SGL Automotive Carbon Fibers, LLC
Notice of Construction/ Prevention of Significant Deterioration Permit Revision Application

Prepared for:
SGL Automotive Carbon Fibers, LLC
8781 Randolph Rd NE
Moses Lake, Washington

Prepared by:
Ramboll Environ US Corporation
Lynnwood, Washington

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RAMBOLL ENVIRON

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1 Introduction

SGL Automotive Carbon Fibers, LLC (ACF) owns and operates an automotive carbon fiber manufacturing facility (the Facility) located at 8781 Randolph Road NE in Moses Lake, Washington. Facility operation is authorized by Washington Department of Ecology (Ecology) Order No. 14AQ-E586 (Approval Order), issued April 20, 2015, and Prevention of Significant Deterioration Permit No. PSD 14-02 (PSD Permit), issued April 13, 2015. The facility is authorized to operate ten carbon fiber production lines, each with a capacity of 1,760 metric tons of carbon fiber per year.

Lines 3-10 are supported by eight diesel-fueled 2,937 horsepower (hp) emergency generators, one per line. Federal regulations require that ACF purchase and install diesel-fueled engines certified to Tier 2 New Source Performance Standards (NSPS), however, ACF voluntarily committed to installing Tier 2 certified engines that are equipped with post combustion control devices (Selective Catalytic Reduction (SCR) and diesel particulate filters (DPF)) such that they comply with Tier 4 emission standards. In the permit application review process, Ecology requested that ACF calculate potential emissions based on load specific emissions data rather than Tier 4 standards, which are based on a weighted average of emissions rates at varying loads. The engine manufacturer, Caterpillar Inc., provided ACF with data that estimated emissions rates at varying loads, and these data were used to calculate potential emissions of NO_X, particulate matter, carbon monoxide, VOC, and diesel engine exhaust particulate.

As discussed in ACF's June 2015 Deviation Report, source testing of the Line 3 emergency generator revealed that the engines cannot meet the emissions rates estimates provided by the manufacturer which are far below the Tier 4 standards that the manufacturer has guaranteed the engines will meet. In this application, ACF requests that the emissions limits for Lines 3-10 emergency generators be revised to correlate to the appropriate NSPS Tier 4 emission rates, which exceed Best Available Control Technology (BACT) requirements for these engines and are comparable to recent permit limits for similar engines at nearby data centers. This request, filed under Washington Administrative Code (WAC) 173-400-111(8), constitutes a permit revision request (not new source review) because ACF is not proposing any physical change or change in the method of operation of the emergency generators.

Secondly, as reported in ACF's July 2015 Deviation Report, it was recently discovered that a small emissions source was not included in previous permitting actions. This emissions source is located in the Feed and Pretension (otherwise referred to as the creel) area, and consists of manual pre-oxidation of polyacrylonitrile splices in small electric ovens. Emissions exhaust the creel area via a ventilation fan-vent, one per building. As discussed in Chapter 2, potential emissions associated with these Pre-Oxidation emissions units in Buildings 1-5 are less than the exemption levels provided in WAC 173-400 Table 110(5), therefore, these emission units are exempt from new source review. In accordance with WAC 173-400-111(8), this application requests that the permits and technical support documents be revised to acknowledge that there are emissions associated with the Feed and Pretension process step but that the emissions units are exempt from new source review.

Chapter 2 provides a project description of the proposed revisions and associate emissions. Chapter 3 identifies how the proposed changes comply with WAC 173-400. Chapter 4 presents proposed permit language revisions.

Due to the recent issuance of ACF's Approval Order and PSD Permit, this application includes in Chapter 5 an air quality analysis that demonstrates that the facility still meets PSD increments and complies with applicable ambient air standards.

Appendix A includes Ecology's standard notice of construction (NOC) forms and the PSD applicability form. Appendix B provides the detailed emission calculations and a facility-wide emission inventory. Caterpillar emissions guarantees are provided as Appendix C. Appendix D includes a secondary $PM_{2.5}$ impacts analysis. Appendix E provides a justification for a revised friction velocity calculation method in the meteorological pre-processor program AERMET. Appendix F provides a regional emission inventory and discussion. Air dispersion model files supporting this application are provided as Appendix G.

2 Project Description and Associated Emissions

This application includes requests filed under WAC 173-400-111(8) to 1) revise emission limits for Lines 3-10 emergency generators, and 2) revise the description of the Feed and Pretension process step. Emissions factors and detailed emissions calculations are provided in Appendix B.

Criteria pollutants include nitrogen oxides (NO_X); carbon monoxide (CO); sulfur dioxide (SO_2); particulate matter (PM); particulate matter with diameter less than 10 microns (PM_{10}), particulate matter with diameter less than 2.5 microns ($PM_{2.5}$), lead (Pb), and volatile organic compounds (VOC). Greenhouse gas (GHG) emissions are presented as carbon dioxide equivalents (CO_2e).

2.1 Lines 3-10 Emergency Generators

Lines 3-10 are supported by eight 2,937 hp diesel-fueled emergency generators, one per line (L3EG through L10EG). Federal regulations require that ACF purchase and install diesel-fueled engines certified to Tier 2 New Source Performance Standards (NSPS), however, ACF voluntarily committed to installing Tier 2 certified engines that are equipped with post combustion control devices (SCR and DPF) such that they comply with Tier 4 emission standards.

In the permit application review process, Ecology requested that ACF calculate potential emissions based on load specific emissions data rather than Tier 4 standards, which are based on a weighted average of emissions rates at varying loads. The engine manufacturer, Caterpillar Inc., provided ACF with data that estimated emissions rates at varying loads, and these data were used to calculate potential emissions of NO_X, particulate matter, CO, VOC, and diesel engine exhaust particulate. As discussed in ACF's June 2015 Deviation Report, source testing of the Line 3 emergency generator revealed that the emissions data provided by the manufacturer are not representative of actual operation.

ACF proposes that permit limits for emissions of NO_X, particulate matter, VOC, and diesel engine exhaust particulate be revised to reflect Tier 4 standards, comparable to recent permit limits for similar engines at nearby data centers. Because the Tier 4 standards, as codified in 40 CFR 1039.101 Table 1, are based on a weighted average of emissions rates at varying loads the standards themselves do not represent the maximum potential emissions rate for an engine. However, 40 CFR 1039.101(e) provides Not-to-Exceed multipliers that are applied to the Tier 4 standards to establish maximum emission limits that engines may not exceed in operation. ACF proposes potential emissions based on Tier 4 Not-to-Exceed standards and start-up emissions using Tier 2 NSPS with the same Not-to-Exceed multipliers.

Diesel engine NSPS provide standards for NO_X, particulate matter, CO, and VOC but are focused primarily on reducing emissions of NO_X and particulate matter. For example, Tier 3 and Tier 4 standards establish emission limits that require add-on controls for particulate matter and NO_X, such as particulate filters and SCR. The 2014 Tier 4 numerical standard for CO is the same as the 2006 Tier 2 standard for engines of this size. Improvements in engine design since 2006 result in emissions of CO that are far below the NSPS standards. In order to not significantly overestimate emissions, potential emissions of CO are calculated using

manufacturer emissions guarantees, included as Appendix C. Start-up CO emissions are calculated using Tier 2 NSPS limits with the corresponding Not-to-Exceed multiplier.

ACF owns and operates a single load bank for engine testing purposes and has no intention of purchasing a second one due to cost. Therefore, hourly emissions for Lines 3-10 emergency generators are based on testing one engine at a time, whereas previous permit applications were based on testing two engines at a time. Daily emissions are based on conducting reliability testing of all eight engines (2 hours per engines). The 8 hour performance test will not be performed on the same day as reliability testing. Annual emissions are based on 8 hours of reliability tests and 8 hours of emergency use per each of the eight engines plus an 8 hour performance test of one engine.

Table 2-1 presents the revised emission rates used to calculated potential emissions from the Lines 3-10 emergency generators, and Table 2-2 presents hourly, daily, and annual emissions for Lines 3-10 emergency generators (8 engines combined).

Table 2-1: Diesel Emergency Generator Emissions Rates

Pollutant	NTE Ratio	Tier 2 Standard	Tier 4 Standard	Start-up Emissions	Controlled Emissions
		g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr
NOx	1.5	4.5	0.5	6.8	0.75
PM/DEEP	1.5	N/A	0.02	N/A	0.034
CO	1.25	2.6	0.54	3.3	0.54
VOC	1.25	0.2	0.14	0.3	0.18

Source:

Tier 2 Table 1 40 CFR 89.112

Tier 4 Table 1 40 CFR 1039.101

Not-to-Exceed Ratios 40 CFR 1039.101(e)(3)

Controlled CO emissions are based on Caterpillar Manufacturer guarantee. Start-up emissions of particulate matter are the same as controlled because the DPF is operational upon start-up.

Table 2-2: Lines 3-10 Diesel Emergency Generator Emissions (8 engines)[1]

Pollutant	Hourly	Daily	Annual
	lb/hr	lb/day	lb/yr
NOx	8.0	90.9	644.8
PM/DEEP	0.2	2.4	20.7
CO	4.5	55.6	415.1
VOC	0.9	13.6	112.8

[1] Hourly emissions based on the maximum hourly rate and testing one engine at a time. Daily emissions based on reliability testing of 8 engines per day (the 8 hour performance test of one engine will not occur on the same day as reliability testing), and annual emissions based on 8 hours of reliability tests and 8 hours of emergency use per each of the eight engines plus an 8 hour performance test of one engine.

A new source is defined as the "construction or modification of a stationary source that increases the amount of any air contaminant emitted by such source or that results in the emission of any air contaminant not previously emitted." Modification means "any physical change in, or change in the method of operation of, a stationary source that increases the amount of any air contaminant emitted by such source or that results in the emissions of any air contaminant not previously emitted." (WAC 173-400-030)

The emergency generator permit limit revisions discussed above do not constitute a new or modified source because ACF is not proposing any physical change or change in the method of operation of the emergency generators. However, Washington's New Source regulations for permit revisions (WAC 173-400-111(8)), require that the revised order continue to require BACT. The Approval Order and PSD Permit establish proper operation and ultra-low sulfur diesel as BACT for these emission sources. ACF voluntarily committed to go above and beyond the requirements of BACT by purchasing engines installed with add-on controls. This application does not affect this commitment to go above and beyond BACT.

The ambient air quality assessment presented in Chapter 5 estimates ambient air concentrations using the emissions rates for Lines 3-10 emergency generators presented in this section.

2.2 Feed and Pretension

As reported in ACF's July 2015 Deviation Report, it was recently discovered that a small emissions source was not included in previous permitting actions. The process of manufacturing carbon fiber starts with feeding the process lines with filaments of polyacrylonitrile (PAN) from a series of boxes (also referred to as creel). From the creel, the PAN is fed onto a tow mechanism, which consists of a series of rollers that uniformly apply tension. In order to provide a continuous strand of PAN into the process, the ends of filament from two boxsets are connected together by manual pre-oxidation of PAN splices in small electric ovens, resulting in uncontrolled emissions in the creel area. Emissions exhaust the creel area via a ventilation fan-vent, one per building. Each building is supported by up to 10 electric ovens, however, these are portable units and may be moved around the facility (50 ovens for Lines 1-10).

Pre-oxidation emissions are based on uncontrolled emissions rates used to calculate emissions during RTO Bypass mode and continuous operation (8760 hours per year). Because only a small portion of each PAN filament is processed in the electric ovens, the RTO Bypass emission rates are scaled by a mass ratio of 0.000014 kg of spliced PAN/(kg in boxset - kg spliced PAN) to evaluate Pre-oxidation emissions in the creel area. The mass of the spliced PAN is calculated based on the mass of the filament (6.35 grams per meter)[1], multiplied by the length of filament per splice (2 overlapping filaments, each 3-feet in length), multiplied by the maximum number of splices per oven (4 splices), multiplied by the number of ovens operating (10 ovens per building). As the ovens are portable, there is a rare possibility that more than 10 ovens may operate in a building at a given time (of the facility-wide 50 ovens), therefore, short term

[1] Per S. Heyden, SGL ACF Quality Engineer, August 2015

emissions (1-hour and 24-hour) are calculated based on 20 ovens operating in a building at the same time (ratio of 0.000028 kg spliced PAN/(kg in boxset - kg spliced PAN)). This is conservative because 20 ovens is double the amount of ovens used in normal operation.

As presented in Table 2-3, potential emissions associated with Pre-Oxidation emissions units are less than the exemption levels provided in WAC 173-400 Table 110(5); therefore, these emission units are exempt from new source review. In accordance with WAC 173-400-111(8), this application requests that the permits and technical support documents be revised to acknowledge that there are emissions associated with the Feed and Pretension process step but that the emissions units are exempt from new source review.

Table 2-3: Pre-Oxidation Potential Emissions

Compound	Avg. Period	Potential Emissions[4] (lb/avg period/building)	Exemption Levels[2] (lb/avg. period)	Greater than Exemption Level? (Y/N)
NOx [3]	1-hr	0.0002	0.46	N
NOx [3]	year	1.0	4000	N
CO	1-hr	0.0002	1.14	N
CO	year	1.0481	10000	N
SO2	1-hr	0.0000	0.46	N
SO2	year	0.0840	4000	N
PM (Filt.)	year	0.05	2500	N
PM10 (Filt. & Cond.)	year	0.15	1500	N
PM2.5 (Filt.& Cond.)	year	0.15	1000	N
VOC	year	0.9	4000	N
CO2e	year	0	N/A	N
Acrolein	24-hr	0	0.00039	N
Acrylonitrile	year	0.02	0.03	N
Ammonia	24-hr	0.01	0.47	N
Ammonium Bisulfate	1-hr	0	0.013	N
Ammonium Sulfate	1-hr	0	0.013	N
Arsenic	year	2.5E-07	0.0029	N
Benzene	year	2.7E-06	0.33	N
Beryllium	year	1.5E-08	0.0040	N
Bromomethane	24-hr	0	0.063	N
1,3-Butadiene	year	0	0.056	N
Cadmium	year	1.4E-06	0.0023	N
Carbon Disulfide	24-hr	1.5E-06	5.26	N
Chloromethane	24-hr	0	0.59	N
Chromium VI	year	7.1E-08	0.00006	N
Cobalt	24-hr	5.8E-10	0.0007	N
Copper	1-hr	2.4E-10	0.01	N
Dichlorobenzene	year	1.5E-06	0.87	N
Dichloromethane	year	0	9.59	N
Formaldehyde	year	9.5E-05	1.60	N

Table 2-3: Pre-Oxidation Potential Emissions

Compound	Avg. Period	Potential Emissions[4] (lb/avg period/building)	Exemption Levels[2] (lb/avg. period)	Greater than Exemption Level? (Y/N)
Hexane	24-hr	1.2E-05	4.60	N
Hydrogen Cyanide	24-hr	2.0E-02	0.059	N
Manganese	24-hr	2.6E-09	0.00026	N
Mercury	24-hr	1.8E-09	0.00059	N
Naphthalene	year	7.7E-07	0.28	N
Nickel	year	2.7E-06	0.04030	N
Propylene	24-hr	0	19.70	N
Selenium	24-hr	1.7E-10	0.13	N
Toluene	24-hr	2.4E-08	32.90	N
Vanadium	24-hr	1.6E-08	0.0013	N
Vinyl Acetate	24-hr	3.3E-06	1.31	N
Benz(a)anthracene	year	2.3E-09	0.087	N
Benzo(a)pyrene	year	1.5E-09	0.0087	N
Benzo(b)fluoranthene	year	2.3E-09	0.087	N
Benzo(k)fluoranthene	year	2.3E-09	0.087	N
Chrysene	year	2.3E-09	0.87	N
Dibenzo(a,h)anthrancene	year	1.5E-09	0.00799	N
Indeno(1,2,3-cd)pyrene	year	2.3E-09	0.09	N
3-Methylcholanthrene	year	2.3E-09	0.0015	N
7,12-Dimethylbenz[a]anthracene	year	2.0E-08	0.00014	N

[1] – Pre-Oxidation Emissions are based on RTO Bypass emission rates scaled by a mass ratio of 0.000014 kg of spliced PAN/(kg in boxset - kg spliced PAN)
[2] – New Source Review Exemption levels are from Washington Administrative Code Section 173-400-110 Table 110(5). Exemption levels apply to each emission unit.
[3] -NOx emissions are included to be consistent with RTO bypass emission factors, but there is no evidence to indicate that NOx would actually be emitted from these electrically-heated portable oxidation ovens.
[4] –Emissions per building. Short term emissions based on 20 ovens operating; annual emissions based on 10 ovens operating.

2.3 Total Increase in Emissions

Because Pre-Oxidation emission units are exempt from minor new source review, the only change in emissions presented in this application is due to the revised Lines 3-10 emergency engine emission factors.[2] Table 2-4 presents the net increase in annual emissions proposed in this application.

[2] ACF recognizes that the major source program does not have the same exemptions as Washington's minor source program but the increases in annual emissions of pollutants governed by PSD are approximately one pound (or less), far below the PSD Significant Emission Rates that are expressed in tons.

Table 2-4: Total increase in Annual Emissions[1]

Pollutant	Current L3EG-10EG Annual Emissions	Proposed L3EG-10EG Annual Emissions	Increase	
	lb/yr	lb/yr	lb/yr	tpy
NOx	439.4	644.8	205.4	0.1
PM/DEEP	6.6	20.7	14.1	0.01
CO	73.3	415.1	341.8	0.2
VOC	32.0	112.8	80.8	0.04

[1] Annual emissions based on 8 hours of reliability tests and 8 hours of emergency use per each of the eight engines plus an 8 hour performance test of one engine.

3 Consistency with WAC 173-400

WAC 173-400-111(8) identifies criteria for Ecology's approval of the proposed revisions to the existing Approval Order:

(a)(i) The change in conditions will not cause the source to exceed an emissions standard set by regulation or rule;

Lines 3-10 emergency generators will continue to meet Tier 4 NSPS emission limits so emissions will be far below emission standards set by regulation or rule. Engines and Pre-Oxidation ovens will meet the general grain loading and SO_2 emission limits established in WAC 173-400.

(a)(ii) No ambient air quality standard will be exceeded as a result of the change;

The ambient air quality assessment presented in Chapter 5 demonstrates that the Lines 3-10 emergency generator emissions will not threaten compliance with ambient air quality standards or Acceptable Source Impact Levels (ASILs). Pre-oxidation emissions are below new source review exemption levels which are set at levels such that exempt emissions units will not cause or contribute to an exceedance of the NAAQS.

(a)(iii) The change will not adversely impact the ability of the permitting authority to determine compliance with an emissions standard;

ACF proposes to continue to confirm compliance with Lines 3-10 emergency generator emission limits as required by the Approval Order and PSD Permit.

(a)(iv) The revised order will continue to require BACT for each new source approved by the order except where the Federal Clean Air Act requires LAER;

Ecology has determined that BACT for the Lines 3-10 emergency generators is use of ULSD and proper operation. ACF will purchase and install emergency generators for Lines 3-10 that are installed with add-on control, above and beyond what is required under BACT.

(a)(v) The revised order meets the requirements of WAC *173-400-111*, *173-400-112*, *173-400-113*, *173-400-720*, *173-400-830*, *and 173-460-040*, as applicable.

- Section 173-400-111 outlines procedural requirements for Ecology's processing of the application
- Section 173-400-112 addresses requirements for new sources in nonattainment areas and is not relevant.
- Section 173-400-113 requires Ecology to ensure that new sources or modification will comply with emissions standards, BACT, PSD provisions, and nonattainment provisions. The revisions are not subject to PSD or nonattainment provisions. The other requirements are addressed by Section 111(a)(i) and (a)(ii), discussed above.

- Section 173-400-720 requires a PSD permit for new major sources and major modifications of an existing major source and is not relevant to the proposed revisions.

- Section 173-400-830 addresses permitting requirements for new major sources and major modifications of an existing major source and is not relevant to the proposed revisions.

- Section 173-460-040 supplements the new source review requirements of WAC 173-400-110. ACF is requesting that the existing Order be revised in accordance with Section 173-400-111. The ambient air quality assessment presented in Chapter 5 demonstrates that the Lines 3-10 emergency generator emissions will not threaten compliance with ASILs.

(b) Actions taken under this subsection are subject to the public involvement provisions of WAC 173-400-171 or the permitting authority's public notice and comment procedures.

ACF recognizes that a public comment period may be required.

(c) The applicant must consider the criteria in 40 C.F.R. 52.21 (r)(4) as adopted by reference in WAC 173-400-720 or 173-400-830(3), as applicable, when determining which new source review approvals are required.

40 C.F.R. 52.21 (r)(4) requires that the requirements under EPA's PSD program must be met when a revision relaxes an emission limit to the extent that the source exceeds the PSD threshold. The change in emissions addressed in this revision application are minute and do not affect PSD applicability.

WAC 173-400-750 identifies criteria for Ecology's approval of the proposed revisions to the existing PSD Permit:

(a) The change in conditions will not cause the source to exceed an emissions standard established by regulation;

Lines 3-10 emergency generators will continue to meet Tier 4 NSPS emission limits so emissions will be far below emission standards set by regulation or rule.

Pre-oxidation emissions are below new source review exemption levels which are set at levels far below emissions standards set by regulation or rule.

(b) No ambient air quality standard or PSD increment will be exceeded as a result of the change;

The ambient air quality assessment presented in Chapter 5 demonstrates that the Lines 3-10 emergency generator emissions will not threaten compliance with ambient air quality standards or PSD Increments.

(c) The change will not adversely impact the ability of ecology or the authority to determine compliance with an emissions standard;

ACF proposes to continue to confirm compliance with Lines 3-10 emergency generator emission limits as required by the Approval Order and PSD Permit.

(d) The revised PSD permit will continue to require BACT for each new or modified emission unit approved by the original PSD permit; and

Ecology has determined that BACT for the Lines 3-10 emergency generators is use of ULSD and proper operation. ACF will purchase and install emergency generators for Lines 3-10 that are installed with add-on control, above and beyond what is required under BACT.

(e) The revised PSD permit continues to meet the requirements of WAC 173-400-800 through 173-400-860, and 173-400-113, as applicable.

- Sections 173-400-800 through 173-400-860 address permitting requirements for new major sources and major modifications of an existing major source and is not relevant to the proposed revisions.
- Section 173-400-113 requires Ecology to ensure that new sources or modification will comply with emissions standards, BACT, PSD provisions, and nonattainment provisions. The revisions are not subject to PSD or nonattainment provisions. The other requirements are addressed by Section 111(a)(i) and (a)(ii), discussed above.

(2) A request to revise a PSD permit must be acted upon using the timelines found in WAC 173-400-730. The fee schedule found in chapter 173-455 WAC also applies.

ACF is submitting a check for a PSD Permit Revision along with this application.

(3) All revisions to PSD permits are subject to public involvement except for the following administrative revisions:
(a) Change of the owner or operator's business name and/or mailing address;
(b) Corrections to typographical errors;
(c) Revisions to compliance monitoring methods that provide for more frequent monitoring, replace a periodic monitoring requirement with a continuous monitoring, result in replacement of a manual emission testing method with an instrumental method, or other similar changes that based on ecology's technical evaluation of the proposal, do not reduce the ability of the permittee, the public, the permitting authority, EPA, or ecology to determine compliance with the emission limitations;
(d) Revisions to reporting requirements contained in a PSD permit to coordinate reporting with reporting requirements contained in the air operating permit issued to the source or that result in more frequent reporting by the permittee; or

(e) Any other revision, similar to those listed above, that based on ecology's technical evaluation of the proposal, does not reduce the stringency of the emission limitations in the PSD permit or the ability of ecology, the permitting authority, EPA, or the public to determine compliance with the approval conditions in the PSD permit.

ACF recognizes that a public comment period may be required.

4 Proposed Approval Order and PSD Permit Language Revisions

Several Approval Conditions in the Approval Order and PSD Permit must be revised in order to allow for the revisions requested in this application. Proposed revisions are provided below in blue text.

4.1 Approval Order 14AQ-E586

6.1 The eight (8) diesel-fuelled emergency power generators (L3EG, L4EG, L5EG, L6EG, L7EG, L8EG, L9EG, and L10EG) are limited to an aggregate of 136 hours of operation in any 12-month rolling period. During reliability and performance testing, no more than ~~two (2)~~ one generator engine~~s~~ may operate concurrently. Records of hours of operation must be kept for each generator in accordance with Approval Condition 10.

7.4 Emissions from each of the eight 2,937 bhp compression ignition diesel-fuelled emergency power engines (L3EG, L4EG, L5EG, L6EG, L7EG, L8EG, L9EG, and L10EG) must not exceed the emission limits listed in the table below unless in Engine Startup Mode. The following table lists the limits to use when quantifying diesel engine in normal operation mode.

Pollutant	Emission Limit
CO	~~0.11~~ 0.54 g/hp-hr
SO_2	1.2×10^{-5} lb/hp-hr
DEEP	~~0.01~~ 0.034 g/hp-hr

7.5 Diesel engine Start-up Mode is defined as and limited to the first 10 minutes of operation. The following table lists the emission factors to use when quantifying diesel engine Start-up Mode emissions from each of the eight 2,937 bhp compression ignition diesel-fuelled emergency power engines (L3EG, L4EG, L5EG, L6EG, L7EG, L8EG, L9EG, and L10EG).

Pollutant	Emission Factor
CO	~~0.38~~ 3.3 g/hp-hr
SO_2	1.2×10^{-5} lb/hp-hr
DEEP	~~0.01~~ 0.034 g/hp-hr

10.10 Daily, monthly, and 12-month rolling totals of the hours of operation for each diesel-fuelled emergency power generator shall be kept, and monthly and 12-month rolling totals of the hours of operation for each natural gas-fuelled emergency engine and fire water pump emergency engine shall be kept to demonstrate compliance with Approval Conditions 6.1 through 6.3. Records must also identify if more than ~~two~~ one diesel-fuelled generator engine~~s~~ operates concurrently in reliability and performance testing modes.

4.2 PSD Permit No. PSD 14-02

IV. EQUIPMENT

Table IV-1 should identify Buildings 1 through 5 Pre-Oxidation sources (Bldg1Pre-Ox – Bldg5Pre-Ox).

VI. BACT EMISSION LIMITS

5. Emissions from each of the eight 2,937 bhp compression ignition diesel-fuelled emergency power engines (L3EG, L4EG, L5EG, L6EG, L7EG, L8EG, L9EG, and L10EG) must not exceed the emission limits listed in the table below unless in diesel engine Start-up Mode. The following table lists the engines' normal operational emission limits at 100 percent load.

Table VI-5. Diesel Generator Normal Mode Emissions	
Pollutant	**Emission Factor**
NO_X	~~0.50~~ 0.75 g/hp-hr
$PM_{10}/PM_{2.5}$	~~0.01~~ 0.034 g/hp-hr
VOC	~~0.03~~ 0.18 g/hp-hr

6. Emissions from each of the eight 2,937 bhp compression ignition diesel-fuelled emergency power engines (L3EG, L4EG, L5EG, L6EG, L7EG, L8EG, L9EG, and L10EG) generated during diesel engine Start-up Mode must be quantified and included in the NO_X monthly and 12-month rolling total as required in Approval Condition XI. Start-up Mode is defined as, and limited to, the first 10 minutes of operation. The following table lists the emission factor to use when quantifying diesel engine Start-up Mode emissions.

Table VI-6. Diesel Generator Start-up Mode Emissions	
Pollutant	**Emission Factor**
NO_X	~~4.4~~ 6.8 g/hp-hr

X. RECORDKEEPING REQUIREMENTS

J. Daily, monthly, and 12-month rolling totals of the hours of operation for each diesel-fuelled emergency power generator shall be kept, and monthly and 12-month rolling totals of the hours of operation for the natural gas-fuelled fire water pump emergency engine (FWP2) shall be kept to demonstrate compliance with Approval Conditions V.G. and V.H. Records must also identify if more than ~~two~~ one diesel-fuelled generator engine~~s~~ operates concurrently in reliability and performance testing modes.

5 Ambient Air Quality Assessment

In August 2014, ACF submitted a minor source permit application addressing Lines 1-2 and minor and major permit applications addressing Lines 3-10.[3] In December 2014, ACF submitted revised permit applications and in April 2015 Ecology issued the Approval Order and PSD Permit authorizing Lines 1-10 and Lines 3-10, respectively. Due to the recent issuance of ACF's Approval Order and PSD Permit, this chapter presents an air quality analysis that demonstrates that had the permit revisions addressed in this application been included in the December Lines 3-10 applications, the facility would still have met PSD increments and complied with applicable ambient air standards.

Lines 1-2 were permitted separately and the ambient air demonstration submitted in December 2014 demonstrated that potential emissions from Lines 1-2 and associated support equipment do not result in potential concentrations that exceed ambient air standards. Because no changes are proposed to Lines 1-2 emission units or permit conditions, and because the Pre-Oxidation emissions are exempt from new source review, there is no need to update the dispersion modeling analysis of Lines 1 and 2.

Ramboll Environ applied computer-based dispersion models to simulate dispersion of criteria and toxic air pollutant (TAP) emissions from Lines 3-10. The results of the modeling are used to assess compliance with the PSD increments, the National (and Washington) Ambient Air Quality Standards (NAAQS and WAAQS), and Ecology's acceptable source impact levels (ASILs) for TAPs.

The December 2014 PSD application included an additional impact analysis (Chapter 6). Because the changes proposed in this revision application result in minute increases in emissions the conclusion drawn from that analysis are still applicable and there is no need to update the analysis.

The dispersion modeling techniques employed in the analysis follow a basic set of EPA regulatory guidelines (40 CFR Part 51, Appendix W; called the Guidelines). The Guidelines include recommendations for model selection, data preparation, and model application, but allow flexibility on a case-by-case basis.

Section 5.1 discusses the selection and application of the dispersion model. Section 5.2 discusses the meteorological data used in the dispersion modeling and summarizes stack parameters for emission sources associated with the facility. Section 5.3 identifies the maximum model-predicted ambient concentrations of criteria pollutants and TAPs and compares these predictions with appropriate regulatory criteria. The Class I analysis is described in Section 5.4. The modeling files are included as Appendix G.

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[3] Under the terms of Settlement Agreement and Agreed Order No. 10768 signed June 16, 2014, Ecology acknowledged that lines 1-2 were appropriately permitted as minor sources.

5.1 Dispersion Model Selection

The rationale for the dispersion modeling approach is based on EPA guidelines (USEPA 1986), considerations of the local terrain, and the emission unit characteristics. AERMOD is currently the preferred dispersion model recommended by the Guideline for complex source configurations, emission units subject to exhaust plume downwash, and situations where there is the potential for exhaust plumes to interact with complex terrain.

AERMOD is used for the modeling analysis primarily because it is the most up-to-date near-field dispersion model currently available. Additionally, the modeling domain and source configuration suggests the potential for exhaust plume downwash and plume impacts on intermediate and complex terrain.

The modeling domain with local terrain elevation is shown in Figure 5-1.

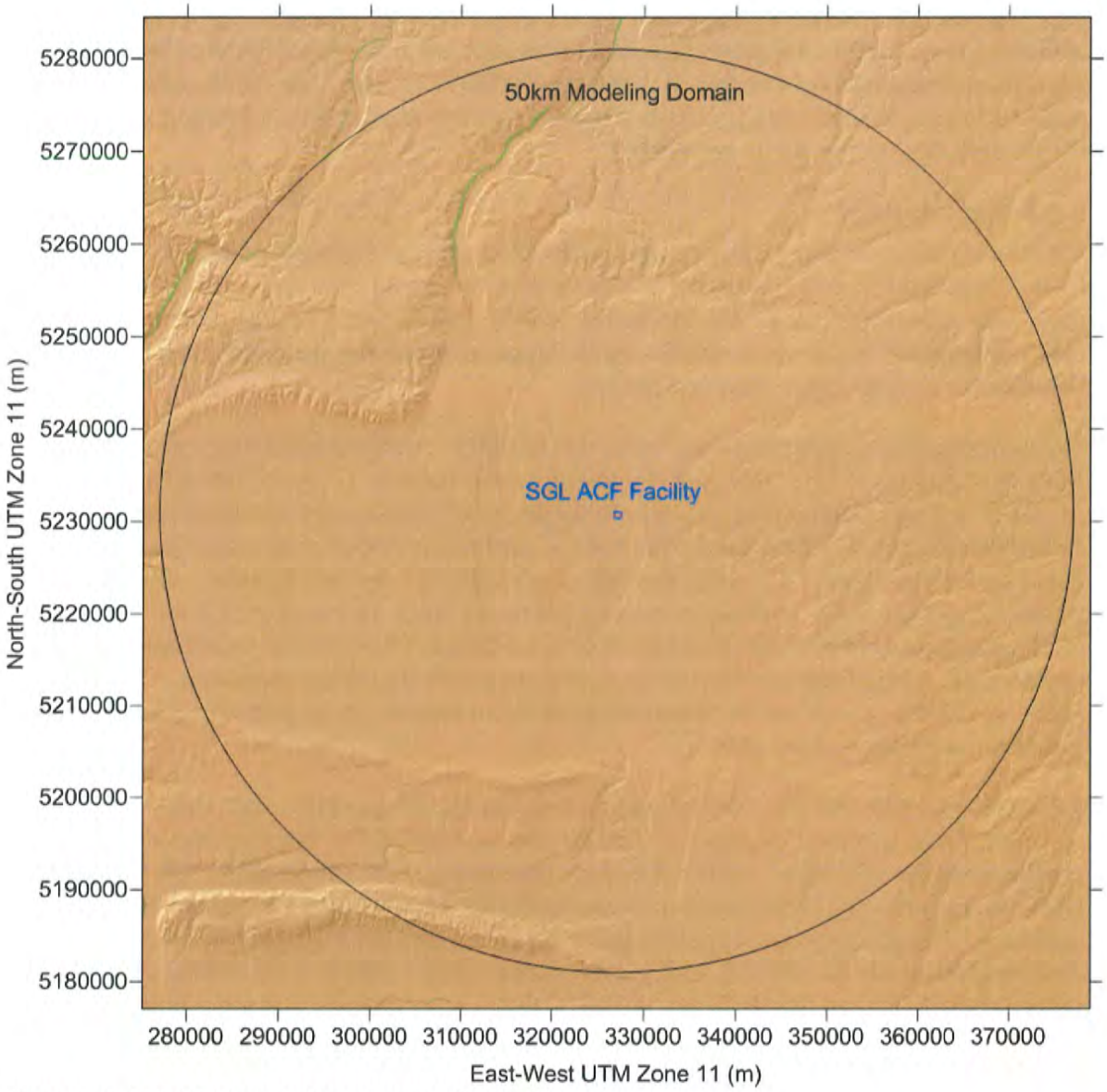

Figure 5-1. AERMOD modeling domain with terrain

5.2 Modeling Methodology

AERMOD was applied to calculated emissions using the regulatory defaults as discussed in this section.

