03
1,2,3,6,7,8-HxCDF	2.52E-03		*4.52E-03*	3.52E-03		1,2,3,6,7,8-HxCDF	3.52E-03	X	0.1	=	3.52E-04
1,2,3,7,8,9-HxCDF	*2.27E-03*		*9.03E-03*	0.00E+00		1,2,3,7,8,9-HxCDF	0.00E+00	X	0.1	=	0.00E+00
1,2,3,4,7,8-HxCDF	1.01E-02		1.81E-02	1.41E-02		1,2,3,4,7,8-HxCDF	1.41E-02	X	0.1	=	1.41E-03
2,3,4,6,7,8-HxCDF	1.01E-02		*9.03E-03*	9.56E-03		2,3,4,6,7,8-HxCDF	9.56E-03	X	0.1	=	9.56E-04
1,2,3,4,6,7,8-HpCDF	5.04E-02		1.26E-01	8.85E-02		1,2,3,4,6,7,8-HpCDF	8.85E-02	X	0.01	=	8.85E-04
1,2,3,4,7,8,9-HpCDF	5.04E-03		*9.03E-03*	7.04E-03		1,2,3,4,7,8,9-HpCDF	7.04E-03	X	0.01	=	7.04E-05
OCDF	1.31E-01		3.79E-01	2.55E-01		OCDF	2.55E-01	X	0.001	=	2.55E-04
									CDF Subtotal	=	6.61E-03
									Total	=	1.22E-02

	Typical Reformation Rate (ng/g/min)	Fly Ash Mass in Flue gas (g/min)	Time in Reformation temp. Region (min)	Min. Flow Rate through Reformation Region (m^3/min)		Estimated TM-17 reformed concentration	Conversion ratio				Toxicity Equivalent (TEQ)-ng/m3
De Novo Synthesis (Reformation)-w/150 ug/m^3 chlorophenol precursor	3300	52.92	0.02162162	5.47E+03		0.690926535	1.38E+02				5.02E-03
TM-17 + De Novo Synthesis						6.91E-01					**1.72E-02**

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Dioxin/Furan - Tires

Test 1B-1D: April-May 1993 Entech Model TOS-80											
Table 11. Dioxins/Furans ng/m3, corrected to 7% O2											
Burn	**B**	**C**	**D**	Average		**Compound**	**Concentration**		**Toxicity Equivalency Factor (TEF)**		**Toxicity Equivalent (TEQ)**
Flow rate (m^3)		1.51E+00		1.51E+00		Units:	ng/m3				ng/m3
% O2		7.30E+00		7.30E+00							
2,3,7,8-TCDD		*1.35E-03*		0.00E+00		2,3,7,8-TCDD	0.00E+00	X	1	=	0.00E+00
1,2,3,7,8-PeCDD		*2.02E-03*		0.00E+00		1,2,3,7,8-PeCDD	0.00E+00	X	0.5	=	0.00E+00
1,2,3,6,7,8-HxCDD		6.75E-03		6.75E-03		1,2,3,6,7,8-HxCDD	6.75E-03	X	0.1	=	6.75E-04
1,2,3,4,7,8-HxCDD		*2.36E-03*		0.00E+00		1,2,3,4,7,8-HxCDD	0.00E+00	X	0.1	=	0.00E+00
1,2,3,7,8,9-HxCDD		6.75E-03		6.75E-03		1,2,3,7,8,9-HxCDD	6.75E-03	X	0.1	=	6.75E-04
1,2,3,4,6,7,8-HpCDD		1.48E-01		1.48E-01		1,2,3,4,6,7,8-HpCDD	1.48E-01	X	0.01	=	1.48E-03
OCDD		8.77E-01		8.77E-01		OCDD	8.77E-01	X	0.001	=	8.77E-04
									CDD Subtotal	=	3.71E-03
2,3,7,8-TCDF		4.05E-02		4.05E-02		2,3,7,8-TCDF	4.05E-02	X	0.1	=	4.05E-03
1,2,3,7,8-PeCDF		5.40E-03		5.40E-03		1,2,3,7,8-PeCDF	5.40E-03	X	0.05	=	2.70E-04
2,3,4,7,8-PeCDF		1.35E-02		1.35E-02		2,3,4,7,8-PeCDF	1.35E-02	X	0.5	=	6.75E-03
1,2,3,6,7,8-HxCDF		4.05E-03		4.05E-03		1,2,3,6,7,8-HxCDF	4.05E-03	X	0.1	=	4.05E-04
1,2,3,7,8,9-HxCDF		*1.69E-03*		0.00E+00		1,2,3,7,8,9-HxCDF	0.00E+00	X	0.1	=	0.00E+00
1,2,3,4,7,8-HxCDF		2.02E-02		2.02E-02		1,2,3,4,7,8-HxCDF	2.02E-02	X	0.1	=	2.02E-03
2,3,4,6,7,8-HxCDF		2.02E-02		2.02E-02		2,3,4,6,7,8-HxCDF	2.02E-02	X	0.1	=	2.02E-03
1,2,3,4,6,7,8-HpCDF		5.40E-02		5.40E-02		1,2,3,4,6,7,8-HpCDF	5.40E-02	X	0.01	=	5.40E-04
1,2,3,4,7,8,9-HpCDF		4.05E-03		4.05E-03		1,2,3,4,7,8,9-HpCDF	4.05E-03	X	0.01	=	4.05E-05
OCDF		1.28E-01		1.28E-01		OCDF	1.28E-01	X	0.001	=	1.28E-04
									CDF Subtotal	=	1.62E-02
									Total	=	1.99E-02

	Typical Reformation Rate (ng/g/min)	Fly Ash Mass in Flue gas (g/min)	Time in Reformation temp. Region (min)	Min. Flow Rate through Reformation Region (m^3/min)		Estimated TM-17 reformed concentration	Conversion ratio				Toxicity Equivalent (TEQ)-ng/m3
De Novo Synthesis (Reformation)-w/150 ug/m^3 chlorophenol precursor	3300	52.92	0.02162162	5.47E+03		0.690926535	6.67E+01				1.04E-02
TM-17 + De Novo Synthesis						6.91E-01					**3.03E-02**

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

Ash

Test 1A-1D: April-May 1993 Entech Model TOS-80								
Metal	Burn 1 (mg/L)	Burn 2 (mg/L)	Burn 4 (mg/L)	Burn 5** (mg/L)	MSW Average (mg/L)	Tires Average (mg/L)	MSW Average (mg/kg)	Tires Average (mg/kg)
Ag	<0.007	<0.007	0.042	0.008	0.007333	0.042	0.146667	0.84
Al	no data							
As	<0.100	<0.005	<0.005	<0.10	ND	<0.005	ND	ND
B	no data							
Ba	0.398	0.155	0.079	0.186	0.246333	0.079	4.926667	1.58
Be	no data							
Bi	no data							
Ca	no data							
Cd	0.174	0.073	0.37	0.209	0.152	0.37	3.04	7.4
Co	no data							
Cr	<0.008	0.025	<0.008	0.027	0.02	<0.008	0.4	ND
Cu	no data							
Fe	no data							
Hg	<0.002	<0.002	<0.002	<0.002	ND	<0.002	ND	ND
K	no data							
Li	no data							
Mg	no data							
Mn	no data							
Mo	no data							
Na	no data							
Ni	no data							
p	no data							
Pb	0.421	0.098	1.33	9.12	3.213	1.33	64.26	26.6
Sb	no data							
Se	<0.100	<0.050	<0.05	<0.100	ND	<0.05	ND	ND
Sr	no data							
Th	no data							
V	no data							
Zn	no data							

*From literature, mg/kg can be approximated by 20*mg/L.
**Ash from Burns 5 and 6 was combined and analyzed

Test 2: December 1990 Municipal Solid Waste Burn Test	
Metal	Concentration (mg/kg)
Ag	<7
Al	86,000
As	<100
B	450
Ba	890
Be	<2
Bi	<100
Ca	79,000
Cd	<10
Co	12
Cr	130
Cu	330
Fe	24,000
Hg	na
K	<49,000
Li	39
Mg	7,700
Mn	1,000
Mo	<10
Na	2,800
Ni	29
p	1,100
Pb	490
Sb	<100
Se	<100
Sr	210
Th	<50
V	36
Zn	3,100

Test 3: December 1990 Tire Burn Test					
Metal	Dec 5 Burn (mg/kg)	Dec 7 Sample 1 (mg/kg)	Dec 7 Sample 2 (mg/kg)	Dec 7 Sample 3 (mg/kg)	Average (mg/kg)
Ag	<6.5	<6.8	<6.9	<5.8	0
Al	35,000	30,000	38,000	46,000	37250
As	<92	<98	<98	<82	0
B	102	110	210	220	161
Ba	130	<98	350	180	190
Be	<1.8	<2	<2	<1.6	0
Bi	<92	<98	<98	<82	0
Ca	50,000	2,700	18,000	11,000	20425
Cd	15	11	20	8.9	14
Co	720	2,000	2,300	2,100	1780
Cr	31	20	40	41	33
Cu	76	140	220	160	149
Fe	8,700	5,200	8,500	6,900	7325
Hg	no data				
K	<47,000	<49,000	<49,000	<42,000	0
Li	39	63	50	92	61
Mg	3,400	5,300	6,500	4,200	4850
Mn	160	74	130	96	115
Mo	<9.2	15	24	20	17
Na	4,100	5,200	8,000	5,600	5725
Ni	31	24	87	44	47
P	1,700	2,900	1,800	2,800	2300
Pb	530	280	520	570	475
Sb	<92	<98	<98	<82	0
Se	<92	<98	<98	<82	0
Sr	140	57	72	96	91
Th	<46	<49	<49	<41	0
V	20	35	57	55	42
Zn	130,000	320,000	380,000	320,000	287500

For test results showing 'less than' (non-detect), use the number following the 'less than' to calculate the average
If all samples are non-detect (less than), average will be zero.

APPENDIX E

Scrubber, SNCR, Ash System Baghouse and Emergency Generator Specifications

Scrubber Control Guarantee

DIRECT CONTACT LLC

Main: 2555 – 34th Street NE – Canton, OH – 44705 (330) 437-0444
West Coast: P.O. Box 2969 - Renton, WA - 98056 (425) 235-1723

August 14, 2012

Dynamis Energy, LLC
776 East Riverside Drive
Suite 150
Eagle, Idaho 833616

Attention: Chris Durand, Project Manager

Reference: MSW to Energy - ADA, County

Subject: Heat Recovery and Pollutant Abatement System
DCI-HTR Scrubbing Heat Recovery System
Revision D

Dear Chris,

We have completed the design of our subject system, and have determined the expect abatement results. These results are based on "Peak Load" Production:

Peak Load Production:

Incoming Flue Gas Mass Flow:	
Non-Reactive/Non-Condensable	491,670-lb/hr
Water Vapor	50,610-lb/hr
Sulfur Dioxide Gas	40-lb/hr
Hydrochloric Acid Vapor	10-lb/hr
Ammonia Vapor	3.57-lb/hr
PM_{10}	7-lb/hr
$PM_{2.5}$ & smaller	6.5-lb/hr
Fahrenheit Temperature	350°F
Absolute Pressure	12.88-Psia

Given the above conditions, design liquid irrigation rates and contact solution pH ranging between 9.5 and 11, and 31-million BTU/hr rate of heat recovery, Direct Contact LLC expects to reduce the exiting gas at the following rates:

Component	*Incoming*	*Removal*
Sulfur Dioxide Gas	40-lb/hr	71.25%
Hydrochloric Acid Vapor	10-lb/hr	94.05%
Ammonia Vapor	3.57-lb/hr	82.00%
PM_{10}	7-lb/hr	99.00%
$PM_{2.5}$ & smaller	6.5-lb/hr	41.00%

Direct Contact LLC will conditionally guarantee the above removal rates at Peak Load Production or lower rate.

Expected removal rates will change based on and relative to the incoming conditions:

If heat recovery rate decreases at a constant mass flow rate, then the expected particulate recovery efficiency will improve slightly, but the acid gases removal efficiency will decrease slightly.

If flue gas mass flow rate is reduced, then the acid gases capture efficiency will increase slightly, but the particulate capture efficiency will decrease slightly.

If the solution in contact with the flue gas has its pH raised then the acid gas capture efficiency will increase conversely if the pH drops the acid gas capture rate will decrease.

As the moisture content of gas entering the DCLLC 'Hydro Thermal Recovery' vessel increases, the PM2.5 particulate removal will increase.

Per our ongoing discussion, I trust that this will clearly state what removal rates we can expect to provide for your 'Peak Load Conditions.' Please contact me with any questions you have on these numbers or any of the above.

Direct Contact LLC appreciates the opportunity to assist Dynamis Energy on your Heat Recovery and Pollution Abatement System.

Thank you for your continued consideration.

With *Warmest* Regards,

Bill Carson, PE

CHIEF ENGINEER

Direct Contact LLC

Waste Heat Recovery... adding up to much more than a drop in the bucket!

(425) 235-1723 **x101** // **cell** (206) 295-7678// fax (425) 277-5780

Energy-Efficiency-Environment

Emergency Generator Specifications

DIESEL GENERATOR SET

CATERPILLAR®

Image shown may not reflect actual package.

STANDBY

300 ekW 375 kVA
60 Hz 1800 rpm 480 Volts

Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

FEATURES

FUEL/EMISSIONS STRATEGY
- EPA Certified for Stationary Emergency Application (EPA Tier 3 emissions levels)

DESIGN CRITERIA
- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

UL 2200
- UL 2200 listed packages available. Certain restrictions may apply. Consult with your Cat® Dealer.

FULL RANGE OF ATTACHMENTS
- Wide range of bolt-on system expansion attachments, factory designed and tested
- Flexible packaging options for easy and cost effective installation

SINGLE-SOURCE SUPPLIER
- Fully prototype tested with certified torsional vibration analysis available

WORLDWIDE PRODUCT SUPPORT
- Cat dealers provide extensive post sale support including maintenance and repair agreements
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries
- The Cat® S•O•S℠ program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

CAT® C9 ATAAC DIESEL ENGINE
- Utilizes ACERT™ Technology
- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Four-stroke diesel engine combines consistent performance and excellent fuel economy with minimum weight
- ADEM™A4 electronic engine control

CAT GENERATOR
- Matched to the performance and output characteristics of Cat engines
- Load adjustment module provides engine relief upon load impact and improves load acceptance and recovery time
- UL 1446 Recognized Class H insulation

CAT EMCP 3 SERIES CONTROL PANELS
- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

FACTORY INSTALLED STANDARD & OPTIONAL EQUIPMENT

System	Standard	Optional
Air Inlet	• Light Duty Air filter • Service indicator	[ ] Single element air filter [ ] Dual element air filter [ ] Heavy-duty dual element air filter with precleaner [ ] Air inlet shut-off
Cooling	• Radiator package mounted • Coolant level sight gauge • Coolant drain line with valve • Fan and belt guards • Cat® Extended Life Coolant	[ ] Radiator duct flange [ ] Low coolant level sensor
Exhaust	• Dry exhaust manifold • Exhaust flange outlet	[ ] Industrial [ ] Residential [ ] Critical Mufflers [ ] Stainless steel exhaust flex fittings with split-cuff [ ] Manifold and turbocharger guards [ ] Elbows and through-wall kits
Fuel	• Primary fuel filter with integral water separator • Secondary fuel filters • Fuel priming pump • Engine fuel transfer pump • Fuel cooler	[ ] Integral dual wall UL listed fuel tank bases [ ] Sub-base dual wall UL listed fuel tank base [ ] Manual transfer pump [ ] Fuel level switch [ ] Flexible fuel lines
Generator	• Class H insulation • Class H temperature Rise • VR6 voltage regulator with 3-phase sensing with load adjustment module • IP23 Protection • Power cable termination box (NEMA mech lug holes)	[ ] Oversize generators [ ] Digital voltage regulator with kVAR/PF control [ ] Anti-condensation space heaters [ ] Coastal Protection (CIP) [ ] Permanent magnet excitor (PMG) [ ] Internal excited (IE) [ ] Reactive droop
Power Termination	• Power center houses EMCP controller and control terminations (rear mounted) • Segregated low voltage wiring termination panel • Bottom cable entry • IP22 Protection	[ ] Power center mounting option (right side) [ ] Circuit breakers, UL listed, 3 pole (80% & 100%) [ ] Circuit breakers, IEC compliant, 3-4 pole (100%) [ ] Power terminal strips (NEMA or IEC mechanical lug holes) [ ] Multiple circuit breakers [ ] Shunt trip [ ] Auxiliary contacts
Governor	• ADEM™A4	[ ] Load share module
Control Panel	• EMCP 3.1 (mounted in power center) • Speed adjust • Voltage adjustment • Emergency stop pushbutton	[ ] EMCP 3.2 or [ ] EMCP 3.3 [ ] Right-hand mounted power center [ ] Local annunciator module (NFPA 99/110) [ ] Remote annunicator module (NFPA 99/110) [ ] Discrete I/O module
Lube	• Lubricating oil and filter • Oil drain line with valves • Fumes disposal • Lube oil level indicator • Oil cooler	[ ] Oil temperature sensor [ ] Manual sump pump
Mounting	• Formed steel wide base frame • Linear vibration isolation-seismic zone 4	[ ] Oil skid base [ ] Formed steel wide base frame
Starting/Charging	• 24 volt starting motor • 24 volt, 45 amp charging alternator	[ ] Jacket water heater with shut off valves [ ] Block heater [ ] Ether starting aid [ ] Battery disconnect switch [ ] Battery charger (5 or 10 amp) [ ] Oversize batteries [ ] Batteries with rack and cables
General	• Paint - Caterpillar yellow except rails and radiators gloss black • Flywheel housing - SAE No.1	[ ] UL 2200 package [ ] CSA Certification [ ] Weather protective enclosure [ ] Sound attenuated protective enclosure

STANDBY 300 ekW 375 kVA

60 Hz 1800 rpm 480 Volts

CATERPILLAR®

SPECIFICATIONS

CAT GENERATOR

Frame size.....LC5014J
Excitation.....Self Excited
Pitch.....0.6667
Number of poles.....4
Number of bearings..... 1
Number of leads.....012
Insulation..... UL 1446 Recognized Class H with tropicalization and antiabrasion
- Consult your Caterpillar dealer for available voltages
IP rating.....IP23
Alignment.....Pilot Shaft
Overspeed capability..... 125% of rated
Wave form deviation (Line to Line)..... 2%
Voltage regulator.....Three phase sensing
Voltage Regulation.. Less than +/- 1/2% (steady state)Less than +/- 1% (no load to full load)
Telephone Influence Factor..... Less than 50
Harmonic distortion..... Less than 5%

CAT DIESEL ENGINE

C9 ATAAC, I-6, 4-stroke-cycle watercooled diesel
Bore - mm..... 112.00 mm (4.41 in)
Stroke - mm..... 149.00 mm (5.87 in)
Displacement - L..... 8.80 L (537.01 in^3)
Compression ratio..... 16.1:1
Aspiration..... Turbocharged Air-to-Air Aftercooled
Fuel system..... HEUI
Governor type..... Caterpillar ADEM control system

CAT EMCP 3 SERIES CONTROLS

- EMCP 3.1 (Standard)
- EMCP 3.2 / EMCP 3.3 (Option)
- Single location customer connector point
- True RMS metering, 3-phase
- Controls
  - Run / Auto / Stop control
  - Speed Adjust
  - Voltage Adjust
  - Emergency Stop Pushbutton
  - Engine cycle crank
- Digital Indication for:
  - RPM
  - Operating hours
  - Oil Pressure
  - Coolant temperature
  - System DC volts
  - L-L volts, L-N volts, phase amps, Hz
  - ekW, kVA, kVAR,kW-hr, %kW, PF (EMCP 3.2 / 3.3)
- Shutdowns with common indicating light for:
  - Low oil pressure
  - High coolant temperature
  - Low coolant level
  - Overspeed
  - Emergency stop
  - Failure to start (overcrank)
- Programmable protective relaying functions: (EMCP 3.2 & 3.3)
  - Under and over voltage
  - Under and over frequency
  - Overcurrent (time and inverse time)
  - Reverse power (EMCP 3.3)
- MODUS isolated data link (RS-485 half-duplex EMCP 3.2 & 3.3)
- Options
  - Vandal door
  - Local annunciator module
  - Remote annunciator module
  - Input / Output module
  - RTD / Thermocouple Modules
  - Monitoring software

TECHNICAL DATA

Open Generator Set - - 1800 rpm/60 Hz/480 Volts	DM8168	
Tier 3		
Generator Set Package Performance		
Genset Power rating @ 0.8 pf	375 kVA	
Genset Power rating with fan	300 ekW	
Coolant to aftercooler		
Coolant to aftercooler temp max	49 ° C	120 ° F
Fuel Consumption		
100% load with fan	86.1 L/hr	22.7 Gal/hr
75% load with fan	66.7 L/hr	17.6 Gal/hr
50% load with fan	51.3 L/hr	13.6 Gal/hr
Cooling System[1]		
Air flow restriction (system)	0.12 kPa	0.48 in. water
Air flow (max @ rated speed for radiator arrangement)	497 m^3/min	17551 cfm
Engine Coolant capacity with radiator/exp. tank	36.0 L	9.5 gal
Engine coolant capacity	22.0 L	5.8 gal
Radiator coolant capacity	14.0 L	3.7 gal
Inlet Air		
Combustion air inlet flow rate	25.7 m^3/min	907.6 cfm
Exhaust System		
Exhaust stack gas temperature	499.5 ° C	931.1 ° F
Exhaust gas flow rate	69.7 m^3/min	2461.4 cfm
Exhaust flange size (internal diameter)	170 mm	7 in
Exhaust system backpressure (maximum allowable)	5.9 kPa	23.7 in. water
Heat Rejection		
Heat rejection to coolant (total)	121 kW	6881 Btu/min
Heat rejection to exhaust (total)	309 kW	17573 Btu/min
Heat rejection to aftercooler	89 kW	5061 Btu/min
Heat rejection to atmosphere from engine	43 kW	2445 Btu/min
Heat rejection to atmosphere from generator	21.9 kW	1245.5 Btu/min
Alternator[2]		
Motor starting capability @ 30% voltage dip	682 skVA	
Frame	LC5014J	
Temperature Rise	150 ° C	270 ° F
Lube System		
Sump refill with filter	39.0 L	10.3 gal
Emissions (Nominal)[3]		
NOx g/hp-hr	4.11 g/hp-hr	
CO g/hp-hr	.25 g/hp-hr	
HC g/hp-hr	.06 g/hp-hr	
PM g/hp-hr	.033 g/hp-hr	

[1] For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.
[2] Generator temperature rise is based on a 40° C (104° F) ambient per NEMA MG1-32.
[3] Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

RATING DEFINITIONS AND CONDITIONS

Meets or Exceeds International Specifications: AS1359, CSA, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-22, NEMA MG 1-33, UL508A, 72/23/EEC, 98/37/EC, 2004/108/EC

Standby - Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year. Standby power in accordance with ISO8528. Fuel stop power in accordance with ISO3046. Standby ambients shown indicate ambient temperature at 100% load which results in a coolant top tank temperature just below the shutdown temperature.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions. **Fuel rates** are based on fuel oil of 35° API [16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements, contact your Cat representative for details. For information regarding Low Sulfur fuel and Biodiesel capability, please consult your Cat dealer.

DIMENSIONS

Package Dimensions		
Length	**3132.0 mm**	**123.31 in**
Width	**1110.0 mm**	**43.7 in**
Height	**1844.5 mm**	**72.62 in**
Weight	**2307 kg**	**5,086 lb**

NOTE: For reference only - do not use for installation design. Please contact your local dealer for exact weight and dimensions. (General Dimension Drawing #2778059).

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Materials and specifications are subject to change without notice. The International System of Units (SI) is used in this publication.

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CATERPILLAR®

GEN SET PACKAGE PERFORMANCE DATA

MAY 17, 2012

For Help Desk Phone Numbers Click here

Performance Number: DM8168

Change Level: 02

Sales Model: C9 DITA
Combustion: DI
Aspr: TA
Engine Power:
300 W/F EKW 319 W/O F EKW 480 HP
Speed: 1,800 RPM
After Cooler: ATAAC
Manifold Type: DRY
Governor Type: ELEC
After Cooler Temp(F): 120
Turbo Quantity: 1
Engine App: GP
Turbo Arrangement:
Hertz: 60
Application Type: PACKAGE-DIE
Engine Rating: PGS
Strategy:
Rating Type: STANDBY
Certification: EPA TIER-3 2005 - ----
EPA STAT EMERC 2011 - ----

General Performance Data 1

GEN W/F EKW	PERCENT LOAD	ENGINE POWER BHP	ENGINE BMEP PSI	FUEL BSFC LB/BHP-HR	FUEL RATE GPH	INTAKE MFLD TEMP DEG F	INTAKE MFLD P IN-HG	INTAKE AIR FLOW CFM	EXH MFLD TEMP DEG F	EXH STACK TEMP DEG F	EXH GAS FLOW CFM
300	100	480	392.91	0.33	22.75	122.72	82.71	911.12	1,252.4	931.1	2,461.43
270	90	430	352.3	0.33	20.5	121.1	78.86	889.93	1,182.74	879.8	2,302.52
240	80	384	314.01	0.34	18.54	121.46	75.07	861.68	1,123.16	841.82	2,168.32
225	75	361	295.45	0.34	17.62	121.64	73.12	847.55	1,096.7	827.06	2,104.76
210	70	339	277.32	0.35	16.8	121.64	71.13	833.43	1,074.56	818.06	2,044.72
180	60	296	242.07	0.36	15.16	121.64	66.57	801.64	1,031.36	801.14	1,924.65
150	50	253	207.55	0.37	13.55	121.64	61.21	759.27	989.24	784.94	1,808.11
120	40	213	173.9	0.39	11.81	121.64	53.1	692.17	947.48	769.28	1,645.67
90	30	170	139.53	0.4	9.8	121.64	42.73	603.88	901.58	753.44	1,423.18
75	25	149	121.83	0.41	8.74	121.64	36.96	557.97	876.92	745.34	1,296.05
60	20	127	103.99	0.42	7.61	121.64	30.77	505	851	737.06	1,158.32
30	10	82	67.44	0.44	5.2	121.46	17.74	391.99	721.58	649.4	844.02

General Performance Data 2

GEN W/F EKW	PERCENT LOAD	ENGINE POWER BHP	COMPRESS OUT PRESS IN-HG	COMPRESS OUT TEMP DEG F
300	100	480	83.63	452.48
270	90	430	79.87	429.08
240	80	384	76.08	407.3
225	75	361	74.15	397.04
210	70	339	72.2	387.5
180	60	296	67.58	368.96
150	50	253	62.16	350.78
120	40	213	53.96	322.88
90	30	170	43.5	283.64
75	25	149	37.67	260.6
60	20	127	31.45	235.22
30	10	82	18.3	178.34

Engine Heat Rejection Data

GEN W/F EKW	PERCENT LOAD	REJ TO JW BTU/MN	REJ TO ATMOS BTU/MN	REJ TO EXHAUST BTU/MN	EXH RCOV TO 350F BTU/MN	FROM OIL CLR BTU/MN	FROM AFT CLR BTU/MN	WORK ENERGY BTU/MN	LHV ENERGY BTU/MN	HHV ENERGY BTU/MN
300	100	6,881.3	1,603.7	18,198.4	12,511.4	2,616.0	5,294.6	20,359.4	49,135.6	52,320.3
270	90	6,255.7	1,313.7	16,492.3	10,975.9	2,354.4	4,822.6	18,255.2	44,244.8	47,145.1
240	80	5,743.9	1,154.5	15,070.5	9,781.6	2,126.9	4,344.9	16,264.8	39,979.5	42,595.5
225	75	5,516.4	1,086.2	14,501.8	9,326.7	2,024.6	4,117.4	15,298.0	38,045.9	40,491.4
210	70	5,288.9	1,006.6	13,990.0	8,928.6	1,927.9	3,907.0	14,388.1	36,226.1	38,557.8
180	60	4,890.8	904.2	12,966.3	8,189.3	1,740.2	3,486.1	12,511.4	32,700.2	34,804.4
150	50	4,549.6	864.4	11,885.8	7,393.1	1,558.2	3,059.6	10,748.4	29,231.1	31,164.7
120	40	4,208.4	875.8	10,520.9	6,483.2	1,353.5	2,451.1	8,985.4	25,420.8	27,126.9
90	30	3,810.3	779.1	8,928.6	5,402.6	1,126.0	1,728.8	7,222.5	21,098.7	22,463.6
75	25	3,582.8	699.5	8,075.5	4,833.9	1,000.9	1,364.9	6,312.6	18,767.1	20,018.2
60	20	3,241.6	557.3	7,165.6	4,265.2	870.1	1,012.3	5,402.6	16,321.7	17,402.2
30	10	2,616.0	568.7	4,833.9	2,559.1	591.5	392.4	3,469.1	11,146.5	11,885.8

EMISSIONS DATA

EPA TIER-3 2005 - ---- ********** D4
Gaseous emissions data measurements are consistent with those described in
40 CFR, EU 97/68/EC, ECE Regulation No. 96 and ISO 8178 for measuring
HC, CO, PM, and NOx.

Gaseous emissions values are WEIGHTED CYCLE AVERAGES and are in compliance
with the following non-road regulations:

LOCALITY	AGENCY/LEVEL	MAX LIMITS - g/kW-hr
U. S. (incl Calif)	EPA/TIER-3	CO:3.5 NOx + HC:4.0 PM:0.2
Europe	EU/Stage-II	CO:3.5 HC:1.0 NOx:6.0 PM:0.2

EPA STAT EMERC 2011 - ---- ********** P4
EPA EMERGENCY STATIONARY
GASEOUS EMISSIONS DATA MEASUREMENTS ARE CONSISTENT WITH THOSE
DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR
MEASURING HC, CO, PM, AND NOX.

GASEOUS EMISSIONS VALUES ARE WEIGHTED CYCLE AVERAGES
AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.