5.2.1 Model Setup

The most recent version of AERMOD (currently version 15181[4]) was applied with the default options for dispersion that depend on local meteorological data, regional upper air data, and the

[4] The December 1, 2014 air quality analysis applied AERMOD version 14134. However, since that application was submitted, a new version was released and is used in this analysis (version 15181).

local physical characteristics of land use surrounding the primary meteorological site. AERMOD contains several options for urban dispersion that were not selected for these analyses due to the rural characteristics of the area in which the Facility is located. The BETA option was selected to include meteorological data prepared with the beta U* (ADJU*) option. Justification for this selection is provided in Appendix E.

5.2.2 Meteorology

A five-year meteorological database was constructed using available surface and upper air data for the dispersion modeling analysis. A meteorological data set was prepared using surface data observations from the National Weather Service (NWS) Grant County International Airport (call sign KMWH) for the period 2009 – 2013. Upper air data was prepared using NWS data from Spokane, Washington (call sign KOTX).

Meteorological data were processed using the AERMOD meteorological preprocessor, AERMET (version 15181). Ramboll Environ also used the beta U* option (ADJU*) within AERMET in light of widely recognized deficiencies in AERMOD under low wind speed conditions. A rational for the use of this beta U* option is provided in Appendix E. A wind rose depicting the wind speed and wind direction data recorded over the five-year period is presented in Figure 5-2. In addition to using the hourly NWS meteorological data, 1-minute wind speed and wind direction data from the Grant County International Airport were used to resolve calm and variable wind conditions using the AERMINUTE preprocessor (Version 11325). A wind speed threshold value of 0.5 meters per second was selected for the 1-minute wind speed observations.[5]

EPA guidance indicates that surface parameters (albedo, Bowen ratio, and surface roughness) surrounding the meteorological site should be used in AERMET to construct the meteorological profiles used by AERMOD. Seasonal surface parameters were calculated for the Grant County NWS site using the AERMET preprocessor, AERSURFACE (version 13016) and EPA guidance.[6] The guidance recommends surface roughness at the measurement site should be estimated using AERSURFACE applying directional sectors with arcs no smaller than 30°, extending to 1 km from the NWS site. AERSURFACE computes the surface roughness for each sector using an inverse-weighted geometric mean of typical roughness values assigned to each land-use category. The guidance recommends the Bowen ratio and albedo should be estimated using a geometric mean of values over a 10 km by 10 km region using typical values assigned to each land use category per season. AERSURFACE will be applied using the following assumptions:

- Seasonal temporal resolution.
- Continuous winter snow cover during winter.
- Site location at an airport.

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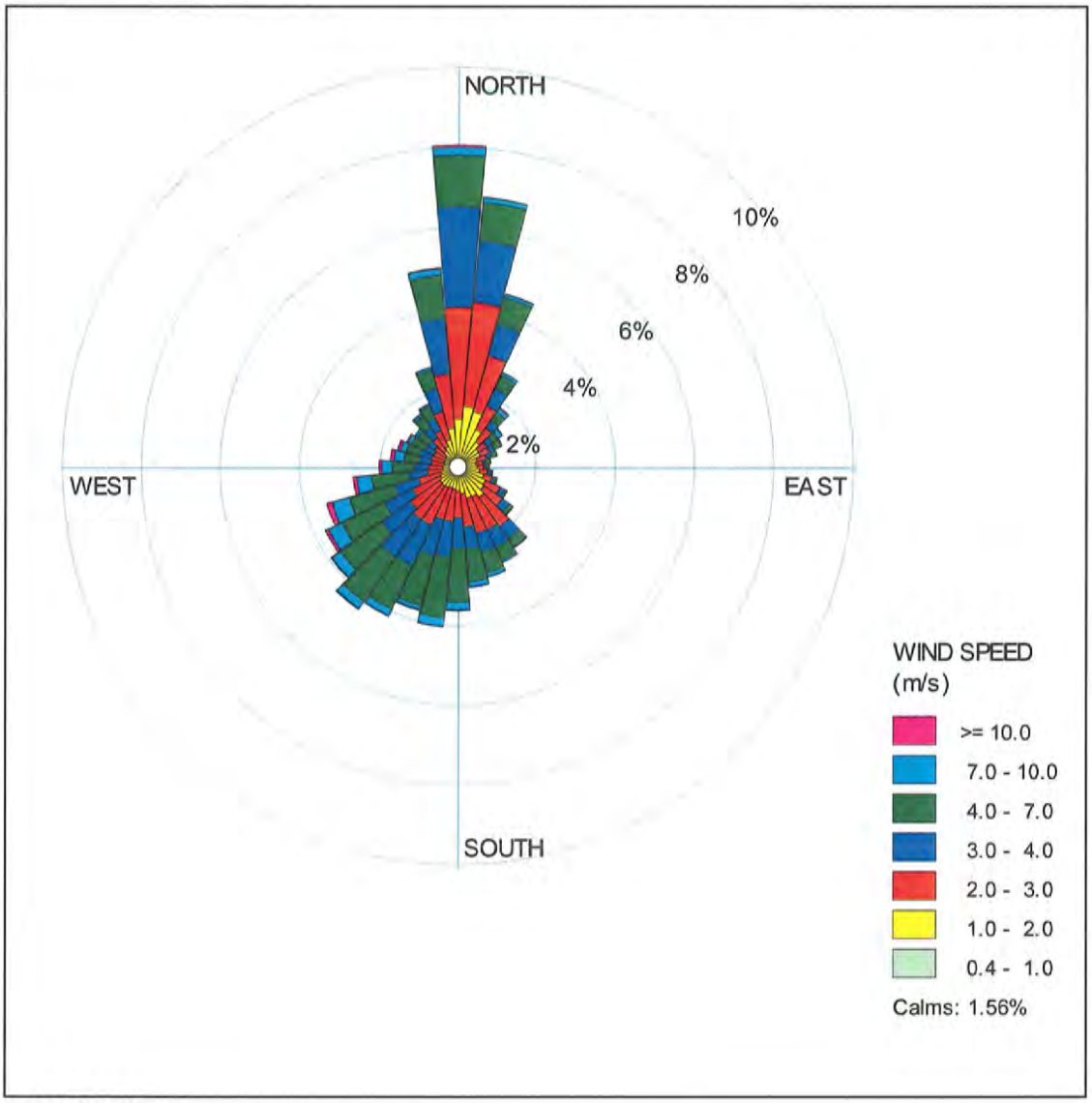
[5] EPA's March 8, 2013 Meteorological Data Clarification Memo

6 The AERMOD Implementation Guide (EPA 2009) and the AERSURFACE User's Guide (EPA-454/B-08-001, January 2008 [Last Revised: January 16, 2013]).

- Average surface moisture characteristics over the 5-year period of the meteorological



database.

Figure 5-2. Grant County Airport Wind Rose for 2009 - 2013

Additional meteorological variables and geophysical parameters are required for use in the AERMOD dispersion modeling analysis to estimate the surface energy fluxes and construct boundary layer profiles. Surface characteristics including albedo, Bowen ratio, and surface roughness length were determined for the area surrounding the Grant County International Airport meteorological station using the AERMET surface characteristic preprocessor, AERSURFACE (Version 13016), and the USGS 1992 National Land Cover (NLCD92) land use data set.[7] The NLCD92 data set used in the analysis has a 30 m mesh size and 21 land use categories. Seasonal surface parameters were determined using AERSURFACE according to the EPA's guidance.[8]

Seasonal albedo and Bowen ratio values were based on averaging over a 10-km by 10-km region centered on the NWS surface meteorological station. An unweighted arithmetic average was used for calculating seasonal albedo; and an unweighted geometric average was used for calculating seasonal Bowen ratio. Seasonal surface roughness values were calculated using an inverse-distance-weighted geometric average for twelve 30° sectors within one kilometer of the meteorological station.

The AERSURFACE input file requires the user to provide additional location and climatological information regarding the primary meteorological station to develop seasonal surface parameter values. The following information was used to AERSURFACE regarding the Grant County International Airport:

- The site was assumed to have continuous snow cover most of the winter.[9]
- The site is located at an airport.
- The site was assumed not to be in an arid region.
- The annual average precipitation recorded in central Washington during 2009 – 2013 was between the 30th and 70th percentiles for the past 30 years (average surface moisture conditions).[10]

The land-use processing domain is shown in Figure 5-3. Table 5-1 presents the seasonal albedo, Bowen ratio, and surface roughness length values calculated by AERSURFACE for the Grant County International Airport meteorological site.

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[7] The USGS NLCD92 data set is described and can be accessed at http://landcover.usgs.gov/natllandcover.php.

[8] The AERMOD Implementation Guide (EPA, 2009) and the AERSURFACE User's Guide (EPA-454/B-08-001, January 2008 [Last Revised: January 16, 2013]).

[9] Western U.S. Climate Historical Summaries can be accessed at http://www.wrcc.dri.edu/Climsum.html

[10] http://www.ncdc.noaa.gov/cag/time-series/us/45/08/pcp/ytd/12/1980-2012?base_prd=true&firstbaseyear=1901&lastbaseyear=2000, accessed August 20, 2013.

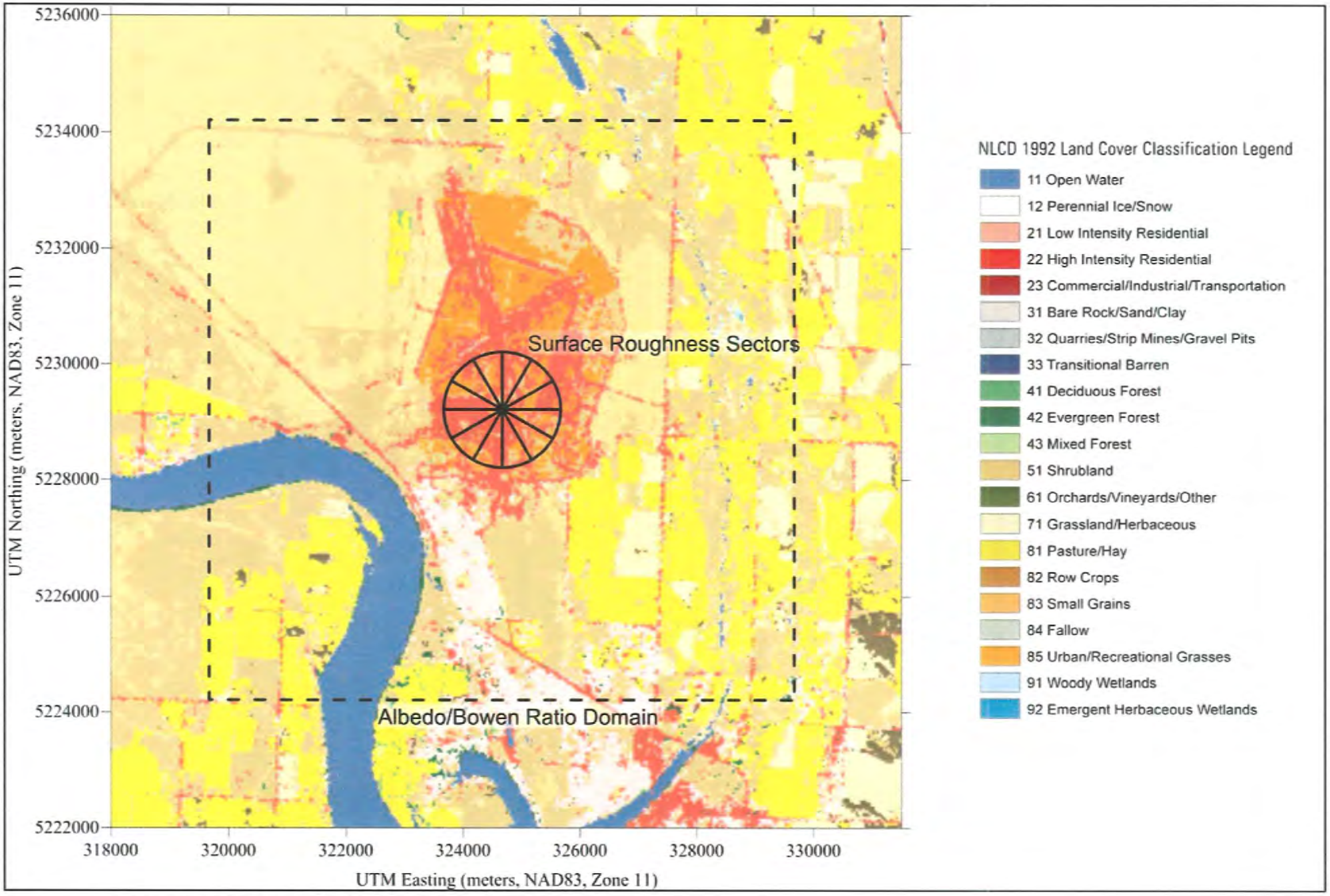

Figure 5-3. AERMET Land Use Analysis Domain

Table 5-1: Grant County International Airport Surface Characteristics

		Winter	Spring	Summer	Autumn
Albedo		0.50	0.16	0.18	0.18
Bowen Ratio		0.45	0.52	0.69	0.91
Surface Roughness Length by Sector (meter)	1	0.035	0.053	0.058	0.053
	2	0.032	0.050	0.055	0.050
	3	0.036	0.053	0.058	0.053
	4	0.039	0.058	0.063	0.058
	5	0.042	0.064	0.069	0.064
	6	0.055	0.071	0.074	0.071
	7	0.045	0.059	0.062	0.059
	8	0.042	0.056	0.060	0.056
	9	0.061	0.068	0.069	0.068
	10	0.043	0.056	0.059	0.056
	11	0.033	0.056	0.062	0.056
	12	0.026	0.047	0.053	0.047

5.2.3 Stack Parameters, Building Dimensions, and Good Engineering Practice

The modeling analysis requires information regarding stack heights, building dimensions, and other exit parameters that characterize exhaust flow from the emission units. As discussed in ACF's December 2014 Lines 3-10 application, process line emissions will be emitted from a single 115-foot tall stack for each line; during shutdowns, most of the oven exhaust gases will be directed to rooftop vents for a period of about 90 seconds. Emissions of ammonia from the ammonium bicarbonate baths are modeled as volume sources located on the north area of Buildings 1, 2, 3 and 4 and the south area of Building 5. Ramboll Environ used the source release parameters shown in Tables 5-2 and 5-3 for the dispersion modeling simulations.

The dispersion modeling simulations assume engine testing is conducted during daylight hours (7:00 am – 5:00 pm) and the eight emergency engines (Lines 3 – 10) are tested one at a time.

Ramboll Environ conducted a GEP stack height design analysis based on EPA procedures and the latest design specifications for the facility buildings. Releases below the GEP stack height are potentially subject to building wake effects, which can produce relatively high ground level predictions from EPA regulatory models. None of the modeled stacks exceeded their associated GEP stack heights. Therefore each line main exhaust stacks was modeled using the proposed stack height of 115 feet above ground.

Table 5-2: Normal Operation Source Release Parameters

Point Sources

Source [b]	UTMx [a] (meters)	UTMy [a] (meters)	Base Elev. [a] (meters)	Stack Height (ft)	Temperature (°F)	Exit Velocity (ft/sec)	Stack Diameter (ft)
Line 1	326895.1	5230919.7	344.0	115.0	378	25.66	7.5
Line 2	326965.8	5230917.2	344.0	115.0	378	25.66	7.5
Line 3	326985.6	5230871.4	344.0	115.0	378	25.66	7.5
Line 4	327056.7	5230869.6	344.0	115.0	378	25.66	7.5
Line 5	327077.7	5230868.0	344.0	115.0	378	25.66	7.5
Line 6	327148.9	5230866.2	344.0	115.0	378	25.66	7.5
Line 7	327169.6	5230864.5	344.0	115.0	378	25.66	7.5
Line 8	327240.8	5230862.7	344.0	115.0	378	25.66	7.5
Line 9	326904.0	5230660.5	344.0	115.0	378	25.66	7.5
Line 10	326978.0	5230658.2	344.0	115.0	378	25.66	7.5
L1EG_1	326899.9	5230844.7	344.0	12.1	1490	328.08	0.42
L1EG_2	326899.8	5230841.5	344.0	12.1	1490	328.08	0.42
L1EG_3	326899.7	5230838.3	344.0	12.1	1490	328.08	0.42
L1EG_4	326899.6	5230835.1	344.0	12.1	1490	328.08	0.42
L1EG_5	326899.4	5230831.9	344.0	12.1	1490	328.08	0.42
L2EG_1	326956.7	5230839.7	344.0	12.1	1490	328.08	0.42
L2EG_2	326956.5	5230836.5	344.0	12.1	1490	328.08	0.42
L2EG_3	326956.4	5230833.3	344.0	12.1	1490	328.08	0.42
L2EG_4	326956.3	5230830.1	344.0	12.1	1490	328.08	0.42
L2EG_5	326956.2	5230826.9	344.0	12.1	1490	328.08	0.42
L3EGEN	326991.8	5230834.8	343.4	17.7	752	80.30	2.0
L4EGEN	327048.2	5230829.4	343.4	17.7	752	80.30	2.0
L5EGEN	327083.7	5230831.1	343.4	17.7	752	80.30	2.0
L6EGEN	327140.2	5230825.8	343.1	17.7	752	80.30	2.0
L7EGEN	327175.5	5230827.6	342.9	17.7	752	80.30	2.0
L8EGEN	327232.0	5230822.3	342.6	17.7	752	80.30	2.0
L9EGEN	326912.6	5230695.5	343.4	17.7	752	80.30	2.0
L10EGEN	326975.7	5230692.7	343.1	17.7	752	80.30	2.0

Volume Sources

Source [c]	UTMx [a] (meters)	UTMy [a] (meters)	Base Elev. [a] (meters)	Release Height (ft)	σ_y initial (ft)	σ_z initial (ft)
BLDG1	326934.4	5230982.0	343.8	12.0	25.9	11.2
BLDG2	327025.5	5230975.2	343.8	12.0	25.9	11.2
BLDG3	327115.7	5230972.7	343.8	12.0	25.9	11.2
BLDG4	327210.1	5230966.4	343.8	12.0	25.9	11.2
BLDG5	326939.1	5230556.0	343.8	12.0	25.9	11.2

Notes:

[a] UTM Zone 11, Datum = NAD 83, Source base elevation is the grade prior to construction of the proposed units.

[b] SCR stack parameters based on combined RTO and TO data from 2013 source tests. Emergency engine stack parameters based on vendor provided data sheets.

[c] Volume source for Buildings 3 through 5 (housing Lines 5 through 10) based on north end of production building, where ammonium bicarbonate baths are located. Fugitive NH3 emissions assumed to leak out doors and windows near the ammonium bicarbonate baths.

Table 5-3: Oxidation Oven Shutdown Release Parameters

Point Sources							
Source [b]	UTMx [a] (meters)	UTMy [a] (meters)	Base Elev. [a] (meters)	Stack Height (ft)	Temperature (°F)	Exit Velocity (ft/sec)	Stack Diameter (ft)
L1SHUT	326895.1	5230919.7	344.0	115	377.6	25.66	7.5
L2SHUT1	326942.6	5230928.1	344.0	65.4	377.6	38.48	5.2
L2SHUT2	326942.0	5230906.3	344.0	65.4	377.6	38.48	5.2
L2SHUT3	326941.2	5230884.7	344.0	65.4	377.6	38.48	5.2
L2SHUT4	326940.2	5230862.7	344.0	65.4	377.6	38.48	5.2
L3SHUT1	327012.1	5230925.4	344.0	65.4	377.6	38.48	5.2
L3SHUT2	327010.7	5230903.7	344.0	65.4	377.6	38.48	5.2
L3SHUT3	327010.2	5230882.2	344.0	65.4	377.6	38.48	5.2
L3SHUT4	327009.5	5230860.2	344.0	65.4	377.6	38.48	5.2
L4SHUT1	327034.7	5230924.0	344.0	65.4	377.6	38.48	5.2
L4SHUT2	327034.0	5230902.5	344.0	65.4	377.6	38.48	5.2
L4SHUT3	327033.2	5230880.7	344.0	65.4	377.6	38.48	5.2
L4SHUT4	327031.9	5230859.0	344.0	65.4	377.6	38.48	5.2
L5_SHUT1	327104.2	5230922.0	344.0	65.4	377.6	38.48	5.2
L5_SHUT2	327102.8	5230900.3	344.0	65.4	377.6	38.48	5.2
L5_SHUT3	327102.3	5230878.8	344.0	65.4	377.6	38.48	5.2
L5_SHUT4	327101.6	5230856.8	344.0	65.4	377.6	38.48	5.2
L6_SHUT1	327126.9	5230920.6	344.0	65.4	377.6	38.48	5.2
L6_SHUT2	327126.2	5230899.1	344.0	65.4	377.6	38.48	5.2
L6_SHUT3	327125.4	5230877.3	344.0	65.4	377.6	38.48	5.2
L6_SHUT4	327124.1	5230855.6	344.0	65.4	377.6	38.48	5.2
L7_SHUT1	327195.9	5230918.3	344.0	65.4	377.6	38.48	5.2
L7_SHUT2	327194.5	5230896.6	344.0	65.4	377.6	38.48	5.2
L7_SHUT3	327194.0	5230875.0	344.0	65.4	377.6	38.48	5.2
L7_SHUT4	327193.2	5230853.1	344.0	65.4	377.6	38.48	5.2
L8_SHUT1	327218.5	5230916.9	344.0	65.4	377.6	38.48	5.2
L8_SHUT2	327217.7	5230895.3	344.0	65.4	377.6	38.48	5.2
L8_SHUT3	327217.0	5230873.6	344.0	65.4	377.6	38.48	5.2
L8_SHUT4	327215.6	5230851.9	344.0	65.4	377.6	38.48	5.2
L9SHUT1	326932.7	5230607.2	344.0	65.4	377.6	38.48	5.2
L9SHUT2	326932.7	5230628.7	344.0	65.4	377.6	38.48	5.2
L9SHUT3	326933.3	5230651.9	344.0	65.4	377.6	38.48	5.2
L9SHUT4	326933.9	5230672.3	344.0	65.4	377.6	38.48	5.2
L10SHUT1	326952.7	5230606.2	344.0	65.4	377.6	38.48	5.2
L10SHUT2	326952.7	5230627.7	344.0	65.4	377.6	38.48	5.2
L10SHUT3	326953.3	5230650.9	344.0	65.4	377.6	38.48	5.2
L10SHUT4	326953.9	5230671.3	344.0	65.4	377.6	38.48	5.2

Notes:

[a] UTM Zone 11, Datum = NAD 83, Source base elevation is the grade prior to construction of the proposed units.

[b] Each production line has four rooftop vents.

5.2.4 Receptor Locations

Ramboll Environ used six nested receptor grids to assess pollutant concentrations. The modeling domain is 50 km by 50 km and includes receptor grids of 50-meter, 100-meter, 250-meter, 500-meter, 1000-meter, and 5000-meter resolution and receptors spaced 25 meters apart on the property boundary, as shown in Figure 5-4. Elevation data for the receptor grids were obtained through running AERMAP with terrain elevations from the USGS National Elevation Dataset (NED) 1/3 Arc-Second data set available on the USGS "Seamless Server" Internet site. These data have a horizontal spatial resolution of about 9×10^{-5} degrees.

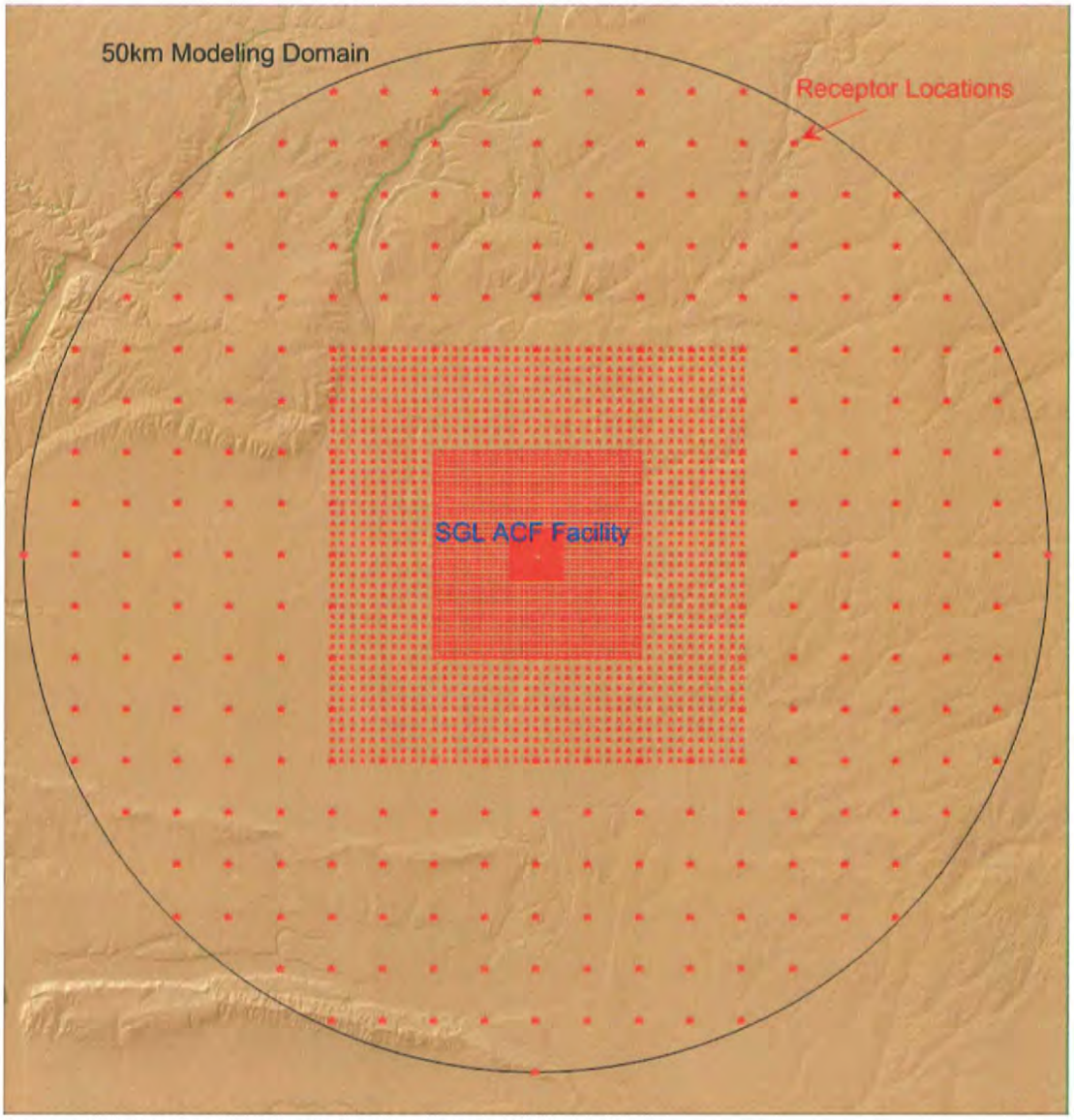

Figure 5-4. Dispersion Modeling Domain with Receptors

5.2.5 Building Downwash (Prime Algorithm)

Ramboll Environ used the EPA's Building Profile Input Program for the PRIME algorithm (BPIP PRIME, version 04274) for the GEP analysis. Ramboll Environ also used BPIP PRIME to prepare the wind direction-specific building profile information required by the dispersion model. The configuration of buildings on the site with respect to the proposed stacks is displayed in Figure 5-5. BPIP PRIME assesses the area of influence for each structure based on the wind direction, structure heights, and the projected structure widths.

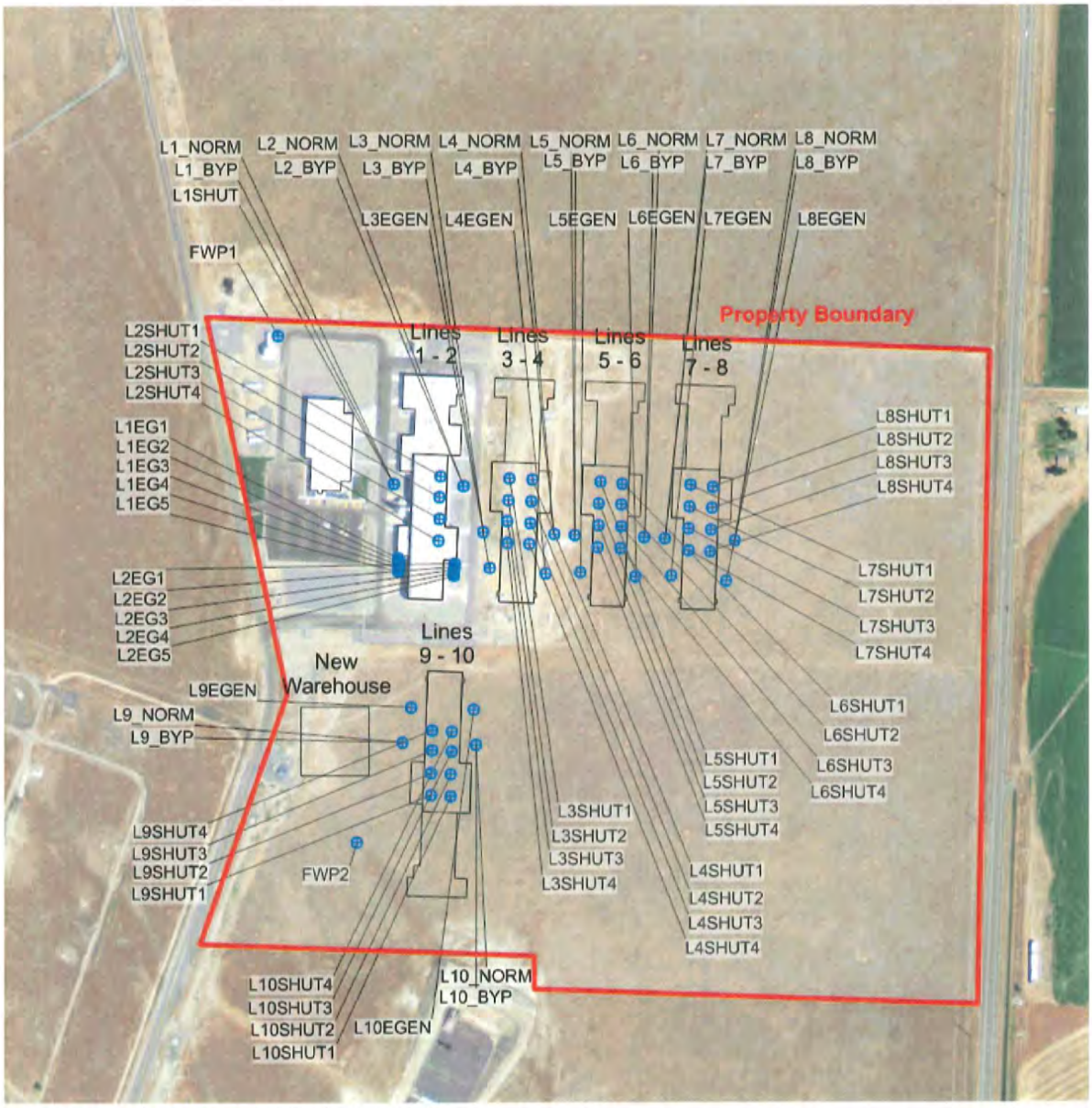

Figure 5-5. Buildings and Emission Units

5.2.6 Chemical Transformations

Ramboll Environ used the Plume Volume Molar Ratio Method (PVMRM) option in AERMOD to assess compliance with the 1-hour and annual NO_2 ambient standards. PVMRM uses in-stack NO_2/NO_X ratio for each stack and hourly ozone concentrations to calculate the conversion rate of NO to NO_2. Ozone monitoring data collected at the Turnbull Slough National Wildlife Refuge monitoring station in Cheney, Washington that matches the meteorological data period (2009 – 2013) were used in the modeling analyses.

The Cheney ozone monitor does not operate during the non-ozone season months, which typically occur between October and April. Hourly ozone data from the Mt. Rainier – Jackson monitoring station is substituted when the Cheney ozone monitor has missing data. When both ozone monitors have missing observations, the maximum 98th percentile ozone concentration during the five year period (58 ppb) was used in the modeling analysis.

Based on 2013 source test results, in-stack NO_2/NO_X ratios for the RTOs and TOs are 0.0756 and 0.0059, respectively. An in-stack ratio of 0.0756 was used for the main stacks. In-stack ratios of 0.10 and 0.20 were used for the natural gas-fired and diesel-fired emergency engines.[11] An equilibrium NO_2/NO_X ratio of 0.80 was used for 1-hour NO_2 model runs and a ratio of 0.75 was used for the annual NO_2 model runs.[12]

5.3 Class II Air Quality Impact Assessment

This section assesses the magnitude and spatial extent of ground level concentrations resulting from criteria and TAP emissions from the Lines 3-10; emissions and assumptions are the same as those in the December 2014 permit applications except that the diesel generator emissions are increased (see Table 2-2). If the calculated concentration of a pollutant subject to PSD exceeds the EPA significant impact levels (SIL) for that pollutant, the impacts of the facility must be assessed in the context of other increment consuming-sources to evaluate total increment consumption. Exceeding a SIL also requires compliance with the applicable NAAQS be evaluated (including Lines 1-2), taking background concentrations and the contributions of significant regional sources into account.

As discussed above, Ramboll Environ applied AERMOD to simulate pollutant dispersion for five years of hourly meteorological conditions. Ramboll Environ determined the highest concentrations at each receptor for each relevant averaging period. This section discusses the results of the modeling assessment.

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[11] San Joaquin Valley APCD Spreadsheet (http://www.valleyair.org/busind/pto/tox_resources/AirQualityMonitoring.htm)

[12] The annual NO_2/NO_X ratio of 0.75 is based on the Ambient Ratio Method (ARM) from 40 CFR Part 51, Appendix W. The hourly NO_2/NO_X ratio of 0.80 is based on EPA recommendation for a default ambient ratio for the 1-hour NO_2 Standard from the Tyler Fox 1-hour NO_2 Modeling Guidance Clarification Memorandum (March 2011).

5.3.1 Criteria Pollutant Concentrations

Ramboll Environ modeled the emission rates used in the December 2014 application with the exception that the revised emission rates presented in Table 2-1 are used for the Lines 3-10 emergency generators. In order to assess the significance of the model predictions, Ramboll Environ compared the maximum criteria pollutant concentrations predicted by AERMOD with the applicable SILs. Table 5-4 indicates the maximum model-predicted concentrations of SO_2 and CO are less than the significance levels and no further analysis is required. Note that the model-predicted concentrations for a SIL assessment are not the same as those used for comparison with NAAQS, which are based on averaging and/or statistical analyses.

Table 5-4: Significant Impact Level Assessment

Criteria Pollutant	Averaging Period	Maximum Model-Predicted Concentration ($\mu g/m^3$) [e]	Significant Impact Level ($\mu g/m^3$)
Project (Line 3 – Line 10) [a]			
NO_2 [b]	1-hr	137.5	7.5
	Annual	5.5	1
SO_2	1-hr	6.6	7.8
	3-hr	5.5	25
	24-hr	3.3	5
	Annual	0.5	1
CO [d]	1-hr	363.4	2,000
	8-hr	186.3	500
PM_{10}	24-hr	10.7	5
$PM_{2.5}$	24-hr	9.6	1.2 [c]
	Annual	1.9	0.3 [c]

Notes:

[a] The modeling includes results from production lines 3 through 10 and their associated diesel-fueled emergency generator engines and a natural gas-fueled firewater pump emergency generator engine.

[b] NO_2 concentrations predicted using PVMRM and have a maximum equilibrium NO_2/NO_x ratio of 80 percent (1-hour NO_2) and 75 percent (annual NO_2). The maximum 1-hour NO_2 concentration is not for comparison with the NAAQS, which is based on the five year average of the 98th percentile daily 1-hour concentrations at each receptor. The maximum concentration is based on the worst-case emergency generator engine testing scenario and worst-case hourly SCR bypass scenario, which includes testing the engine associated with Line 10 and bypassing the SCR on Line 4.

[c] The $PM_{2.5}$ SILs were vacated on January 22, 2013. Ramboll Environ has included the $PM_{2.5}$ SILs for reference.

[d] Maximum CO predictions based on RTO bypass and line shutdown scenarios.

[e] Maximum Model-Predicted concentrations for 1-hour NO_2, 1-hour SO_2, and 24-hour $PM_{2.5}$ are the maximum concentrations at each receptor averaged across five years of modeling.

Because model-predicted NO_2, PM_{10}, and $PM_{2.5}$ concentrations exceed their respective SILs, Ramboll Environ conducted a "Full Impact Analyses" that considers facility-wide potential

emissions (Lines 1 – 10) at ACF (see Appendix B for emissions details), other regional industrial sources within 50 km of ACF, and representative background concentrations. Working from emissions inventories provided by Ecology's central and eastern regional offices, Ramboll Environ created a regional industrial source emission inventory that estimates:

- potential annual NOx emissions to address annual NO_2 increment consumption;
- potential 24-hour and annual $PM_{2.5}$ emissions to address NAAQS compliance; and
- potential 1-hour and annual NOx emissions to address 1-hour NO_2 NAAQS compliance.

Emissions and release parameters associated with the regional analysis are discussed and presented in Appendix F.

Nearby sources were initially screened to determine whether the sources could significantly impact receptors for which the revised Lines 3-10 project had model-predicted concentrations greater than the SIL. Facilities that had individual concentrations higher than the applicable SIL at these receptors were included in the facility wide regional NAAQS analysis.

The submittal of the PSD permit application for lines 3-10 on December 1, 2014, established the $PM_{2.5}$ minor source baseline date for the Eastern Washington-Northern Idaho Interstate Air Quality Control Region. Actual emissions from lines 3-4, potential emissions from lines 5-10 (yet to be built or yet to commence operation), and the higher diesel engine $PM_{2.5}$ emissions were used to assess compliance with the $PM_{2.5}$ increment. Emissions based on stack test data for lines 3 and 4 were used in the $PM_{2.5}$ 24-hour increment modeling assessment because these represent actual emissions. As indicated in Table 5-5, Project $PM_{2.5}$ emissions do not result in concentrations that exceed allowable PSD increments.

The NO_2 minor source baseline date was established in 1992. Although actual emissions are appropriate when evaluating increment consumption, Ramboll Environ conservatively included potential annual NOx emissions from industrial sources within 50 kilometers of the Facility to evaluate annual NO_2 increment consumption. An additional conservative measure was to assume all regional sources consume NO_2 increment even though some of them were constructed prior to 1992 and would therefore not consume NO_2 increment. Despite these very conservative assumptions, Table 5-5 indicates cumulative NOx emissions do not result in concentrations that exceed the annual NO_2 increment.

Table 5-5: Maximum Predicted Concentrations – PSD Increment Assessment

Criteria Pollutant	Averaging Period	Maximum Model-Predicted Concentration ($\mu g/m^3$) [b]	Class II PSD Increment ($\mu g/m^3$)
NO_2 [a]	Annual	5.50	25
PM_{10}	24-hr	9.02	30
$PM_{2.5}$	24-hr	7.95	9.0
	Annual	1.86	4.0

Notes:

[a] NO_2 concentrations predicted using PVMRM and have a maximum equilibrium NO_2/NO_X ratio of 80 percent (1-hour NO_2) and 75 percent (annual NO_2).

[b] Short term concentrations are the maximum second highest values across 5 years of modeling.

The results of the Full Impact Analysis are compared with NAAQS in Table 5-6. Multiple operating configurations were modeled to determine the SCR bypass and emergency generator testing scenario that resulted in the worst case hourly NO_2 concentrations. The SIL analysis showed that Line 4 SCR bypass and engine testing on emergency generator engine associated with Line 10 was the worst case scenario. Because the SIL analysis only evaluated sources associated with Lines 3-10, our NAAQS analysis also evaluated potential testing and bypass scenarios associated with Lines 1 and 2. The 1-hour NO_2 concentration presented in Table 5-6 is the worst case of these scenarios: fire water pump testing with normal operations of Lines 1 through 10. Analysis of the modeled results indicated off-site sources were responsible for more than 99% of the concentration at the receptor with the highest design concentration. The results indicate cumulative emissions still comply with NAAQS.

Table 5-6: Maximum Predicted Concentrations (NAAQS Assessment)

Criteria Pollutant	Averaging Period	Maximum Facility-Wide and Regional Concentration ($\mu g/m^3$)	Background[b] ($\mu g/m^3$)	Total [c] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2 [a]	1-hr	151.1	16.0	167.1	188
	Annual	6.4	2.8	9.2	100
PM_{10}	24-hr	10.2	92	102.2	150
$PM_{2.5}$ [d]	24-hr	8.1	19.4	27.5	35
	Annual	2.2	6.5	8.7	12

Notes:

[a] NO_2 concentrations predicted using PVMRM and have a maximum equilibrium NO_2/NO_X ratio of 80 percent (1-hour NO_2) and 75 percent (annual NO_2). 1-hour NO_2 concentrations are based on the five year average of 98th percentile daily maximum 1-hour concentrations at each receptor. Several modeling scenarios were considered for 1-hour NO_2. The worst case 1-hour NO2 concentration presented represents testing both fire water pumps during normal operation of lines 1 through 10. The maximum predicted annual NO2 concentration is presented.

[b] With the exception of $PM_{2.5}$, background concentrations were provided by Ecology from http://lar.wsu.edu/nw-airquest/lookup.html, accessed on February 26, 2014. Ramboll Environ converted the NO_2 values from ppb to $\mu g/m^3$ using a conversion factor of 1.88. $PM_{2.5}$ background values are design concentrations from 2011-2013 at the Ecology nephelometer at 412 S. Balsam St. in Moses Lake (mentioned earlier in this section) accessed from https://fortress.wa.gov/ecy/enviwa/ on June 10, 2014.

[c] The total concentration is the sum of the facility-wide and regional AERMOD-predicted concentration and the background concentration.

[d] 24-hour $PM_{2.5}$ concentrations are based on the five year average of 98th percentile maximum 24-hour $PM_{2.5}$ concentrations.

Figures 5-6 and 5-7 present the AERMOD-predicted cumulative 24-hour $PM_{2.5}$ concentrations and 1-hour NO_2 concentrations attributable to facility-wide emissions and nearby facility emissions (without background concentrations).

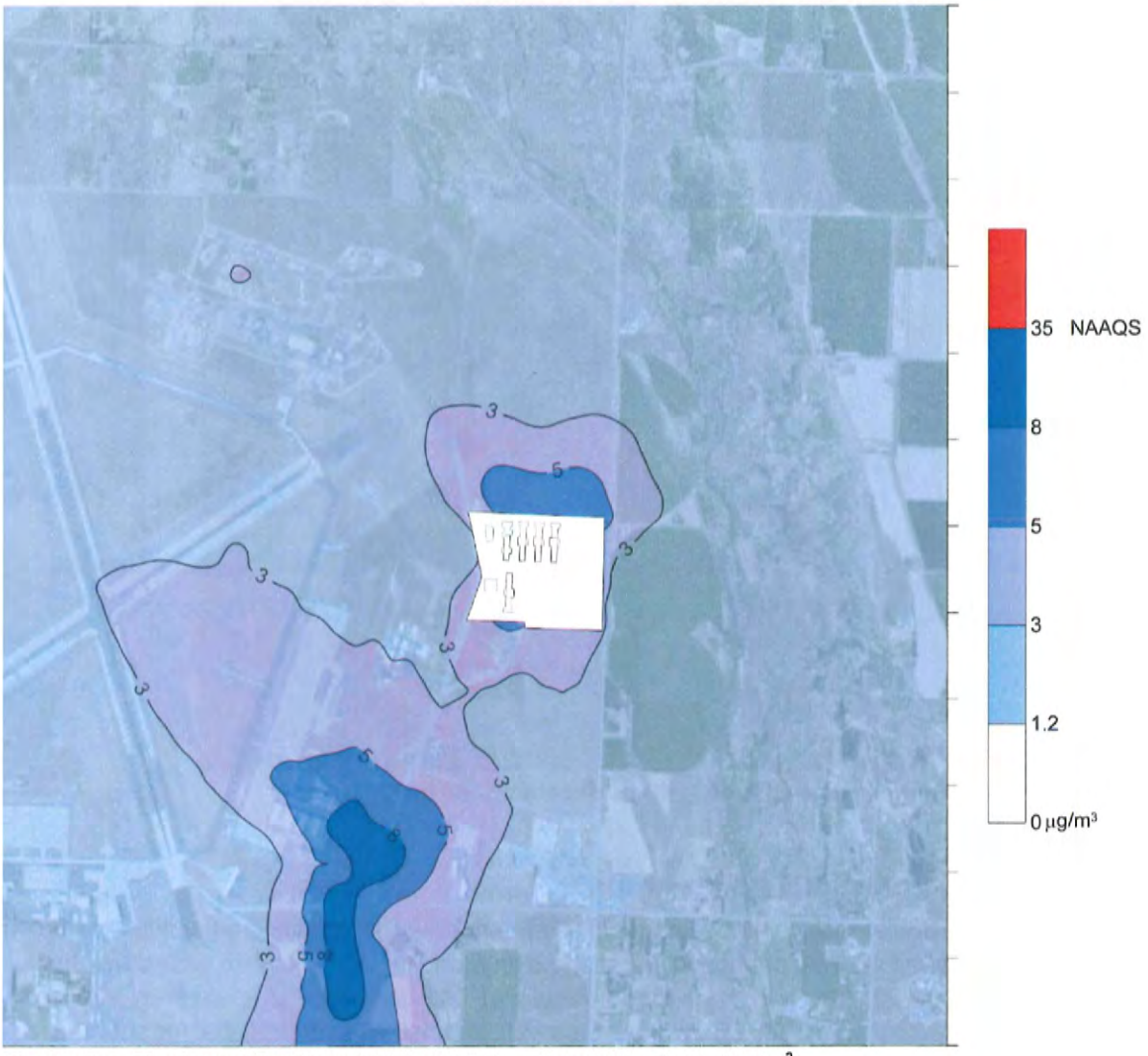


Figure 5-6. Maximum Predicted 24-hour $PM_{2.5}$ Concentrations (µg/m^3)

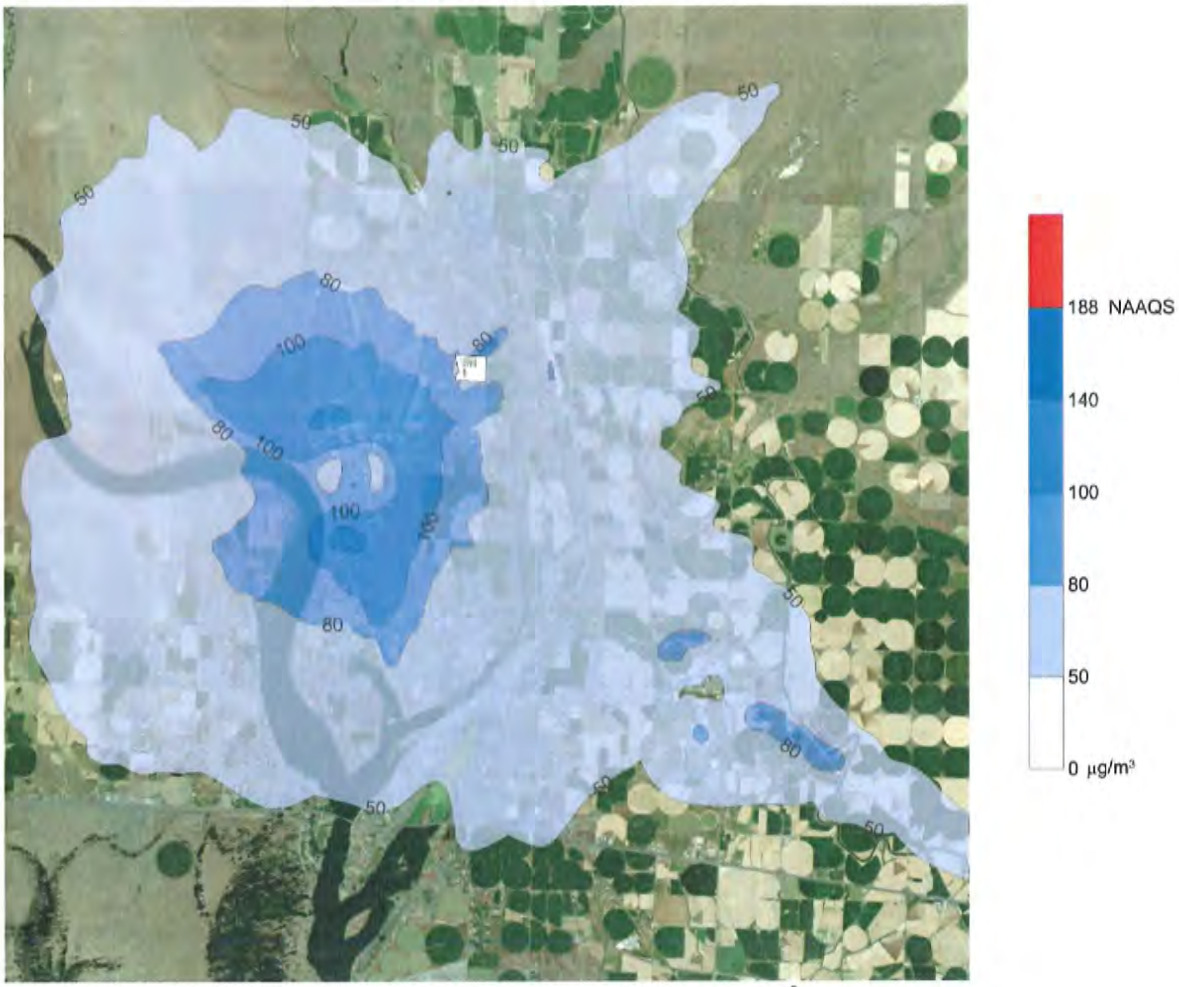


Figure 5-7. Maximum Predicted 1-hour NO_2 Concentrations (µg/m^3)

5.3.2 Toxic Air Pollutant Concentrations

WAC 173-460 regulates toxic air pollutants (TAPs) from new and modified air pollution sources and requires permit applications to include dispersion modeling of TAPs with emissions that exceed certain thresholds. Maximum model-predicted TAP concentrations are then compared with the ASILs. Concentrations below the ASILs indicate insignificant potential for adverse health effects from these chemicals and a permit can be granted without further analysis. If not, the applicant must revise the project or submit a health risk assessment demonstrating that toxic emissions from the source are sufficiently low to protect human health.

Ramboll Environ conducted a dispersion modeling analysis of the TAP emission from the Lines 3-10, including higher emissions of NO_x and particulate emissions from the diesel engines (DEEP). As presented in the December 2014 application, sixteen TAPs exceed their respective SQERs (including NO_2 and DEEP). Because a new version of AERMOD was released since the previous air quality analysis was conducted, Ramboll Environ elected to remodel all sixteen TAPs using the newer AERMOD version (15181).

Maximum AERMOD-predicted concentrations at the worst-case location are compared to ASILs in Table 5-7. All model-predicted concentrations attributable to emission from the Lines 3-10 project are less than the ASILs with the exception of acrylonitrile. Figures 5-8 and 5-9 present the AERMOD-predicted 24-hour HCN and annual acrylonitrile concentrations attributable to emissions from Lines 3 – 10.

Table 5-7: Maximum Toxic Air Pollutant Concentrations

TAP	Averaging Period	Max. AERMOD Concentration [a] (µg/m³)	ASIL [b] (µg/m³)	Exceed ASIL?
Project (Line 3 – Line 10) [c]				
7,12-Dimethylbenz[a]anthracene	Annual	2.19E-07	1.41E-05	No
Acrolein	24-hour	0.02	0.06	No
Acrylonitrile	Annual	4.36E-03	0.00345	Yes
Ammonia	24-hour	13.71	70.8	No
Ammonium Bisulfate	1-hour	16.17	120	No
Ammonium Sulfate	1-hour	16.17	120	No
Arsenic	Annual	2.73E-06	3.03E-04	No
Benzene	Annual	2.40E-04	0.0345	No
Cadmium	Annual	2.00E-05	2.38E-04	No
Chromium VI	Annual	7.65E-07	6.67E-06	No
Diesel Engine Particulate	Annual	1.52E-03	0.00333	No
Formaldehyde	Annual	1.10E-03	0.167	No
HCN [d]	24-hour	8.05	9	No
Nickel	Annual	3.00E-05	0.0042	No
NO_2 [e]	1-hour	145.70	470	No
SO_2	1-hour	6.69	660	No

Notes:

[a] The highest model prediction over five years is compared to the applicable ASILs.

[b] Acceptable Source Impact Levels (ASILs) from WAC 173-460.

[c] The modeling includes results from production lines 3 through 10 and their associated diesel-fueled emergency generator engines, and a natural gas-fueled firewater pump emergency generator engine.

[d] 24-hour hydrogen cyanide modeling is based on 1.5 hours of RTO bypass per day and other lines operating normally (Line 9 RTO bypass results in the highest AERMOD predictions).

[e] NO_2 concentrations predicted using PVMRM and have a maximum equilibrium NO_2/NOX ratio of 80 percent for 1-hour NO_2. The maximum concentration is based on the worst-case emergency generator engine testing scenario which includes testing the engine associated with Line 10, and the worst case hourly SCR bypass scenario which is bypassing the SCR on Line 4.

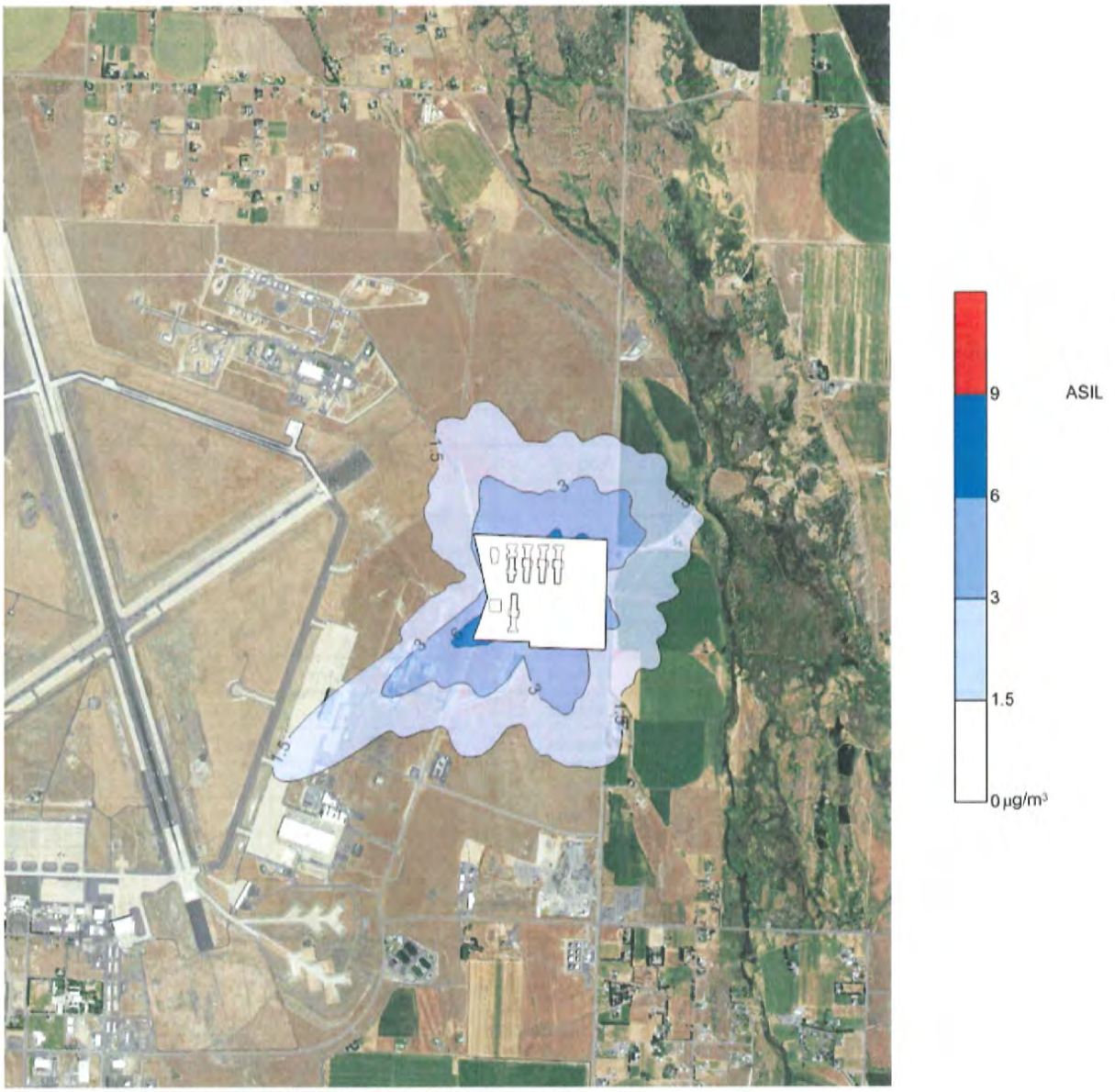


Figure 5-8. Maximum Predicted 24-hour HCN Concentrations (µg/m³)

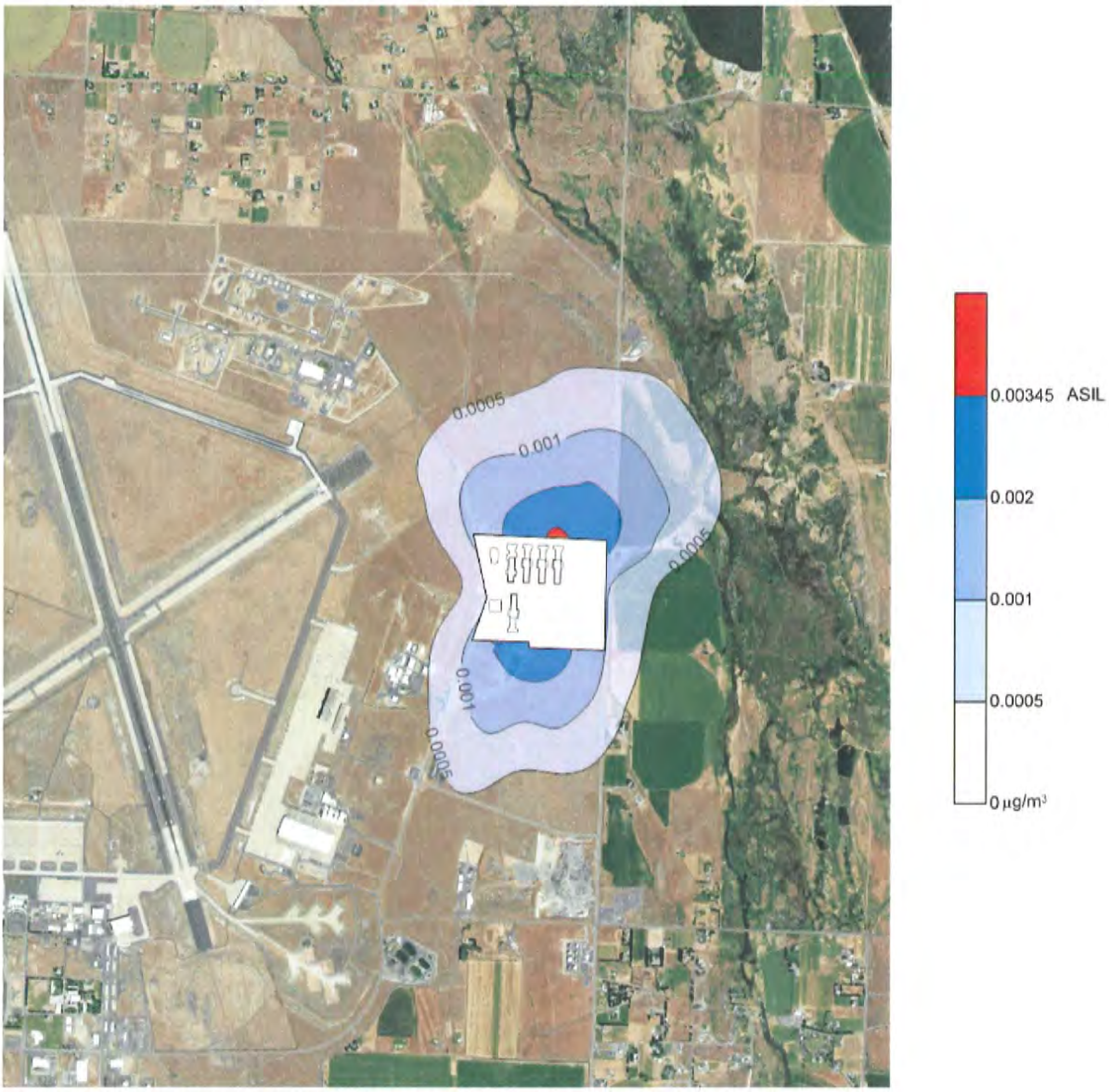


Figure 5-9. Maximum Predicted Annual Acrylonitrile Concentrations (µg/m^3)

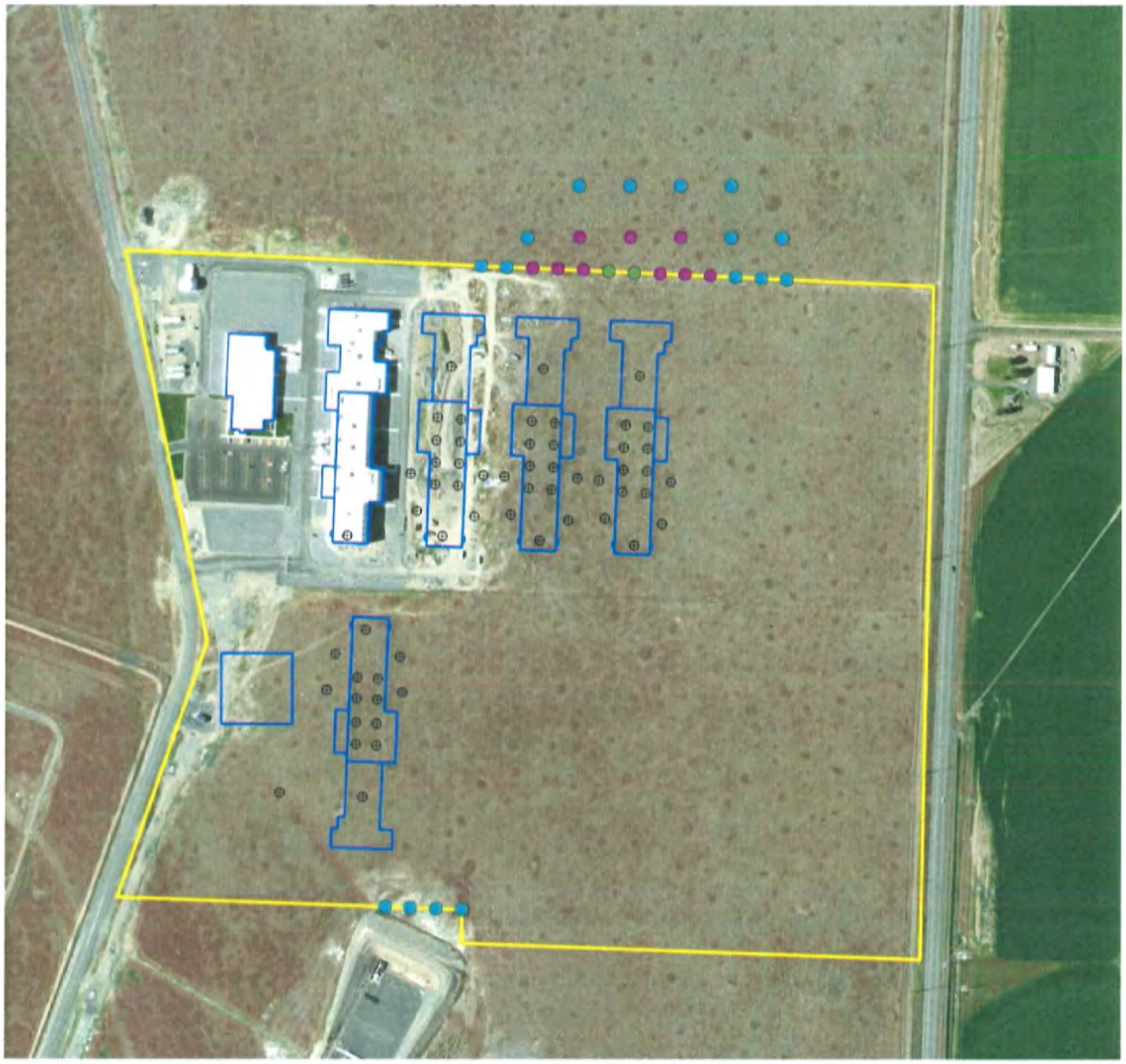
This permit revision application does not affect potential emissions of acrylonitrile from any emissions unit subject to new source review. However, since the December 2014 application was submitted, a new version of AERMOD was released and is used in this analysis. Therefore, the following discussion provides an updated analysis of what additional land will be required to be purchased in order for the facility to comply with the acrylonitrile ASIL.

Model-predicted concentrations of acrylonitrile attributable to emissions from the revised Lines 3-10 project are greater than the ASIL in only a very small area along the property line. These

model-predicted concentrations greater than the ASIL reflect emissions attributable to Lines 3 – 10. However, if the facility were only to include Lines 3 – 7 the maximum model-predicted concentration of acrylonitrile would be 0.00314 $\mu g/m^3$, which is below the 0.00345 $\mu g/m^3$ ASIL.

At this time, ACF has firm plans only for Lines 3 – 5 but is permitting additional lines to prepare for possible future market demand. If the market changes and additional lines beyond Line 7 are desired, ACF will acquire the additional property where model-predicted acrylonitrile concentrations exceed the ASIL.

Figure 5-10 displays the receptors where the model-calculated concentration exceeded the annual acrylonitrile ASIL. Receptors are color coded to indicate which production lines would need to be in operation before the ambient concentration could potentially exceed the ASIL. The areas associated with these receptors are further described in Table 5-8.



Lines 3 through 8
Lines 3 through 9
Lines 3 through 10
Modeled Structure
Current Property Boundaries
Source Location

Figure 5-10. Receptors exceeding Acrylonitrile ASIL by Production Capacity

Table 5-8: Acrylonitrile ASIL Extents

Construction Scenario	UTM coordinates of property corners (meters)				Property dimensions (feet)	
	Northwest	Northeast	Southeast	Southwest	North-South	East-West
North of site						
With line 8	327168, 5231092	327218, 5231090	327217, 5231066	327166, 5231068	83	164
With lines 8&9	327093, 5231125	327292, 5231125	327292, 5231062	327092, 5231071	204	656
With lines 8-10	327042, 5231175	327366, 5231175	327367, 5231060	327042, 5231073	379	1065
South of site						
With line 8	N/A	N/A	N/A	N/A	N/A	N/A
With lines 8&9	N/A	N/A	N/A	N/A	N/A	N/A
With lines 8-10	326949, 5230448	327049, 5230445	327048, 5230420	326948, 5230423	82	328

ACF proposes that the 14AQ-E586 technical support document be revised to reflect the updated results presented in Figure 5-10 and Table 5-8.

5.3.3 Power Outage Assessment

For previous applications, Ecology requested that ACF evaluate engine emissions during a power outage that causes the emergency generator engines to operate in support of a controlled shutdown of the process lines. In practice, Grant County PUD is a very reliable source of electricity for the Facility. Between January 2010 and August 2013, the substation providing power to the ACF facility has had one outage, and that outage lasted for only 16 minutes.[13] Grant County PUD system reliability records show that, on average, customers experience one power outage per year over the PUD's entire service area. [14]

Ecology requested that ACF evaluate a power loss scenario where all of the emergency engines could operate for up to one hour. During a power loss, the emergency generators provide power for emergency lighting, oven shutdown fans, and facility conveyors. The conveyors ensure the carbon fibers do not remain stationary in the ovens and cause a fire. The emergency generators do not provide enough power to maintain production operations at the facility.