LOCALITY	AGENCY/LEVEL	MAX LIMITS - g/kW-hr
U.S. (INCL CALIF)	EPA/STAT EMERGENCY	CO:3.5 NOx + HC:4.0 PM:0.20

REFERENCE EXHAUST STACK DIAMETER	4 IN
WET EXHAUST MASS	4,157.9 LB/HR
WET EXHAUST FLOW (930.20 F STACK TEMP)	2,461.79 CFM
WET EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG)	865.00 STD CFM
DRY EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG)	792.46 STD CFM
FUEL FLOW RATE	23 GAL/HR

RATED SPEED "Not to exceed data"

GEN PWR EKW	PERCENT LOAD	ENGINE POWER BHP	TOTAL NOX (AS NO2) LB/HR	TOTAL CO LB/HR	TOTAL HC LB/HR	PART MATTER LB/HR	OXYGEN IN EXHAUST PERCENT
300	100	480	5.2700	.4900	.1300	.0700	9.1000
225	75	361	2.6500	.3700	.1400	.0600	11.1000
150	50	253	1.3500	.5300	.2000	.1400	12.7000
75	25	149	.7200	.4600	.1900	.1000	13.9000
30	10	82	.5400	.4300	.1700	.0600	15.3000

RATED SPEED "Nominal Data"

GEN PWR EKW	PERCENT LOAD	ENGINE POWER BHP	TOTAL NOX (AS NO2) LB/HR	TOTAL CO LB/HR	TOTAL HC LB/HR	TOTAL CO2 LB/HR	PART MATTER LB/HR	OXYGEN IN EXHAUST PERCENT
300	100	480	4.3600	.2600	.0700	500.6	.0300	9.1000
225	75	361	2.1900	.2000	.0700	387.7	.0300	11.1000
150	50	253	1.1100	.2900	.1100	297.9	.0700	12.7000
75	25	149	.5900	.2500	.1000	191.4	.0500	13.9000
30	10	82	.4400	.2300	.0900	113.6	.0300	15.3000

Altitude Capability Data(Corrected Power Altitude Capability)

Ambient Operating Temp. / Altitude	50 F	68 F	86 F	104 F	122 F	NORMAL
0 F	480.09 hp	480.09 hp	480.09 hp	480.09 hp	480.09 hp	480.09 hp
984.25 F	480.09 hp	480.09 hp	480.09 hp	480.09 hp	480.09 hp	480.09 hp
1,640.42 F	480.09 hp	480.09 hp	480.09 hp	480.09 hp	469.36 hp	480.09 hp
3,280.84 F	480.09 hp	480.09 hp	470.7 hp	455.95 hp	441.2 hp	480.09 hp
4,921.26 F	473.38 hp	457.29 hp	442.54 hp	427.79 hp	415.72 hp	457.29 hp
6,561.68 F	445.22 hp	430.47 hp	415.72 hp	402.31 hp	390.24 hp	434.49 hp
8,202.1 F	418.4 hp	403.65 hp	391.58 hp	378.17 hp	366.1 hp	413.03 hp
9,842.52 F	392.92 hp	379.51 hp	367.44 hp	355.37 hp	344.64 hp	391.58 hp
11,482.94 F	368.78 hp	356.71 hp	344.64 hp	333.91 hp	323.19 hp	371.46 hp
13,123.36 F	345.98 hp	333.91 hp	323.19 hp	312.46 hp	303.07 hp	352.69 hp
14,763.78 F	323.19 hp	312.46 hp	301.73 hp	292.34 hp	282.96 hp	333.91 hp

The powers listed above and all the Powers displayed are Corrected Powers

Identification Reference and Notes

Engine Arrangement:	2531644	**Lube Oil Press @ Rated Spd(PSI):**	45.3
Effective Serial No:	S9L00001	**Piston Speed @ Rated Eng SPD(FT/Min):**	1,752.0
Primary Engine Test Spec:	0K6616	**Max Operating Altitude(FT):**	3,280.8
Performance Parm Ref:	TM5739	**PEEC Elect Control Module Ref**	
Performance Data Ref:	DM8168	**PEEC Personality Cont Mod Ref**	
Aux Coolant Pump Perf Ref:			
Cooling System Perf Ref:		**Turbocharger Model**	S310-1.25 VTF
Certification Ref:	EPA TIER 3	**Fuel Injector**	
Certification Year:	2005	**Timing-Static (DEG):**	--
Compression Ratio:	16.1	**Timing-Static Advance (DEG):**	--
Combustion System:	DI	**Timing-Static (MM):**	--
Aftercooler Temperature (F):	120	**Unit Injector Timing (MM):**	--
Crankcase Blowby Rate(CFH):	--	**Torque Rise (percent)**	--
Fuel Rate (Rated RPM) No Load(Gal/HR):	--	**Peak Torque Speed RPM**	--
Lube Oil Press @ Low Idle Spd(PSI):	42.5	**Peak Torque (LB/FT):**	--

Reference Number: DM8168

THIS PERFORMANCE DATA IS ALSO APPLICABLE TO
ENGINE ARRANGEMENT 2591809 AND TEST SPEC 0K6795.
EPA TIER-3 2005----D4EPA STAT EMERC 2011----P4

Parameters Reference: TM5739

GEN SET - PACKAGED - DIESEL

TOLERANCES:
AMBIENT AIR CONDITIONS AND FUEL USED WILL AFFECT THESE VALUES. EACH OF THE VALUES MAY VARY IN ACCORDANCE WITH THE FOLLOWING TOLERANCES.

Power	+/- 3%
Exhaust Stack Temperature	+/- 8%
Generator Power	+/- 5%
Inlet Airflow	+/- 5%
Intake Manifold Pressure-gage	+/- 10%
Exhaust Flow	+/- 6%
Specific Fuel Consumption	+/- 3%
Fuel Rate	+/- 5%
Heat Rejection	+/- 5%
Heat Rejection - Exhaust Only	+/- 10%

T4i Tolerance Exceptions
C15: Power Tolerance +4% , -0%
C27: Power Tolerance +0% , -4%

CONDITIONS:
ENGINE PERFORMANCE IS CORRECTED TO INLET AIR STANDARD CONDITIONS OF 99 KPA (29.31 IN HG) AND 25 DEG C (77 DEG F).

THESE VALUES CORRESPOND TO THE STANDARD ATMOSPHERIC PRESSURE AND TEMPERATURE IN ACCORDANCE WITH SAE J1349. ALSO INCLUDED IS A CORRECTION TO STANDARD FUEL GRAVITY OF 35 DEGREES API HAVING A LOWER HEATING VALUE OF 42,780 KJ/KG (18,390 BTU/LB) WHEN USED AT 29 DEG C (84.2 DEG F) WHERE THE DENSITY IS 838.9 G/L (7.002 LB/GAL).

THE CORRECTED PERFORMANCE VALUES SHOWN FOR CATERPILLAR ENGINES WILL APPROXIMATE THE VALUES OBTAINED WHEN THE OBSERVED PERFORMANCE DATA IS CORRECTED TO SAE J1349, ISO 3046-2 & 8665 & 2288 & 9249 & 1585, EEC 80/1269 AND DIN70020 STANDARD REFERENCE CONDITIONS.

ENGINES ARE EQUIPPED WITH STANDARD ACCESSORIES; LUBE OIL, FUEL PUMP AND JACKET WATER PUMP. THE POWER REQUIRED TO DRIVE AUXILIARIES MUST BE DEDUCTED FROM THE GROSS OUTPUT TO ARRIVE AT THE NET POWER AVAILABLE FOR THE EXTERNAL (FLYWHEEL) LOAD. TYPICAL AUXILIARIES INCLUDE COOLING FANS, AIR COMPRESSORS, AND CHARGING ALTERNATORS.

RATINGS MUST BE REDUCED TO COMPENSATE FOR ALTITUDE AND/OR AMBIENT TEMPERATURE CONDITIONS ACCORDING TO THE APPLICABLE DATA SHOWN ON THE PERFORMANCE DATA SET.

ALTITUDE:
ALTITUDE CAPABILITY - THE RECOMMENDED REDUCED POWER VALUES FOR SUSTAINED ENGINE OPERATION AT SPECIFIC ALTITUDE LEVELS AND AMBIENT

TEMPERATURES.

COLUMN "N" DATA - THE FLYWHEEL POWER OUTPUT AT NORMAL AMBIENT TEMPERATURE.

AMBIENT TEMPERATURE - TO BE MEASURED AT THE AIR CLEANER AIR INLET DURING NORMAL ENGINE OPERATION.

NORMAL TEMPERATURE - THE NORMAL TEMPERATURE AT VARIOUS SPECIFIC ALTITUDE LEVELS IS FOUND ON TM2001.

THE GENERATOR POWER CURVE TABULAR DATA REPRESENTS THE NET ELECTRICAL POWER OUTPUT OF THE GENERATOR.

GENERATOR SET RATINGS

EMERGENCY STANDBY POWER (ESP)

OUTPUT AVAILABLE WITH VARYING LOAD FOR THE DURATION OF AN EMERGENCY OUTAGE. AVERAGE POWER OUTPUT IS 70% OF THE ESP RATING. TYPICAL OPERATION IS 50 HOURS PER YEAR, WITH MAXIMUM EXPECTED USAGE OF 200 HOURS PER YEAR.

STANDBY POWER RATING

OUTPUT AVAILABLE WITH VARYING LOAD FOR THE DURATION OF AN EMERGENCY OUTAGE. AVERAGE POWER OUTPUT IS 70% OF THE STANDBY POWER RATING. TYPICAL OPERATION IS 200 HOURS PER YEAR, WITH MAXIMUM EXPECTED USAGE OF 500 HOURS PER YEAR.

PRIME POWER RATING

OUTPUT AVAILABLE WITH VARYING LOAD FOR AN UNLIMITED TIME. AVERAGE POWER OUTPUT IS 70% OF THE PRIME POWER RATING. TYPICAL PEAK DEMAND IS 100% OF PRIME RATED EKW WITH 10% OVERLOAD CAPABILITY FOR EMERGENCY USE FOR A MAXIMUM OF 1 HOUR IN 12. OVERLOAD OPERATION CANNOT EXCEED 25 HOURS PER YEAR.

CONTINUOUS POWER RATING

OUTPUT AVAILABLE WITH NON-VARYING LOAD FOR AN UNLIMITED TIME. AVERAGE POWER OUTPUT IS 70-100% OF THE CONTINUOUS POWER RATING. TYPICAL PEAK DEMAND IS 100% OF CONTINUOUS RATED EKW FOR 100% OF OPERATING HOURS.

SOUND DEFINITIONS:

Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 03/14/12

Caterpillar Confidential: **Green**
Content Owner: Shane Gilles
Web Master(s): PSG Web Based Systems Support
Current Date: Thursday, May 17, 2012 7:41:45 AM
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SNCR Ammonia Slip Information/SNCR NOx Control Guarantee

1.0 INTRODUCTION

De-NOx Technologies, LLC (DNT) is pleased to offer Dynamis Energy, LLC the following revised Firm Price Proposal for the design and supply of a urea-based SNCR system. This system is to be installed on one 200,000pph MSW Gasification unit in Boise ID. The proposed system will utilize 50wt% urea solution.

DNT will provide the process design, mechanical design, electrical and control design, equipment selection, equipment fabrication, injector supply, and process guarantees.

The major design parameters are presented in Table 1.

TABLE 1
Design Conditions

Design Parameters	Typical
Combustor Steam Rate (pph)	200,000
Oxygen Level (% v)	4-6
Carbon Monoxide (lb/MMBTU)	<0.2
Load Range (%)	70-100
Furnace Exit Gas Temperature (degF)	1900-2000
Estimated MCR Reagent Consumption, GPH	5
Minimum Gas Residence Time after injection and before Boiler, sec	0.75
Design Uncontrolled NOX_x (pph, as NO2)	50
Guaranteed Controlled NOX_x (pph)	30

2.0 SCOPE OF SUPPLY

DNT will provide the following design services and equipment:

2.1 Equipment

- One (1) 6000 gallon non-metallic atmospheric pressure Storage Tank. The tank can be located outdoors on a properly designed level concrete foundation. It will be supplied with heating pads and temperature controls to maintain 80 degF at the local winter design temperature.

  The storage tank will be supplied with:

  - Side Bolted Manway
  - Corrosion barrier
  - UV resistant outer treatment
  - Hold Down and Lifting Lugs
  - Flanged fittings for Pump Suction, Vent, Fill, and Recirc
  - Isolation Valves
  - Level Indicator/Transmitter
  - Temperature Indicator/Transmitter

- One Control Module will be supplied to be located in a climate controlled enclosure (enclosure by others) in immediate proximity to the Storage Tank. This module will: 1)provide circulation and external heating of concentrated reagent, 2)filter and regulate the flow of reagent and dilution water, and 3)mix the reagent with dilution water for the boiler. The module will be pre-assembled.

  The proper amount of reagent is determined based upon feedback from a CEM system, and algorithms resident in the PLC System. Urea will be metered to the boiler unit through positive displacement pumps. Materials of construction for the concentrated reagent and diluted reagent lines shall be SS piping and/or tubing. Duplex strainers of 316 SS construction, capable of continuous filtering of the reagent and dilution water shall be provided. The device shall be capable of being maintained while on line.

  The Control Module will be supplied with a NEMA 4X enclosure which houses the Main Circuit Breaker/Handle, AB PLC components,,

motor starters, instrument/ power terminal strips, 24VDC Power Supply, and variable speed drives. The system will be capable of full manual operation from the face of the panel.

The Module will be supplied with reagent flow measurement, reagent circulation, external electric circulation heater, and automatic flush-out.

- Distribution Module. One Distribution Module will be provided in near proximity to the injection nozzles. The module distributes the supply of diluted reagent to each injector, as well as control atomizing air pressure. These modules are designed to save floor space and can be mounted on walls, columns, or over handrail.

- Dual Fluid Nozzle Atomizing Injectors. These injectors are DNT's proven and proprietary design. They have proven, excellent, service life on refuse and biomass units.

  The exact location of these ports will be determined during the contract phase of the project. This proposal assumes 6 injectors generally located 0.5 sec prior to the first convective tube surface. The injectors are inserted and retracted by hand. Flexible hoses, attached to the injectors with quick connects, will be supplied.

2.2 Engineering and Start-up Services. These services would include:

- P&ID's, Equipment Arrangement Drawings, equipment fabrication drawings, logic and interconnect drawings

- Specify, select, purchase, prefabricate, and deliver the equipment specified above.

- Five Maintenance and Operation Manuals.

2.3 Provided by Owner

- Approximately 3 GPM of dilution water @ 80 psig to the Control Module. This dilution water should be softened and generally be of drinking quality.

- Compressed Air – Approximately 90 scfm at a minimum pressure of 80 psig to the Distribution Panel.

- Fused disconnects for power to the tank panel, heat tracing and Control Module, as follows:
  - Control Module – 480 VAC, 20 Amp.
  - Tank – 120VAC, 4000 watt

- All local permits and/or licenses.

- Compliance and/or Performance Testing.

- Terminations to the Central Control Station, any additions to hardware/software and graphics/configuration.

- All Receiving and Installation, including all piping heat tracing.

3.0 PRICING

The firm price for the Scope as described herein is [redacted] freight excluded. The price includes 5 days of on-site Field Services for Mechanical Check-Out, Training and Start-Up. DNT's Terms and Conditions attached.

4.0 PROJECT SCHEDULE

Begin Equipment Design	At Notice to Proceed
Submit Mech and Elec Drawings for Approval	4 weeks after NTP
Shipment of Equipment	12 weeks after Approvals

From: "David Wojichowski" <dwojichowski@de-nox.com>
Date: August 1, 2012 6:31:57 AM MDT
To: "'Chris Durand'" <cdurand@dynamisenergy.com>
Cc: "'Solvason, John'" <JSolvason@eeeug.com>
Subject: RE: Dynamis SNCR

As you might expect, estimation of ammonia slip on paper is difficult to impossible. It greatly depends upon combustion conditions, reagent stoiciometry, and mixing effectiveness.