Although, a power loss at the site would be a rare event based on historical data from Grant County PUD, ACF evaluated emergency engine operation for one hour for pollutants with applicable short-term ambient standards (SIL or ASIL). Long-term modeling results presented in the tables above already include an additional 8 hours of emergency engine use per year. AERMOD-predicted concentrations during a power outage at the worst-case location are compared to ambient standards in Table 5-9.

[13] Email correspondence between Semra Yilmaz (ACF Engineer) and Michelle Clark (Grant County PUD) on August 22, 2013.

[14] Grant County PUD System Reliability Indice Numbers (2006 – 2012).

All predicted concentrations attributable to a power outage are less than the ambient screening levels (SIL/ASIL) except for 1-hour NO_2, which is above the applicable SIL. A NAAQS evaluation of 1-hour NO_2 concentrations is not necessary because the design value for the 1-hour NO_2 NAAQS is based on the three year average of the 98th percentile daily maximum 1-hour NO_2 concentrations. The 98th percentile value is the 8th highest daily prediction each year, which means the emission scenario (all emergency engines operating concurrently for over an hour) would have to occur at least eight days each year. EPA's 1-hour NO_2 modeling guidance recommends only including emission scenarios that are relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations.[15]

Based on historical power outage information for the site and reliability data for Grant County PUD overall, we do not believe a power outage scenario would occur frequently enough to significantly contribute to annual 1-hour NO_2 ambient concentrations. Because ASILs are not established using the same statistical considerations as NAAQS, Ramboll Environ compares the maximum NO_2 concentrations with the ASIL in Table 5-9. These are the concentrations that would result if the power outage occurred in the worst case meteorological hour of the five year period.

Table 5-9: Maximum Predicted Concentrations – Significant Impact Assessment for a Power Outage

Criteria Pollutant	Averaging Period	Maximum Model-Predicted Concentration [a] ($\mu g/m^3$)	ASIL ($\mu g/m^3$)
NO_2 [b]	1-hr	443.6	470
CO	1-hr	415.0	23,000

Notes:

[a] Emergency use based on all emergency engines operating for one hour.

[b] NO_2 concentrations predicted using PVMRM and have a maximum equilibrium NO_2/NO_X ratio of 80 percent (1-hour NO_2).

[15] EPA's March 2011 Memorandum, Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard.

5.4 Class I Air Quality Impact Assessment

PSD regulations require analysis of potential air quality impacts to Federal Class I areas within 100 km of the project. However, the Federal Land Managers have typically requested analyses of Air Quality Related Values (AQRVs) impacts for additional Class I areas within 300 km of the site. Figure 5-11 displays the location Class I areas relative to the site.

Ramboll Environ evaluated criteria pollutant concentrations and AQRVs at the 11 Class I areas that have any portion of their area inside the 300-km radius around the site. The Spokane Indian Reservation, Columbia River Gorge, and Mt. Baker are also included in the analysis even though they are not Class I areas because Ecology has previously requested their inclusion in Class I assessments.

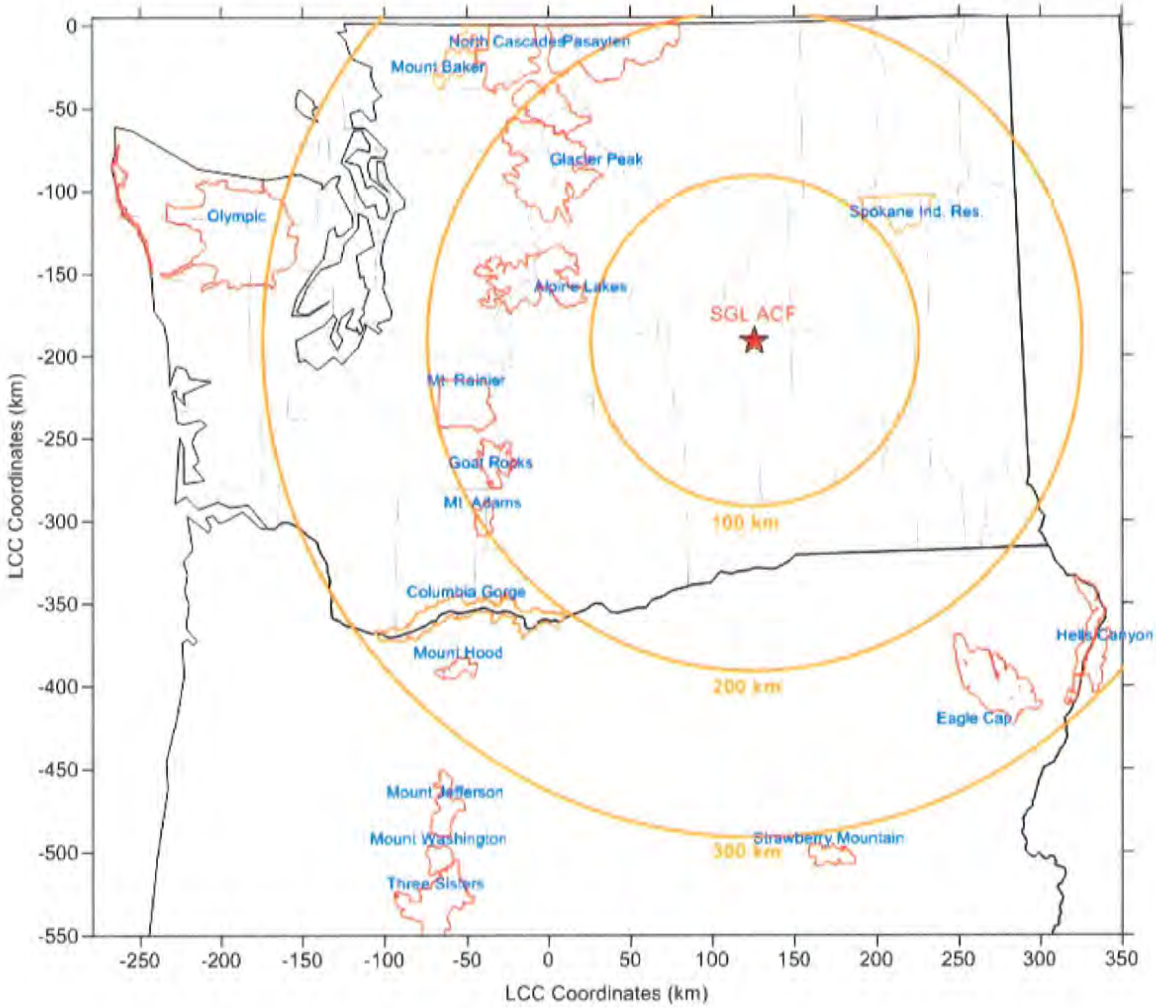


Figure 5-11. Class I areas and Spokane Indian Reservation

5.4.1 Q/D Emission Calculation Methodology

The FLM AQRV Work Group (FLAG) developed the Q/D screening test to determine when detailed analysis of impacts to AQRV in Class I areas is necessary. In this screening test, Q is calculated based on the sum of the maximum 24-hour emissions of NO_X, SO_2, particulate matter (PM_{10}), and sulfuric acid (H_2SO_4) and assuming continuous operation 365 days per year. Per FLAG guidance, "For new sources, applicants should sum all of the visibility-impairing pollutants of concern to reach a total Q value for the project, whereas for modified sources, applicants should only include the emission increases associated with the modification, not the total from the facility."[16] Because the addition of Lines 3-10 is a modification to an existing source (Lines 1-2), Q/D calculations in the modeling protocol were based on Lines 3-10 emissions.

Because Don Shepherd of the National Park Service requested Q/D calculations based on facility-wide emissions, we present both analyses below. Facility-wide Q/D calculations include two production lines (Lines 1-2), one firewater pump, and ten smaller natural gas emergency generators. Emissions from Lines 1 and 2 are similar to Lines 3 – 6 because they are operated with SCR.

Maximum daily emissions of NO_X, SO_2, and PM_{10} from these emission units were summed and converted to tons per year assuming 365 days of operation in a year. None of the proposed emissions units will emit H_2SO_4 except to the extent some of the SO_2 emissions potentially convert to acid form. Daily emissions from the production lines are based on 24-hours of continuous operation. Daily emissions from the emergency generator engines and firewater pump engines are based on reliability testing durations, and assume all engines are tested in a single day. Maximum daily emissions rates used for the production lines are presented in Table 5-1.

Based on these maximum daily emissions the resulting Q values are 593 and 703 for Project emissions and facility-wide emissions, respectively. The Q/D values for Project and facility-wide emissions are included in Table 5-10. Note that a Q/D screening value of 10 is the screening threshold established by the FLMs.

[16] Federal land Managers' Air Quality Related Values Work Group (FLAG) Response to Public Comments on Revised Phase I Report (2010), page 7. (http://www.nature.nps.gov/air/pubs/pdf/flag/FLAG_RtC_2010.pdf)

Table 5-10. Maximum Daily Emissions by Emission Unit

Unit Description	Emission (lb/day)				
	NOx w/SCR	NOx w/o SCR	PM w/o SCR	PM w/SCR	SO_2
Production Lines (per line)[1]	204	429.6	48.2	72.0	16.5
Line 3-10 EGENs [2]	90.9		2.4		0.6
Lines 3-10 FWP[4]	8.0		0.3		0.01
Line 1-2 EGENs[3]	10.0		0.4		0.01
Lines 1-2 FWP[4]	8.0		0.3		0.01

1- Daily emissions based on 24 hours continuous operation. Lines 1-6 are proposed to be installed with SCR, Lines 7-10 would not be installed with SCR. NOx emissions with SCR control based on 8.5 lb/hr (SCR vendor quote for combined RTO and TO exhaust), and 17.9 lb/hr without SCR control (2013 Source test results). PM emissions based on 2013 and 2014 source test and SO2 emissions based on current emission limit for Lines 1 & 2, Condition 4.5 of 12AQ-E465.

2- Daily emissions based on 2-hour long reliability tests for 8 engines. NOx and PM emission factors from Not-to-Exceed NSPS emission rates, SO2 emission factors from AP-42 Section 3.4, Large Stationary Diesel and Dual-Fuel Engines (October 1996). Fuel sulfur content of ULSD is 0.0015%

3- Daily emissions based on 10 engines operating for 30 minutes for reliability testing. NOx emission factors based on Generac NSPS certification testing (maximum of 2010 and 2012 testing). PM and SO2 emission factors are from AP42, Table 3.2-3.

4- Daily emissions based on one engine operating for 4 hours for reliability testing. NOx emission factors based on Generac NSPS certification testing (maximum of 2010 and 2012 testing). PM and SO2 emission factors are from AP42, Table 3.2-3.

Table 5-11. Q/D Values for Class I Areas within 300 km of ACF

Name	Approximate distance to closest part of Class I area (km)	Q/D Value (Lines 3-10) (TPY/km)	Q/D Value (Facility-Wide) (TPY/km)
Alpine Lakes	108	5.5	6.5
Spokane Indian Reservation	103	5.8	6.8
Glacier Peak	140	4.2	5.0
Goat Rocks	165	3.6	4.3
Mt. Rainier	170	3.5	4.1
Mt. Adams	194	3.1	3.6
North Cascades	172	3.4	4.1
Pasayten	184	3.2	3.8
Columbia River Gorge	215	2.8	3.3
Eagle Cap	222	2.7	3.2
Hells Canyon	250	2.4	2.8
Mt. Hood	267	2.2	2.6
Mt. Baker	249	2.4	2.8
Olympic National Park	292	2.0	2.4

In the event that an SCR malfunctions, the Approval Order and PSD Permit allow for exhaust from the RTO to bypass the SCR for up to 100 hours per year, during which time NO_X emissions are uncontrolled (SCR Bypass Mode). While emissions during this mode only account for approximately 1 percent of production line potential annual emissions, annual emissions calculated based on maximum daily emissions rates would be higher because the permits does not limit daily hours of operation in SCR Bypass mode. The permits do require that only one line may operate in SCR Bypass mode at a time. Table 5-12 presents Q values for the Lines 3-10 and the facility if one of the lines installed with SCR operates in SCR Bypass mode and the remaining operating in normal mode for 24 hours per day.

Table 5-12. Q Values for SCR Bypass Mode Scenarios (in tons per year)

Lines 3-10	Facility-wide
Q w/1 Line in SCR Bypass	Q w/1 Line in SCR Bypass
630	740

The Q/D values for Lines 3-10 and facility-wide emissions are included in Table 5-13. Because the Q/D values are all less than 10, FLAG criteria imply no further Class I AQRV analysis is warranted.

Table 5-13. Q/D Values for Class I Areas within 300 km of ACF for SCR Bypass Mode Scenarios

Name	Approximate distance to closest part of Class I area (km)	Lines 3-10 (TPY/km)	Facility-wide (TPY/km)
		Q/D w/1 Line in SCR Bypass	Q/D w/1 Line in SCR Bypass
Alpine Lakes	108	5.8	6.9
Spokane Indian Reservation	103	6.1	7.2
Glacier Peak	140	4.5	5.3
Goat Rocks	165	3.8	4.5
Mt. Rainier	170	3.7	4.4
Mt. Adams	194	3.2	3.8
North Cascades	172	3.7	4.3
Pasayten	184	3.4	4.0
Columbia River Gorge	215	2.9	3.4
Eagle Cap	222	2.8	3.3
Hells Canyon	250	2.5	3.0
Mt. Hood	267	2.4	2.8
Mt. Baker	249	2.5	3.0
Olympic National Park	292	2.2	2.5

5.4.2 Class I Significant Impact Level Assessment

Ramboll Environ evaluated compliance with the NAAQS and PSD Increments at Class I areas using a conservative analysis based on AERMOD. In lieu of conducting regional modeling using CALPUFF, which is labor intensive, Ramboll Environ has applied AERMOD to identify concentrations at receptors 50 km from ACF. This is the maximum distance that EPA condones for using AERMOD. The rationale is that if AERMOD predictions are less than the Class I SILs

at 50 km, the concentrations are certainly less than the SILs at the nearest Class I area, which is 100 km from ACF.

Consistent with direction from the Federal Land Managers, three receptor datasets were prepared for the Class I modeling analysis:

- A circle of receptors located 50 km from the Facility, at 1 degree increments, and at a uniform elevation equal to the highest elevation found in the Class I areas within 300 km of the Facility;
- A circle of receptors located 50 km from the Facility, at 2 degree increments, and at a uniform elevation equal to the lowest elevation found in the Class I areas within 300 km of the Facility; and
- A circle of receptors located 50 km from the Facility, at 1 degree increments, and at a uniform elevation equal to the average elevation found in the Class I areas within 300 km of the Facility.

Receptor heights were based on data obtained from the National Park Service Class I receptor tool. The maximum AERMOD-predicted concentration at the 50 km receptors are compared to the applicable Class I PSD increments and proposed Class I SILs in Table 5-14.

Table 5-14. Class I Area Significant Levels and Increments

Pollutant	Averaging Period	Maximum Model Predicted Concentration ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	USEPA SIL ($\mu g/m^3$) [a]
PM_{10}	Annual	0.022	4	0.2
	24-hour	0.321	8	0.3
$PM_{2.5}$	Annual	0.022	1	0.06 [b]
	24-hour[c]	0.182	2	0.07 [b]
SO_2	Annual	0.006	2	0.1
	24-hour	0.091	5	0.2
	3-hour	0.363	25	1
NO_2	Annual	0.087	2.5	0.1

Notes:
[a] – SIL = Significant Impact Level; USEPA proposed from the Federal Register, Vol. 61, No. 142, p. 38292, July 23, 1996
[b] – The Class I $PM_{2.5}$ SILs were vacated on January 22, 2013, but presented here for comparison.
[c] - The maximum 24-hour $PM_{2.5}$ model prediction is based on the maximum five year average of the 100th percentile values at each receptor location and each receptor height.

With the exception of 24-hour PM_{10} and 24-hour $PM_{2.5}$, all model-predicted concentrations are lower than their associated Class I SILs. To further refine the screening results for pollutants over the Class I SILs, an additional directional component was considered in the Class I Significance analysis. Figure 5-12 and 5-13 presents the locations of receptors with model

predicted concentrations greater than the SIL with respect to Class I Areas within 300km from the facility.

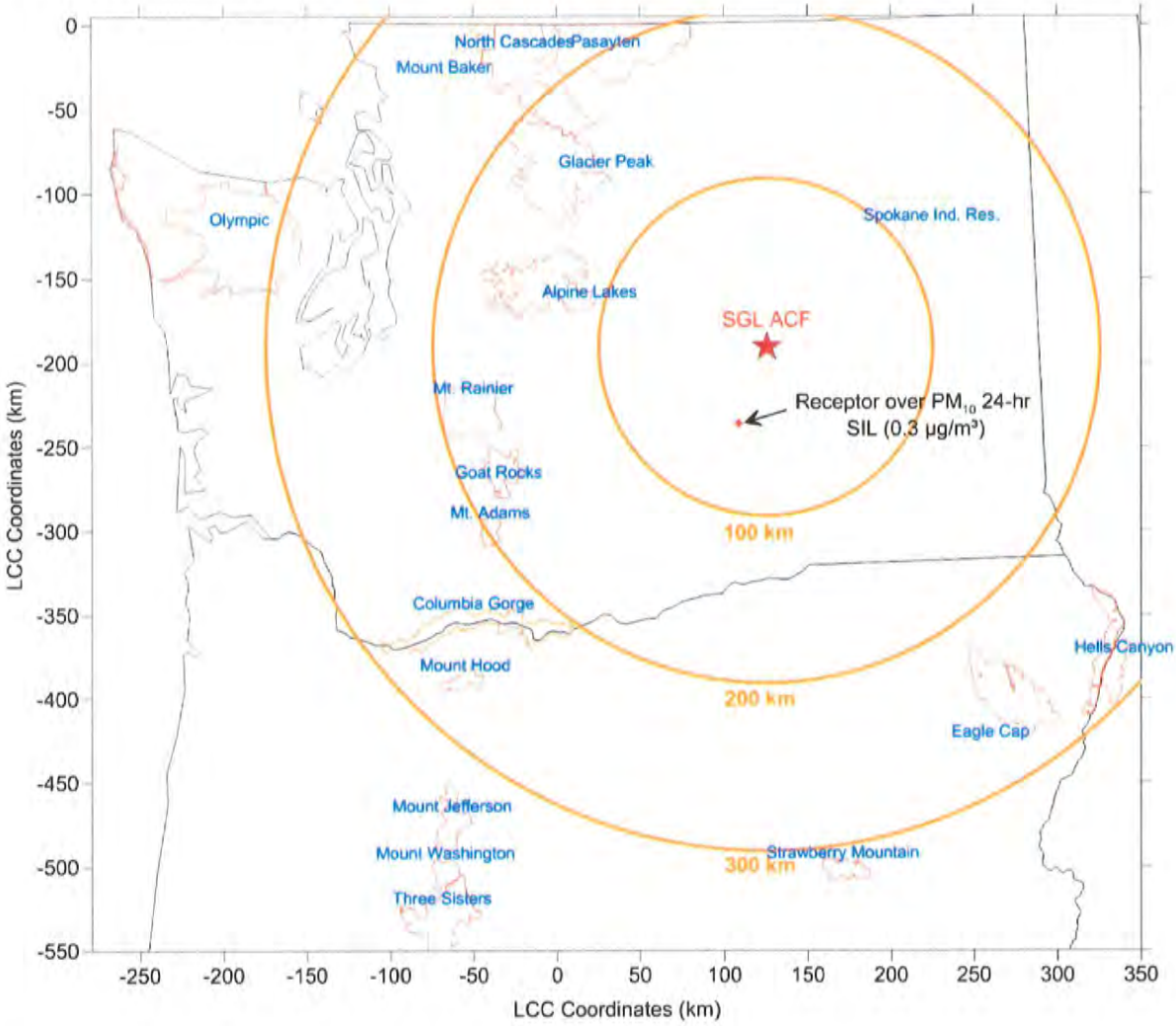


Figure 5-12. Class I PM_{10} Significant Receptors.

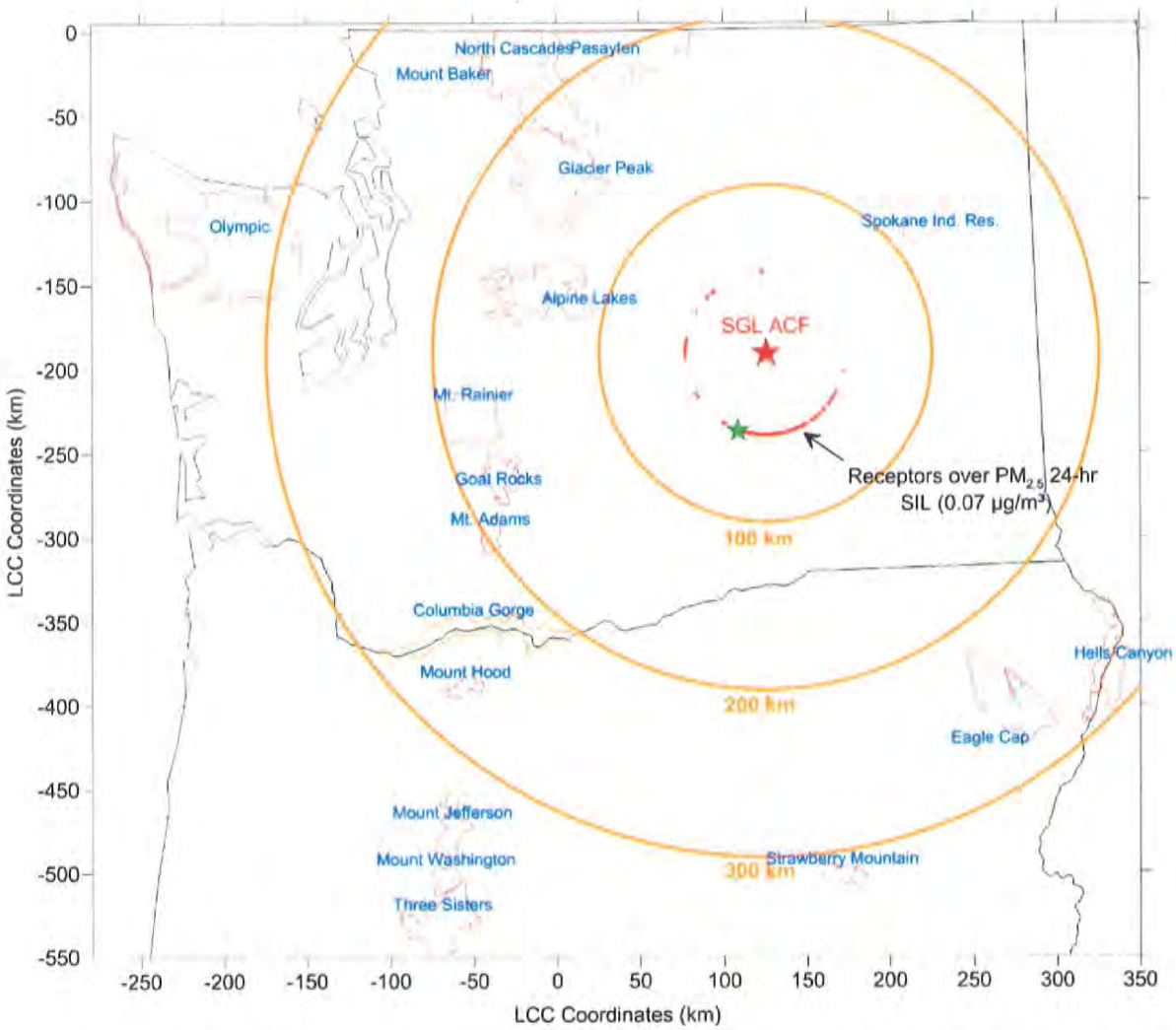


Figure 5-13. Class I $PM_{2.5}$ Significant Receptors.

Figure 5-12 shows that a single receptor is over the 24-hour PM_{10} Class I SIL. The closest Class I area located along the path of a line extending from the facility through this receptor is more than 300 km from the facility. Given the distance to the nearest Class I area, the concentration of PM_{10} would decrease by more than 0.021 µg/m³ and would not significantly contribute to 24-hour PM_{10} concentrations at any Class I area.

Figure 5-13 shows that the receptors with model-predicted concentrations greater than the 24-hour $PM_{2.5}$ SIL surround several portions of the facility. The maximum predicted concentration, 0.18 µg/m³, is located at the receptor marked with a green star on Figure 5-13. The closest Class I area located along the path of a line extending from the facility through this receptor is more than 300 km from the facility. Given the distance to the nearest Class I area, the concentration of $PM_{2.5}$ would decrease by more than 0.11 µg/m³ and would not significantly contribute to 24-hour $PM_{2.5}$ concentrations at any Class I area.

Appendix A:

NOC and PSD Permit Application Forms

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

July 1, 2011

NOTICE

The Air Quality Program has revised our permit fees beginning July 1, 2011. Bear with us as we fine-tune this new system. We want to give you a heads up on one point. Ecology set the initial fee rate at an amount that would cover the simplest type of permit. The amount of time required to review a permit application and issue a permit varies based on the complexity of the project. Therefore, it is possible that your initial fee will not cover the cost of processing your request. If that happens, we will send you a bill to cover our expenses.

We encourage you to work closely with your permit writer so that the permitting process, timeline, and costs are clear. These changes are our first step toward meeting the legislative mandate of shifting the cost of permitting from the state General Fund to the recipients of the permits. If you have any questions, please call the contact listed below.

Ecology Permitting Authority	**Contact**
Ecology Central Regional Office – Air Quality Program Chelan, Douglas, Kittitas, Klickitat, or Okanogan County	Lynnette Haller (509) 457-7126
Ecology Eastern Regional Office – Air Quality Program Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Stevens,	Greg Flibbert (509) 329-3452 greg.flibbert@ecy.wa.gov
Ecology Northwest Regional Office – Air Quality Program San Juan County	Nick Roach (425) 649-7082
Ecology Industrial Section – W2Resources Program For actions taken at	Garin Schrieve (360) 407-6916
Ecology Nuclear Waste Program	Ron Skinnarland (509) 372-7924

DEPARTMENT OF ECOLOGY State of Washington

Application for Prevention of Significant Deterioration

INSTRUCTIONS

Use this form for all projects in Washington that are subject to the Prevention of Significant Deterioration (PSD) Program. If you want Ecology to determine whether your project is subject to the PSD Program, submit a Request for a PSD Program Applicability Determination form (ECY 070-413).

Fill out the front and back of this form. Attach a check for the initial fee and mail the form and your application to:

Department of Ecology
Cashiering Unit
P.O. Box 47611
Olympia, WA 98504-7611

For Fiscal Office Use Only:
001-NSR-216-0299-000404

Check the box to indicate what you are submitting for review.

New project	**Initial Fee**
☐ New project application. The initial fee covers 158 hours of review.	$15,000
☐ New PSD permit application that is limited to greenhouse gases. The initial fee covers 79 hours of review.	$7,500
Revise an existing PSD permit	
☐ Administrative permit revision. The initial fee covers 20 hours of review.	$1,900
☒ All other permit revisions. The initial fee covers 79 hours of review.	$7,500
☐ Major modification. The initial fee covers 158 hours of review.	$15,000
Other actions	
☐ Permit extension. This is a flat fee.	$500
☐ Plant-wide applicability emission limit: establish limit. The initial fee covers 158 hours of review. [See note]	$15,000
☐ Plant-wide applicability emission limit: all other requests. Other requests may include increasing a limit; renewing a limit; or processing an expired limit. The initial fee covers 79 hours of review. [See note]	$7,500
Note. An additional fee does not apply when a request to establish a plant-wide applicability limit is part of an application covered by the new project, all other permit revisions, or major modification fees on this form.	

For more information	
Air Quality Program Science and Engineering Section Ecology Headquarters Office	David Ogulei Phone: (360) 407-6803 E-mail: david.ogulei@ecy.wa.gov

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Application for Prevention of Significant Deterioration

Read each statement, then check the box next to it to acknowledge what you have read.

☒	The initial fee you submit may not cover the cost of processing your application. Ecology will track the number of hours spent on your project. If the number of hours exceeds the number of hours included in your initial fee, Ecology will send you a bill for that extra time.
☒	Ecology will bill you $95 per hour for each hour worked beyond the initial hours.
☒	You must pay the bill before we will issue your permit or finalize an action or decision.

Applicant Information
The applicant is the business requesting services from Ecology and is responsible for paying the costs Ecology incurs.

Name of business ___SGL Automotive Carbon Fibers_____

Physical location of project (city) _Moses Lake, WA_____

Name of project __Lines 3-10 Emergency Generator Permit Revision_____

Project Manager Information
Ecology will send this person all official correspondence.

Name, Title__Brian Radke, Head of Operations _____

Mailing address _8781 Randolph Road NE_____

City, State, Zip_Moses Lake, WA 98837_____

Phone, Fax, E-mail_509-762-4658, brian.radke@sglacf.com_____

Project Billing Contact Information
Ecology will send the Project Manager the bills if there are any.
☒ If the Project Billing Contact is different from the Project Manager, check this box and provide the required information.

Name, Title _Benoit Labelle, _____

Mailing address _8781 Randolph Road NE _____

City, State, Zip_ Moses Lake, WA 98837_____

Phone, Fax, E-mail_509-762-4626, Benoit.Labelle@sglacf.com_____

Project Consultant Information
☒ If you hired a consultant to prepare the application (or materials), check this box and provide the required information.

Consultant Name, Title _Margaret Donegan-Ryan, Manager_____

Organization__Ramboll Environ US Corporation_____

Mailing address _19020 33rd Ave West_____

City, State, Zip__Lynnwood, WA, 98036_____

Phone, Fax, E-mail__425-412-1824, mdoneganryan@environcorp.com_____

DEPARTMENT OF ECOLOGY State of Washington

Notice of Construction Application

This application applies statewide for facilities under the Department of Ecology's jurisdiction. Submit this form for review of your project to construct a new or modified source of air emissions. Please refer to Ecology Forms ECY 070-410a-g, "Instructions for NOC Application," for general information about completing the application.

Ecology offers up to two hours of free pre-application assistance. We encourage you to schedule a pre-application meeting with the contact person specified for the location of your proposal, below. If you use up your two hours of free pre-application assistance, we will continue to assist you after you submit Part 1 of the application and the application fee. You may schedule a meeting with us at any point in the process.

Upon completion of the application, please enclose a check for the initial fee and mail to:

Department of Ecology
Cashiering Unit
P.O. Box 47611
Olympia, WA 98504-7611

For Fiscal Office Use Only:
001-NSR-216-0299-000404

Check the box for the location of your proposal. For assistance, call the contact listed below:		
	Ecology Permitting Office	**Contact**
☐ **CRO**	**Chelan, Douglas, Kittitas, Klickitat, or Okanogan County** Ecology Central Regional Office – Air Quality Program	Lynnette Haller (509) 457-7126 lynnette.haller@ecy.wa.gov
☒ **ERO**	**Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Stevens, Walla Walla or Whitman County** Ecology Eastern Regional Office – Air Quality Program	Greg Flibbert (509) 329-3452 gregory.flibbert@ecy.wa.gov
☐ **NWRO**	**San Juan County** Ecology Northwest Regional Office – Air Quality Program	David Adler (425) 649-7082 david.adler@ecy.wa.gov
☐ **IND**	**For actions taken at Kraft and Sulfite Paper Mills and Aluminum Smelters** Ecology Industrial Section – Waste 2 Resources Program Permit manager: _____	Garin Schrieve (360) 407-6916 garin.schrieve@ecy.wa.gov
☐ **NWP**	**For actions taken on the US Department of Energy Hanford Reservation** Ecology Nuclear Waste Program	Philip Gent (509) 372-7983 philip.gent@ecy.wa.gov

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

DEPARTMENT OF ECOLOGY State of Washington

Notice of Construction Application

Check the box below for the fee that applies to your application.

New project or equipment:

☐	**$1,500: Basic project** initial fee covers up to 16 hours of review.
☐	**$10,000: Complex project** initial fee covers up to 106 hours of review.

Change to an existing permit or equipment:

☐	**$200: Administrative or simple change** initial fee covers up to 3 hours of review Ecology may determine your change is complex during completeness review of your application. If your project is complex, you must pay the additional $675 before we will continue working on your application.
☒	**$875: Complex change** initial fee covers up to 10 hours of review
☐	**$350** flat fee: **Replace or alter control technology equipment under WAC 173-400-114** Ecology will contact you if we determine your change belongs in another fee category. You must pay the fee associated with that category before we will continue working on your application.

Read each statement, then check the box next to it to acknowledge that you agree.	
☒	The initial fee you submitted may not cover the cost of processing your application. Ecology will track the number of hours spent on your project. If the number of hours Ecology spends exceeds the hours included in your initial fee, Ecology will bill you $95 per hour for the extra time.
☒	You must include all information requested by this application. Ecology may not process your application if it does not include all the information requested.
☒	Submittal of this application allows Ecology staff to visit and inspect your facility.

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

DEPARTMENT OF ECOLOGY State of Washington

Notice of Construction Application

Part 1: General Information

I. Project, Facility, and Company Information

1. Project Name Lines 3-10 Emergency Engine Permit Revision
2. Facility Name SGL Automotive Carbon Fibers
3. Facility Street Address 8781 Randolph Road NE, Moses Lake, WA 98837
4. Facility Legal Description Moses Lake North 7.5' USGS Quads Township 20N Range 28E Section 22
5. Company Legal Name (if different from Facility Name) SGL Automotive Carbon Fibers, LLC
6. Company Mailing Address (street, city, state, zip) 8781 Randolph Road NE, Moses Lake, WA 98837

II. Contact Information and Certification

1. Facility Contact Name (who will be onsite) Brian Radke	
2. Facility Contact Mailing Address (if different than Company Mailing Address)	
3. Facility Contact Phone Number 509-762-4658	4. Facility Contact E-mail brian.radke@sglacf.com
5. Billing Contact Name (who should receive billing information) Benoit Labelle	
6. Billing Contact Mailing Address (if different than Company Mailing Address)	
7. Billing Contact Phone Number 509-762-4658	8. Billing Contact E-mail Benoit.Labelle@sglacf.com
9. Consultant Name (optional – if 3rd party hired to complete application elements) Margaret Donegan-Ryan	
10. Consultant Organization/Company Ramboll Environ US Corporation	
11. Consultant Mailing Address (street, city, state, zip) 19020 33rd Ave West, Suite 310, Lynnwood, WA, 98036	
12. Consultant Phone Number 425-412-1824	13.Consultant E-mail mdoneganryan@environcorp.com
14. Responsible Official Name and Title (who is responsible for project policy or decision-making) Brian Radke, Head of Operations	
16. Responsible Official Phone 509-762-4658	17. Responsible Official E-mail brian.radke@sglacf.com
18. Responsible Official Certification and Signature I certify, based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate and complete. Signature [signature] Date 9-25-2015	

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

DEPARTMENT OF ECOLOGY State of Washington

Notice of Construction Application

Part 2: Technical Information

The Technical Information may be sent with this application form to the Cashiering Unit, or may be sent directly to the Ecology regional office with jurisdiction along with a copy of this application form.

For all sections, check the box next to each item as you complete it.

III. Project Description

Please attach the following to your application.

☒ Written narrative describing your proposed project.
☒ Projected construction start and completion dates.
☒ Operating schedule and production rates.
☒ List of all major process equipment with manufacturer and maximum rated capacity.
☐ Process flow diagram with all emission points identified.
☐ Plan view site map.

☒ Manufacturer specification sheets for major process equipment components.
☐ Manufacturer specification sheets for pollution control equipment.
☐ Fuel specifications, including type, consumption (per hour & per year) and percent sulfur.

IV. State Environmental Policy Act (SEPA) Compliance

Check the appropriate box below.

☒ SEPA review is complete:
Include a copy of the final SEPA checklist and SEPA determination (e.g., DNS, MDNS, EIS) with your application.

☐ SEPA review has not been conducted:

☐ If review will be conducted by another agency, list the agency. You must provide a copy of the final SEPA checklist and SEPA determination before Ecology will issue your permit.
Agency Reviewing SEPA: _City of Moses Lake _____

☐ If the review will be conducted by Ecology, fill out a SEPA checklist and submit it with your application. You can find a SEPA checklist online at www.ecy.wa.gov/programs/sea/sepa/docs/echecklist.doc

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

V. Emissions Estimations of Criteria Pollutants

Does your project generate criteria air pollutant emissions? ☒ Yes ☐ No

If yes, please provide the following information regarding your criteria emissions in your application.

☒ The names of the criteria air pollutants emitted (i.e., NO_x, SO_2, CO, $PM_{2.5}$, PM_{10}, TSP, VOC, and Pb)

☒ Potential emissions of criteria air pollutants in tons per hour, tons per day, and tons per year (include calculations)

☐ If there will be any fugitive criteria pollutant emissions, clearly identify the pollutant and quantity

VI. Emissions Estimations of Toxic Air Pollutants

Does your project generate toxic air pollutant emissions? ☒ Yes ☐ No

If yes, please provide the following information regarding your toxic air pollutant emissions in your application.

☒ The names of the toxic air pollutants emitted (specified in WAC 173-460-150[1])

☒ Potential emissions of toxic air pollutants in pounds per hour, pounds per day, and pounds per year (include calculations)

☐ If there will be any fugitive toxic air pollutant emissions, clearly identify the pollutant and quantity

VII. Emission Standard Compliance

☒ Provide a list of all applicable new source performance standards, national emission standards for hazardous air pollutants, national emission standards for hazardous air pollutants for source categories, and emission standards adopted under Chapter 70.94 RCW.

Does your project comply with all applicable standards identified? ☒ Yes ☐ No

VIII. Best Available Control Technology

☒ Provide a complete evaluation of Best Available Control Technology (BACT) for your proposal.

IX. Ambient Air Impacts Analyses

Please provide the following:

☒ Ambient air impacts analyses for Criteria Air Pollutants (including fugitive emissions)

☒ Ambient air impacts analyses for Toxic Air Pollutants (including fugitive emissions)

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[1] http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460-150

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

☒ Discharge point data for each point included in air impacts analyses (include only if modeling is required)

- ☐ Exhaust height
- ☐ Exhaust inside dimensions (ex. diameter or length and width)
- ☐ Exhaust gas velocity or volumetric flow rate
- ☐ Exhaust gas exit temperature
- ☐ The volumetric flow rate
- ☐ Description of the discharges (i.e., vertically or horizontally) and whether there are any obstructions (ex., raincap)
- ☐ Identification of the emission unit(s) discharging from the point
- ☐ The distance from the stack to the nearest property line
- ☐ Emission unit building height, width, and length
- ☐ Height of tallest building on-site or in the vicinity and the nearest distance of that building to the exhaust
- ☐ Whether the facility is in an urban or rural location

Does your project cause or contribute to a violation of any ambient air quality standard or acceptable source impact level? ☐ Yes ☒ No

If you need this document in a format for the visually impaired, call the Air Quality Program at 360-407-6800. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Appendix B:

Detailed Emission Calculations

Pre-Oxidation Emissions (1 per building)

			Emissions		
			1-hr	24-hr	year
CAS #	Compound	Oxidation Ovens RTO Bypass Emissions (lbs/hr)	Uncontrolled Splice Event hourly emission rate (20 ovens) (lb/hr)	Daily Emissions (assume hourly occurs every hour) (20 ovens) (lb/day)	Annual Emissions for building (10 ovens) (lbs/year)
10102-44-0	NOx	8.5	2.39E-04	5.74E-03	1.05E+00
630-08-0	CO	8.5	2.39E-04	5.74E-03	1.05E+00
7446-09-05	SO2	0.7	1.92E-05	4.60E-04	8.40E-02
PM	PM (Filt.)	0.4	1.19E-05	2.86E-04	5.23E-02
PM10	PM10 (Filt. & Cond.)	1.2	3.37E-05	8.09E-04	1.48E-01
PM2.5	PM2.5 (Filt.& Cond.)	1.2	3.37E-05	8.09E-04	1.48E-01
VOC	VOC	7.2	2.03E-04	4.86E-03	8.88E-01
CO2e	CO2e	--	0	0	0
107-02-8	Acrolein	--	0	0	0
107-13-1	Acrylonitrile	1.7E-01	4.87E-06	1.17E-04	2.13E-02
7664-41-7	Ammonia	9.5	2.67E-04	6.42E-03	1.17E+00
7803-63-6	Ammonium Bisulfate	--	0	0	0
7783-20-2	Ammonium Sulfate	--	0	0	0
7440-38-2	Arsenic	2.0E-06	5.76E-11	1.38E-09	2.52E-07
71-43-2	Benzene	2.1E-05	6.05E-10	1.45E-08	2.65E-06
7440-41-7	Beryllium	1.2E-07	3.46E-12	8.30E-11	1.51E-08
74-83-9	Bromomethane	--	0	0	0
106-99-0	1,3-Butadiene	--	0	0	0
7440-43-9	Cadmium	1.1E-05	3.17E-10	7.61E-09	1.39E-06
75-15-0	Carbon Disulfide	2.2E-03	6.19E-08	1.49E-06	2.71E-04
74-87-3	Chloromethane	--	0	0	0
18540-29-9	Chromium VI	5.7E-07	1.61E-11	3.87E-10	7.07E-08
7440-48-4	Cobalt	8.6E-07	2.42E-11	5.81E-10	1.06E-07
7440-50-8	Copper	8.7E-06	2.45E-10	5.88E-09	1.07E-06
106-46-7	Dichlorobenzene	1.2E-05	3.46E-10	8.30E-09	1.51E-06
75-09-2	Dichloromethane	--	0	0	0
50-00-0	Formaldehyde	7.7E-04	2.16E-08	5.19E-07	9.47E-05
110-54-3	Hexane	1.8E-02	5.19E-07	1.24E-05	2.27E-03
74-90-8	Hydrogen Cyanide	29.7	8.36E-04	2.01E-02	3.66E+00
7439-96-5	Manganese	3.9E-06	1.09E-10	2.63E-09	4.80E-07
7439-97-6	Mercury	2.7E-06	7.49E-11	1.80E-09	3.28E-07
91-20-3	Naphthalene	6.2E-06	1.76E-10	4.22E-09	7.70E-07
7440-02-0	Nickel	2.1E-05	6.05E-10	1.45E-08	2.65E-06
115-07-1	Propylene	--	0	0	0
7782-49-2	Selenium	2.5E-07	6.92E-12	1.66E-10	3.03E-08
108-88-3	Toluene	3.5E-05	9.80E-10	2.35E-08	4.29E-06
7440-62-2	Vanadium	2.4E-05	6.63E-10	1.59E-08	2.90E-06
108-05-4	Vinyl Acetate	4.9E-03	1.39E-07	3.33E-06	6.08E-04
56-55-3	Benz(a)anthracene	1.8E-08	5.19E-13	1.24E-11	2.27E-09
50-32-8	Benzo(a)pyrene	1.2E-08	3.46E-13	8.30E-12	1.51E-09
205-99-2	Benzo(b)fluoranthene	1.8E-08	5.19E-13	1.24E-11	2.27E-09
207-08-9	Benzo(k)fluoranthene	1.8E-08	5.19E-13	1.24E-11	2.27E-09
218-01-9	Chrysene	1.8E-08	5.19E-13	1.24E-11	2.27E-09
53-70-3	Dibenzo(a,h)anthrancene	1.2E-08	3.46E-13	8.30E-12	1.51E-09
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-08	5.19E-13	1.24E-11	2.27E-09
56-49-5	3-Methylcholanthrene	1.8E-08	5.19E-13	1.24E-11	2.27E-09
57-97-6	7,12-Dimethylbenz[a]ant	1.6E-07	4.61E-12	1.11E-10	2.02E-08

Emission Calculation Notes (from client)

Using uncontrolled oxidation oven emissions, which is an overestimate as the splices are not heated to the high range of the ox ovens.

Length of Splice:	# of Splices per oven	Ovens per building
3 ft	4	10 annual
		20 short-term

Precursor weight of a splice:

12.7	grams precursor/meter
3.87	grams precursor/ft
0.012	kg precursor/splice
0.05	kg precursor/oven
0.46	annual rate kg precursor/building
0.93	short-term rate kg precurser/building

Ratio:

annual	0.000014	kg spliced precursor/(kg in a boxset-kg spliced precursor)
short term	0.000028	kg spliced precursor/(kg in a boxset-kg spliced precursor)

Per Quality Engineer:
1 tow at 1 meter = 6.35 grams
For a splice (two tows) = 12.7 grams

Each box contains 550 kg of precursor
60 boxes per box set
33,000 kg of precursor per box set

CAS #	Compound	Avg. Period	Emissions (lb/avg period)	De Minimis (lb/avg. period)	Greater than De Minimis? (Y/N)
10102-44-0	NOx	1-hr	0.0002	0.46	N
10102-44-0	NOx	year	1.0	4000	N
630-08-0	CO	1-hr	0.0002	1.14	N
630-08-0	CO	year	1.0481	10000	N
7446-09-05	SO2	1-hr	0.0000	0.46	N
9/5/7446	SO2	year	0.0840	4000	N
PM	PM (Filt.)	year	0.05	2500	N
PM10	PM10 (Filt. & Cond.)	year	0.15	1500	N
PM2.5	PM2.5 (Filt.& Cond.)	year	0.15	1000	N
VOC	VOC	year	0.9	4000	N
CO2e	CO2e	year	0	N/A	N
107-02-8	Acrolein	24-hr	0	0.00039	N
107-13-1	Acrylonitrile	year	0.02	0.03	N
7664-41-7	Ammonia	24-hr	0.01	0.47	N
7803-63-6	Ammonium Bisulfate	1-hr	0	0.013	N
7783-20-2	Ammonium Sulfate	1-hr	0	0.013	N
7440-38-2	Arsenic	year	2.5E-07	0.0029	N
71-43-2	Benzene	year	2.7E-06	0.33	N
7440-41-7	Beryllium	year	1.5E-08	0.0040	N
74-83-9	Bromomethane	24-hr	0	0.063	N
106-99-0	1,3-Butadiene	year	0	0.056	N
7440-43-9	Cadmium	year	1.4E-06	0.0023	N
75-15-0	Carbon Disulfide	24-hr	1.5E-06	5.26	N
74-87-3	Chloromethane	24-hr	0	0.59	N
18540-29-9	Chromium VI	year	7.1E-08	0.00006	N
7440-48-4	Cobalt	24-hr	5.8E-10	0.0007	N
7440-50-8	Copper	1-hr	2.4E-10	0.01	N
106-46-7	Dichlorobenzene	year	1.5E-06	0.87	N
75-09-2	Dichloromethane	year	0	9.59	N
50-00-0	Formaldehyde	year	9.5E-05	1.60	N
110-54-3	Hexane	24-hr	1.2E-05	4.60	N
74-90-8	Hydrogen Cyanide	24-hr	2.0E-02	0.059	N
7439-96-5	Manganese	24-hr	2.6E-09	0.00026	N
7439-97-6	Mercury	24-hr	1.8E-09	0.00059	N
91-20-3	Naphthalene	year	7.7E-07	0.28	N
7440-02-0	Nickel	year	2.7E-06	0.04030	N
115-07-1	Propylene	24-hr	0	19.70	N
7782-49-2	Selenium	24-hr	1.7E-10	0.13	N
108-88-3	Toluene	24-hr	2.4E-08	32.90	N
7440-62-2	Vanadium	24-hr	1.6E-08	0.0013	N
108-05-4	Vinyl Acetate	24-hr	3.3E-06	1.31	N
56-55-3	Benz(a)anthracene	year	2.3E-09	0.087	N
50-32-8	Benzo(a)pyrene	year	1.5E-09	0.0087	N
205-99-2	Benzo(b)fluoranthene	year	2.3E-09	0.087	N
207-08-9	Benzo(k)fluoranthene	year	2.3E-09	0.087	N
218-01-9	Chrysene	year	2.3E-09	0.87	N
53-70-3	Dibenzo(a,h)anthrancene	year	1.5E-09	0.00799	N
193-39-5	Indeno(1,2,3-cd)pyrene	year	2.3E-09	0.09	N
56-49-5	3-Methylcholanthrene	year	2.3E-09	0.0015	N
57-97-6	7,12-Dimethylbenz[a]ant	year	2.0E-08	0.00014	N

SGL ACF - Moses Lake Facility

Emergency Generators (Lines 3-10) CAT 3516C 2000 ekW Standby Tier4 Engines

- ULSD Fuel

	Engine Specifications	
Total Number of Gens	8	SGL ACF
Max Generators tested together	1	SGL ACF
Max Generators tested per day	8	SGL ACF
Routine Testing Time	2 hours/test	(per engine)
ReliabilityTests per Year	04.0 hours/year	(per engine)
Reliability Testing hours	8 hours/yr	(per engine, from SGL ACF)
Performance Testing hours	8 hours/yr	(one engine every 60 months, continues from a quarterly test)
Emergency hours	8 hour/year	(per engine, from Ecology)
Startup time	10 min/startup	(per engine, from Ecology)
Number of startups	5	(per engine)
Total Startup Hours	0.7 hour/year	(per engine, one startup per test and one startup for both regeneration and emergency operation)
Total Controlled Hours	15.3 hour/year	(per engine, from Ecology)
Total Normal Operating Hours	16.0 hour/year	(per engine)
Gen. Set Output Rating	2,937 hp	(bhp, spec sheet)
Diesel Fuel Heat Content	139 MMBtu/Mgal	
Normal Operating Load	70%	(Vendor info)
Performance test and emergency use operating load	70%	
Engine Information		
Maximum Fuel Use Rate	138.0 gal/hr	
Power Rating	2,000 ekW	

Pollutant Emissions

		Emission Factor					Routine Testing Single Engine Emission Rate [h]			Emergency Operation Single Engine Emission Rate [i]			Performance Test Emission Rate [j]			Total Emission Rate [k] (Eight Engines)		
CAS	Compound	Startup g/hp-hr	Controlled 70% g/hp-hr	Controlled 100% g/hp-hr	lb/hp-hr	lb/mmBtu [d]	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
10102-44-0	NOx [a]	6.8	0.75	0.75	--	--	7.97E+00	1.14E+01	4.55E+01	7.97E+00	3.17E+01	3.17E+01	3.40E+00	2.72E+01	2.72E+01	8.0	90.92	644.80
630-08-0	CO [b]	3.3	0.54	0.54	--	--	4.50E+00	6.95E+00	2.78E+01	4.50E+00	2.16E+01	2.16E+01	2.45E+00	1.96E+01	1.96E+01	4.5	55.61	415.12
PM	PM [a]	--	0.034	0.034	--	--	1.52E-01	3.04E-01	1.22E+00	0.152092	1.22E+00	1.22E+00	1.52E-01	1.22E+00	1.22E+00	0.2	2.43	20.68
PM10	PM10 [e]	--	0.034	0.034	--	--	1.52E-01	3.04E-01	1.22E+00	0.152092	1.22E+00	1.22E+00	1.52E-01	1.22E+00	1.22E+00	0.2	2.43	20.68
PM2.5	PM2.5 [a]	--	0.034	0.034	--	--	1.52E-01	3.04E-01	1.22E+00	0.152092	1.22E+00	1.22E+00	1.52E-01	1.22E+00	1.22E+00	0.2	2.43	20.68
7446-09-05	SO2 [c]	--			1.2E-05	--	3.56E-02	7.13E-02	2.85E-01	3.56E-02	2.85E-01	2.85E-01	3.56E-02	2.85E-01	2.85E-01	0.0	0.57	4.85
VOC	VOC [a]	0.30	0.18	0.18	--	--	8.94E-01	1.70E+00	6.79E+00	8.94E-01	6.51E+00	6.51E+00	8.03E-01	6.42E+00	6.42E+00	0.9	13.58	112.83
CO2	CO2 [f]	--			--	1.6E+02	3.13E+03	6.26E+03	2.50E+04	3.13E+03	2.50E+04	2.50E+04	3.13E+03	2.50E+04	2.50E+04	3.13E+03	5.00E+04	4.25E+05
CH4	CH4 [f]	--			--	6.6E-03	1.27E-01	2.54E-01	1.01E+00	1.27E-01	1.01E+00	1.01E+00	1.27E-01	1.01E+00	1.01E+00	1.27E-01	2.03E+00	1.73E+01
N2O	N2O [f]	--			--	1.3E-03	2.54E-02	5.07E-02	2.03E-01	2.54E-02	2.03E-01	2.03E-01	2.54E-02	2.03E-01	2.03E-01	2.54E-02	4.06E-01	3.45E+00
CO2e	CO2e [g]	--			--	--	3.14E+03	6.28E+03	2.51E+04	3.14E+03	2.51E+04	2.51E+04	3.14E+03	2.51E+04	2.51E+04	3.14E+03	5.02E+04	4.27E+05
75-07-0	Acetaldehyde	--			--	2.52E-05	4.83E-04	9.67E-04	3.87E-03	4.83E-04	3.87E-03	3.87E-03	4.83E-04	3.87E-03	3.87E-03	4.83E-04	7.73E-03	6.57E-02
107-02-8	Acrolein	--			--	7.88E-06	1.51E-04	3.02E-04	1.21E-03	1.51E-04	1.21E-03	1.21E-03	1.51E-04	1.21E-03	1.21E-03	1.51E-04	2.42E-03	2.06E-02
71-43-2	Benzene	--			--	7.76E-04	1.49E-02	2.98E-02	1.19E-01	1.49E-02	1.19E-01	1.19E-01	1.49E-02	1.19E-01	1.19E-01	1.49E-02	2.38E-01	2.02E+00
DPM	DEEP [e]	--			--	--	1.52E-01	3.04E-01	1.22E+00	1.52E-01	1.22E+00	1.22E+00	1.52E-01	1.22E+00	1.22E+00	1.52E-01	2.43E+00	2.07E+01
50-00-0	Formaldehyde	--			--	7.89E-05	1.51E-03	3.03E-03	1.21E-02	1.51E-03	1.21E-02	1.21E-02	1.51E-03	1.21E-02	1.21E-02	1.51E-03	2.42E-02	2.06E-01
91-20-3	Naphthalene	--			--	1.40E-04	2.69E-03	5.37E-03	2.15E-02	2.69E-03	2.15E-02	2.15E-02	2.69E-03	2.15E-02	2.15E-02	2.69E-03	4.30E-02	3.65E-01
115-07-1	Propylene	--			--	2.79E-03	5.35E-02	1.07E-01	4.28E-01	5.35E-02	4.28E-01	4.28E-01	5.35E-02	4.28E-01	4.28E-01	5.35E-02	8.56E-01	7.28E+00
108-88-3	Toluene	--			--	2.81E-04	5.39E-03	1.08E-02	4.31E-02	5.39E-03	4.31E-02	4.31E-02	5.39E-03	4.31E-02	4.31E-02	5.39E-03	8.62E-02	7.33E-01
1330-20-7	Xylenes	--			--	1.93E-04	3.70E-03	7.40E-03	2.96E-02	3.70E-03	2.96E-02	2.96E-02	3.70E-03	2.96E-02	2.96E-02	3.70E-03	5.92E-02	5.03E-01
50-32-8	Benzo(a)pyrene	--			--	2.57E-07	4.93E-06	9.86E-06	3.94E-05	4.93E-06	3.94E-05	3.94E-05	4.93E-06	3.94E-05	3.94E-05	4.93E-06	7.89E-05	6.70E-04
56-55-3	Benzo(a)anthracene	--			--	6.22E-07	1.19E-05	2.39E-05	9.54E-05	1.19E-05	9.54E-05	9.54E-05	1.19E-05	9.54E-05	9.54E-05	1.19E-05	1.91E-04	1.62E-03
205-99-2	Benzo(b)fluoranthene	--			--	1.11E-06	2.13E-05	4.26E-05	1.70E-04	2.13E-05	1.70E-04	1.70E-04	2.13E-05	1.70E-04	1.70E-04	2.13E-05	3.41E-04	2.90E-03
218-01-9	Chrysene	--			--	1.53E-06	2.93E-05	5.87E-05	2.35E-04	2.93E-05	2.35E-04	2.35E-04	2.93E-05	2.35E-04	2.35E-04	2.93E-05	4.70E-04	3.99E-03
53-70-3	Dibenz(a,h)anthracene	--			--	3.46E-07	6.64E-06	1.33E-05	5.31E-05	6.64E-06	5.31E-05	5.31E-05	6.64E-06	5.31E-05	5.31E-05	6.64E-06	1.06E-04	9.03E-04
193-39-5	Indeno(1,2,3-cd)pyrene	--			--	4.14E-07	7.94E-06	1.59E-05	6.35E-05	7.94E-06	6.35E-05	6.35E-05	7.94E-06	6.35E-05	6.35E-05	7.94E-06	1.27E-04	1.08E-03
83-32-9	Acenaphthene	--			--	4.68E-06	8.98E-05	1.80E-04	7.18E-04	8.98E-05	7.18E-04	7.18E-04	8.98E-05	7.18E-04	7.18E-04	8.98E-05	1.44E-03	1.22E-02
208-96-8	Acenaphthylene	--			--	9.23E-06	1.77E-04	3.54E-04	1.42E-03	1.77E-04	1.42E-03	1.42E-03	1.77E-04	1.42E-03	1.42E-03	1.77E-04	2.83E-03	2.41E-02
120-12-7	Anthracene	--			--	1.23E-06	2.36E-05	4.72E-05	1.89E-04	2.36E-05	1.89E-04	1.89E-04	2.36E-05	1.89E-04	1.89E-04	2.36E-05	3.78E-04	3.21E-03
191-24-2	Benzo(g,h,i)perylene	--			--	5.56E-07	1.07E-05	2.13E-05	8.53E-05	1.07E-05	8.53E-05	8.53E-05	1.07E-05	8.53E-05	8.53E-05	1.07E-05	1.71E-04	1.45E-03
207-08-9	Benzo(k)fluoranthene	--			--	2.18E-07	4.18E-06	8.36E-06	3.35E-05	4.18E-06	3.35E-05	3.35E-05	4.18E-06	3.35E-05	3.35E-05	4.18E-06	6.69E-05	5.69E-04
206-44-0	Fluoranthene	--			--	4.03E-06	7.73E-05	1.55E-04	6.18E-04	7.73E-05	6.18E-04	6.18E-04	7.73E-05	6.18E-04	6.18E-04	7.73E-05	1.24E-03	1.05E-02
86-73-7	Fluorene	--			--	1.28E-05	2.46E-04	4.91E-04	1.96E-03	2.46E-04	1.96E-03	1.96E-03	2.46E-04	1.96E-03	1.96E-03	2.46E-04	3.93E-03	3.34E-02
85-01-8	Phenanthrene	--			--	4.08E-05	7.83E-04	1.57E-03	6.26E-03	7.83E-04	6.26E-03	6.26E-03	7.83E-04	6.26E-03	6.26E-03	7.83E-04	1.25E-02	1.06E-01
129-00-0	Pyrene	--			--	3.71E-06	7.12E-05	1.42E-04	5.69E-04	7.12E-05	5.69E-04	5.69E-04	7.12E-05	5.69E-04	5.69E-04	7.12E-05	1.14E-03	9.68E-03
POM	Polycyclic Organic Matter	--			--	--												

notes:

a - NOx, CO, PM, and VOC emission factors from NSPS Tier 2 (uncontrolled)[40 CFR 89.112] and Tier 4 (controlled)[40 CFR 1039.101] emissions standards with Not-to-Exceed factors accounted for [40 CFR 1039.101(e)(3)]
b - Emission factors for CO provided by manufacturer guarantee.
c - Emission factors from AP-42 Section 3.4, Large Stationary Diesel and Duel-Fuel Engines (October 1996). Fuel sulfur content of ULSD is 0.0015%.
d - HAP and TAP emission factors based on AP-42, Section 3.4 (Large Stationary Diesel and Duel-Fuel Engines).
e - Diesel Engine Exhaust Particulate (DEEP) emissions based on filterable portion of PM10 emission rate. Ratio of filterable PM to total PM10 based on emissions rates from Table 3.4-2 of AP-42 Section 3.4 (Large Stationary Diesel and Duel-Fuel Engines).
f - Greenhouse Gas emission factors from 40 CFR 98, Subpart C, Table C-1.
g - CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 25; and N2O = 298 (40 CFR Part 98, Subpart A).
h - Hourly emissions based on 2937 hp-hr/hr and normal operations at 70% load, fuel consumption rate of 138.0 gal/hr, startup emission rate based on uncontrolled emissions ratesfor 10 minutes/startup and controlled emissions for the remainder of the hour, daily emissions based on one hour of emissions that account for cold start adjustments and one hour of steady-state operation, and annual emissions based on 8 hrs/yr.
i - Hourly emissions based on 2937 hp-hr/hr and normal operations at 100% load, fuel consumption rate of 138.0 gal/hr, startup emission rate based on uncontrolled emissions rates and 10 minutes/startup and controlled emissions for the remainder of the hour, daily emissions based on one hour of emissions that account for cold start adjustments and seven hours of steady-state operation, and annual emissions based on 8 hrs/yr.

j - Hourly emissions based on 2937 hp-hr/hr and operations at 100% load, fuel consumption rate of 138.0 gal/hr, daily and annual emissions based on 8 hrs per test and one test per year.
k - Hourly emissions based on the maximum hourly rate and testing 1 engines at a time. Daily emissions based on reliability testing of 8 engines per day, and annual emissions based on 8 hours of routine tests and 8 hours of emergency use per each of the eight engines plus a 8 h performance test of one engine.

NSPS Emission Factors

	NTE Ratio	Tier 2 Standard		Tier 4 Standard		Startup	Controlled 70%	Controlled 100%
		g/kW-hr	g/hp-hr	g/kW-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr
NOx	1.5	6.1	4.5	0.670	0.500	6.8	0.7	0.7
PM	1.5	N/A		0.03	0.02	N/A	0.034	0.034
CO	1.25	3.5	2.6	N/A	N/A	3.3	N/A	N/A
VOC	1.25	0.3	0.2	0.190	0.142	0.3	0.18	0.18

Source:

Tier 2 Table 1 40 CFR 89.112

NOx emissions are based on 95 percent of the NOx+THC emission standard (California Air Resource Board (CARB) June 28, 2004 Guidance document, New Policy: CARB Emission Factors – Percent HC in Relation to NMHC + NOx).

Tier 4 Table 1 40 CFR 1039.101

NTE Ratio 40 CFR 1039.101(e)(3)

Controlled CO emissions based on manufacturer guarantee

Total increase in Annual Emissions[1]				
Pollutant	Current L3EG-10EG Annual Emissions	Proposed L3EG-10EG Annual Emissions	Net Increase	
	lb/yr	lb/yr	lb/yr	tpy
NOx	439.4	644.8	205.4	0.1
PM/DEEP	6.6	20.7	14.1	0.01
CO	73.3	415.1	341.8	0.2
VOC	32.0	112.8	80.8	0.04

[1] Annual emissions based on 8 hours of reliability tests and 8 hours of emergency use per each of the eight engines plus an 8 hour performance test of one engine.

ACF - Line 3 - 10 Permit Application

- Emissions Summary for Lines 3 - 10 - Project Analysis

	Normal Mode w/SCR	Normal Mode w/out SCR	SCR Bypass	Shutdown Line 2-6 rate	Shutdown Line 7-10 rate	RTO Bypass	Lines 3-10 EGENs	Firewater Pump EGENs
hr/day	24	24	24	0.025	0.025	1.5	2	4
hr/yr	8760	8760	100	9.125	9.125	4.5	16	38
# units hr [a]	4	4	1	4	4	1	1	1
# units day or yr	4	4	4	4	4	8	7	1
hr/day - ENG Test							10	4
hr/yr - ENG Test							24	38
# units yr - ENG Test							1	

a - Emissions are based on 1.5 hr of cumulative RTO bypass per day.

Criteria Pollutants

CAS	Compound	Emissions For Lines 3 -10									
		Units	Normal Mode w/SCR	Normal Mode w/out SCR	SCR Bypass	Shutdown Line 2-6	Shutdown Line 7-10 rate	RTO Bypass	Lines 3-10 EGENs	Firewater Pump EGENs	Total
10102-44-0	NOx	lb/hr	34.0	71.6	115.0	34.0	71.6	105.6	8.0	2.0	125.0
		tpy	148.9	313.6	1.9	0.0	0.0	0.0	0.32	0.04	465
630-08-0	CO	lb/hr	5.3	5.3	10.6	5.9	5.9	18.5	4.5	4.0	27.0
		tpy	23.2	23.2	0.0	0.1	0.1	0.1	0.21	0.1	47
7446-09-05	SO2	lb/hr	2.7	2.7	5.5	2.7	2.7	5.5	0.04	0.002	5.5
		tpy	12.0	12.0	0.0	0.0	0.0	0.0	0.00	0.00005	24
PM	PM (Filt.)	lb/hr	4.2	4.2	8.5	4.2	4.2	8.5	0.15	0.04	8.7
		tpy	18.5	18.5	0.0	0.0	0.0	0.0	0.01	0.001	37
PM10	PM10 (Filt. & Cond.)	lb/hr	12.0	8.0	20.0	12.0	8.0	20.0	0.15	0.1	20.3
		tpy	52.6	35.2	-0.2	0.0	0.0	0.0	0.01	0.002	88
PM2.5	PM2.5 (Filt.& Cond.)	lb/hr	12.0	8.0	20.0	12.0	8.0	20.0	0.15	0.1	20.3
		tpy	52.6	35.2	-0.2	0.0	0.0	0.0	0.01	0.002	88
VOC	VOC	lb/hr	6.7	6.7	13.5	7.3	7.3	20.4	0.9	1.0	22.3
		tpy	29.5	29.5	0.0	0.1	0.1	0.1	0.06	0.02	59
CO2e	CO2e	lb/hr	6588.6	6588.6	13177.3	6588.6	6588.6	13177.3	3138.4	460.5	16776.2
		tpy	28858.2	28858.2	0.0	0.0	0.0	0.0	213.41	8.7	57939

Because proposed potential emissions during Normal Mode are not limited below 8,760, proposed annual emissions during alternate modes are only accounted for as the net increase above Normal Mode emission rates during the allowed time period. Apart from NOx emissions during SCR Bypass mode, no other pollutant is emitted in rates that exceed those during Normal Mode.