Your application should be better than a typical waterwall boiler application. In those, we typically see 10 ppmv or less during optimized operation.

David L. Wojichowski, P.E.
President
De-NOx Technologies, LLC
(603) 974-1411
(815) 301-8450 E-Fax
www.de-nox.com

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-----Original Message-----
From: Chris Durand [mailto:cdurand@dynamisenergy.com]
Sent: Tuesday, July 31, 2012 6:13 PM
To: dwojichowski@de-nox.com
Subject: Dynamis SNCR

David,

Justin and John from Evergreen said I could contact you directly with questions.

Do you have an estimate on the maximum amount of ammonia slip that your system will typically operate below? We need this information for the

scrubber company to estimate the removal guarantee for permitting.

Thank you,

Chris durand

Sent from my Dynamis Energy iPhone

No virus found in this message.
Checked by AVG - www.avg.com
Version: 2012.0.2196 / Virus Database: 2437/5167 - Release Date: 07/31/12

Ash System Baghouse Fan Curves and Exhaust Stack Schematic

Donaldson
Filtration Solutions

Donaldson Company, Inc.
Industrial Air Filtration
1400 West 94th Street
Bloomington, MN
55431-2370

Mailing Address:
P.O. Box 1299
Minneapolis, MN
55440-1299 U.S.A.

Tel 952-887-3847
Fax 952-698-2479
www.Donaldson.com
www.donaldsontorit.com

Dynamis Energy, LLC
Attn: K. Patrick Silveira
Address: 776 E Riverside Drive, Suite 150

April 25, 2012

Reference: Dynamis Energy, LLC Emission Guarantee for a Donaldson® Torit® Model DFO 3-24 Dust Collector with Ultra-Web® Filters.

Equipment	One Donaldson Torit Model DFO 3-24 dust collector equipped with (24) Ultra-Web filters.
Application	Waste-to-Energy Facility
Dust	Flyash
Inlet Loading	< 2 gr/dscf
Air Volume	14,000 ACFM
Gas Stream	Operating temperature of 100°F with a maximum temperature of 150°F
Collector Location	Outdoors
Collector Exhaust	Outdoors

The Donaldson® Torit® Model DFO 3-24 Collector equipped with 24 Donaldson Torit Ultra-Web® filters offers a net filtration area of 4560 square feet. Dividing the actual air volume by the filtration area provides a net air-to-media ratio of 3.07:1. Based on the Donaldson Torit Model DFO 3-24 Collector being installed and operated in accordance with the DFO Installation, Operation, and Maintenance Manual; accepted industrial ventilation practices; and under the conditions stated above, we are offering the following emission guarantee utilizing Donaldson Torit Ultra-Web filters. This guarantee does not cover filter failure due to negligence or improper operation and specifically excludes failure due to exceeding the recommended air-to-media ratio; damage due to fire, corrosion, abrasion or physical abuse; wet or oily compressed air usage, or the lack of adequate compressed air for proper filter cleaning.

Emission: The maximum average particulate emissions in the discharge gas stream from the Donaldson Torit DFO 3-24 Collector using the Donaldson Torit Ultra-Web filters will not exceed 0.005 grains per dry standard cubic foot of particulate matter 2.5 microns or smaller over the life of the media.

The guarantee period ends after 4000 hours of operation or 12 months from the date of shipment, whichever is shorter. This provides ample time to confirm performance meets the stipulated thresholds in this document.

[The emissions portion of this warranty requires that all emission testing be performed by a qualified testing agency agreed upon by Donaldson Company and Dynamis Energy, LLC. Such testing will be performed in accordance with recognized testing procedures, agreed upon by both Donaldson Company and Dynamis Energy, LLC. Fees for the testing will be the responsibility of Dynamis Energy, LLC.]

Pressure Drop: Average pressure drop not to exceed 6.0 inches of water gauge on a continual basis as measured across Donaldson Torit Ultra-Web filter media and tube sheet of the Torit DFO 3-24 collector.

During the warranty period, Donaldson Company reserves the right to make any modifications, adjustments or take other necessary corrective actions, at Donaldson's expense, should the guarantee not be met by equipment malfunction due to defects in materials and/or workmanship as supplied by Donaldson Company. In no event shall Donaldson Company be liable for incidental, special or consequential damages resulting from nonconformity. Failure to use genuine Donaldson replacement parts or changes to the original system, either process or engineering, will cancel this guarantee.

Regards,

Hube Visee

IAF National Sales Director

Guarantee Number: 12CK0406 Dynamis Energy, LLC

24 BISW

Wheel Diameter = 24½ in.
Outlet Area = 3.45 ft.^{2}
Tip Speed = 6.41 x RPM
Maximum BHP = (RPM/750)^3

Minimum Starting HP = ½
Maximum RPM Class I = 1570
Maximum RPM Class II = 2048
Maximum RPM Class III = 2580
Maximum RPM Class IV = 3110

Maximum Open Motor Frame Size

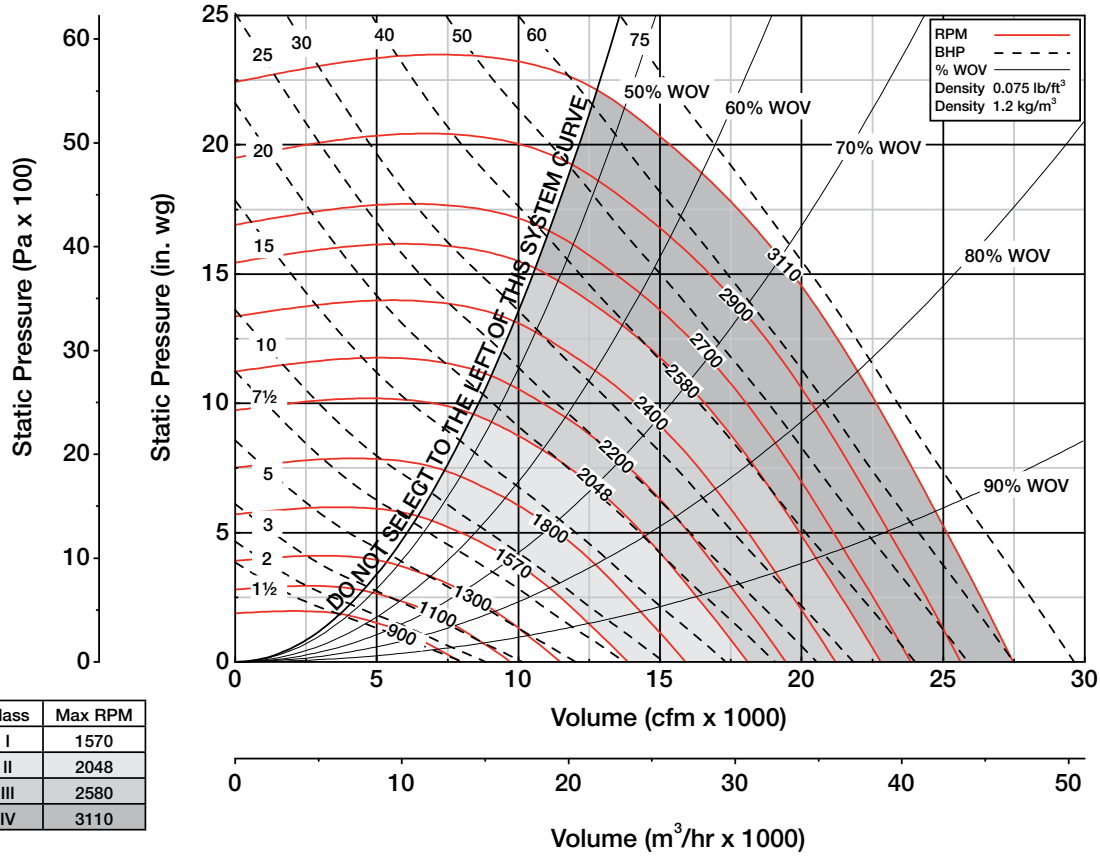
Class	I	II	III	IV
Arr. 9	284T	284T	286T	NA
Arr. 10	215T	284T	NA	NA

CFM	OV	STATIC PRESSURE (in. wg)																			
		0.50		1.00		1.50		2.00		2.50		3.00		3.50		4.00		4.50		5.00	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2800	811	513	0.31	665	0.62																
3230	936	541	0.37	686	0.71																
3660	1060	574	0.45	707	0.81	826	1.20														
4090	1185	608	0.53	734	0.92	846	1.35	947	1.80												
4520	1310	646	0.63	762	1.04	868	1.50	967	1.98	1056	2.48										
4950	1434	685	0.75	794	1.18	895	1.66	988	2.18	1076	2.71	1157	3.27								
5380	1559	726	0.89	828	1.34	923	1.85	1012	2.38	1097	2.95	1177	3.54	1251	4.14						
5810	1684	767	1.04	862	1.52	953	2.05	1040	2.61	1120	3.21	1198	3.83	1271	4.46	1340	5.11	1405	5.77		
6240	1808	810	1.21	900	1.72	986	2.27	1068	2.86	1146	3.47	1220	4.12	1292	4.79	1361	5.47	1425	6.17	1487	6.87
6670	1933	853	1.40	939	1.94	1020	2.51	1097	3.13	1174	3.77	1244	4.44	1314	5.14	1381	5.86	1446	6.58	1507	7.32
7100	2057	896	1.61	978	2.18	1055	2.78	1130	3.42	1202	4.09	1272	4.78	1338	5.50	1403	6.25	1466	7.01	1527	7.78
7530	2182	940	1.84	1019	2.45	1093	3.07	1164	3.73	1232	4.43	1301	5.15	1365	5.89	1427	6.66	1488	7.46	1548	8.27
7960	2307	985	2.10	1060	2.75	1131	3.40	1198	4.07	1266	4.80	1329	5.54	1393	6.31	1453	7.10	1512	7.92	1570	8.76
8390	2431	1030	2.38	1102	3.07	1169	3.75	1235	4.45	1299	5.19	1361	5.96	1422	6.76	1482	7.58	1538	8.41	1594	9.28
8820	2556	1075	2.69	1145	3.41	1210	4.13	1273	4.85	1333	5.61	1394	6.41	1451	7.23	1510	8.08	1566	8.94	1620	9.82
9250	2681	1120	3.02	1188	3.78	1250	4.54	1311	5.29	1369	6.07	1428	6.89	1484	7.74	1539	8.61	1595	9.50	1648	10.4

CFM	OV	STATIC PRESSURE (in. wg)																			
		5.00		5.50		6.00		6.50		7.00		7.50		8.00		8.50		9.00		10.00	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6200	1797	1485	6.83																		
6690	1939	1508	7.34	1566	8.09	1622	8.86														
7180	2081	1531	7.87	1589	8.66	1645	9.46	1698	10.3												
7670	2223	1554	8.43	1612	9.25	1668	10.1	1721	10.9	1772	11.8	1822	12.7								
8160	2365	1581	9.0	1636	9.87	1691	10.7	1744	11.6	1795	12.5	1845	13.4	1893	14.4	1940	15.3	1985	16.2		
8650	2507	1610	9.6	1664	10.5	1716	11.4	1768	12.4	1819	13.3	1868	14.2	1916	15.2	1962	16.1	2008	17.1	2087	19.0
9140	2649	1641	10.3	1692	11.2	1744	12.1	1794	13.1	1842	14.1	1891	15.0	1939	16.0	1985	17.0	2031	18.0	2109	20.0
9630	2791	1673	10.9	1724	11.9	1772	12.9	1821	13.9	1870	14.9	1916	15.9	1963	16.9	2009	18.0	2054	19.0	2132	21.0
10120	2933	1706	11.7	1756	12.7	1804	13.7	1851	14.7	1897	15.7	1944	16.8	1989	17.8	2033	18.9	2077	20.0	2155	22.0
10610	3075	1740	12.5	1789	13.5	1837	14.5	1883	15.5	1928	16.6	1973	17.7	2017	18.8	2060	19.9	2103	21.0	2178	23.1
11100	3217	1778	13.3	1823	14.3	1870	15.4	1916	16.5	1960	17.5	2003	18.6	2046	19.7	2088	20.9	2130	22.1	2203	24.3
11590	3359	1816	14.2	1860	15.2	1903	16.3	1948	17.4	1993	18.5	2036	19.7	2077	20.8	2118	22.0	2159	23.1	2230	25.4
12080	3501	1854	15.1	1898	16.2	1941	17.3	1982	18.4	2025	19.6	2068	20.8	2110	21.9	2150	23.1	2189	24.3	2257	26.6
12570	3643	1893	16.1	1937	17.2	1979	18.4	2020	19.5	2060	20.7	2101	21.9	2142	23.1	2182	24.3	2221	25.5	2286	27.8
13060	3785	1935	17.1	1976	18.3	2018	19.4	2058	20.6	2098	21.8	2136	23.1	2175	24.3	2215	25.6	2254	26.8	2318	29.1
13550	3927	1977	18.2	2016	19.4	2057	20.6	2097	21.8	2136	23.1	2174	24.3	2211	25.6	2248	26.8	2287	28.1	2350	30.5

CFM	OV	STATIC PRESSURE (in. wg)																			
		10.00		11.00		12.00		13.00		14.00		15.00		16.00		17.00		18.00		20.00	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
11000	3188	2197	24.0	2277	26.4	2354	28.7	2428	31.1	2500	33.5	2568	36.0	2635	38.4						
11530	3342	2227	25.3	2303	27.7	2379	30.1	2453	32.6	2524	35.1	2593	37.6	2659	40.1	2724	42.7	2786	45.3		
12060	3495	2256	26.5	2332	29.0	2405	31.6	2478	34.1	2549	36.7	2617	39.3	2684	41.9	2748	44.5	2810	47.2		
12590	3649	2287	27.9	2362	30.4	2434	33.0	2504	35.7	2574	38.3	2642	41.0	2708	43.7	2772	46.4	2834	49.1	2954	54.7
13120	3802	2322	29.3	2392	31.9	2464	34.5	2533	37.3	2600	40.0	2667	42.8	2733	45.5	2797	48.3	2859	51.1	2978	56.8
13650	3956	2357	30.8	2427	33.5	2493	36.1	2563	38.9	2629	41.7	2694	44.6	2756	47.4	2821	50.3	2883	53.2	3002	59.0
14180	4110	2392	32.4	2462	35.1	2529	37.8	2593	40.6	2659	43.5	2723	46.4	2785	49.3	2846	52.3	2908	55.3	3027	61.3
14710	4263	2427	34.0	2496	36.8	2563	39.6	2627	42.4	2689	45.3	2753	48.3	2815	51.3	2875	54.4	2933	57.4	3051	63.6
15240	4417	2466	35.7	2532	38.6	2598	41.4	2662	44.4	2722	47.3	2782	50.3	2844	53.4	2904	56.5	2962	59.6	3074	66.0
15770	4571	2506	37.5	2568	40.4	2633	43.4	2696	46.3	2757	49.3	2816	52.4	2873	55.4	2933	58.6	2992	61.9		
16300	4724	2547	39.4	2608	42.3	2668	45.3	2731	48.4	2792	51.5	2851	54.6	2907	57.7	2963	60.9	3021	64.2		
16830	4878	2588	41.3	2649	44.4	2708	47.4	2766	50.5	2827	53.7	2886	56.8	2942	60.0	2997	63.3	3051	66.5		
17360	5031	2630	43.4	2690	46.5	2748	49.6	2805	52.7	2862	55.9	2920	59.2	2977	62.4	3032	65.7				
17890	5185	2671	45.5	2731	48.6	2789	51.8	2845	55.0	2899	58.3	2955	61.6	3012	64.9	3067	68.3				
18420	5339	2715	47.7	2773	50.9	2830	54.1	2886	57.4	2939	60.8	2992	64.1	3047	67.5						
18950	5492	2761	50.1	2814	53.2	2872	56.6	2927	59.9	2980	63.3	3032	66.7	3082	70.2						

Performance certified is for model BISW Arrangement 1, Installation Type B: free inlet, ducted outlet.
Performance ratings do not include the effects of appurtenances (accessories).
Power rating (Bhp) does not include transmission losses.