Toxic Air Pollutants

CAS	Compound	Emissions For Lines 3-10										
		Ave. Time	Normal Mode w/SCR	Normal Mode w/out SCR	SCR Bypass	Shutdown Line 2-6	Shutdown Line 7-10 rate	RTO Bypass	Lines 3-10 EGENs	Firewater Pump EGENs	Ammonium Bicarbonate	Max (per avg. period)
10102-44-0	NOx	1-hr	34.0	71.6	115.0	34.0	71.6	105.6	8.0	2.0		125.0
630-08-0	CO	1-hr	5.3	5.3	10.6	5.9	5.9	18.5	4.5	4.0		27.0
7446-09-05	SO2	1-hr	2.7	2.7	5.5	2.7	2.7	5.5	3.6E-02	2.5E-03		5.5
75-07-0	Acetaldehyde	year	--	--	--	--	--	--	6.6E-02	4.4E-01		0.5
107-02-8	Acrolein	24-hr	--	--	--	--	--	--	2.4E-03	4.4E-02		0.0
107-13-1	Acrylonitrile	year	196.4	196.4	0.0	4.7	4.7	6.0	--	--		408.3
7664-41-7	Ammonia	24-hr	290.4	290.4	523.4	291.1	291.1	590.8	--	--	1.79	594.0
7803-63-6	Ammonium Bisulfate	1-hr	12.0	--	--	12.0	--	--				12.0
7783-20-2	Ammonium Sulfate	1-hr	12.0	--	--	12.0	--	--				12.0
7440-38-2	Arsenic	year	1.3E-01	1.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		2.6E-01
71-43-2	Benzene	year	5.9E+00	5.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+00	2.5E-01		1.4E+01
7440-41-7	Beryllium	year	7.8E-03	7.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		1.6E-02
74-83-9	Bromomethane	24-hr	1.7E-02	1.7E-02	3.4E-02	1.7E-02	1.7E-02	3.4E-02	--	--		3.4E-02
106-99-0	1,3-Butadiene	year	--	--	--	--	--	--	--	1.1E-01		0.1
7440-43-9	Cadmium	year	7.2E-01	7.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		1.4E+00
75-15-0	Carbon Disulfide	24-hr	2.6E-01	2.6E-01	5.2E-01	2.6E-01	2.6E-01	5.2E-01	--	--		5.2E-01
74-87-3	Chloromethane	24-hr	5.9E-03	5.9E-03	1.2E-02	5.9E-03	5.9E-03	1.2E-02	--	--		1.2E-02
18540-29-9	Chromium VI	year	3.7E-02	3.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		7.3E-02
7440-48-4	Cobalt	24-hr	1.5E-04	1.5E-04	3.0E-04	1.5E-04	1.5E-04	3.0E-04	--	--		3.0E-04
7440-50-8	Copper	1-hr	6.3E-05	6.3E-05	1.3E-04	6.3E-05	6.3E-05	1.3E-04	--	--		1.3E-04
106-46-7	Dichlorobenzene	year	7.8E-01	7.8E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		1.6E+00
75-09-2	Dichloromethane	year	2.1E-02	2.1E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	6.5E-03		4.8E-02
DPM	Diesel Engine Particulate	year	--	--	--	--	--	--	2.1E+01	--		20.7
50-00-0	Formaldehyde	year	4.9E+01	4.9E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E-01	3.3E+00		1.0E+02
110-54-3	Hexane	24-hr	2.7E+00	2.7E+00	5.5E+00	2.7E+00	2.7E+00	5.5E+00	--	--		5.5E+00
74-90-8	Hydrogen Cyanide	24-hr	1.3E+02	1.3E+02	2.6E+02	1.3E+02	1.3E+02	3.1E+02	--	--		3.1E+02
7439-96-5	Manganese	24-hr	6.8E-04	6.8E-04	1.4E-03	6.8E-04	6.8E-04	1.4E-03	--	--		1.4E-03
7439-97-6	Mercury	24-hr	4.7E-04	4.7E-04	9.3E-04	4.7E-04	4.7E-04	9.3E-04	--	--		9.3E-04
91-20-3	Naphthalene	year	4.0E-01	4.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E-01	1.5E-02		1.2E+00
7440-02-0	Nickel	year	1.4E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		2.7E+00
115-07-1	Propylene	24-hr	1.0E-02	1.0E-02	2.1E-02	1.0E-02	1.0E-02	2.1E-02	8.6E-01	--		8.8E-01
7782-49-2	Selenium	24-hr	4.3E-05	4.3E-05	8.6E-05	4.3E-05	4.3E-05	8.6E-05	--	--		8.6E-05
108-88-3	Toluene	24-hr	2.5E-02	2.5E-02	4.9E-02	2.5E-02	2.5E-02	4.9E-02	8.6E-02	9.3E-03		1.4E-01
7440-62-2	Vanadium	24-hr	4.1E-03	4.1E-03	8.2E-03	4.1E-03	4.1E-03	8.2E-03	--	--		8.2E-03
108-05-4	Vinyl Acetate	24-hr	4.9E-01	4.9E-01	9.8E-01	4.9E-01	4.9E-01	9.8E-01	--	--		9.8E-01
1330-20-7	Xylenes	24-hr	--	--	--	--	--	--	5.9E-02	3.3E-03		0.1
56-55-3	Benz(a)anthracene	year	1.2E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-03	--		4.0E-03
50-32-8	Benzo(a)pyrene	year	7.8E-04	7.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.7E-04	--		2.2E-03
205-99-2	Benzo(b)fluoranthene	year	1.2E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-03	--		5.3E-03
207-08-9	Benzo(k)fluoranthene	year	1.2E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.7E-04	--		2.9E-03
218-01-9	Chrysene	year	1.2E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.0E-03	--		6.3E-03
53-70-3	Dibenzo(a,h)anthrancene	year	7.8E-04	7.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.0E-04	--		2.5E-03
193-39-5	Indeno(1,2,3-cd)pyrene	year	1.2E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-03	--		3.4E-03
56-49-5	3-Methylcholanthrene	year	1.2E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		2.4E-03
57-97-6	7,12-Dimethylbenz[a]anthr	year	1.0E-02	1.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--		2.1E-02

Because proposed potential emissions during Normal Mode are not limited below 8,760, proposed annual emissions during alternate modes are only accounted for as the net increase above Normal Mode emission rates during the allowed time period. Apart from NOx emissions during SCR Bypass mode, no other pollutant is emitted in rates that exceed those during Normal Mode.

ACF - Line 3 - 10 Permit Application

- Emissions Summary for Lines 1 - 10 - Emissions for Facility-wide NAAQS Analysis

	Normal Mode w/SCR	Normal Mode w/out SCR	SCR Bypass	Shutdown Line1 rate	Shutdown Line 2-6 rate	Shutdown Line 7-10 rate	RTO Bypass	Lines 1-2 EGENs	Lines 3-10 EGENs	Firewater Pump EGENs
hr/day	24	24	24	0.025	0.025	0.025	1.5	0.5	2	4
hr/yr	8760	8760	100	9.125	9.125	9.125	4.5	34	16	38
# units hr [a]	6	4	1	1	5	4	1	2	1	2
# units day or yr	6	4	6	1	5	4	10	10	7	2
hr/day - ENG Test									10	4
hr/yr - ENG Test									24	38
# units yr - ENG Test									1	

a - Emissions are based on 1.5 hr of cumulative RTO bypass per day.

Criteria Pollutants

CAS	Compound	Emissions For Lines 1 -10											
		Units	Normal Mode w/SCR	Normal Mode w/out SCR	SCR Bypass	Shutdown Line1	Shutdown Line 2-6	Shutdown Line 7-10 rate	RTO Bypass	Lines 1-2 EGENs	Lines 3-10 EGENs	Firewater Pump EGENs	Total
10102-44-0	NOx	lb/hr	51.0	71.6	132.0	8.5	42.5	71.6	122.6	2.0	8.0	4.0	146.0
		tpy	223.4	313.6	2.8	0.0	0.0	0.0	0.0	0.3	0.32	0.08	541
630-08-0	CO	lb/hr	7.9	5.3	13.2	1.4	7.4	5.9	21.2	4.0	4.5	8.0	37.7
		tpy	34.7	23.2	0.0	0.0	0.1	0.1	0.2	0.7	0.21	0.2	59
7446-09-05	SO2	lb/hr	4.1	2.7	6.9	0.7	3.4	2.7	6.9	0.0	0.04	0.005	6.9
		tpy	18.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00009	30
PM	PM (Filt.)	lb/hr	6.3	4.2	10.6	1.1	5.3	4.2	10.6	0.0	0.15	0.08	10.8
		tpy	27.8	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.002	46
PM10	PM10 (Filt. & Cond.)	lb/hr	18.0	8.0	26.0	3.0	15.0	8.0	29.0	0.1	0.15	0.2	29.4
		tpy	78.8	35.2	-0.3	0.0	0.0	0.0	0.0	0.0	0.01	0.00	114
PM2.5	PM2.5 (Filt.& Cond.)	lb/hr	18.0	8.0	26.0	3.0	15.0	8.0	29.0	0.1	0.15	0.2	29.4
		tpy	78.8	35.2	-0.3	0.0	0.0	0.0	0.0	0.0	0.01	0.003	114
VOC	VOC	lb/hr	10.1	6.7	16.9	1.8	9.1	7.3	23.8	1.0	0.9	2.0	27.7
		tpy	44.3	29.5	0.0	0.0	0.1	0.1	0.2	0.2	0.06	0.04	75
CO2e	CO2e	lb/hr	9883.0	6588.6	16471.6	1647.2	8235.8	6588.6	16471.6	460.5	3138.4	921.0	20991.5
		tpy	43287.3	28858.2	0.0	0.0	0.0	0.0	0.0	78.3	213.41	17.5	72455

Because proposed potential emissions during Normal Mode are not limited below 8,760, proposed annual emissions during alternate modes are only accounted for as the net increase above Normal Mode emission rates during the allowed time period. Apart from NOx emissions during SCR Bypass mode, no other pollutant is emitted in rates that exceed those during Normal Mode.

Toxic Air Pollutants

CAS	Compound	Emissions (lb/avg. period)												
		Ave. Time	Normal Mode w/SCR	Normal Mode w/out SCR	SCR Bypass	Shutdown Line1	Shutdown Line 2-6	Shutdown Line 7-10 rate	RTO Bypass	Lines 1-2 EGENs	Lines 3-10 EGENs	Firewater Pump EGENs	Ammonium Bicarbonate	Max (per avg. period)
10102-44-0	NOx	1-hr	51.0	71.6	132.0	8.5	42.5	71.6	122.6	2.0	8.0	4.0		146.0
630-08-0	CO	1-hr	7.9	5.3	13.2	1.4	7.4	5.9	21.2	4.0	4.5	8.0		37.7
7446-09-05	SO2	1-hr	4.1	2.7	6.9	0.7	3.4	2.7	6.9	0.0	3.6E-02	4.9E-03		6.9
75-07-0	Acetaldehyde	year	--	--	--	--	--	--	--	4.0	6.6E-02	8.9E-01		4.9
107-02-8	Acrolein	24-hr	--	--	--	--	--	--	--	0.1	2.4E-03	8.8E-02		0.1
107-13-1	Acrylonitrile	year	294.6	196.4	0.0	0.9	5.9	4.7	7.5	--	--	--		510.1
7664-41-7	Ammonia	24-hr	435.7	290.4	668.6	72.7	363.9	291.1	736.0	--	--	--	2.24	740.0
7803-63-6	Ammonium Bisulfate	1-hr	18.0	--	--	3.0	15.0	--	--					18.0
7783-20-2	Ammonium Sulfate	1-hr	18.0	--	--	3.0	15.0	--	--					18.0
7440-38-2	Arsenic	year	2.0E-01	1.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		3.3E-01
71-43-2	Benzene	year	8.8E+00	5.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2	2.0E+00	5.0E-01		2.0E+01
7440-41-7	Beryllium	year	1.2E-02	7.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		2.0E-02
74-83-9	Bromomethane	24-hr	2.5E-02	1.7E-02	4.2E-02	4.2E-03	2.1E-02	1.7E-02	4.2E-02	--	--	--		4.2E-02
106-99-0	1,3-Butadiene	year	--	--	--	--	--	--	--	0.9	--	2.1E-01		1.2
7440-43-9	Cadmium	year	1.1E+00	7.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		1.8E+00
75-15-0	Carbon Disulfide	24-hr	3.9E-01	2.6E-01	6.5E-01	6.5E-02	3.3E-01	2.6E-01	6.5E-01	--	--	--		6.5E-01
74-87-3	Chloromethane	24-hr	8.9E-03	5.9E-03	1.5E-02	1.5E-03	7.4E-03	5.9E-03	1.5E-02	--	--	--		1.5E-02
18540-29-9	Chromium VI	year	5.5E-02	3.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		9.2E-02
7440-48-4	Cobalt	24-hr	2.3E-04	1.5E-04	3.8E-04	3.8E-05	1.9E-04	1.5E-04	3.8E-04	--	--	--		3.8E-04
7440-50-8	Copper	1-hr	9.5E-05	6.3E-05	1.6E-04	1.6E-05	7.9E-05	6.3E-05	1.6E-04	--	--	--		1.6E-04
106-46-7	Dichlorobenzene	year	1.2E+00	7.8E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		2.0E+00
75-09-2	Dichloromethane	year	3.1E-02	2.1E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.1	--	1.3E-02		1.2E-01
DPM	Diesel Engine Particulate	year	--	--	--	--	--	--	--	--	2.1E+01	--		20.7
50-00-0	Formaldehyde	year	7.4E+01	4.9E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	29.1	2.1E-01	6.5E+00		1.6E+02
110-54-3	Hexane	24-hr	4.1E+00	2.7E+00	6.8E+00	6.8E-01	3.4E+00	2.7E+00	6.8E+00	--	--	--		6.8E+00
74-90-8	Hydrogen Cyanide	24-hr	2.0E+02	1.3E+02	3.3E+02	3.3E+01	1.7E+02	1.3E+02	3.7E+02	--	--	--		3.8E+02
7439-96-5	Manganese	24-hr	1.0E-03	6.8E-04	1.7E-03	1.7E-04	8.5E-04	6.8E-04	1.7E-03	--	--	--		1.7E-03
7439-97-6	Mercury	24-hr	7.0E-04	4.7E-04	1.2E-03	1.2E-04	5.8E-04	4.7E-04	1.2E-03	--	--	--		1.2E-03
91-20-3	Naphthalene	year	6.0E-01	4.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.1	3.7E-01	3.1E-02		1.5E+00
7440-02-0	Nickel	year	2.1E+00	1.4E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		3.4E+00
115-07-1	Propylene	24-hr	1.6E-02	1.0E-02	2.6E-02	2.6E-03	1.3E-02	1.0E-02	2.6E-02	--	8.6E-01	--		8.8E-01
7782-49-2	Selenium	24-hr	6.5E-05	4.3E-05	1.1E-04	1.1E-05	5.4E-05	4.3E-05	1.1E-04	--	--	--		1.1E-04
108-88-3	Toluene	24-hr	3.7E-02	2.5E-02	6.2E-02	6.2E-03	3.1E-02	2.5E-02	6.2E-02	0.0	8.6E-02	1.9E-02		1.8E-01
7440-62-2	Vanadium	24-hr	6.2E-03	4.1E-03	1.0E-02	1.0E-03	5.2E-03	4.1E-03	1.0E-02	--	--	--		1.0E-02
108-05-4	Vinyl Acetate	24-hr	7.3E-01	4.9E-01	1.2E+00	1.2E-01	6.1E-01	4.9E-01	1.2E+00	--	--	--		1.2E+00
1330-20-7	Xylenes	24-hr	--	--	--	--	--	--	--	0.0	5.9E-02	6.5E-03		0.1
56-55-3	Benz(a)anthracene	year	1.8E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	1.6E-03	--		4.6E-03
50-32-8	Benzo(a)pyrene	year	1.2E-03	7.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	6.7E-04	--		2.6E-03
205-99-2	Benzo(b)fluoranthene	year	1.8E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	2.9E-03	--		5.8E-03
207-08-9	Benzo(k)fluoranthene	year	1.8E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	5.7E-04	--		3.5E-03
218-01-9	Chrysene	year	1.8E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	4.0E-03	--		6.9E-03
53-70-3	Dibenzo(a,h)anthrancene	year	1.2E-03	7.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	9.0E-04	--		2.9E-03
193-39-5	Indeno(1,2,3-cd)pyrene	year	1.8E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	1.1E-03	--		4.0E-03
56-49-5	3-Methylcholanthrene	year	1.8E-03	1.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		2.9E-03
57-97-6	7,12-Dimethylbenz[a]anthr	year	1.6E-02	1.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	--	--	--		2.6E-02

Because proposed potential emissions during Normal Mode are not limited below 8,760, proposed annual emissions during alternate modes are only accounted for as the net increase above Normal Mode emission rates during the allowed time period. Apart from NOx emissions during SCR Bypass mode, no other pollutant is emitted in rates that exceed those during Normal Mode.

ACF - Line 3 - 10 Permit Application

- Emission Factors Summary for Lines 1 - 10

		Emission Factor (lb/hr)											
CAS	Compound	Normal Mode Lines 1-6	Normal Mode Lines 7-10	SCR Bypass	Shutdown Line1	Shutdown Line 2-6	Shutdown Line 7-10	RTO Bypass	Lines 1-2 EGENs (1 engine)	Lines 3-10 EGENs (1 engine lb/hr)	Lines 3-10 EGENs (8 engines lb/day)	Lines 3-10 EGENs (8 engine lb/yr)	Firewater Pump EGENs (1 engine)
10102-44-0	NOx	8.5	17.9	17.9	8.5	8.5	17.9	8.5	2.0	8.0	90.9	644.8	2.00
630-08-0	CO	1.3	1.3	1.3	5.9	7.5	7.5	9.3	4.0	4.5	55.6	415.1	4.0
7446-09-05	SO2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.002	0.0	0.6	4.8	0.002
PM	PM (Filt.)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.04	0.2	2.4	20.7	0.04
PM10	PM10 (Filt. & Cond.)	3.0	2.0	2.0	3.0	3.0	2.0	2.0	0.1	0.2	2.4	20.7	0.1
PM2.5	PM2.5 (Filt.& Cond.)	3.0	2.0	2.0	3.0	3.0	2.0	2.0	0.1	0.2	2.4	20.7	0.1
VOC	VOC	1.7	1.7	1.7	5.7	7.1	7.1	8.6	1.0	0.9	13.6	112.8	1.0
CO2e	CO2e	1647.16	1647.16	1647	1647	1647	1647	1647	460.5	3138.4	50214.1	426819.7	460

Toxic Air Pollutants

CAS	Compound	Ave. Time	Emission Factor (lb/hr)											
			Normal Mode Lines 1-6	Normal Mode Lines 7-10	SCR Bypass	Shutdown Line1	Shutdown Line 2-6	Shutdown Line 7-10	RTO Bypass	Lines 1-2 EGENs (1 engine)	Lines 3-10 EGENs (1 engine lb/hr)	Lines 3-10 EGENs (8 engines lb/day)	Lines 3-10 EGENs (8 engine lb/yr)	Firewater Pump EGENs (1 engine)
10102-44-0	NOx	1-hr	8.5	17.9	17.9	8.5	8.5	17.9	8.5	2.0	8.0	90.9	644.8	2.0
630-08-0	CO	1-hr	1.3	1.3	1.3	5.9	7.5	7.5	9.3	4.0	4.5	55.6	415.1	4.0
7446-09-05	SO2	1-hr	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.0	3.6E-02	5.7E-01	4.8E+00	0.0
75-07-0	Acetaldehyde	year	--	--	--	--	--	--	--	0.01	4.8E-04	7.7E-03	6.6E-02	0.01
107-02-8	Acrolein	24-hr	--	--	--	--	--	--	--	0.01	1.5E-04	2.4E-03	2.1E-02	0.01
107-13-1	Acrylonitrile	year	0.006	0.006	0.006	0.103	0.136	0.136	0.17	--	--	--	--	--
7664-41-7	Ammonia	24-hr	3.0	3.0	0.6	8.3	10.0	10.0	9.6	--	--	--	--	--
7803-63-6	Ammonium Bisulfate	1-hr	3.0	--	--	3.0	3.0	--	--	--	--	--	--	--
7783-20-2	Ammonium Sulfate	1-hr	3.0	--	--	3.0	3.0	--	--	--	--	--	--	--
7440-38-2	Arsenic	year	3.7E-06	3.7E-06	3.7E-06	3.7E-06	3.7E-06	3.7E-06	3.7E-06	--	--	--	--	--
71-43-2	Benzene	year	1.7E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04	6.6E-03	1.5E-02	2.4E-01	2.0E+00	6.6E-03
7440-41-7	Beryllium	year	2.2E-07	2.2E-07	2.2E-07	2.2E-07	2.2E-07	2.2E-07	2.2E-07	--	--	--	--	--
74-83-9	Bromomethane	24-hr	1.8E-04	1.8E-04	1.8E-04	1.8E-04	1.8E-04	1.8E-04	1.8E-04	--	--	--	--	--
106-99-0	1,3-Butadiene	year	--	--	--	--	--	--	--	2.8E-03	--	--	--	2.8E-03
7440-43-9	Cadmium	year	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05	--	--	--	--	--
75-15-0	Carbon Disulfide	24-hr	2.7E-03	2.7E-03	2.7E-03	2.7E-03	2.7E-03	2.7E-03	2.6E-03	--	--	--	--	--
74-87-3	Chloromethane	24-hr	6.2E-05	6.2E-05	6.2E-05	6.2E-05	6.2E-05	6.2E-05	6.2E-05	--	--	--	--	--
18540-29-9	Chromium VI	year	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	--	--	--	--	--
7440-48-4	Cobalt	24-hr	1.6E-06	1.6E-06	1.6E-06	1.6E-06	1.6E-06	1.6E-06	1.6E-06	--	--	--	--	--
7440-50-8	Copper	1-hr	1.6E-05	1.6E-05	1.6E-05	1.6E-05	1.6E-05	1.6E-05	1.6E-05	--	--	--	--	--
106-46-7	Dichlorobenzene	year	2.2E-05	2.2E-05	2.2E-05	2.2E-05	2.2E-05	2.2E-05	2.2E-05	--	--	--	--	--
75-09-2	Dichloromethane	year	5.9E-07	5.9E-07	5.9E-07	5.9E-07	5.9E-07	5.9E-07	5.9E-07	1.7E-04	--	--	--	1.7E-04
DPM	Diesel Engine Particulate	year	--	--	--	--	--	--	--	--	1.5E-01	2.4E+00	2.1E+01	--
50-00-0	Formaldehyde	year	1.4E-03	1.4E-03	1.4E-03	1.4E-03	1.4E-03	1.4E-03	1.4E-03	8.6E-02	1.5E-03	2.4E-02	2.1E-01	8.6E-02
110-54-3	Hexane	24-hr	2.8E-02	2.8E-02	2.8E-02	2.8E-02	2.8E-02	2.8E-02	2.8E-02	--	--	--	--	--
74-90-8	Hydrogen Cyanide	24-hr	1.4E+00	1.4E+00	1.4E+00	1.8E+01	2.4E+01	2.4E+01	3.0E+01	--	--	--	--	--
7439-96-5	Manganese	24-hr	7.1E-06	7.1E-06	7.1E-06	7.1E-06	7.1E-06	7.1E-06	7.1E-06	--	--	--	--	--
7439-97-6	Mercury	24-hr	4.9E-06	4.9E-06	4.9E-06	4.9E-06	4.9E-06	4.9E-06	4.9E-06	--	--	--	--	--
91-20-3	Naphthalene	year	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05	4.1E-04	2.7E-03	4.3E-02	3.7E-01	4.1E-04
7440-02-0	Nickel	year	3.9E-05	3.9E-05	3.9E-05	3.9E-05	3.9E-05	3.9E-05	3.9E-05	--	--	--	--	--
115-07-1	Propylene	24-hr	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04	--	5.4E-02	8.6E-01	7.3E+00	--
7782-49-2	Selenium	24-hr	4.5E-07	4.5E-07	4.5E-07	4.5E-07	4.5E-07	4.5E-07	4.5E-07	--	--	--	--	--
108-88-3	Toluene	24-hr	2.6E-04	2.6E-04	2.6E-04	2.6E-04	2.6E-04	2.6E-04	2.6E-04	2.3E-03	5.4E-03	8.6E-02	7.3E-01	2.3E-03
7440-62-2	Vanadium	24-hr	4.3E-05	4.3E-05	4.3E-05	4.3E-05	4.3E-05	4.3E-05	4.3E-05	--	--	--	--	--
108-05-4	Vinyl Acetate	24-hr	5.1E-03	5.1E-03	5.1E-03	5.0E-03	5.0E-03	5.0E-03	4.9E-03	--	--	--	--	--
1330-20-7	Xylenes	24-hr	--	--	--	--	--	--	--	8.2E-04	3.7E-03	5.9E-02	5.0E-01	8.2E-04
56-55-3	Benz(a)anthracene	year	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	--	1.2E-05	1.9E-04	1.6E-03	--
50-32-8	Benzo(a)pyrene	year	2.2E-08	2.2E-08	2.2E-08	2.2E-08	2.2E-08	2.2E-08	2.2E-08	--	4.9E-06	7.9E-05	6.7E-04	--
205-99-2	Benzo(b)fluoranthene	year	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	--	2.1E-05	3.4E-04	2.9E-03	--
207-08-9	Benzo(k)fluoranthene	year	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	--	4.2E-06	6.7E-05	5.7E-04	--
218-01-9	Chrysene	year	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	--	2.9E-05	4.7E-04	4.0E-03	--
53-70-3	Dibenzo(a,h)anthrancene	year	2.2E-08	2.2E-08	2.2E-08	2.2E-08	2.2E-08	2.2E-08	2.2E-08	--	6.6E-06	1.1E-04	9.0E-04	--
193-39-5	Indeno(1,2,3-cd)pyrene	year	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	--	7.9E-06	1.3E-04	1.1E-03	--
56-49-5	3-Methylcholanthrene	year	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08	--	--	--	--	--
57-97-6	7,12-Dimethylbenz[a]anthr	year	3.0E-07	3.0E-07	3.0E-07	3.0E-07	3.0E-07	3.0E-07	3.0E-07	--	--	--	--	--

SGL ACF - Moses Lake Facility

Summary of Line 1 Emissions Factors

	Line 1 Specifications	
SCR Ammonia Slip (lb/hr)	2.4	
	RTO Specifications	
RTO Heater Firing rate	8.40 MMBtu/hr	
RTO Backup Heater Firing rate	2.04 MMBtu/hr	
Oxidation oven Shutdown Duration	90 seconds	
shutdown per Day	1	
RTO Bypass (hrs/day)	1.5	
	TO Specifications	
TO Heater Firing rate	4.00 MMBtu/hr	
Stack Exhaust Flow Information		
Typical RTO Exhaust gas flow rate	57,400 cfm	June 2013 RTO Source Test Results
Line 1 Exhaust gas volume flow	80,000 cfm	Shutdown Fan Specification - provided by Semra (SGL ACF) during 4/30/2013 phone conversation.

Summary of Line 1 Emissions Factors

Line 1 RTO - Hourly Emission Summary

		Emission Factors [a]				Emission Rates				
		Normal	SCR Bypass	RTO Shutdown [j]	RTO Bypass	Hourly (lb/hr)				
CAS	Compound	lb/mmBtu	lb/mmBtu	lb/mmBtu	lb/mmBtu	Normal	SCR Bypass	RTO Shutdown	RTO Bypass	Maximum Hourly
10102-44-0	NOx [b]	--	--	--	--	8.5	14.9	8.5	8.5	14.9
630-08-0	CO [c]	--	--	--	--	0.56	0.56	5.2	8.50	8.5
7446-09-05	SO2 [d]	--	--	--	--	0.68	0.68	0.7	0.68	0.68
PM	PM (Filt.) [e]	--	--	--	--	0.4	0.4	0.4	0.4	0.4
PM10	PM10 (Filt. & Cond.) [e]	--	--	--	--	1.2	1.2	1.2	1.2	1.2
PM2.5	PM2.5 (Filt.& Cond.) [e]	--	--	--	--	1.2	1.2	1.2	1.2	1.2
VOC	VOC [f]	--	--	--	--	0.24	0.24	4.3	7.2	7.2
CO2e	CO2e [m]	--	--	--	--	--	--	--	--	--
107-02-8	Acrolein [k]	--	--	--	--	--	--	--	--	--
107-13-1	Acrylonitrile [g]	--	--	--	--	5.6E-03	5.6E-03	0.1	0.17	0.17
7664-41-7	Ammonia [h]	--	--	--	--	0.50	0.50	5.7	9.5	9.5
7803-63-6	Ammonium Bisulfate	--	--	--	--	--	--	--	--	--
7783-20-2	Ammonium Sulfate	--	--	--	--	--	--	--	--	--
7440-38-2	Arsenic	2.0E-07	2.0E-07	2.0E-07	2.0E-07	2.0E-06	2.0E-06	2.0E-06	2.0E-06	2.0E-06
71-43-2	Benzene	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05
7440-41-7	Beryllium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-07	1.2E-07	1.2E-07	1.2E-07	1.2E-07
74-83-9	Bromomethane [k]	--	--	--	--	--	--	--	--	--
106-99-0	1,3-Butadiene [k]	--	--	--	--	--	--	--	--	--
7440-43-9	Cadmium	1.1E-06	1.1E-06	1.1E-06	1.1E-06	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05
75-15-0	Carbon Disulfide [l]	--	--	--	--	2.3E-03	2.3E-03	2.2E-03	2.2E-03	2.3E-03
74-87-3	Chloromethane [k]	--	--	--	--	--	--	--	--	--
18540-29-9	Chromium VI	5.5E-08	5.5E-08	5.5E-08	5.5E-08	5.7E-07	5.7E-07	5.7E-07	5.7E-07	5.7E-07
7440-48-4	Cobalt	8.2E-08	8.2E-08	8.2E-08	8.2E-08	8.6E-07	8.6E-07	8.6E-07	8.6E-07	8.6E-07
7440-50-8	Copper	8.3E-07	8.3E-07	8.3E-07	8.3E-07	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06
106-46-7	Dichlorobenzene	1.2E-06	1.2E-06	1.2E-06	1.2E-06	1.2E-05	1.2E-05	1.2E-05	1.2E-05	1.2E-05
75-09-2	Dichloromethane [k]	--	--	--	--	--	--	--	--	--
50-00-0	Formaldehyde	7.4E-05	7.4E-05	7.4E-05	7.4E-05	7.7E-04	7.7E-04	7.7E-04	7.7E-04	7.7E-04
110-54-3	Hexane	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-02	1.8E-02	1.8E-02	1.8E-02	1.8E-02
74-90-8	Hydrogen Cyanide [i]	--	--	--	--	1.1E+00	1.10	17.75	29.70	29.7
7439-96-5	Manganese	3.7E-07	3.7E-07	3.7E-07	3.7E-07	3.9E-06	3.9E-06	3.9E-06	3.9E-06	3.9E-06
7439-97-6	Mercury	2.5E-07	2.5E-07	2.5E-07	2.5E-07	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06
91-20-3	Naphthalene	6.0E-07	6.0E-07	6.0E-07	6.0E-07	6.2E-06	6.2E-06	6.2E-06	6.2E-06	6.2E-06
7440-02-0	Nickel	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05
115-07-1	Propylene [k]	--	--	--	--	--	--	--	--	--
7782-49-2	Selenium	2.4E-08	2.4E-08	2.4E-08	2.4E-08	2.5E-07	2.5E-07	2.5E-07	2.5E-07	2.5E-07
540-84-1	2,2,4-Trimethylpentane [k]	--	--	--	--	--	--	--	--	--
108-88-3	Toluene	3.3E-06	3.3E-06	3.3E-06	3.3E-06	3.5E-05	3.5E-05	3.5E-05	3.5E-05	3.5E-05
7440-62-2	Vanadium	2.3E-06	2.3E-06	2.3E-06	2.3E-06	2.4E-05	2.4E-05	2.4E-05	2.4E-05	2.4E-05
108-05-4	Vinyl Acetate [l]	--	--	--	--	5.1E-03	5.1E-03	5.0E-03	4.9E-03	5.1E-03
56-55-3	Benz(a)anthracene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
50-32-8	Benzo(a)pyrene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08
205-99-2	Benzo(b)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
207-08-9	Benzo(k)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
218-01-9	Chrysene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
53-70-3	Dibenzo(a,h)anthrancene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
56-49-5	3-Methylcholanthrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-08	1.6E-08	1.6E-08	1.6E-08	1.6E-07	1.6E-07	1.6E-07	1.6E-07	1.6E-07

notes:

a - Emission factors based on AP-42, Section 1.4 (Natural Gas Combustion) corrected to lb/mmBtu using natural gas heat content (1,020 btu/cf). Unless noted, the RTO and SCR mode (i.e. bypass or shutdown) should not affect emissions. Hourly emissions based on 8.4 MMBtu/hr for the RTO and 2.0 MMBtu/hr for the Backup RTO burner.

b - NOx emissions based on 8.5 lb/hr (emission limit for combined RTO and TO exhaust), 14.7 lb/hr during SCR bypass (2013 Source test results), and 8.5 lb/hr during RTO bypass (Ecology permit condition) although RTO inlet design is 0.43 lb/hr.

c - CO normal and SCR bypass emissions based on 2013 source test results, 8.5 lb/hr during RTO bypass (2013 testing of RTO inlet).

d - SO2 normal, SCR bypass, RTO shutdown, and RTO bypass emissions based on 0.68 lb/hr (current emission limit for Lines 1 & 2, Condition 4.5 of 12AQ-E465).

e - PM, PM10, and PM2.5 normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 2014 source test results.

f - VOC normal and SCR bypass emissions based on 2013 source test results, 7.2 lb/hr during RTO bypass (2013 testing of RTO inlet).

g - Acrylonitrile normal and SCR bypass emissions based on January 2013 and June 2013 source test results with safety factor (all samples were below detection), 0.17 lb/hr during RTO bypass (2013 testing of RTO inlet).

h - Ammonia normal and SCR bypass emissions based on 2013 source test results with a safety factor of two, 9.5 lb/hr during RTO bypass (2013 testing of RTO inlet).

i - Hydrogen Cyanide normal, SCR bypass, and current emissions based on 1.1 lb/hr (current emission limit for Lines 1 & 2, Condition 4.7 of 12AQ-E465), and 29.7 lb/hr during RTO bypass (2013 testing

j - Line 1 oxidation oven shutdown emissions based on 58 % bypassing RTO, and 42 % of oven exhaust continuing through RTO as normal. Emission rate reflects if the line is in shutdown mode for a full hour.

k - Acrolein, bromomethane, chloromethane, dichloromethane, propylene, 2,2,4-trimethylpentane, and 1,3 butadiene not detectable in RTO inlet or exhaust.

l - Carbon disulfide and vinyl acetate emission rates based on average of January 2013 and June 2013 source test results. Only one sample in RTO exhaust was above detection level, and emissions are

m - CO2 based on 2014 source test results of the combined stack (see emission factors). Methane and nitrous oxide emission factors from 40 CFR 98, Subpart C, Table C-1. CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 25; and N2O = 298 (40 CFR Part 98, Subpart A).

Summary of Line 1 Emissions Factors

Line 1 TO - Hourly Emission Summary

		Emission Factors [a]				Emission Rates				
		Normal	SCR Bypass	RTO Shutdown [i]	RTO Bypass [i]	Hourly (lb/hr)				
CAS	Compound	lb/mmBtu	lb/mmBtu	lb/mmBtu	lb/mmBtu	Normal	SCR Bypass	RTO Shutdown [i]	RTO Bypass [i]	Maximum Hourly
10102-44-0	NOx [b]	--	--	--	--	8.5	3.0	8.5	8.5	8.5
630-08-0	CO [c]	--	--	--	--	0.39	0.39	0.39	0.39	0.39
7446-09-05	SO2 [d]	5.9E-04	5.9E-04	5.9E-04	5.9E-04	2.4E-03	2.4E-03	2.4E-03	2.4E-03	2.4E-03
PM	PM (Filt) [e]	--	--	--	--	0.6	0.6	0.6	0.6	0.6
PM10	PM10 (Filt. & Cond.) [e]	--	--	--	--	0.8	0.8	0.8	0.8	0.8
PM2.5	PM2.5 (Filt.& Cond.) [e]	--	--	--	--	0.8	0.8	0.8	0.8	0.8
VOC	VOC [f]	--	--	--	--	1.4	1.4	1.4	1.4	1.4
CO2e	CO2e [l]	--	--	--	--	--	--	--	--	--
107-02-8	Acrolein [j]	--	--	--	--	--	--	--	--	--
107-13-1	Acrylonitrile [j]	--	--	--	--	--	--	--	--	--
7664-41-7	Ammonia [g]	--	--	--	--	0.13	0.13	0.13	0.13	0.13
7803-63-6	Ammonium Bisulfate	--	--	--	--	--	--	--	--	--
7783-20-2	Ammonium Sulfate	--	--	--	--	--	--	--	--	--
7440-38-2	Arsenic	2.0E-07	2.0E-07	2.0E-07	2.0E-07	7.8E-07	7.8E-07	7.8E-07	7.8E-07	7.8E-07
71-43-2	Benzene [k]	--	--	--	--	1.4E-04	1.4E-04	1.4E-04	1.4E-04	1.4E-04
7440-41-7	Beryllium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	4.7E-08	4.7E-08	4.7E-08	4.7E-08	4.7E-08
74-83-9	Bromomethane [k]	--	--	--	--	1.8E-04	1.8E-04	1.8E-04	1.8E-04	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--	--	--	--	--
7440-43-9	Cadmium	1.1E-06	1.1E-06	1.1E-06	1.1E-06	4.3E-06	4.3E-06	4.3E-06	4.3E-06	4.3E-06
75-15-0	Carbon Disulfide [k]	--	--	--	--	4.3E-04	4.3E-04	4.3E-04	4.3E-04	4.3E-04
74-87-3	Chloromethane [k]	--	--	--	--	6.2E-05	6.2E-05	6.2E-05	6.2E-05	6.2E-05
18540-29-9	Chromium VI	5.5E-08	5.5E-08	5.5E-08	5.5E-08	2.2E-07	2.2E-07	2.2E-07	2.2E-07	2.2E-07
7440-48-4	Cobalt	8.2E-08	8.2E-08	8.2E-08	8.2E-08	3.3E-07	3.3E-07	3.3E-07	3.3E-07	3.3E-07
7440-50-8	Copper	8.3E-07	8.3E-07	8.3E-07	8.3E-07	3.3E-06	3.3E-06	3.3E-06	3.3E-06	3.3E-06
106-46-7	Dichlorobenzene	1.2E-06	1.2E-06	1.2E-06	1.2E-06	4.7E-06	4.7E-06	4.7E-06	4.7E-06	4.7E-06
75-09-2	Dichloromethane [k]	--	--	--	--	5.9E-07	5.9E-07	5.9E-07	5.9E-07	5.9E-07
50-00-0	Formaldehyde	7.4E-05	7.4E-05	7.4E-05	7.4E-05	2.9E-04	2.9E-04	2.9E-04	2.9E-04	2.9E-04
110-54-3	Hexane	--	--	--	--	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03
74-90-8	Hydrogen Cyanide [h]	--	--	--	--	2.7E-01	0.27	0.27	0.27	0.27
7439-96-5	Manganese	3.7E-07	3.7E-07	3.7E-07	3.7E-07	1.5E-06	1.5E-06	1.5E-06	1.5E-06	1.5E-06
7439-97-6	Mercury	2.5E-07	2.5E-07	2.5E-07	2.5E-07	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06
91-20-3	Naphthalene	6.0E-07	6.0E-07	6.0E-07	6.0E-07	2.4E-06	2.4E-06	2.4E-06	2.4E-06	2.4E-06
7440-02-0	Nickel	2.1E-06	2.1E-06	2.1E-06	2.1E-06	8.2E-06	8.2E-06	8.2E-06	8.2E-06	8.2E-06
115-07-1	Propylene [k]	--	--	--	--	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04
7782-49-2	Selenium	2.4E-08	2.4E-08	2.4E-08	2.4E-08	9.4E-08	9.4E-08	9.4E-08	9.4E-08	9.4E-08
540-84-1	2,2,4-Trimethylpentane [k]	--	--	--	--	4.5E-07	4.5E-07	4.5E-07	4.5E-07	4.5E-07
108-88-3	Toluene [k]	--	--	--	--	2.1E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04
7440-62-2	Vanadium	2.3E-06	2.3E-06	2.3E-06	2.3E-06	9.0E-06	9.0E-06	9.0E-06	9.0E-06	9.0E-06
108-05-4	Vinyl Acetate [j]	--	--	--	--	--	--	--	--	--
56-55-3	Benz(a)anthracene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
50-32-8	Benzo(a)pyrene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09
205-99-2	Benzo(b)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
207-08-9	Benzo(k)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
218-01-9	Chrysene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
53-70-3	Dibenzo(a,h)anthrancene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
56-49-5	3-Methylcholanthrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-08	1.6E-08	1.6E-08	1.6E-08	6.3E-08	6.3E-08	6.3E-08	6.3E-08	6.3E-08

notes:

a - Emission factors based on AP-42, Section 1.4 (Natural Gas Combustion) corrected to lb/mmBtu using natural gas heat content (1,020 btu/cf). Unless noted, the RTO and SCR mode (i.e. bypass or shutdown) should not affect emissions. Hourly emissions based on 4.0 MMBtu/hr.

b - NOx emissions based on 8.5 lb/hr (SCR vendor quote for combined RTO and TO exhaust), 3.0 lb/hr during SCR bypass (CEMS data) which do not affect the TO exhaust which is not directed to the SCR. Oxidation oven (RTO) shutdown and RTO Bypass do not affect the furnace emissions or operation so the emissions are equivalent to Normal operation (SCR vendor quote for combined RTO and

c - CO normal and SCR bypass emissions based on 0.385 lb/hr (current emission limit for Lines 1 & 2, Condition 5.2 of 12AQ-E465). RTO Bypass and oxidation oven shutdown do not effect furnace and

d - SO2 normal, SCR bypass, RTO shutdown, and RTO bypass emissions based on AP-42 emission factor and TO heater rating.

e - PM, PM10, and PM2.5 normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 2014 source test results and tube cleaner contribution . RTO operation does not effect furnace or

f - VOC normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 1.42 lb/hr (current emission limit for Lines 1 & 2, Condition 5.5 of 12AQ-E465). RTO operation does not effect furnace

g - Ammonia normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 0.13 lb/hr (current emission limit for Lines 1 & 2, Condition 5.7 of 12AQ-E465). RTO operation does not effect furnace or TO operation.

h - Hydrogen Cyanide normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 0.27 lb/hr (current emission limit for Lines 1 & 2, Condition 5.8 of 12AQ-E465). RTO operation does not effect furnace or TO operation.

i - RTO shutdown and RTO Bypass do not affect the furnace or TO operation, therefore emission rates are equivalent to normal operation.

j - Acrolein, acrylonitrile, vinyl acetate, and 1,3 butadiene not detected in TO exhaust.

k - Benzene, bromomethane, carbon disulfide, chloromethane, dichloromethane, 2,2,4-trimethylpentane, and toluene lb/hr emissions based on January 2013 source test results. Average of three TO exhaust samples, and emissions are 1/2 the detection level for any measurements below detection level.

l - CO2 based on 2014 source test results of the combined stack (see emission factors). Methane and nitrous oxide emission factors from 40 CFR 98, Subpart C, Table C-1. CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 25; and N2O = 298 (40 CFR Part 98, Subpart A).

Summary of Line 1 Emissions Factors

Line 1 - Hourly Emission Summary for Normal Operation

CAS	Compound	Normal Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	--	--	--	--	8.5
630-08-0	CO	0.6	0.4	0.4	--	1.3
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. & Cond.)	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.& Cond.)	1.2	0.8	0.03	--	2.0
VOC	VOC	0.2	1.4	0.02	--	1.7
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	5.6E-03	--	--	--	5.6E-03
7664-41-7	Ammonia	0.5	0.1	--	2.4	3.0
7803-63-6	Ammonium Bisulfate	--	--	--	3.0	3.0
7783-20-2	Ammonium Sulfate	--	--	--	3.0	3.0
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromomethane	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disulfide	2.3E-03	4.3E-04	--	--	2.7E-03
74-87-3	Chloromethane	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenzene	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichloromethane	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyde	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cyanide	1.1	0.3	--	--	1.4
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	5.1E-03	--	--	--	5.1E-03
56-55-3	Benz(a)anthracene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyrene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)anthrancene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylcholanthrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

notes:

a - SCR emission limit is 8.5 lb/hr.

Line 1 - Hourly Emission Summary for SCR Bypass

CAS	Compound	SCR Bypass Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	14.9	3	--	--	17.9
630-08-0	CO	0.6	0.4	0.4	--	1.3
7446-09-05	SO2	0.68	0.002	2.7E-03	--	0.7
PM	PM (Filt.)	0.42	0.63	0.01	--	1.1
PM10	PM10 (Filt. & Co	1.20	0.78	0.03	--	2.0
PM2.5	PM2.5 (Filt.& Co	1.20	0.78	0.03	--	2.0
VOC	VOC	0.24	1.42	0.02	--	1.7
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	5.6E-03	--	--	--	5.6E-03
7664-41-7	Ammonia	0.5	0.1	--	--	0.6
7803-63-6	Ammonium Bisu	--	--	--	--	--
7783-20-2	Ammonium Sulf	--	--	--	--	--
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromomethane	--	0.0	--	--	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disulfide	0.0	0.0	--	--	2.7E-03
74-87-3	Chloromethane	--	0.0	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenzene	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichloromethane	--	0.0	--	--	5.9E-07
50-00-0	Formaldehyde	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cyanid	1.1	0.3	--	--	1.4
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	0.0	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	0.0	--	--	--	5.1E-03
56-55-3	Benz(a)anthrace	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyrene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluoran	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluoran	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)ant	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-cd)	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylcholant	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethylbe	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

notes:

a - Ammonia Injection is not operating during SCR Bypass.

Summary of Line 1 Emissions Factors

Line 1 - Hourly Emission Summary for Shutdown Operation

CAS	Compound	Normal with Shutdown Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	--	--	--	--	8.5
630-08-0	CO	5.2	0.4	0.4	--	5.9
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. & Cond.)	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.& Cond.)	1.2	0.8	0.03	--	2.0
VOC	VOC	4.3	1.4	0.02	--	5.7
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	1.0E-01	--	--	--	1.0E-01
7664-41-7	Ammonia	5.7	0.1	--	2.4	8.3
7803-63-6	Ammonium Bisulfate	--	--	--	3.0	3.0
7783-20-2	Ammonium Sulfate	--	--	--	3.0	3.0
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromomethane	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disulfide	2.2E-03	4.3E-04	--	--	2.7E-03
74-87-3	Chloromethane	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenzene	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichloromethane	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyde	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cyanide	17.8	0.3	--	--	18.0
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	5.0E-03	--	--	--	5.0E-03
56-55-3	Benz(a)anthracene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyrene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)anthrancene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylcholanthrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

notes:

a - SCR emission limit is 8.5 lb/hr.

Line 1 - Hourly Emission Summary for RTO Bypass

CAS	Compound	RTO Bypass Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	--	--	--	--	8.5
630-08-0	CO	8.5	0.4	0.38	--	9.3
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. & Co	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.& Co	1.2	0.8	0.03	--	2.0
VOC	VOC	7.2	1.4	0.02	--	8.6
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	1.7E-01	--	--	--	0.2
7664-41-7	Ammonia	9.5	0.1	--	--	9.6
7803-63-6	Ammonium Bisu	--	--	--	--	--
7783-20-2	Ammonium Sulf	--	--	--	--	--
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromomethane	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disulfide	2.2E-03	4.3E-04	--	--	2.6E-03
74-87-3	Chloromethane	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenzene	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichloromethane	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyde	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cyani	29.7	0.3	--	--	30.0
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	4.9E-03	--	--	--	4.9E-03
56-55-3	Benz(a)anthrace	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyrene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluoran	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluoran	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)ant	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-cd)	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylcholant	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethylbe	1.64E-07	6.27E-08	7.2E-08	--	3.0E-07

notes:

a - During an RTO Bypass oxidation oven and TO exhaust also bypass the SCR system. Ammonia Injection is not operated. Oxidation oven NOx emissions are lower because the RTO control device generates NOx.

SGL ACF - Moses Lake Facility

Summary of Line 2 - 10 Emissions Factors

	Line 2 - 4 Specifications	
SCR Ammonia Slip (lb/hr)	2.4	
	RTO Specifications	
RTO Heater Firing rate	8.40 MMBtu/hr	
RTO Backup Heater Firing rate	2.04 MMBtu/hr	
Oxidation oven Shutdown Duration	90 seconds	
shutdown per Day	1	
RTO Bypass (hrs/day)	1.5	
	TO Specifications	
TO Heater Firing rate	4.00 MMBtu/hr	
Stack Exhaust Flow Information		
Typical RTO Exhaust gas flow rate	57,400 cfm	June 2013 RTO Source Test Results
Line 2 - 8 Exhaust gas volume flow	200,000 cfm	Shutdown Fan Information - provided by Semra (SGL ACF) during 6/26/2013 email.

Summary of Line 2 - 10 Emissions Factors

Line 2 - 10 RTO - Hourly Emission Summary

		Emission Factors [a]				Emission Rates					
		Normal	SCR Bypass	RTO Shutdown [j]	RTO Bypass	Hourly (lb/hr)					
CAS	Compound	lb/mmBtu	lb/mmBtu	lb/mmBtu	lb/mmBtu	Normal	Normal (annual)	SCR Bypass	RTO Shutdown	RTO Bypass	Maximum Hourly
10102-44-0	NOx [b]	--	--	--	--	8.5	8.5	14.9	8.5	8.5	14.9
630-08-0	CO [c]	--	--	--	--	0.56	0.56	0.56	6.7	8.50	8.5
7446-09-05	SO2 [d]	--	--	--	--	0.68	0.68	0.68	0.7	0.68	0.68
PM	PM (Filt.) [e]	--	--	--	--	0.42	0.42	0.4	0.4	0.4	0.4
PM10	PM10 (Filt. & Cond.) [e]	--	--	--	--	1.20	1.20	1.2	1.2	1.2	1.2
PM2.5	PM2.5 (Filt.& Cond.) [e]	--	--	--	--	1.20	1.20	1.2	1.2	1.2	1.2
VOC	VOC [f]	--	--	--	--	0.24	0.24	0.24	5.6	7.2	7.2
CO2e	CO2e [m]	--	--	--	--	--	--	--	--	--	--
107-02-8	Acrolein [k]	--	--	--	--	--	--	--	--	--	--
107-13-1	Acrylonitrile [g]	--	--	--	--	5.6E-03	5.6E-03	5.6E-03	0.1	0.17	0.17
7664-41-7	Ammonia [h]	--	--	--	--	0.50	0.50	0.50	7.5	9.5	9.5
7803-63-6	Ammonium Bisulfate	--	--	--	--	--	--	--	--	--	--
7783-20-2	Ammonium Sulfate	--	--	--	--	--	--	--	--	--	--
7440-38-2	Arsenic	2.0E-07	2.0E-07	2.0E-07	2.0E-07	2.0E-06	2.0E-06	2.0E-06	2.0E-06	2.0E-06	2.0E-06
71-43-2	Benzene	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05
7440-41-7	Beryllium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-07	1.2E-07	1.2E-07	1.2E-07	1.2E-07	1.2E-07
74-83-9	Bromomethane [k]	--	--	--	--	--	--	--	--	--	--
106-99-0	1,3-Butadiene [k]	--	--	--	--	--	--	--	--	--	--
7440-43-9	Cadmium	1.1E-06	1.1E-06	1.1E-06	1.1E-06	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05
75-15-0	Carbon Disulfide [l]	--	--	--	--	2.3E-03	2.3E-03	2.3E-03	2.2E-03	2.2E-03	2.3E-03
74-87-3	Chloromethane [k]	--	--	--	--	--	--	--	--	--	--
18540-29-9	Chromium VI	5.5E-08	5.5E-08	5.5E-08	5.5E-08	5.7E-07	5.7E-07	5.7E-07	5.7E-07	5.7E-07	5.7E-07
7440-48-4	Cobalt	8.2E-08	8.2E-08	8.2E-08	8.2E-08	8.6E-07	8.6E-07	8.6E-07	8.6E-07	8.6E-07	8.6E-07
7440-50-8	Copper	8.3E-07	8.3E-07	8.3E-07	8.3E-07	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06	8.7E-06
106-46-7	Dichlorobenzene	1.2E-06	1.2E-06	1.2E-06	1.2E-06	1.2E-05	1.2E-05	1.2E-05	1.2E-05	1.2E-05	1.2E-05
75-09-2	Dichloromethane [k]	--	--	--	--	--	--	--	--	--	--
50-00-0	Formaldehyde	7.4E-05	7.4E-05	7.4E-05	7.4E-05	7.7E-04	7.7E-04	7.7E-04	7.7E-04	7.7E-04	7.7E-04
110-54-3	Hexane	1.8E-03	1.8E-03	1.8E-03	1.8E-03	1.8E-02	1.8E-02	1.8E-02	1.8E-02	1.8E-02	1.8E-02
74-90-8	Hydrogen Cyanide [l]	--	--	--	--	1.10	1.10	1.10	23.32	29.70	29.7
7439-96-5	Manganese	3.7E-07	3.7E-07	3.7E-07	3.7E-07	3.9E-06	3.9E-06	3.9E-06	3.9E-06	3.9E-06	3.9E-06
7439-97-6	Mercury	2.5E-07	2.5E-07	2.5E-07	2.5E-07	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06	2.7E-06
91-20-3	Naphthalene	6.0E-07	6.0E-07	6.0E-07	6.0E-07	6.2E-06	6.2E-06	6.2E-06	6.2E-06	6.2E-06	6.2E-06
7440-02-0	Nickel	2.1E-06	2.1E-06	2.1E-06	2.1E-06	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05	2.1E-05
115-07-1	Propylene [k]	--	--	--	--	--	--	--	--	--	--
7782-49-2	Selenium	2.4E-08	2.4E-08	2.4E-08	2.4E-08	2.5E-07	2.5E-07	2.5E-07	2.5E-07	2.5E-07	2.5E-07
540-84-1	2,2,4-Trimethylpentane [k]	--	--	--	--	--	--	--	--	--	--
108-88-3	Toluene	3.3E-06	3.3E-06	3.3E-06	3.3E-06	3.5E-05	3.5E-05	3.5E-05	3.5E-05	3.5E-05	3.5E-05
7440-62-2	Vanadium	2.3E-06	2.3E-06	2.3E-06	2.3E-06	2.4E-05	2.4E-05	2.4E-05	2.4E-05	2.4E-05	2.4E-05
108-05-4	Vinyl Acetate [l]	--	--	--	--	5.1E-03	5.1E-03	5.1E-03	5.0E-03	4.9E-03	5.1E-03
56-55-3	Benz(a)anthracene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
50-32-8	Benzo(a)pyrene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08
205-99-2	Benzo(b)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
207-08-9	Benzo(k)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
218-01-9	Chrysene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
53-70-3	Dibenzo(a,h)anthrancene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08	1.2E-08
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
56-49-5	3-Methylcholanthrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08	1.8E-08
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-08	1.6E-08	1.6E-08	1.6E-08	1.6E-07	1.6E-07	1.6E-07	1.6E-07	1.6E-07	1.6E-07

notes:

a - Emission factors based on AP-42, Section 1.4 (Natural Gas Combustion) corrected to lb/mmBtu using natural gas heat content (1,020 btu/cf). Unless noted, the RTO and SCR mode (i.e. bypass or shutdown) should not effect emissions. Hourly emissions based on 8.4 MMBtu/hr.

b - NOx emissions based on 8.5 lb/hr (permit limit for combined RTO and TO exhaust), 14.7 lb/hr during SCR bypass (2013 Source test results), and 8.5 lb/hr during RTO bypass (Ecology permit limit) although RTO inlet design is 0.43 lb/hr.

c - CO normal and SCR bypass emissions based on 2013 source test results, 8.5 lb/hr during RTO bypass (2013 testing of RTO inlet).

d - SO2 normal, SCR bypass, RTO shutdown, and RTO bypass emissions based on 0.68 lb/hr (current emission limit for Lines 1 & 2, Condition 4.5 of 12AQ-E465).

e - PM, PM10, and PM2.5 normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 2014 source test results.

f - VOC normal and SCR bypass emissions based on 2013 source test results, 7.2 lb/hr during RTO bypass (2013 testing of RTO inlet).

g - Acrylonitrile normal and SCR bypass emissions based on January 2013 and June 2013 source test results with 1.5 safety factor (all samples were below detection), 0.17 lb/hr during RTO bypass (2013 testing of RTO inlet).

h - Ammonia normal and SCR bypass emissions based on 2013 source test results with a safety factor of two, 9.5 lb/hr during RTO bypass (2013 testing of RTO inlet).

i - Hydrogen Cyanide normal, SCR bypess, and current emissions based on 1.1 lb/hr (current emission limit for Lines 1 & 2, Condition 4.7 of 12AQ-E465), and 29.7 lb/hr during RTO bypass (2013 testing of RTO inlet).

j - Line 2-10 oxidation oven shutdown emissions based on 78 % bypassing RTO, and 22 % of oven exhaust continuing through RTO as normal. Emission factor reflects rate if in shutdown mode for a full hour.

k - Acrolein, bromomethane, chloromethane, dichloromethane, propylene, 2,2,4-trimethylpentane, and 1,3 butadiene not detectable in RTO inlet or exhaust.

l - Carbon disulfide and vinyl acetate emission rates based on average of January 2013 and June 2013 source test results. Only one sample in RTO exhaust was above detection level, and emissions are 1/2 the detection level

m - CO2 based on 2014 source test results for the combined stack (see emission factors). Methane and nitrous oxide emission factors from 40 CFR 98, Subpart C, Table C-1. CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 25; and N2O = 298 (40 CFR Part 98, Subpart A).

Summary of Line 2 - 10 Emissions Factors

Line 2 - 10 TO - Hourly Emission Summary

		Emission Factors [a]				Emission Rates					
				RTO	RTO	Hourly (lb/hr)					
		Normal	SCR Bypass	Shutdown [i]	Bypass [i]				RTO	RTO	
CAS	Compound	lb/mmBtu	lb/mmBtu	lb/mmBtu	lb/mmBtu	Normal	Normal (annual)	SCR Bypass	Shutdown	Bypass	Maximum Hourly
10102-44-0	NOx [b]	--	--	--	--	8.5	8.5	3.0	8.5	8.5	8.5
630-08-0	CO [c]	--	--	--	--	0.39	0.39	0.39	0.39	0.39	0.4
7446-09-05	SO2 [d]	5.9E-04	5.9E-04	5.9E-04	5.9E-04	2.4E-03	2.4E-03	2.4E-03	2.4E-03	2.4E-03	2.4E-03
PM	PM (Filt) [e]	--	--	--	--	0.6	0.6	0.6	0.6	0.6	0.6
PM10	PM10 (Filt. & Cond.) [e]	--	--	--	--	0.8	0.8	0.8	0.8	0.8	0.8
PM2.5	PM2.5 (Filt.& Cond.) [e]	--	--	--	--	0.8	0.8	0.8	0.8	0.8	0.8
VOC	VOC [f]	--	--	--	--	1.4	1.4	1.4	1.4	1.4	1.4
CO2e	CO2e [l]	--	--	--	--	--	--	--	--	--	--
107-02-8	Acrolein [j]	--	--	--	--	--	--	--	--	--	0.0
107-13-1	Acrylonitrile [j]	--	--	--	--	--	--	--	--	--	0.0
7664-41-7	Ammonia [g]	--	--	--	--	0.13	0.13	0.13	0.13	0.13	0.13
7803-63-6	Ammonium Bisulfate	--	--	--	--	--	--	--	--	--	--
7783-20-2	Ammonium Sulfate	--	--	--	--	--	--	--	--	--	--
7440-38-2	Arsenic	2.0E-07	2.0E-07	2.0E-07	2.0E-07	7.8E-07	7.8E-07	7.8E-07	7.8E-07	7.8E-07	7.8E-07
71-43-2	Benzene [k]	--	--	--	--	1.4E-04	1.4E-04	1.4E-04	1.4E-04	1.4E-04	1.4E-04
7440-41-7	Beryllium	1.2E-08	1.2E-08	1.2E-08	1.2E-08	4.7E-08	4.7E-08	4.7E-08	4.7E-08	4.7E-08	4.7E-08
74-83-9	Bromomethane [k]	--	--	--	--	1.8E-04	1.8E-04	1.8E-04	1.8E-04	1.8E-04	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--	--	--	--	--	0.0E+00
7440-43-9	Cadmium	1.1E-06	1.1E-06	1.1E-06	1.1E-06	4.3E-06	4.3E-06	4.3E-06	4.3E-06	4.3E-06	4.3E-06
75-15-0	Carbon Disulfide [k]	--	--	--	--	4.3E-04	4.3E-04	4.3E-04	4.3E-04	4.3E-04	4.3E-04
74-87-3	Chloromethane [k]	--	--	--	--	6.2E-05	6.2E-05	6.2E-05	6.2E-05	6.2E-05	6.2E-05
18540-29-9	Chromium VI	5.5E-08	5.5E-08	5.5E-08	5.5E-08	2.2E-07	2.2E-07	2.2E-07	2.2E-07	2.2E-07	2.2E-07
7440-48-4	Cobalt	8.2E-08	8.2E-08	8.2E-08	8.2E-08	3.3E-07	3.3E-07	3.3E-07	3.3E-07	3.3E-07	3.3E-07
7440-50-8	Copper	8.3E-07	8.3E-07	8.3E-07	8.3E-07	3.3E-06	3.3E-06	3.3E-06	3.3E-06	3.3E-06	3.3E-06
106-46-7	Dichlorobenzene	1.2E-06	1.2E-06	1.2E-06	1.2E-06	4.7E-06	4.7E-06	4.7E-06	4.7E-06	4.7E-06	4.7E-06
75-09-2	Dichloromethane [k]	--	--	--	--	5.9E-07	5.9E-07	5.9E-07	5.9E-07	5.9E-07	5.9E-07
50-00-0	Formaldehyde	7.4E-05	7.4E-05	7.4E-05	7.4E-05	2.9E-04	2.9E-04	2.9E-04	2.9E-04	2.9E-04	2.9E-04
110-54-3	Hexane	--	--	--	--	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03
74-90-8	Hydrogen Cyanide [h]	--	--	--	--	0.27	0.27	0.27	0.27	0.27	0.27
7439-96-5	Manganese	3.7E-07	3.7E-07	3.7E-07	3.7E-07	1.5E-06	1.5E-06	1.5E-06	1.5E-06	1.5E-06	1.5E-06
7439-97-6	Mercury	2.5E-07	2.5E-07	2.5E-07	2.5E-07	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06
91-20-3	Naphthalene	6.0E-07	6.0E-07	6.0E-07	6.0E-07	2.4E-06	2.4E-06	2.4E-06	2.4E-06	2.4E-06	2.4E-06
7440-02-0	Nickel	2.1E-06	2.1E-06	2.1E-06	2.1E-06	8.2E-06	8.2E-06	8.2E-06	8.2E-06	8.2E-06	8.2E-06
115-07-1	Propylene [k]	--	--	--	--	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04
7782-49-2	Selenium	2.4E-08	2.4E-08	2.4E-08	2.4E-08	9.4E-08	9.4E-08	9.4E-08	9.4E-08	9.4E-08	9.4E-08
540-84-1	2,2,4-Trimethylpentane [k]	--	--	--	--	4.5E-07	4.5E-07	4.5E-07	4.5E-07	4.5E-07	4.5E-07
108-88-3	Toluene [k]	--	--	--	--	2.1E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04
7440-62-2	Vanadium	2.3E-06	2.3E-06	2.3E-06	2.3E-06	9.0E-06	9.0E-06	9.0E-06	9.0E-06	9.0E-06	9.0E-06
108-05-4	Vinyl Acetate [j]	--	--	--	--	--	--	--	--	--	0.0E+00
56-55-3	Benz(a)anthracene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
50-32-8	Benzo(a)pyrene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09
205-99-2	Benzo(b)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
207-08-9	Benzo(k)fluoranthene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
218-01-9	Chrysene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
53-70-3	Dibenzo(a,h)anthrancene	1.2E-09	1.2E-09	1.2E-09	1.2E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09	4.7E-09
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
56-49-5	3-Methylcholanthrene	1.8E-09	1.8E-09	1.8E-09	1.8E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09	7.1E-09
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-08	1.6E-08	1.6E-08	1.6E-08	6.3E-08	6.3E-08	6.3E-08	6.3E-08	6.3E-08	6.3E-08

notes:

a - Emission factors based on AP-42, Section 1.4 (Natural Gas Combustion) corrected to lb/mmBtu using naturel gas heat content (1,020 btu/cf). Unless noted, the RTO and SCR mode (i.e. bypass or shutdown) should not affect emissions. Hourly emissions based on 4.0 MMBtu/hr.

b - NOx emissions based on 8.5 lb/hr (permit limit for combined RTO and TO exhaust), 3.0 lb/hr during SCR bypass (CEMS data) which do not affect the TO exhaust which is not directed to the SCR. Oxidation oven (RTO) shutdown and RTO Bypass do not affect the furnace emissions or operation so the emissions are equivalent to Normal operation (SCR vendor quote for combined RTO and TO exhaust)

c - CO normal and SCR bypass emissions based on 0.385 lb/hr (current emission limit for Lines 1 & 2, Condition 5.2 of 12AQ-E465). RTO Bypass and oxidation oven shutdown do not effect furnace and TO

d - SO2 normal, SCR bypass, RTO shutdown, and RTO bypass emissions based on AP-42 emission factor and TO heater rating.

e - PM, PM10, and PM2.5 normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 2014 source test results. RTO operation does not effect furnace or TO operation.

f - VOC normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 1.42 lb/hr (current emission limit for Lines 1 & 2, Condition 5.5 of 12AQ-E465). RTO operation does not effect furnace or TO operation.

g - Ammonia normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 0.13 lb/hr (current emission limit for Lines 1 & 2, Condition 5.7 of 12AQ-E465). RTO operation does not effect furnace or TO operation.

h - Hydrogen Cyanide normal, SCR bypass, RTO shutdown, and RTO Bypass emissions based on 0.27 lb/hr (current emission limit for Lines 1 & 2, Condition 5.6 of 12AQ-E465). RTO operation does not effect furnace or TO

i - RTO shutdown and RTO Bypass do not affect the furnace or TO operation, therefore emission rates are equivalent to normal operation.

j - Acrolein, acrylonitrile, vinyl acetate, and 1,3 butadiene not detected in TO exhaust.

k - Benzene, bromomethane, carbon disulfide, chloromethane, dichloromethane, 2,2,4-trimethylpentane, and toluene lb/hr emissions based on January 2013 source test results. Average of three TO exhaust samples, and emissions are 1/2 the detection level for any measurements below detection level.

l - CO2 based on 2014 source test results for the combined stack (see emission factors). Methane and nitrous oxide emission factors from 40 CFR 98, Subpart C, Table C-1. CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 25; and N2O = 298 (40 CFR Part 98, Subpart A).

Summary of Line 2 - 10 Emissions Factors

Line 2 - 10 - Hourly Emission Summary for Normal Operation

CAS	Compound	Normal Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	--	--	--	--	8.5
630-08-0	CO	0.6	0.4	0.4	--	1.3
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. & Cond.)	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.& Cond.)	1.2	0.8	0.03	--	2.0
VOC	VOC	0.2	1.4	0.02	--	1.7
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	5.6E-03	--	--	--	5.6E-03
7664-41-7	Ammonia	0.5	0.1	--	2.4	3.0
7803-63-6	Ammonium Bisulfate	--	--	--	3.0	3.0
7783-20-2	Ammonium Sulfate	--	--	--	3.0	3.0
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromomethane	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disulfide	2.3E-03	4.3E-04	--	--	2.7E-03
74-87-3	Chloromethane	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenzene	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichloromethane	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyde	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cyanide	1.1	0.3	--	--	1.4
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	5.1E-03	--	--	--	5.1E-03
56-55-3	Benz(a)anthracene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyrene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)anthrancene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylcholanthrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

Line 2 - 10 - Hourly Emission Summary for SCR Bypass

CAS	Compound	SCR Bypass Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	14.9	3	--	--	17.9
630-08-0	CO	0.6	0.4	0.4	--	1.3
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. &	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.&	1.2	0.8	0.03	--	2.0
VOC	VOC	0.2	1.4	0.02	--	1.7
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	5.6E-03	--	--	--	5.6E-03
7664-41-7	Ammonia	0.5	0.1	--	--	0.6
7803-63-6	Ammonium B	--	--	--	--	--
7783-20-2	Ammonium S	--	--	--	--	--
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromometha	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadien	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disul	2.3E-03	4.3E-04	--	--	2.7E-03
74-87-3	Chlorometha	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium V	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenz	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichlorometh	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyd	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cy	1.1	0.3	--	--	1.4
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	5.1E-03	--	--	--	5.1E-03
56-55-3	Benz(a)anthr	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyre	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluo	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluo	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylchol	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethy	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

notes:

a - Ammonia Injection is not operating during SCR Bypass.