Class	Max RPM
I	1570
II	2048
III	2580
IV	3110

% WOV = (CFM X 100) / (RPM X 8.84)

Sound Power [dB Ref 10^{-12} watts]

RPM	%WOV	Inlet Sound Power, L_{Wi} 1	2	3	4	5	6	7	8	L_{Wi}A
450	100	81	76	71	64	58	51	44	38	67
	80	74	68	64	57	51	45	38	32	60
	60	73	65	60	54	51	44	36	31	57
	50	71	64	59	54	53	45	38	32	58
	40	71	63	58	54	53	45	38	32	57
900	100	88	89	86	81	78	74	64	58	84
	80	84	86	83	78	74	69	62	57	80
	60	83	87	82	76	74	68	64	60	80
	50	84	84	80	75	73	68	65	61	78
	40	85	83	79	75	73	68	66	62	78
1300	100	91	91	98	90	85	86	77	70	94
	80	88	88	96	87	81	80	74	68	91
	60	88	86	93	84	80	78	74	71	88
	50	88	85	91	82	79	76	75	72	87
	40	88	85	93	82	80	77	75	72	88
1800	100	98	95	104	97	94	96	92	82	102
	80	94	91	102	93	89	89	85	78	97
	60	94	87	97	89	87	86	84	80	94
	50	95	88	98	87	86	85	84	82	94
	40	98	93	100	89	86	86	85	82	95
2580	100	105	106	109	110	103	103	102	95	111
	80	101	102	106	106	99	97	95	90	107
	60	101	100	101	102	96	94	93	90	103
	50	102	101	102	102	94	93	93	91	103
	40	105	105	106	104	96	94	93	91	104
3110	100	108	111	113	113	109	107	106	101	115
	80	104	107	109	110	105	102	99	95	111
	60	104	105	105	105	101	99	97	95	107
	50	105	106	107	105	100	98	97	95	107
	40	108	110	110	107	102	98	97	96	109

RPM	%WOV	Outlet Sound Power, L_{Wo} 1	2	3	4	5	6	7	8	L_{Wo}A
450	100	84	78	71	67	62	54	47	40	69
	80	84	77	69	62	58	50	43	37	67
	60	83	74	66	59	57	49	44	38	64
	50	81	73	64	58	56	48	45	39	63
	40	80	72	64	58	56	48	45	39	63
900	100	95	94	86	82	82	77	68	61	86
	80	94	91	82	78	77	71	64	59	82
	60	90	89	80	75	74	67	63	60	79
	50	91	88	79	74	73	67	64	64	79
	40	91	88	78	74	72	67	64	64	78
1300	100	102	99	98	92	90	89	82	73	96
	80	99	97	98	89	87	84	77	71	94
	60	96	94	97	86	84	79	74	71	91
	50	95	94	96	85	82	77	73	72	90
	40	95	94	95	84	81	77	74	72	89
1800	100	108	105	107	100	99	99	95	86	105
	80	103	102	104	97	96	94	90	82	101
	60	101	99	101	94	93	89	85	81	99
	50	101	99	99	93	91	87	84	81	97
	40	101	99	98	92	90	86	84	82	96
2580	100	114	114	114	112	107	107	105	99	114
	80	109	110	110	109	104	103	100	94	111
	60	107	108	108	106	102	99	95	91	108
	50	108	108	106	104	100	97	94	91	106
	40	108	108	106	103	99	96	93	91	105
3110	100	118	118	118	115	112	111	109	104	118
	80	113	114	114	112	109	107	105	100	115
	60	111	112	112	109	107	104	100	96	112
	50	111	112	111	107	105	102	99	96	110
	40	111	112	111	107	104	101	98	95	110

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet L_{Wi}, L_{Wi}A and outlet L_{Wo}, L_{Wo}A sound power levels for Installation Type B: free inlet, ducted outlet. Outlet ratings include the effects of duct end correction. The A-weighted sound ratings shown have been calculated per AMCA International Standard 301.

27 BISW

Wheel Diameter = 27 in.
Outlet Area = 4.19 ft.^{2}
Tip Speed = 7.09 x RPM
Maximum BHP = (RPM/638)^3

Minimum Starting HP = ¾
Maximum RPM Class I = 1425
Maximum RPM Class II = 1859
Maximum RPM Class III = 2342
Maximum RPM Class IV = 2823

Maximum Open Motor Frame Size

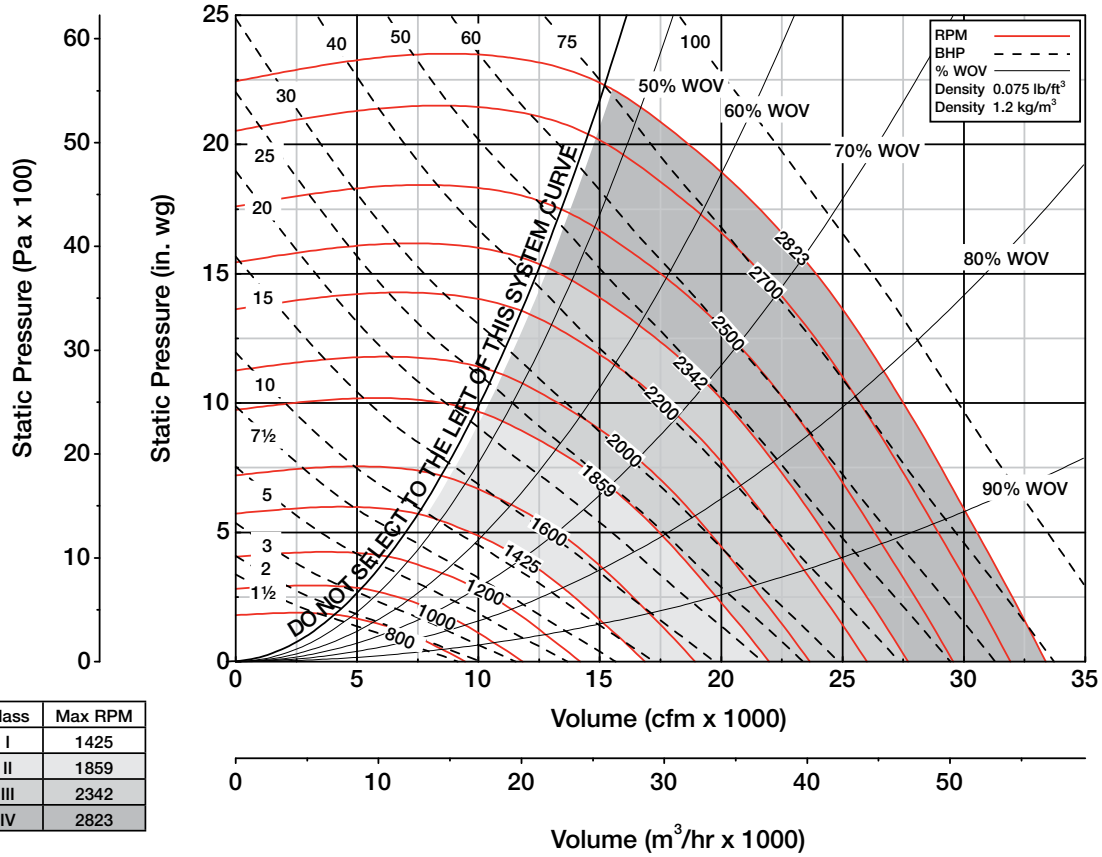
Class	I	II	III	IV
Arr. 9	284T	284T	286T	NA
Arr. 10	254T	284T	NA	NA

CFM	OV	STATIC PRESSURE (in. wg)																			
		0.50		1.00		1.50		2.00		2.50		3.00		3.50		4.00		4.50		5.00	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3400	811	465	0.38	604	0.75																
3930	937	492	0.46	622	0.86																
4460	1064	522	0.55	642	0.98	750	1.47														
4990	1190	553	0.65	667	1.12	769	1.64	860	2.19												
5520	1317	588	0.78	693	1.28	789	1.83	879	2.42	960	3.03										
6050	1443	624	0.92	723	1.45	814	2.03	898	2.66	978	3.32	1051	3.99								
6580	1570	662	1.09	754	1.65	840	2.26	920	2.92	996	3.62	1070	4.33	1137	5.06						
7110	1696	700	1.28	786	1.87	868	2.51	946	3.20	1019	3.93	1089	4.68	1156	5.46	1218	6.25	1277	7.05		
7640	1823	739	1.49	821	2.12	898	2.79	972	3.51	1043	4.26	1110	5.05	1175	5.87	1237	6.70	1296	7.55	1351	8.41
8170	1949	779	1.73	856	2.39	930	3.09	1000	3.84	1069	4.63	1133	5.44	1195	6.30	1256	7.18	1314	8.06	1370	8.96
8700	2076	819	1.99	893	2.70	962	3.42	1030	4.21	1095	5.03	1158	5.87	1218	6.75	1276	7.67	1333	8.60	1388	9.54
9230	2202	860	2.28	931	3.04	997	3.79	1061	4.60	1123	5.45	1185	6.33	1243	7.24	1299	8.18	1354	9.15	1407	10.1
9760	2329	901	2.61	968	3.41	1032	4.20	1093	5.02	1154	5.91	1211	6.82	1269	7.76	1323	8.72	1376	9.72	1428	10.8
10290	2455	942	2.96	1007	3.80	1068	4.64	1127	5.49	1185	6.40	1241	7.35	1295	8.32	1350	9.32	1401	10.3	1451	11.4
10820	2582	984	3.34	1047	4.23	1105	5.11	1162	6.00	1216	6.92	1271	7.91	1323	8.91	1376	9.95	1427	11.0	1475	12.1
11350	2708	1026	3.77	1087	4.70	1143	5.63	1197	6.55	1250	7.50	1303	8.50	1354	9.54	1403	10.6	1453	11.7	1501	12.8

CFM	OV	STATIC PRESSURE (in. wg)																			
		5.00		5.50		6.00		6.50		7.00		7.50		8.00		8.50		9.00		10.00	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7500	1789	1346	8.27																		
8090	1930	1367	8.88	1420	9.79	1470	10.7														
8680	2071	1388	9.52	1441	10.5	1491	11.4	1540	12.4												
9270	2212	1408	10.2	1461	11.2	1512	12.2	1560	13.2	1607	14.3	1652	15.3								
9860	2353	1433	10.9	1482	11.9	1533	13.0	1581	14.1	1628	15.1	1672	16.2	1716	17.3	1758	18.5				
10450	2494	1458	11.6	1507	12.7	1555	13.8	1602	14.9	1648	16.0	1693	17.2	1737	18.3	1779	19.5	1820	20.7	1892	22.9
11040	2634	1486	12.4	1533	13.5	1580	14.6	1625	15.8	1669	17.0	1714	18.2	1758	19.4	1800	20.6	1840	21.8	1913	24.1
11630	2775	1515	13.2	1561	14.3	1606	15.5	1650	16.7	1694	17.9	1736	19.2	1779	20.4	1821	21.7	1861	22.9	1933	25.4
12220	2916	1544	14.1	1590	15.3	1634	16.5	1676	17.7	1719	18.9	1761	20.2	1802	21.5	1842	22.8	1882	24.1	1954	26.6
12810	3057	1574	15.0	1620	16.2	1663	17.5	1705	18.7	1746	20.0	1786	21.3	1827	22.7	1866	24.0	1905	25.4	1974	27.9
13400	3198	1608	16.0	1649	17.3	1693	18.5	1734	19.8	1775	21.1	1814	22.5	1853	23.8	1891	25.2	1930	26.6	1996	29.3
13990	3338	1643	17.1	1683	18.3	1722	19.7	1764	21.0	1804	22.3	1843	23.7	1881	25.1	1918	26.5	1955	27.9	2020	30.7
14580	3479	1677	18.2	1717	19.5	1756	20.8	1794	22.2	1833	23.6	1872	25.0	1910	26.4	1947	27.9	1982	29.3	2045	32.1
15170	3620	1712	19.3	1752	20.7	1790	22.1	1828	23.5	1864	24.9	1902	26.3	1939	27.8	1976	29.3	2011	30.8	2070	33.5
15760	3761	1749	20.6	1787	22.0	1825	23.4	1862	24.8	1898	26.3	1932	27.8	1969	29.3	2005	30.8	2040	32.3	2099	35.1
16350	3902	1787	21.9	1823	23.3	1860	24.8	1896	26.2	1932	27.7	1966	29.2	2000	30.8	2035	32.3	2070	33.9	2128	36.8

CFM	OV	STATIC PRESSURE (in. wg)																			
		10.00		11.00		12.00		13.00		14.00		15.00		16.00		17.00		18.00		20.00	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
13400	3198	1996	29.3	2068	32.1	2138	35.0	2206	37.9	2270	40.8	2333	43.8	2393	46.8						
14040	3350	2022	30.8	2092	33.7	2161	36.7	2228	39.7	2292	42.7	2355	45.8	2415	48.9	2473	52.0	2530	55.2		
14680	3503	2049	32.3	2118	35.4	2184	38.4	2250	41.5	2315	44.7	2377	47.8	2437	51.0	2495	54.2	2552	57.5		
15320	3656	2077	33.9	2145	37.0	2211	40.2	2274	43.4	2337	46.7	2399	49.9	2459	53.2	2517	56.5	2574	59.8	2682	66.6
15960	3809	2109	35.7	2172	38.8	2237	42.1	2300	45.4	2361	48.7	2422	52.0	2481	55.4	2539	58.8	2596	62.2	2704	69.2
16600	3961	2140	37.5	2204	40.7	2264	44.0	2327	47.3	2388	50.8	2446	54.2	2503	57.7	2562	61.2	2618	64.7	2726	71.8
17240	4114	2172	39.4	2235	42.7	2296	46.0	2354	49.4	2414	52.9	2472	56.5	2529	60.0	2584	63.7	2640	67.3	2748	74.5
17880	4267	2204	41.4	2267	44.8	2327	48.2	2385	51.6	2441	55.1	2499	58.8	2555	62.4	2610	66.1	2663	69.9	2770	77.3
18520	4420	2239	43.4	2298	46.9	2358	50.4	2416	53.9	2471	57.5	2526	61.1	2582	64.9	2636	68.7	2689	72.5	2791	80.2
19160	4572	2275	45.6	2331	49.1	2390	52.7	2448	56.3	2503	60.0	2556	63.7	2608	67.4	2663	71.3	2716	75.2		
19800	4725	2312	47.9	2368	51.5	2422	55.1	2479	58.8	2534	62.5	2588	66.3	2639	70.1	2689	74.0	2742	78.0		
20440	4878	2349	50.2	2405	53.9	2458	57.6	2511	61.4	2566	65.2	2619	69.1	2671	73.0	2720	76.9	2769	80.8		
21080	5031	2387	52.7	2441	56.4	2494	60.2	2545	64.0	2598	67.9	2651	71.9	2702	75.9	2752	79.9				
21720	5183	2424	55.2	2479	59.0	2531	62.9	2582	66.8	2631	70.8	2682	74.8	2733	78.9	2783	83.0				
22360	5336	2464	57.9	2516	61.8	2568	65.7	2619	69.7	2667	73.8	2715	77.8	2765	82.0						
23000	5489	2505	60.8	2554	64.6	2606	68.7	2656	72.7	2704	76.8	2751	81.0	2797	85.2						

Performance certified is for model BISW Arrangement 1, Installation Type B: free inlet, ducted outlet.
Performance ratings do not include the effects of appurtenances (accessories).
Power rating (Bhp) does not include transmission losses.



Class	Max RPM
I	1425
II	1859
III	2342
IV	2823

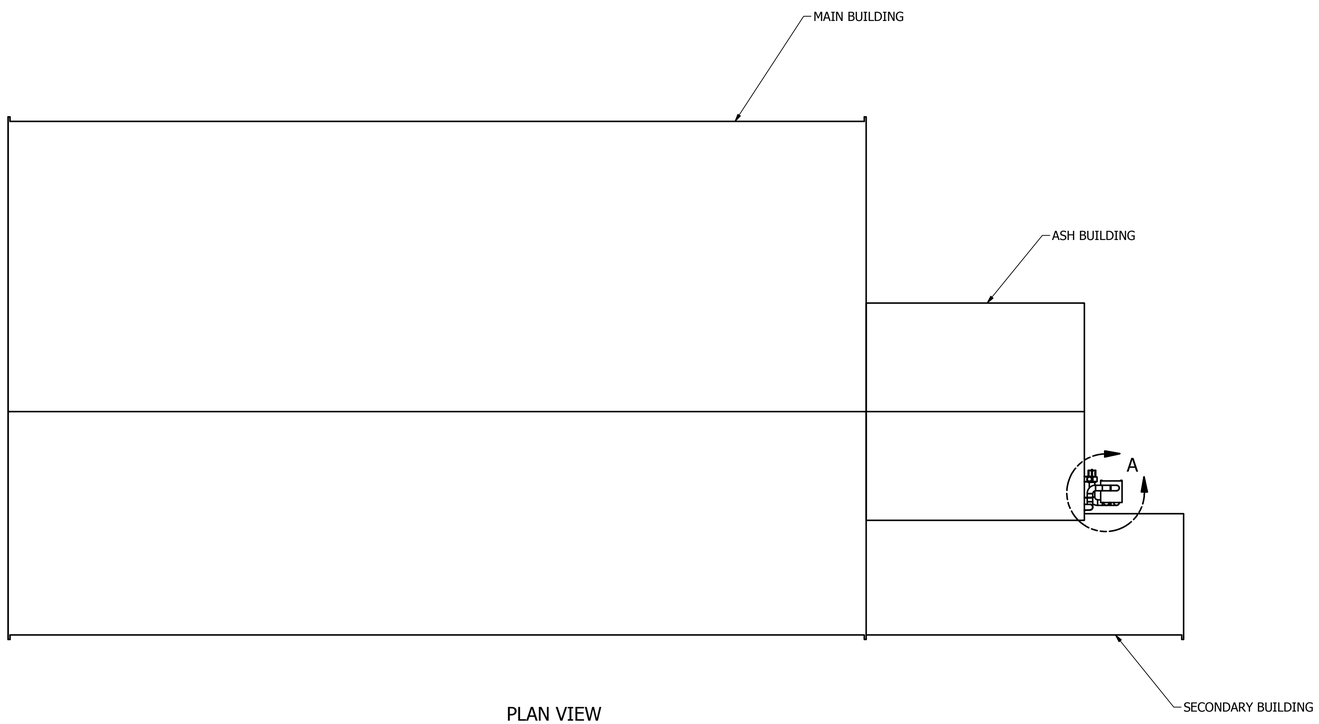
% WOV = (CFM X 100) / (RPM X 11.8)

Sound Power [dB Ref 10^{-12} watts]

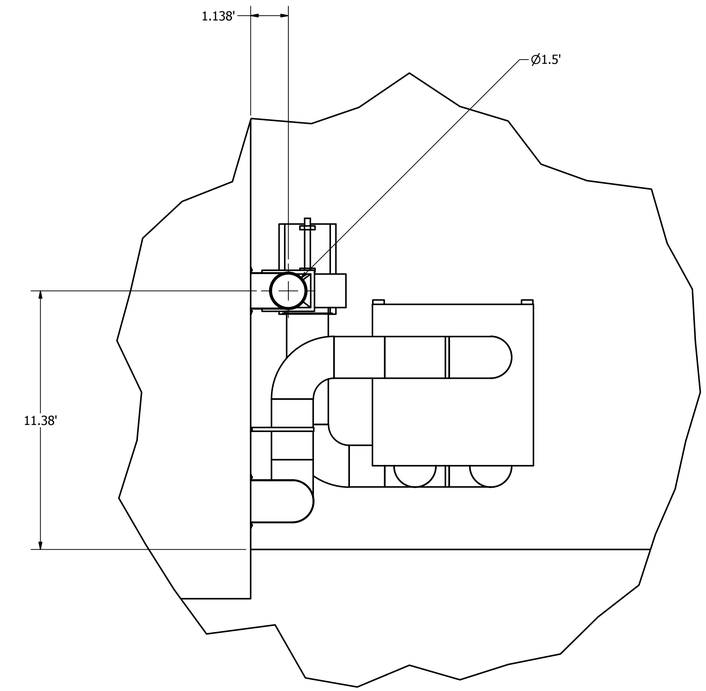
RPM	%WOV	Inlet Sound Power, L_{Wi} 1	2	3	4	5	6	7	8	L_{Wi}A
400	100	83	75	71	63	58	51	43	37	67
	80	76	67	63	56	51	44	37	32	60
	60	75	63	59	53	51	43	36	30	57
	50	73	63	58	54	53	44	37	32	57
	40	72	61	58	54	53	44	38	31	57
800	100	89	89	86	81	78	73	63	58	83
	80	86	87	82	78	74	68	61	56	80
	60	85	88	81	76	73	68	64	60	80
	50	84	84	79	75	73	68	65	61	78
	40	86	84	78	75	73	68	66	62	78
1200	100	93	94	99	91	86	86	78	71	94
	80	90	90	97	87	82	81	74	69	91
	60	89	88	93	84	80	78	75	71	88
	50	90	87	92	83	80	77	76	73	87
	40	89	88	93	83	81	78	76	73	88
1700	100	100	98	106	99	96	97	92	83	103
	80	96	94	104	94	91	90	86	79	99
	60	95	90	99	90	88	87	85	82	96
	50	96	91	100	89	87	87	86	83	96
	40	99	96	102	91	88	87	86	84	97
2342	100	107	106	111	109	104	104	102	94	111
	80	103	102	108	106	99	98	95	89	107
	60	103	100	103	101	96	95	93	90	103
	50	104	101	104	101	95	94	93	91	103
	40	107	105	107	103	96	95	94	92	105
2823	100	110	112	114	115	109	108	107	100	116
	80	106	108	111	112	105	102	100	95	112
	60	107	106	107	108	101	99	98	95	109
	50	107	107	108	108	100	98	98	96	108
	40	110	111	111	110	102	99	98	96	111

RPM	%WOV	Outlet Sound Power, L_{Wo} 1	2	3	4	5	6	7	8	L_{Wo}A
400	100	85	77	70	66	62	53	46	40	69
	80	85	76	68	61	58	49	42	36	66
	60	84	73	65	58	57	47	44	38	64
	50	82	71	63	58	57	47	44	39	63
	40	81	71	63	58	57	47	45	39	63
800	100	95	94	85	82	81	76	67	60	86
	80	94	91	82	78	77	71	64	58	82
	60	91	89	79	75	73	67	63	60	79
	50	91	87	78	74	72	67	64	64	78
	40	91	88	77	74	72	67	64	64	78
1200	100	103	100	98	92	91	89	82	73	97
	80	100	98	98	90	88	84	77	71	94
	60	97	96	97	87	84	79	75	72	92
	50	96	95	96	85	82	78	74	73	90
	40	97	95	95	84	82	78	75	73	90
1700	100	109	107	109	101	100	100	96	87	107
	80	104	104	105	98	97	95	91	83	103
	60	102	101	103	96	95	91	86	83	100
	50	103	100	101	94	92	89	86	83	98
	40	103	100	100	93	91	88	86	83	97
2342	100	116	114	115	111	108	107	105	98	115
	80	111	111	111	108	105	103	100	94	111
	60	109	108	109	106	102	99	95	91	108
	50	109	108	107	104	100	97	94	91	106
	40	109	108	107	103	99	96	94	91	106
2823	100	119	119	119	118	113	112	110	104	120
	80	114	115	115	115	110	108	105	100	116
	60	112	112	113	112	107	104	100	96	114
	50	113	113	112	111	105	102	99	96	112
	40	112	113	111	110	104	101	98	96	111

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet L_{Wi}, L_{Wi}A and outlet L_{Wo}, L_{Wo}A sound power levels for Installation Type B: free inlet, ducted outlet. Outlet ratings include the effects of duct end correction. The A-weighted sound ratings shown have been calculated per AMCA International Standard 301.



PLAN VIEW



DETAIL A
SCALE 1 / 40
(ASH SYSTEM BAGHOUSE)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:		DRAWN KS	7/3/2012
DECIMAL	WELD ± 1/32	CHECKED	
.X ±.1	CHAMFERS ±5°	QA	
.XX ±.02	ANGLES ±1°	MFG	
.XXX ±.005	CAST ±1/8	APPROVED	
FRACTIONS ±1/16			
THIRD ANGLE PROJECTION		MATERIAL N/A	FINISH N/A

DYNAMIS ENERGY

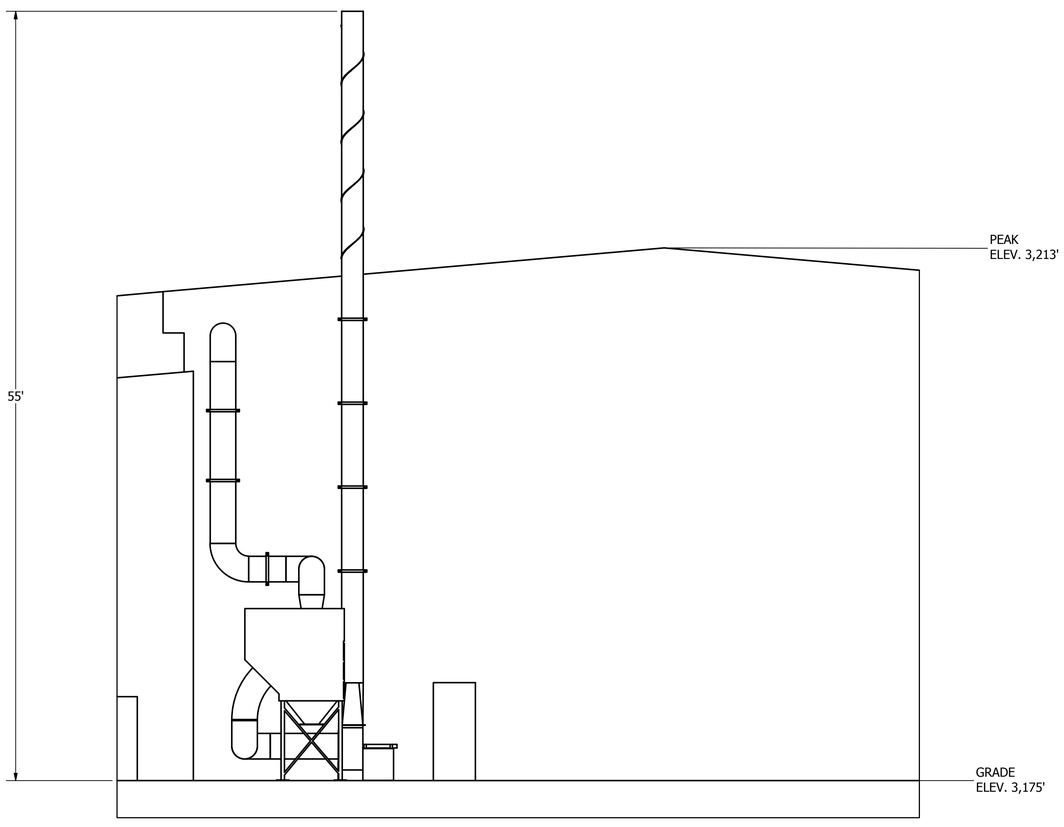
Dynamis Energy LLC,
776 E. Riverside Dr. Ste. 150
Eagle, ID 83616

TITLE
ASH ROOM, BAGHOUSE, STACK, ADA COUNTY

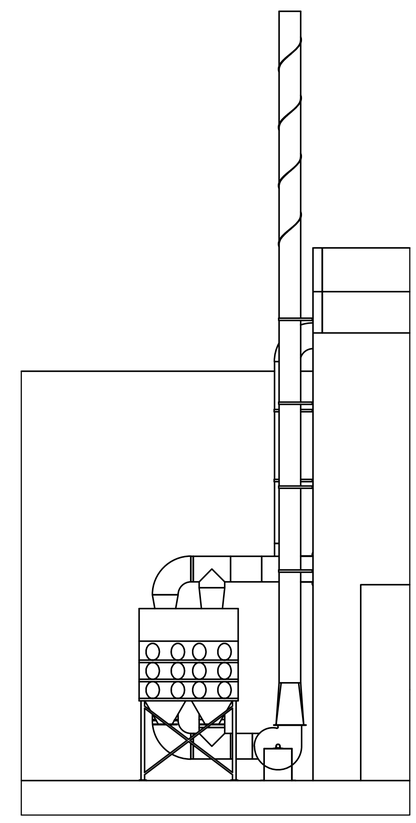
SIZE	DWG NO	REV
D	1003202	-

SCALE: NTS

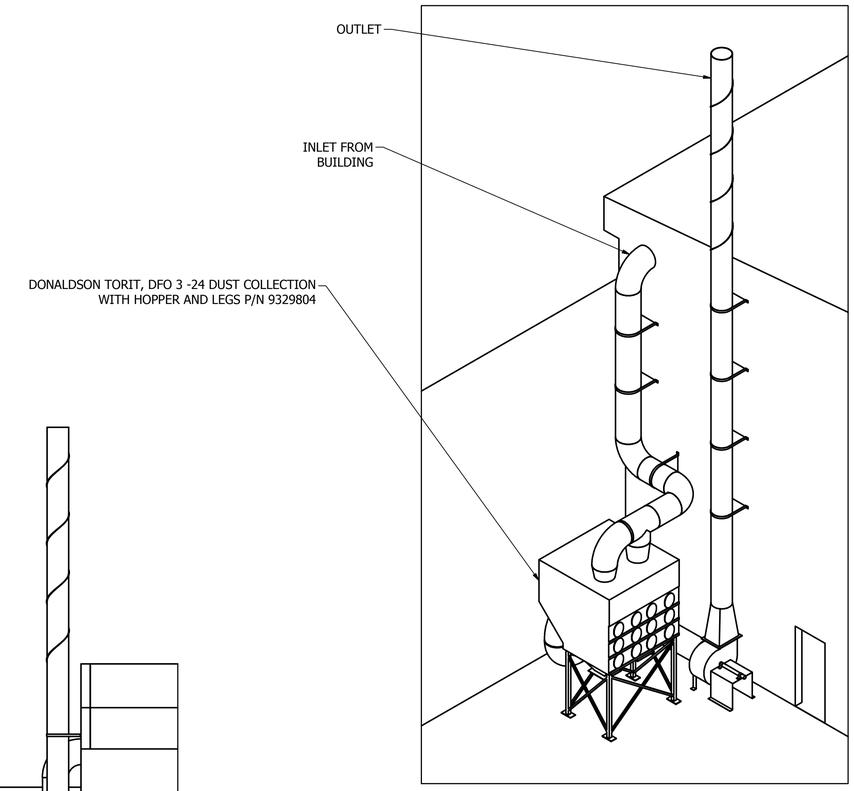
SHEET 1 OF 2



ELEVATION VIEW (EAST SIDE)



ELEVATION VIEW (NORTH SIDE)



DRAWN KS	7/3/2012	DYNAMIS ENERGY	Dynamis Energy LLC, 776 E. Riverside Dr. Ste, 150 Eagle, ID 83616
CHECKED		SIZE D	DWG NO 1003202 — REV -
		SCALE: NTS	SHEET 2 OF 2

APPENDIX F

DEQ Modeling Forms

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline - 1-877-5PERMIT

PERMIT TO CONSTRUCT APPLICATION

Revision 3
4/5/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Dynamis Energy, LLC
Facility Name:	Hidden Hollow Waste-To-Energy (WTE) Facility
Facility ID No.:	
Brief Project Description:	Municipal solid waste thermal conversion facility located at the Ada County Landfill

SUMMARY OF AIR IMPACT ANALYSIS RESULTS - CRITERIA POLLUTANTS

				2.	3.	4.		5.
Criteria Pollutants	**Averaging Period**	**Significant Impact Analysis Results (µg/m3)**	**Significant Contribution Level (µg/m3)**	**Full Impact Analysis Results (µg/m3)**	**Background Concentration (µg/m3)**	**Total Ambient Impact (µg/m3)**	**NAAQS (µg/m3)**	**Percent of NAAQS**
$PM_{2.5}$	24-hour	11.10	1.2	11.10	19.30	30.40	35	87%
	Annual	1.77	0.3	1.79	6.30	8.09	15	54%
PM_{10}	24-hr	15.80	5	13.30	73.00	86.30	150	58%
SO_2	1-hr	93.70	7.9	46.20	33.10	79.30	196	40%
	Annual	0.78	1	n/a	2.60	n/a	80	#VALUE!
NO_2	1-hr	171.30	7.5	229.30	Variable	229.30	188	122%
	Annual	8.87	1	8.89	40.00	48.89	100	49%
CO	1-hr	n/a	2000	n/a	n/a	n/a	10000	n/a
	8-hr	n/a	500	n/a	n/a	n/a	40000	n/a

DEQ AIR QUALITY PROGRAM
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PERMIT TO CONSTRUCT APPLICATION
Revision 3
3/27/2007

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Company Name:	Dynamis Energy, LLC
Facility Name:	Hidden Hollow Waste-To-Energy (WTE) Facility
Facility ID No.:	
Brief Project Description:	Municipal solid waste thermal conversion facility located at the Ada County Landfill

POINT SOURCE STACK PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Stack Height (m)**	**Modeled Diameter (m)**	**Stack Exit Temperature (K)**	**Stack Exit Flowrate (acfm)**	**Stack Exit Velocity (m/s)**	**Stack orientation (e.g., horizontal, rain cap)**
Point Source(s)										
UNITPEAK		558,564.86	4,839,455.69	967.74	18.29	1.52	325.04	120,725.46	31.23	Vertical
UNIT1OP		558,564.86	4,839,455.69	967.74	18.29	1.52	330.09	33,894.06	8.77	Vertical
ASHBH		558,516.34	4,839,409.81	967.74	16.76	0.46	310.93	14,000.00	40.25	Vertical
EMERGEN		558,527.07	4,839,379.75	967.74	3.05	0.13	772.65	2,461.43	91.69	Vertical
CT1		558,541.27	4,839,482.28	967.74	10.44	10.00	303.52	1,181,020.80	7.10	Vertical
CT2		558,554.77	4,839,482.28	967.74	10.44	10.00	303.52	1,181,020.80	7.10	Vertical
HGEN1		557,482.93	4,838,615.04	872.63	4.39	0.37	754.26	12,484.05	56.00	Vertical
HGEN2		557,479.78	4,838,607.43	872.40	4.39	0.37	754.26	12,484.05	56.00	Vertical
HGEN3		557,475.20	4,838,597.18	871.97	4.39	0.37	754.26	12,484.05	56.00	Vertical
HGEN4		557,472.06	4,838,589.83	871.69	4.39	0.37	754.26	12,484.05	56.00	Vertical
FLARE1 - Scenario 1		557,489.99	4,838,641.83	873.88	12.19	3.05	1,064.00	4,947.39	0.32	Vertical
FLARE1 - Scenario 2		557,489.99	4,838,641.83	873.88	12.19	3.05	1,064.00	8,750.70	0.57	Vertical
FLARE2		557,494.64	4,838,635.18	872.90	12.19	3.05	1,060.00	8,719.77	0.56	Vertical
CCHIPGEN		558,120.57	4,839,320.81	984.00	1.83	0.20	768.71	3,439.12	50.00	Vertical
CSCRNGEN		558,143.64	4,839,310.00	986.00	1.83	0.08	797.00	483.14	50.00	Vertical

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PERMIT TO CONSTRUCT APPLICATION
Revision 3
4/5/2007

Please see instructions on page 2 before filling out the form.

Company Name:	Dynamis Energy, LLC
Facility Name:	Hidden Hollow Waste-To-Energy (WTE) Facility
Facility ID No.:	
Brief Project Description:	Municipal solid waste thermal conversion facility located at the Ada County Landfill

FUGITIVE SOURCE PARAMETERS

1.	2.	3a.	3b.	4.	5.	6.	7.	8.	9.	10.
Emissions units	**Stack ID**	**UTM Easting (m)**	**UTM Northing (m)**	**Base Elevation (m)**	**Release Height (m)**	**Easterly Length (m)**	**Northerly Length (m)**	**Angle from North (°)**	**Initial Vertical Dimension (m)**	**Initial Horizontal Dimension (m)**
Area Source(s)										
n/a										
Volume Source(s)										
n/a										

DEQ AIR QUALITY PROGRAM
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PERMIT TO CONSTRUCT APPLICATION

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4/5/2007

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Company Name:	Dynamis Energy, LLC
Facility Name:	Hidden Hollow Waste-To-Energy (WTE) Facility
Facility ID No.:	
Brief Project Description:	Municipal solid waste thermal conversion facility located at the Ada County Landfill

BUILDING AND STRUCTURE INFORMATION

1.	2.	3.	4.	5.	6.	7.
Building ID Number	**Length (ft)**	**Width (ft)**	**Base Elevation (m)**	**Building Height (m)**	**Number of Tiers**	**Description/Comments**
TURBINE	81.00	92.00	967.74	10.67	1	Dynamis Turbine Building
BOILER	79.00	39.90	962.41	15.24	1	Dynamis Boiler Structure
CTBLDG	96.00	58.00	967.74	10.36	1	Dynamis Cooling Tower Bases/Enclosure
MAIN	389.00	197.50	967.74	10.67	1	Dynamis Main Building (dimensions represent max length and width, building is not a rectangle)
HHBLDG1	12.80	9.10	871.85	3.66	1	GEN1_GEN2 Bldg
HHBLDG2	12.80	9.10	870.94	3.66	1	GEN3_GEN4 Bldg
CFLRSKID	14.67	44.01	873.41	2.44	1	ACLF FLR Skid
CGENCTRL	7.33	14.67	873.80	3.66	1	ACLF Generator Control Bldg
DEQCNTRL	24.70	12.90	874.32	3.05	1	ACLF Control Bldg

APPENDIX G

SIL Receptor List (on CD)

APPENDIX H

Model Protocol Approval

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 NORTH HILTON, BOISE, ID 83706 · (208) 373-0502

C. L. "BUTCH" OTTER, GOVERNOR
CURT FRANSEN, DIRECTOR

April 11, 2012

VIA EMAIL

Shannon Manoulian, P.E.
Project Engineer
JBR Environmental Consultants, Inc.
Boise, ID 83714

RE: Modeling Protocol for the 15-Day Pre-Permit to Construct Application for the Dynamis Energy Waste to Energy Facility at the Ada County Landfill near Boise, Idaho

Dear Ms. Manoulian:

DEQ received a dispersion modeling protocol from JBR Environmental Consultants, Inc., (JBR) on March 19, 2012, via email. The modeling protocol was submitted on behalf of Dynamis Energy, LLC (Dynamis). The modeling protocol proposes methods and data for use in Class II area ambient air impact analyses in support of a 15-Day Pre-Permit to Construct (15-Day PTC) application for a municipal solid waste-to-energy (MSWTE) conversion facility at the Hidden Hollow Landfill (HHLF). The HHLF site is owned and operated by Ada County.

The MSWTE facility is proposed to be located on a parcel of property leased from Ada County and will be entirely contained within the HHLF facility property. The facility would receive a portion of the MSW delivered to the HHLF. The proposed MSWTE facility would process up to 408 tons per day (TPD) of a combination of these materials to produce steam for electricity generation and ash as a saleable byproduct.

This protocol approval is based on the March 19 and March 21, 2012 protocol submittals, and is independent of the modeling protocol received on December 8, 2010, the DEQ protocol approval letter issued on December 16, 2010, and the 15-Day PTC application for the Dynamis 250 TPD MSWTE facility, received on December 30, 2010.

The modeling protocol has been reviewed and DEQ has the following comments:

- **Comment 1: Background Concentrations.** Your modeling protocol indicates that potential emissions of CO are below the Level I modeling applicability threshold of 15 pounds per hour. Modeling will not be required for this pollutant.

  DEQ provided ambient background concentrations to JBR Environmental Consultants, via email, on February 28, 2012. Monitoring data for NO_2 and ozone is limited to a small

number of sites within Idaho, and the most representative sites were selected for your project.

The ITD monitoring site is the closest source of NO_2 data in proximity to the Hidden Hollow Landfill. The preliminary backgrounds for nitrogen dioxide (NO_2) and ozone background data that were based on historical data from the Idaho Transportation Department (ITD) monitoring site in Boise. The NO_2 and ozone backgrounds submitted to you via email on February 28, 2012 have been replaced by the background values in this protocol approval. The 2011 NO_2 monitoring data was invalidated and has been removed from the NO_2 background values. The revised NO_2 background concentrations were based on 2007 and 2010 data from the ITD site, and represent the 98th percentile values for each hour during a day. 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.

The ozone and NO_2 data was collected during periods when ozone and NO_2 are expected to be at their highest levels during the year—generally starting in April or May, depending on the monitoring record, and ending on September 30th of each year. The monitoring data was reduced to single hourly values for each of the 24 hourly periods within a day.

Table 1. Ozone and Nitrogen Dioxide Background Concentrations

Hour Interval	Ozone Concentration 98th Percentile Value (ppb)[a]	Nitrogen Dioxide Concentration 98th Percentile Value (µg/m^3)[b]
1	53.0	43.2
2	50.9	41.4
3	51.9	33.8
4	48.0	32.0
5	47.9	30.1
6	46.0	37.6
7	41.0	43.2
8	43.0	48.9
9	48.0	54.6
10	54.3	43.2
11	61.0	32.0
12	66.0	26.7
13	72.9	17.3
14	76.0	11.3
15	80.0	11.3
16	78.4	11.2
17	73.7	11.2
18	70.0	15.0
19	67.0	30.1
20	62.8	54.4
21	55.0	56.4
22	55.0	58.3
23	55.0	58.3
24	53.9	54.5

a. Parts per billion.
b. Micrograms per cubic meter.

Backgrounds for the other criteria air pollutants required to be modeled are:

- PM_{10}: 73 µg/m^3, 24-hour average.

  The PM_{10} background value was based on historical DEQ airshed modeling for the Boise area, and is intended to represent the background at the landfill.

- $PM_{2.5}$: 19.3 µg/m^3, 24-hour average, and
  6.3 µg/m^3, annual average.

  $PM_{2.5}$ backgrounds were based on the Meridian, Idaho monitor's 2008, 2009, and 2010 finalized data from the U.S. EPA AirData website. The 24-hour average background is the 3-year average of each year's 98th percentile value. The annual average background is the 3-year average of the weighted mean value for each year.

- SO_2: 33.1 µg/m^3, 1-hour average, and
  2.6 µg/m^3, annual average.

  Due to the limited monitoring data for SO_2 within Idaho that are typically available from source-influenced sites, and which would be considered to be non-representative of the conditions at this site, this project will use the same SO_2 backgrounds as the current Ada County Landfill and Hidden Hollow Energy permitting projects. These SO_2 background values were based on monitoring data for the Fargo, North Dakota/Moorhead, Minnesota area, which was deemed to be more suitable for the Boise site considering the similar population and industrial source emissions within the immediate area than exist at either the Pocatello or Soda Springs, Idaho monitoring sites.

- Lead: 0.04 µg/m, 3-month average.

If Dynamis Energy's initial modeling does not demonstrate compliance with any of the NAAQS, and alterations to the proposed emission units' exhaust parameters or the requested allowable emission rates do not provide the necessary reductions in ambient impacts, please contact DEQ to discuss options with modifying the ambient background concentrations, to the extent the values used will be defensible in protecting public health and the environment.

- **Comment 3: Multiple Operating Scenarios.** Two distinct operating scenarios for Dynamis' facility were described in the modeling protocol. The first scenario described processing 380 tons during a 16-hour period from 7 AM to 11 PM, and a second scenario was described for processing 28 tons during an 8-hour period from 11 PM to 7 AM. The first scenario results in an average municipal solid waste (MSW) throughput of 23.75 tons per hour (T/hr), and the second scenario results in an average hourly MSW throughput of 3.5 T/hr. Additional variation within the two time periods was not discussed.

  If the 23.75 T/hr throughput rate is not the true maximum design capacity of the thermal conversion units and the secondary combustion chamber system, the maximum potential

hourly conditions have not been identified, and the average hourly operation rate may be exceeded during operation. The effects of the material throughput on release parameters must be substantiated and documented. Partial capacity operations may cause ambient impacts to occur in different locations and at different concentrations in the modeling analyses receptor grids.

For example, if increased hourly capacity is needed to allow for spikes in the grid's electricity demand during the peak summertime cooling season, the maximum hourly capacity must be accounted for in the modeling demonstration. Also, the "peaking" approach may be presented as an additional scenario that is modeled for a specific season with the use of "operational factors" in the model setup.

Because the new National Ambient Air Quality Standards (NAAQS) for sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) are based on a period of a single hour, average operations spanning longer time intervals cannot be used as a "potential to emit" scenario when modeling for compliance with the 1-hour significant impact levels (SILs) or the NAAQS unless Dynamis Energy is willing to accept those limitations on an individual hourly basis. The modeling demonstration must account for the effects on hourly emissions rates and effects on the release parameters. The effects of varying types of waste, such as typical residential solid waste versus used tires, need to be evaluated for the estimate of worst-case hourly emission rates and release parameters for the pollutants with 1-hour averaging periods. If different waste types create different emissions profiles or release parameters this information must be presented and discussed thoroughly in the permit application's modeling report and must be incorporated in the modeling demonstration.

- **Comment 4: Justification of Release Parameters.** Documentation and justification of release parameters must be provided in the application. Refer to Section 3.4.3 of the *State of Idaho Guideline for Performing Air Quality Impact Analyses*, July 2011. Dynamis Energy's modeling protocol did not provide documentation of the release parameters for the proposed facility's emissions units so review and approval of release parameters will be conducted during the application's completeness review and the completeness determination will incorporate the *Guideline's* substantiation requirements.

  In most instances, typical values should be used rather than extreme values, and should represent the conditions at the point of release to the atmosphere. Conservative assumed values may be used where supporting documentation is unavailable. Documentation can include manufacturer's specifications sheets or design documents. The application's modeling report should confirm that the orientation of each of the point sources is vertical and uninterrupted, rather than a horizontal release or impeded by a raincap or similar feature.

  Be advised that an increase in the assumed stack release height is generally accompanied by a decrease in exit temperature, volumetric flow rate, and exit velocity if heat transfer from the stack is a significant loss factor. An example of the difference in release parameters that the location of the point of sampling in the exhaust system can make can be illustrated by the exhaust parameter supporting test data submitted for another project. The source tested was a diesel-fired 288 brake horsepower fire water pump driver engine and was conducted at full load conditions using Reference Methods 2 and 4.

Cummins CFP83-F40 Fire Pump Driver Exhaust Parameters		
Source of Data	**Exhaust Temperature (degrees Fahrenheit)**	**Exhaust Flow Rate (CFM)**
Manufacturer's Specification Sheet at operating at 288 bhp [a, b]	952	1632[c]
Engine Test Report[d]	685	1028

a. Brake horsepower.
b. Manufacturer testing condition barometric pressure at 29.53 inches Hg.
c. Reported as "CFM."
d. Test port location was listed as 4 feet below the stack exit height.
The source was modeled with a release height of 18 feet.
Testing was conducted at an elevation of 4200 feet above sea level.
Temperature and flow rate values were averaged based on four runs lasting from 3 to 5 minutes each.

- **Comment 5: Receptor Grid.** The proposed receptor grid may provide a good starting point for the modeling analyses. However, if DEQ performs a sensitivity analysis using a more densely-spaced receptor grid and any applicable ambient standards are exceeded, the permit will be denied. Approval of an initial receptor grid described in a modeling protocol does not qualify for final approval of a receptor grid layout for this project. This project must consider complicating factors of complex terrain on the Hidden Hollow Landfill property immediately adjacent to the proposed Dynamis Energy facility, as documented in Appendix A of the modeling protocol, and the nearby sources of Hidden Hollow Energy and the Ada County Landfill flare installation. Locations of the impacts may be different for some air pollutants due to the difference in source operating schedules, emission rates, location of emission releases, and other exhaust parameters for the various sources in your modeling demonstration.

  DEQ generally requests that modeling demonstrations use a denser spacing of receptors in areas of steep terrain. Erring on the side of a more densely-spaced receptor grid may be advisable. DEQ's *Guideline* no longer contains recommended ranges for approved receptor spacing. Often, the use of one or more additional grids of densely-spaced receptors is useful in resolving the maximum ambient impacts in specific areas. The receptor grid must contain all locations where the proposed facility will cause a significant ambient impact.

- **Comment 6: Ambient Air Boundary.** The modeling protocol contained a description of the ambient air boundary and the methods that Dynamis Energy will employ to preclude public access to the land that Dynamis Energy will treat as exempt from ambient air. The ambient air boundary was established as Dynamis Energy's leased property boundary and applied the appropriate levels of control of public access for a non-Prevention of Significant Deterioration project.

- **Comment 7: NO_2, 1-Hour Average SIL and NAAQS Modeling.** The modeling protocol submitted by Dynamis did not contain any documentation on the methods that may be used for an NO_2, 1-hour average, Significant Impact Level (SIL) or NAAQS modeling analyses. The Tier 1 and the Tier 2 Ambient Ratio Method (ARM) compliance methods may be used without prior DEQ approval.

  The Tier 3 Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) compliance methods are non-regulatory guideline methods, and approved on

a case-by-case basis. OLM and PVMRM use an in-stack NO_2 to NO_x ratio for each NO_x emission source, and an equilibrium ratio for the model run's calculation of NO_2 formation. The Tier 3 methods are approved for Dynamis Energy's modeling demonstration, but be advised that in-stack NO_2 to NO_x ratios are often specific to fuel type and source design and can vary considerably even within the same source type, as is the case for diesel-fired engines for example. If an in-stack NO_2 to NO_x ratio other than the default value of 0.5 is used Dynamis must submit the supporting documentation. The default NO_2 equilibrium ratio is 0.90.

- **Comment 8: Diesel-Fired Emergency Generator Engine Testing Schedule.** The approach proposed in the modeling protocol appears reasonable. If DEQ performs sensitivity analyses using the MHRDOW7 option selecting a different month and NAAQS compliance is not demonstrated, the permit application may be denied.

- **Comment 9: DEQ Application Forms.** Please complete all modeling information application forms for this permit application package. An emission inventory specifically for modeling is included in these forms.

- **Comment 10: Ada County Landfill and Hidden Hollow Energy Nearby Sources Emissions Inventory.** DEQ requests that Dynamis include the emissions of two nearby sources—Hidden Hollow Energy, LLC (HHE) and the Ada County Landfill (ACLF)—as co-contributing sources in the your modeling demonstration. The exhaust parameters, locations, and emission rates for these sources were originally provided in an email dated December 6, 2010 for this project's initial PTC application. The ACLF and the HHE have experienced a marked increase in hydrogen sulfide (H_2S) generation for the landfill gas collected by the ACLF capture and control system. The HHE facility has an active PTC modification project on file with DEQ. The potential to emit SO_2 for the two existing engines at HHE and the two proposed engines will be affected by this permitting action. The final results of this permitting action are unclear, but DEQ will provide emission inventory and release parameter documentation that are likely to represent future operations at these facilities.

  On March 26, 2012, DEQ received notification that ACLF will not install a hydrogen sulfide (H_2S) control system, which would have also reduced SO_2 emissions for any combustion unit downstream of the control system. ACLF's flares are permitted to combust landfill gas with up to 600 parts per million by volume (ppm_v) of H_2S, which is valid for the Dynamis Energy nearby source analysis.

  HHE will be assumed to operate four generator engines with 2,400 standard cubic feet per minute (scfm) of landfill gas limited to an H_2S content of 180 parts per million by volume (ppm_v). The ACLF flaring operations will be assumed to operate at 950 scfm of landfill gas combusted in one flare.

  A second operating scenario for the nearby sources assumes that HHE is non-operational and ACLF is combusting 3,350 scfm of landfill gas at 600 parts per million on a volumetric basis (ppm_v) of H_2S. Dynamis must determine which operating scenario will cause the worst-case ambient impacts to verify that Dynamis will not cause or contribute to an exceedence of any of the NAAQS. Only ambient receptors where Dynamis' emissions cause a predicted impact greater or equal to the significant impact levels are

subject to these verification requirements. Ambient impacts caused by each of these three facilities within each facility's ambient air boundary are not evaluated for compliance with the NAAQS. In other words a facility does not cause or contribute to a NAAQS exceedence within its own ambient air boundary.

The emission rates and release parameters are provided in Attachment 1 to this protocol approval letter and are to be regarded as the appropriate information for your nearby source analyses for this project. The flare release parameters are dependent upon flow rate of landfill gas. The preliminary emission rate and exhaust parameter documentation provided to JBR during the meetings on February 9, 2012, and via email on February 15, 2012, may differ slightly from this protocol approval's information.

- **Comment 11: TAPs Regulated by 40 CFR 60 Subpart Eb**. Dynamis requested exclusion of emissions of cadmium, dioxin and furans, and hydrochloric acid from additional compliance demonstration methods as allowed by Section 210.20 of the State of Idaho Air Rules. The TAPs are regulated under 40 CFR 60, Subpart Eb, the Dynamis facility will be subject to this subpart, and DEQ agrees that a compliance demonstration according to the requirements of Section 210 of the State of Idaho Air Rules is not required for these pollutants.

- **Comment 12**: **Terrain Data.** DEQ recommends that Dynamis use a 1/3 arc second National Elevation Dataset (NED) file when running AERMAP to provide a 10-meter resolution in all areas where significant terrain features are present. The Hidden Hollow Landfill itself and nearby residential areas where ambient impacts are of highest concern have significant terrain features which need to be represented as accurately as possible with the data resources available. The coarsely-spaced outer receptor grids where the terrain is relatively flat could be based on the 30 meter resolution 1 arc second files if necessary.

DEQ's modeling staff considers the submitted dispersion modeling protocol, with resolution of the additional items noted above, to be approved. It should be noted, however, that the approval of the modeling protocol, and 15-day pre-permit application construction approval, are not meant to imply approval of completed dispersion modeling analyses. The protocol approval does not provide an exhaustive review of all issues that may factor into the completeness of the modeling demonstration, and more extensive documentation in the permit application's modeling report may be necessary where the modeling protocol does not provide supporting documentation and detail. Completeness determinations weigh the materials presented in permit application and modeling report in evaluating whether the modeling analyses adequately demonstrate compliance with the applicable standards and increments. Please refer to the State of Idaho Air Quality Modeling Guideline, which is available on the Internet at http://www.deq.idaho.gov/media/355037-modeling-guideline.pdf, for further guidance.

To ensure a complete and timely review of any analyses submitted to the Idaho Department of Environmental Quality, our modeling staff requests that electronic copies of all modeling input and output files (including BPIP and AERMAP input and output files) be submitted with analyses reports. Also, please include a copy of the protocol and this approval notice with the submitted application. If you have any further questions or comments, please contact me at (208) 373-0536.

Sincerely,

Darrin Mehr

Darrin Mehr
Air Quality Analyst
Monitoring, Modeling, and Emission Inventories
Air Quality Stationary Source Program

Attachment 1

Co-Contribution Source Analysis Information

for the

Ada County Landfill and the Hidden Hollow Energy Facilities

SCENARIO 1: This scenario represents Hidden Hollow Energy (HHE) operating at full capacity of 2,400 standard cubic feet per minute (scfm) of landfill gas at 180 ppm_v H_2S. Ada County Landfill (ACLF) is operating at partial capacity in flaring landfill gas at 950 scfm at 600 ppm_v H_2S, and at full capacity with Woodwaste Processing. All stacks were vertically oriented with no obstruction to exhaust flow.

Exhaust Parameters: Scenario 1							
Source	**UTM[a] Zone 11 (NAD83)[b]**		**Elevation (m)**	**Stack Height (m)**	**Stack Temperature (K)[d]**	**Stack Diameter (m)**	**Stack Velocity (m/s)[e]**
	Easting (m)[c]	**Northing (m)**					
Hidden Hollow Energy Sources							
Generator Engine 1	557482.93	4838615.04	872.63	4.39	754.26	0.366	56
Generator Engine 2	557479.78	4838607.43	872.4	4.39	754.26	0.366	56
Generator Engine 3	557475.2	4838597.18	871.97	4.39	754.26	0.366	56
Generator Engine 4	557472.06	4838589.83	871.69	4.39	754.26	0.366	56
Ada County Landfill Sources							
Flare 1	557489.99	4838641.83	873.88	12.19	1064	3.048	0.32
Chipper Engine	558217	4839332	987.01	1.83	768.71	0.2033	50
Power Screen Engine	558236	4839310	988.54	1.83	797	0.0762	50

a. Universal Transverse Mercator (geographical coordinate system).
b. North American Datum of 1983.
c. Meters.
d. Kelvin.
e. Meters per second.

Emission Rates: Scenario 1						
Source	**$PM_{10}/PM_{2.5}$[a]**		**SO_2[b]**		**NO_x[c]**	
	(lb/hr)[d]	**(T/yr)[e]**	**(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

a. Particulate matter with a mean aerodynamic diameter of 10 microns or less, including condensables / Particulate matter with a mean aerodynamic diameter of 2.5 microns or less, including condensables.
b. Sulfur dioxide.
c. Nitrogen oxides.
d. Pounds per hour.
e. Tons per year.

Comments on Scenario 1:

- The Chipper Engine and Power Screen Engine may be left out of the co-contributing source modeling analysis for SO_2. The potential emissions are insignificant.
- Flare 1 was assumed to operate 24 hours per day and 8,760 hours per year.
- The Wood Chipper and Power Screen Engines were assumed both operate 24 hours per day and 3,300 days per year, as limited in the ACLF Permit to Construct.
- HHE generator engines each operate 24 hours per day and 8,760 hours per year.

SCENARIO 2: HHE is non-operational, combusting no landfill gas. Ada County Landfill is operating at full capacity in flaring landfill gas at 3,350 scfm at 600 ppm_v H_2S with the landfill gas split equally between the two flares. The Chipper and Power Screen operations were assumed to operate at full capacity. All stacks were vertically oriented with no obstruction to exhaust flow.

Exhaust Parameters: Scenario 2							
Source	**UTM[a] Zone 11 (NAD83)[b]**		**Elevation (m)**	**Stack Height (m)**	**Stack Temperature (K)[d]**	**Stack Diameter (m)**	**Stack Velocity (m/s)[e]**
	Easting (m)[c]	**Northing (m)**					
Ada County Landfill Sources							
Flare 1	557489.99	4838641.83	873.88	12.19	1064	3.048	0.566
Flare 2	557494.64	4838635.18	872.9	12.19	1060	3.048	0.564
Chipper Engine	558217	4839332	987.01	1.83	768.71	0.2033	50
Power Screen Engine	558236	4839310	988.54	1.83	797	0.0762	50

a. Universal Transverse Mercator (geographical coordinate system).
b. North American Datum of 1983.
c. Meters.
d. Kelvin.
e. Meters per second.

Emission Rates: Scenario 2						
Source	**$PM_{10}/PM_{2.5}$[a]**		**SO_2[b]**		**NO_x[c]**	
	(lb/hr)[d]	**(T/yr)[e]**	**(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

a. Particulate matter with a mean aerodynamic diameter of 10 microns or less, including condensables / Particulate matter with a mean aerodynamic diameter of 2.5 microns or less, including condensables.
b. Sulfur dioxide.
c. Nitrogen oxides.
d. Pounds per hour.
e. Tons per year.

Comments on Scenario 2:

- The Chipper Engine and Power Screen Engine may be left out of the co-contributing source modeling analysis for SO_2. The potential emissions are insignificant.
- Flares 1 and 2 were assumed to operate 24 hours per day and 8,760 hours per year.
- The Wood Chipper and Power Screen Engines were assumed both operate 24 hours per day and 3,300 days per year, as limited in the ACLF Permit to Construct.
- Hidden Hollow Energy's generator engines are not included in this scenario.

APPENDIX I

MAXDAYCONT Output Files (on CD)