Summary of Line 2 - 10 Emissions Factors

Line 2 - 10 - Hourly Emission Summary for Shutdown Operation

CAS	Compound	Normal with Shutdown Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	--	--	--	--	8.5
630-08-0	CO	6.7	0.4	0.4	--	7.5
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. & Cond.)	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.& Cond.)	1.2	0.8	0.03	--	2.0
VOC	VOC	5.6	1.4	0.02	--	7.1
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	1.4E-01	--	--	--	1.4E-01
7664-41-7	Ammonia	7.5	0.1	--	2.4	10.0
7803-63-6	Ammonium Bisulfate	--	--	--	3.0	3.0
7783-20-2	Ammonium Sulfate	--	--	--	3.0	3.0
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromomethane	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadiene	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disulfide	2.2E-03	4.3E-04	--	--	2.7E-03
74-87-3	Chloromethane	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenzene	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichloromethane	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyde	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cyanide	23.3	0.3	--	--	23.6
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	5.0E-03	--	--	--	5.0E-03
56-55-3	Benz(a)anthracene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyrene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluoranthene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)anthrancene	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-cd)pyrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylcholanthrene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethylbenz[a]anthracene	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

Line 2 - 10 - Hourly Emission Summary for RTO Bypass

CAS	Compound	RTO Bypass Emission Rates (lb/hr) Oxidation Ovens	Furnaces	SCR Heater	SCR Ammonia Slip	Total
10102-44-0	NOx	--	--	--	--	8.5
630-08-0	CO	8.5	0.4	0.38	--	9.3
7446-09-05	SO2	0.7	2.4E-03	2.7E-03	--	0.7
PM	PM (Filt.)	0.4	0.6	0.01	--	1.1
PM10	PM10 (Filt. &	1.2	0.8	0.03	--	2.0
PM2.5	PM2.5 (Filt.&	1.2	0.8	0.03	--	2.0
VOC	VOC	7.2	1.4	0.02	--	8.6
CO2e	CO2e	--	--	--	--	--
107-02-8	Acrolein	--	--	--	--	--
107-13-1	Acrylonitrile	1.7E-01	--	--	--	0.2
7664-41-7	Ammonia	9.5	0.1	--	--	9.6
7803-63-6	Ammonium B	--	--	--	--	--
7783-20-2	Ammonium S	--	--	--	--	--
7440-38-2	Arsenic	2.0E-06	7.8E-07	9.0E-07	--	3.7E-06
71-43-2	Benzene	2.1E-05	1.4E-04	9.5E-06	--	1.7E-04
7440-41-7	Beryllium	1.2E-07	4.7E-08	5.4E-08	--	2.2E-07
74-83-9	Bromometha	--	1.8E-04	--	--	1.8E-04
106-99-0	1,3-Butadien	--	--	--	--	--
7440-43-9	Cadmium	1.1E-05	4.3E-06	5.0E-06	--	2.1E-05
75-15-0	Carbon Disul	2.2E-03	4.3E-04	--	--	2.6E-03
74-87-3	Chlorometha	--	6.2E-05	--	--	6.2E-05
18540-29-9	Chromium VI	5.7E-07	2.2E-07	2.5E-07	--	1.0E-06
7440-48-4	Cobalt	8.6E-07	3.3E-07	3.8E-07	--	1.6E-06
7440-50-8	Copper	8.7E-06	3.3E-06	3.8E-06	--	1.6E-05
106-46-7	Dichlorobenz	1.2E-05	4.7E-06	5.4E-06	--	2.2E-05
75-09-2	Dichlorometh	--	5.9E-07	--	--	5.9E-07
50-00-0	Formaldehyd	7.7E-04	2.9E-04	3.4E-04	--	1.4E-03
110-54-3	Hexane	1.8E-02	1.9E-03	8.1E-03	--	2.8E-02
74-90-8	Hydrogen Cy	29.7	0.3	--	--	30.0
7439-96-5	Manganese	3.9E-06	1.5E-06	1.7E-06	--	7.1E-06
7439-97-6	Mercury	2.7E-06	1.0E-06	1.2E-06	--	4.9E-06
91-20-3	Naphthalene	6.2E-06	2.4E-06	2.8E-06	--	1.1E-05
7440-02-0	Nickel	2.1E-05	8.2E-06	9.5E-06	--	3.9E-05
115-07-1	Propylene	--	1.1E-04	--	--	1.1E-04
7782-49-2	Selenium	2.5E-07	9.4E-08	1.1E-07	--	4.5E-07
108-88-3	Toluene	3.5E-05	2.1E-04	1.5E-05	--	2.6E-04
7440-62-2	Vanadium	2.4E-05	9.0E-06	1.0E-05	--	4.3E-05
108-05-4	Vinyl Acetate	4.9E-03	--	--	--	4.9E-03
56-55-3	Benz(a)anthr	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
50-32-8	Benzo(a)pyre	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
205-99-2	Benzo(b)fluo	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
207-08-9	Benzo(k)fluo	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
218-01-9	Chrysene	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
53-70-3	Dibenzo(a,h)	1.2E-08	4.7E-09	5.4E-09	--	2.2E-08
193-39-5	Indeno(1,2,3-	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
56-49-5	3-Methylchol	1.8E-08	7.1E-09	8.1E-09	--	3.4E-08
57-97-6	7,12-Dimethy	1.6E-07	6.3E-08	7.2E-08	--	3.0E-07

notes:

a - During an RTO Bypass oxidation oven and TO exhaust also bypass the SCR system. Ammonia Injection is not operated. Oxidation oven NOx emissions are lower because the RTO control device

SGL ACF - Moses Lake Facility

Emergency Generators and Firewater Pumps (Lines 1 & 2, 10 smaller emergency generators)

	Generator Specifications	*Constants*
Testing Time	30 minutes/test	(per engine)
Tests per year	52	(per engine)
Testing Hours	26 hours/year	(per engine, from SGL ACF)
Once/year test of FWP	4 hours/year	(in 1 day on FWP)
Emergency Hours	8 hours/year	(per engine, from Ecology)
Total Operating hours - EGEN	34 hours/year	(per engine)
Total Operating hours - FWP	38 hours/year	
Design capacity	454.00 hp	(per engine, spec sheet)
Fuel Consumption	4,100 cf/h	(per engine @ 100% load, spec sheet)
Inlet Capacity	4.2 MMBtu/hr	(per engine @ 100% load)

Pollutant Emissions

Emergency Generators

(Total hourly emissions based on 10 engines operating for 30 minutes, Daily emissions based on 10 engines operating for 30 minutes (testing), and Annual emissions based on 52 thirty minute tests and 8 hrs/yr of emergency operation)

		Emission Factor[a]		Testing Operations Single Engine Emission Rate			Total Emission Rate (10 engines at a time)	Total Emission Rate (10 engines at a time)	Total Emission Rate (10 engines at a time)
Pollutant	Cas #	g/bhp-hr	lb/MMBtu	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
NOx (NSPS Standard)	10102-44-0	2.0	-	1.00	1.00	68.1	10.0	10.0	680.6
CO (NSPS Standard)	630-08-0	4.0	-	2.00	2.00	136.1	20.0	20.0	1361.2
SO2	7446-09-05	-	5.88E-04	0.001	0.001	0.08	0.012	0.0	0.8
VOC	VOC	1.0	-	0.50	0.50	34.0	5.0	5.0	340.3
PM (filterable)	PM	-	9.50E-03	0.02	0.02	1.4	0.2	0.2	13.5
PM_{10} (filterable+condensable)	PM10	-	1.94E-02	0.04	0.04	2.8	0.41	0.4	27.6
$PM_{2.5}$ (filterable+condensable)	PM2.5	-	1.94E-02	0.04	0.04	2.8	0.4	0.4	27.6
1,1,2,2-Tetrachloroethane	79-34-5	-	2.53E-05	5.3E-05	5.3E-05	3.6E-03	0.0005	0.001	0.0
1,1,2-Trichloroethane	79-00-5	-	1.53E-05	3.2E-05	3.2E-05	2.2E-03	0.0003	0.000	0.0
1,1-Dichloroethane	75-34-3	-	1.13E-05	2.4E-05	2.4E-05	1.6E-03	0.0002	0.000	0.0
1,2-Dichloroethane	107-06-2	-	1.13E-05	2.4E-05	2.4E-05	1.6E-03	0.0002	0.000	0.0
1,2-Dichloropropane	78-87-5	-	1.30E-05	2.7E-05	2.7E-05	1.8E-03	0.0003	0.000	0.0
1,3-Butadiene	106-99-0	-	6.63E-04	0.001	0.001	0.09	0.014	0.01	0.9
1,3-Dichloropropene	542-75-6	-	1.27E-05	2.7E-05	2.7E-05	1.8E-03	0.0003	0.000	0.0
Acetaldehyde	75-07-0	-	2.79E-03	0.006	0.006	0.4	0.06	0.06	4.0
Acrolein	107-02-8	-	2.63E-03	0.005	0.005	0.4	0.055	0.05	3.7
Benzene	71-43-2	-	1.58E-03	0.003	0.003	0.2	0.033	0.03	2.2
Carbon Tetrachloride	56-23-5	-	1.77E-05	3.7E-05	3.7E-05	2.5E-03	0.0004	0.000	0.0
Chlorobenzene	108-90-7	-	1.29E-05	2.7E-05	2.7E-05	1.8E-03	0.0003	0.000	0.0
Chloroform	67-66-3	-	1.37E-05	2.9E-05	2.9E-05	1.9E-03	0.0003	0.000	0.0
Ethylbenzene	100-41-4	-	2.48E-05	5.2E-05	5.2E-05	3.5E-03	0.0005	0.001	0.0
Ethylene Dibromide	106-93-4	-	2.13E-05	4.5E-05	4.5E-05	3.0E-03	0.0004	0.000	0.0
Formaldehyde	50-00-0	-	2.05E-02	0.043	0.043	2.9	0.43	0.43	29.1
Methanol	67-56-1	-	3.06E-03	0.006	0.006	0.4	0.06	0.06	4.4
Methylene Chloride	75-09-2	-	4.12E-05	8.6E-05	8.6E-05	5.9E-03	0.0009	0.001	0.1
Naphthalene	91-20-3	-	9.71E-05	2.0E-04	2.0E-04	1.4E-02	0.0020	0.002	0.1
Styrene	100-42-5	-	1.19E-05	2.5E-05	2.5E-05	1.7E-03	0.0002	0.000	0.0
Toluene	108-88-3	-	5.58E-04	0.001	0.001	0.08	0.012	0.012	0.8
Vinyl Chloride	75-01-4	-	7.18E-06	1.5E-05	1.5E-05	1.0E-03	0.0002	0.000	0.0
Xylene	1330-20-7	-	1.95E-04	0.0004	0.0004	0.03	0.0041	0.004	0.3
CO2	CO2	-	1.10E+02	230	230	15,641	2,300	2,300	156,407
CH4	CH4	-	2.20E-03	0.0046	0.0046	0.31	0.0460	0.046	3.1
N2O	N2O	-	2.20E-04	0.0005	0.0005	0.03	0.0046	0.005	0.3
CO2e [b]	CO2e	-	-	230	230	15,657	2,302	2,302	156,569

notes:

a - NOx and CO emission factors based on Generac NSPS certification testing (maximum of 2010 and 2012 testing). VOC emission factor is based on NSPS certification level. All other emission factors are from AP42, Table 3.2-3. Methane and nitrous oxide emission factors from 40 CFR 98, Subpart C, Table C-1.

b - CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 21; and N2O = 310 (40 CFR Part 98, Subpart A).

Emergency Generators and Firewater Pumps (Lines 1 & 2, 10 smaller emergency generators)

Firewater Pump (tests for 30 minutes once per week, with an additional 4 hour test once per year). Also include 8 hours of emergency usage in the annual emission rate calculation.

		Emission Factor[a]		One FWP Emissions Emission Rate			1 FWP Total Emissions		
Pollutant	Cas #	g/bhp-hr	lb/MMBtu	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
NO_X (certification)		0.05	-	0.05	0.2	1.9	0.05	0.2	1.9
CO (certification)		0.81	-	0.81	3.2	30.8	0.81	3.2	30.8
NO_X (NSPS Standard)	10102-44-0	2.00	-	2.00	8.0	76.1	2.00	8.0	76.1
CO (NSPS Standard)	630-08-0	4.0	-	4.00	16.0	152.1	4.00	16.0	152.1
SO_2	7446-09-05	-	5.88E-04	0.002	0.01	0.09	0.002	0.01	0.09
VOC	VOC	1.0	-	1.00	4.0	38.0	1.00	4.0	38.0
PM (filterable)	PM	-	9.50E-03	0.04	0.2	1.5	0.04	0.2	1.5
PM_{10} (filterable+condensable)	PM10	-	1.94E-02	0.08	0.3	3.1	0.08	0.3	3.1
$PM_{2.5}$ (filterable+condensable)	PM2.5	-	1.94E-02	0.08	0.3	3.1	0.08	0.3	3.1
1,1,2,2-Tetrachloroethane	79-34-5	-	2.53E-05	1.1E-04	4.2E-04	4.0E-03	1.1E-04	4.2E-04	4.0E-03
1,1,2-Trichloroethane	79-00-5	-	1.53E-05	6.4E-05	2.6E-04	2.4E-03	6.4E-05	2.6E-04	2.4E-03
1,1-Dichloroethane	75-34-3	-	1.13E-05	4.7E-05	1.9E-04	1.8E-03	4.7E-05	1.9E-04	1.8E-03
1,2-Dichloroethane	107-06-2	-	1.13E-05	4.7E-05	1.9E-04	1.8E-03	4.7E-05	1.9E-04	1.8E-03
1,2-Dichloropropane	78-87-5	-	1.30E-05	5.4E-05	2.2E-04	2.1E-03	5.4E-05	2.2E-04	2.1E-03
1,3-Butadiene	106-99-0	-	6.63E-04	0.0028	0.011	0.11	0.0028	0.011	0.11
1,3-Dichloropropene	542-75-6	-	1.27E-05	5.3E-05	2.1E-04	2.0E-03	5.3E-05	2.1E-04	2.0E-03
Acetaldehyde	75-07-0	-	2.79E-03	0.012	0.047	0.4	0.012	0.047	0.4
Acrolein	107-02-8	-	2.63E-03	0.011	0.044	0.4	0.011	0.044	0.4
Benzene	71-43-2	-	1.58E-03	0.0066	0.026	0.3	0.0066	0.026	0.3
Carbon Tetrachloride	56-23-5	-	1.77E-05	7.4E-05	3.0E-04	2.8E-03	7.4E-05	3.0E-04	2.8E-03
Chlorobenzene	108-90-7	-	1.29E-05	5.4E-05	2.2E-04	2.1E-03	5.4E-05	2.2E-04	2.1E-03
Chloroform	67-66-3	-	1.37E-05	5.7E-05	2.3E-04	2.2E-03	5.7E-05	2.3E-04	2.2E-03
Ethylbenzene	100-41-4	-	2.48E-05	1.0E-04	4.1E-04	3.9E-03	1.0E-04	4.1E-04	3.9E-03
Ethylene Dibromide	106-93-4	-	2.13E-05	8.9E-05	3.6E-04	3.4E-03	8.9E-05	3.6E-04	3.4E-03
Formaldehyde	50-00-0	-	2.05E-02	0.086	0.3	3.3	0.086	0.3	3.3
Methanol	67-56-1	-	3.06E-03	0.013	0.05	0.5	0.013	0.05	0.5
Methylene Chloride	75-09-2	-	4.12E-05	1.7E-04	6.9E-04	6.5E-03	1.7E-04	6.9E-04	6.5E-03
Naphthalene	91-20-3	-	9.71E-05	4.1E-04	1.6E-03	1.5E-02	4.1E-04	1.6E-03	1.5E-02
Styrene	100-42-5	-	1.19E-05	5.0E-05	2.0E-04	1.9E-03	5.0E-05	2.0E-04	1.9E-03
Toluene	108-88-3	-	5.58E-04	0.002	0.009	0.09	0.002	0.009	0.09
Vinyl Chloride	75-01-4	-	7.18E-06	3.0E-05	1.2E-04	1.1E-03	3.0E-05	1.2E-04	1.1E-03
Xylene	1330-20-7	-	1.95E-04	0.0008	0.003	0.03	0.0008	0.003	0.03
CO2	CO2	-	1.10E+02	460	1,840	17,481	460	1,840	17,481
CH4	CH4	-	2.20E-03	0.0092	0.037	0.35	0.0092	0.037	0.35
N2O	N2O	-	2.20E-04	0.0009	0.004	0.03	0.0009	0.004	0.03
CO2e [b]	CO2e	-	-	460	1,842	17,499	460	1,842	17,499

notes:

a - NOx and CO emission factors based on Generac NSPS certification testing (maximum of 2010 and 2012 testing). VOC emission factor is based on NSPS certification level. All other emission factors are from AP42, Table 3.2-3. Methane and nitrous oxide emission factors from 40 CFR 98, Subpart C, Table C-1.

b - CO2e calculated based on global warming potential (GWP) for each Greenhouse gas: CO2 = 1; CH4 = 21; and N2O = 310 (40 CFR Part 98, Subpart A).

SGL ACF - Moses Lake Facility

Ammonium Bicarbonate Baths (Per Line)

	Temperature (C)	pH	Volume (gal)	Volume (L)	Water (g)	Total Amonnium Bicarbonate (g)	Total Ammonium (g)	Total ammonium (mol)	Ammonium (mol/L)	Ammonia (mol/L)	Free Ammonia (mol/L)	Free Ammonia Mass Flux Rate (mol/(s-m^2)	Ammonia Emission Rate (lb/hr)	Ammonia Emission Rate (tpy)
Bath 1-Etching	25	8.96	147.4	557.9	556297	138640	31627	1754	3.14	1.07	0.4	-2.20E-05	0.009	0.04
Bath 2 - Rinse	50	8	57.4	217.1	216454	-	-	-	-	-	-	-	-	-
Bath 3 - Rinse	50	7.88	55.4	209.8	209134	-	-	-	-	-	-	-	-	-

Source: Calculator - http://www.hbu See Ammonia Tab for calculations

Solubility of Ammonium bicarbonate

Temp C	Concentration %wt	
20	17.8	
30	22.1	
25*	19.95	average

http://vitusaproducts.com/globe/fact_sheets/ammonium_bicarbonate.htm

Solubility of Ammonia at 25C

Temp C	Concentration %wt
25C	31.55

% Free Ammonia

At 9 pH, 25 C	37%

Density of water at 25 C

0.997044	g/mL
997.044	g/L

Ammonium Bicarbonate Components

	g/mol	%
NH4	18.0327	0.23
HCO3	61.016	0.77
total	79.0487	1

NH3	17.0247

Alternate Units for Calculator Input

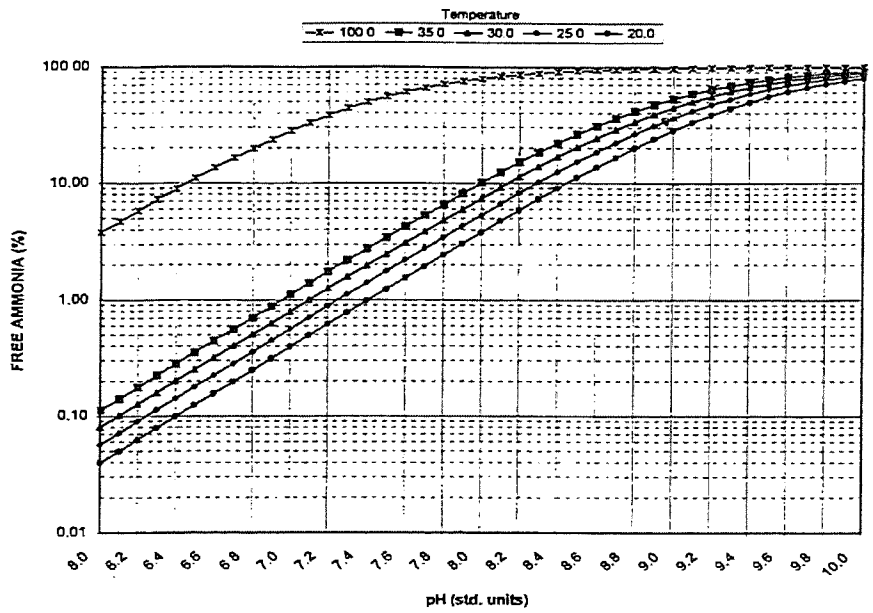
Total Mol NH4HCO3	1753.9	mol
Total Nitrogen-NH4	24566.3	grams
	44029.8	mg/L
Total Nitrogen-NH3	15041.3	mg/L
	599.1	mol NH3
	10200.3	grams Ammonia in solution
	3774.107969	grams Free Ammonia per bath

Bath Surface area	3.14	m^2

Conversions

1	in^3	0.004329004	gal
1	g/mL	8.34540445	lb/gal
1	gal	3.785412	L
1 gram		0.0022046	lb

FIGURE 2-7. FREE AMMONIA, pH, & TEMPERATURE CORRELATIONS



35%

FIGURE 2-8. FREE NITROUS ACID, PH, & TEMPERATURE CORRELATIONS

Appendix C:

Caterpillar Emissions Guarantee

CATERPILLAR®

CAT® SCR PROPOSAL

Wednesday, February 19, 2014 Quotation Number: **14021104RW-E** Revision: **1**

SCR & DPF units in a 304L Stainless Steel Double Wall Critical Grade Silencer Housing

Project Description: SGL - CAT 3516C 2000 ekW Generator Tier 4 Final Levels

Prepared for:

NC Power Systems
Brant Briody
Sales Representative
17900 W. Valley Highway
Tukwila, WA 98188

Email: bbriody@ncpowersystems.com
Telephone: **(425) 656-4587**
Mobile: **(206) 510-3491**

Application Specifications:

Site Location (Address):	**Moses Lake, WA**		
Environment (Alt,Temp,RH):			
Mounting Location:			
Regulation Requirement:	**BACT Tier 4 Final levels**		
Average Running Load (%):		Runtime (hr/yr):	
Minimal Operating Load (%):	**30%**	Minimal Exhaust Temp:	**350 deg C**

Engine Specifications: *Quantity 2 CAT, reference # DM8263*

Engine Model Number:	**3516C , Tier 2**			Engine S/N:	**516DE5B**
Generator Power Rating (ekW):	**2,000**	**Standby**		EPA Family #:	
Engine Displacement (liters):	**69**			Model Name:	**Generator**
Max Fuel Sulfur Content (ppm):	**< 50**				
Engine Power Output (bhp):	**2,937**	or	***2191***	***bkW @ 1800 RPM***	
Exhaust Flow Rate (ACFM):	**15,293**	or	***433.0***	***m^3/min***	
Exhaust Stack Temp (deg F):	**752**	or	***400.0***	***deg C***	
Max Exhaust Pressure(" H_2O):	**27**	or	***6.7***	***kPa***	

Estimated Engine Emissions Data:

Requirement **Emissions Source:** ***100% Load, PSV***

Tier 4f Levels		*Pre Catalyst*	*Post Catalyst Estimates***
g/bhp-hr		**g/bhp-hr**	g/bhp-hr
0.50	**NOx***	**6.54**	0.50
2.60	**CO**	**0.54**	0.54
0.14	**HC**	**0.15**	0.14
0.02	**PM**	**0.04**	0.02

**NOx Reductions will be validated by a calibrated gas analyzer during Dealer Site Commissioning of the CAT SCR System at defined load points and steady-state conditions.*

***Post Catalyst Emissions Reduction based on 100% Load & Engine Rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JAN90 Standard Reference Conditions*

DPF Specifications:

Material:	**Platinum Group Catalyzed Cordierite Ceramic wall-flow filter substrates**
Number of Filters:	**9** **FDA221**
Typical Regeneration using ULSD:	Above 350 deg C (662 deg F) for 30% of engine operating time & greater than 40% engine load
Max Number of Cold Starts:	**12 consecutive 10 minute idle sessions followed by 2 hrs regeneration**

SCR Specifications:

Material:	**Extruded Vanadia Substrates**		# T6 Modules:	**24**
Total Amount of Catalyst (cubic ft):	**43 (12.2 cubic meters)**		# T2 Modules:	**48**
Number of Catalyst Layers:	**3 layers @ 64 blocks/layer**	***8 wide by 8 high***	# T4 Modules:	
Injection Lance:	**36 inches (914 mm)**			
Approximate DEF Consumption:	8.4 gal/hr or 31.8 liters/hr of 32.5% Technical Grade Urea			
Recommended Reductant:	***32.5% DEF (Diesel Exhaust Fluid), Please reference Cat document PELJ1160***			
Maximum Ammonia Slip:	***Not Specified***			

Dosing Control Cabinet: *Nema 12 Enclosure (36" high x 32" wide x 12" deep)*

*Touch Screen Display & Dual NOx Sensors for a True Closed-Loop System
*Controller, Pressure Sensor, Temperature Sensor, Dosing Pump, Pressure Regulator, Secondary Urea Filter
*Power requirement: 240/120 volts AC, 10/20 amps, 50 or 60 Hertz
*Records NOx levels pre and post, Temperature and Pressure, Time and Date
*ModBus Communications Enabled
*Auto Start, Stop and Purge Cycle

Tube Bundle: *Dosing Control Cabinet to Injection Lance*

*1/4" Heat Traced Stainless Steel tubing for DEF Flow
*1/2" Stainless Steel or Poly tubing for Compressed Air

Injection and Mixing Section: *Integrated within the E-POD housing*

*Air & Urea Injection with Static Mixers internal to the SCR Silencer Housing
*Compressed Air requirement to be Oil Free, 10 SCFM @ 100 PSIG with a refrigerated dryer

Silencer Housing Specifications:

Material:	**304L Stainless Steel, Double Wall, Welded Surface Finish**				
Approximate Dimensions L x W x H (inches):	182	x	94	x	58
Approximate Dimensions L x W x H (mm):	4,623	x	2,388	x	1,473
Estimated Weight (pounds / kilograms):	**10,000**	**/ 4550**			
Silencer Sound Reduction (dBa):	**27-35**	**Critical Grade Silencing**			
Est. Pressure Drop Silencer+SCR+DPF ("H_2O):	20.6	*as configured at rated load or (kPa):*			5.1
Inlet Size inches (mm):	**20 (508)**		**Flange**	# of Inlets:	**1**
Outlet Size inches (mm):	**20 (508)**		**Flange**		

This System Includes:

SILENCER - Stainless Steel:	**Yes**	INTERNAL Mixing and DEF Injection:	**Yes**
SCR Catalyst:	**Yes**	Dosing Control Cabinet:	**Yes**
DPF Units:	**Yes**	Operation & Maintenance Manual:	**Yes**
		Start-up Commissioning:	**No**

This System Excludes:

Delivery/Freight Expenses, Consumables and Utilities
Installation and supply of interconnecting power, control cables, conduit, reductant tanks, plumbing, supply pumps, etc.
Installation, Commissioning of the Proposed System and any required permitting
Exhaust piping insulation *(Recommend insulating the exhaust from the engine to the inlet of the emissions control system)*

CATERPILLAR®

Notes:

Terms & Conditions: *Incoterms:* FCA Santa Fe

Estimated Ship Date:	**10 weeks from date of purchase order and approved design**
Terms:	**Net 30 Days.**
Proposal Valid :	**30 days from proposal date**
Warranty:	**24 months or 8,000 hours of operation, whichever comes first, from date of commissioning**

Pricing:

Closed-Loop System

	Ref/Cat #	Description	Quantity	Unit Price	Dealer Net Total (USD)
1	11092002AE	CAT® SCR w/ SCR & DPF in a 304L Stainless Steel Double Wall Critical Grade Silencer	2		
2	11092002AE-IB	Custom Insulating Blanket	2		
				Estimated Freight:	
				Total:	

Appendix D:

Secondary Aerosol Analysis

Appendix D: Secondary $PM_{2.5}$ Analysis

Industrial sources complying with the federal Prevention of Significant Deterioration (PSD) rules are required to assess the influence of primary particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$) and, additionally, the impacts of potential formation of secondary $PM_{2.5}$. Precursors of secondary $PM_{2.5}$ include nitrogen oxides (NO_X), sulfur dioxides (SO_2), and volatile organic compounds (VOCs). These precursors, under specific atmospheric conditions, and in the presence of other chemicals integral to the photochemical processes that form secondary $PM_{2.5}$, may coagulate on existing particles or nucleate into new particles. Understanding existing $PM_{2.5}$ chemical composition near a proposed project is essential to assessing the influence that project emissions could have on secondary $PM_{2.5}$ formation.

The U.S. Environmental Protection Agency (USEPA) has provided guidance that allows a hybrid qualitative and quantitative assessment of secondary $PM_{2.5}$ formation attributable to new or modified sources subject to PSD. The purpose of the assessment is to confirm that formation of secondary $PM_{2.5}$ would not result in total $PM_{2.5}$ levels (i.e., primary plus secondary $PM_{2.5}$) that exceed the NAAQS or the PSD increment. Provided that the hybrid approach demonstrates adequate margin between the total $PM_{2.5}$ impacts and the NAAQS and PSD increment, a more detailed quantitative photochemical grid modeling assessment of secondary aerosol formation is not required.

This assessment has been prepared consistent with the USEPA guidance regarding secondary $PM_{2.5}$ formation. It is a hybrid assessment akin to the example provided within the USEPA guidance. Historic sulfate and nitrate composition at nearby $PM_{2.5}$ speciation monitors are reviewed and interpollutant trading ratios for $PM_{2.5}$ offsets are applied to conservatively assess the project-specific influence of secondary $PM_{2.5}$. Because Lines 3-10 NOx emissions substantially exceed Lines 3-10 SO_2 emissions, this analysis focuses primarily on the formation of particulate nitrate.

Historic Evaluation of Sulfate and Nitrate Composition

Monitoring data from three Interagency Monitoring of Protected Visual Environments (IMPROVE) sites were reviewed for the period between 2009 and 2011 to document regional nitrate and sulfate composition near the project site. The analyzed IMPROVE sites are located in Yakima (AQS Site: 053-077-0009) and Klickitat (AQS Sites: 53-039-0010 and 53-039-0011) counties. These IMPROVE sites are considered representative because they are located in counties that are adjacent to Grant county, and because no speciated $PM_{2.5}$ data are available closer to the facility and within the same airshed.

The results of the historic composition analysis indicate that approximately 8-26% of 24-Hr $PM_{2.5}$ samples are attributable to sulfate and 16-19% of the $PM_{2.5}$ is attributable to nitrate. Generally, the formation of nitrate is most prominent during the winter months. The composition of the top 10% of wintertime (November through March inclusive) 24-hour $PM_{2.5}$ observations was assessed to understand the influence of nitrate formation. These wintertime peak $PM_{2.5}$ concentrations corresponded with inconsistent variations in the sulfate composition and large increases in nitrate composition. The increase in nitrate composition indicates that nitrate formation is dominant in the south central Washington region. The results of the historic analysis are provided in Table 1.

Table 1: 2009-2011 $PM_{2.5}$ sulfate and nitrate composition

Site	AQS	SO_4 (% of 24-Hr $PM_{2.5}$ concentration [ug/m^3])		NO_3 (% of 24-Hr $PM_{2.5}$ concentration [ug/m^3])	
		Mean of Observations	Winter Season Top 10%	Mean of Observations	Winter Season Top 10%
Yakima, Yakima County	053-077-0009	8.42%	4.32%	18.66%	23.43%
Wishram, Klickitat County	053-039-0011	19.76%	28.16%	18.67%	48.55%
White Salmon, Klickitat County	053-039-0010	25.73%	21.75%	16.78%	33.83%

Application of Interpollutant Trading Ratios

The analysis of historical composition of $PM_{2.5}$ indicates secondary $PM_{2.5}$ formation will be primarily from nitrates. An estimate of the secondary $PM_{2.5}$ impacts to the modeling results was made using the previously approved interpollutant trading ratios[1]. These estimates are very conservative due to the low likelihood of the primary and secondary impacts being paired in time and space. Within the Western U.S., the interpollutant trading ratios were defined as 1 ton per year (tpy) of $PM_{2.5}$ for every 100 tpy of NO_X or 40 tpy of SO_2 emitted. Using the trading ratios, an increase in direct $PM_{2.5}$ emissions due to secondary $PM_{2.5}$ formation is calculated to scale up the $PM_{2.5}$ impacts derived from AERMOD modeling.

NAAQS Analysis

The NAAQS analysis presented in Section 5.3 of the application used AERMOD to assess the impacts from facility emission units. The interpollutant trading ratio analysis was applied to the aggregate NO_X, SO_2, and $PM_{2.5}$ emissions to conservatively estimate the increase in $PM_{2.5}$ due to secondary formation. These secondary emissions were added to the direct $PM_{2.5}$ emissions to obtain an effective $PM_{2.5}$ emission rate. The increased $PM_{2.5}$ emission rate was divided by the direct emission rate to obtain a scaling value for use with the AERMOD results. The results of this assessment are provided in Table 2.

Table 2: Interpollutant Trading Ratio NAAQS Analysis

Pollutant	Project Emissions (tpy)	Interpollutant Trading Ratio	Project $PM_{2.5}$ Equivalent
SO_2	24	40	0.60
NO_X	465	100	4.65
$PM_{2.5}$	88	1	88
TOTAL $PM_{2.5}$ Emission (tpy)			**93.25**
Modeled $PM_{2.5}$ Scaling Value			**1.06**

[1] "Details on Technical Assessment to Develop Interpollutant Trading Ratios for $PM_{2.5}$ Offsets", U.S. Environmental Protection Agency, Docket # EPA-HQ-OAR-2003-0062, July 23, 2007.

The maximum AERMOD-predicted concentrations of $PM_{2.5}$ were 8.1 ug/m^3 and 2.2 ug/m^3 for 24-hour and annual averaging times respectively. These concentrations increase to 27.98 ug/m^3 and 8.80 ug/m^3 when the interpollutant trading ratio scaling value and the background $PM_{2.5}$ concentration are applied. These conservative estimates of concentrations resulting from secondary $PM_{2.5}$ formation fall below the $PM_{2.5}$ NAAQS for both averaging periods, indicating that regional modeling is not required for $PM_{2.5}$. A summary of the interpollutant trading ratio assessment applied to the AERMOD NAAQS analysis results is provided in Table 3.

Table 3: Interpollutant Trading Ratio NAAQS Analysis Modeling Results

Averaging Period	AERMOD Maximum Concentration (ug/m^3)	Scaled AERMOD Concentration (ug/m^3)	Background Concentration (ug/m^3)	Overall Concentration (ug/m^3)	NAAQS (ug/m^3)
24-Hour	8.1	8.58	19.40	27.98	35
Annual	2.2	2.33	6.50	8.83	12

PSD Increment Analysis

The PSD increment analysis used AERMOD to predict concentrations resulting from revised emissions from the Lines 3-10 sources. This is in contrast to the NAAQS analysis which considered background in addition to the Lines 3-10 emissions. The interpollutant trading ratio analysis was applied to the PSD increment emissions using the same methodology as before.

The maximum AERMOD-predicted concentrations of $PM_{2.5}$ were 7.95 ug/m^3 and 1.86 ug/m^3 for 24-hour and annual averaging times, respectively. These concentrations increase to 8.43 ug/m^3 and 1.97 ug/m^3 when the interpollutant trading ratio scaling value is applied. These scaled $PM_{2.5}$ concentrations fall below the PSD $PM_{2.5}$ increment for both averaging periods. A summary of the interpollutant trading ratio assessment for the increment analysis provided in Table 3.

Table 4: Interpollutant Trading Ratio PSD Increment Analysis Modeling Results

Averageing Period	**AERMOD Maximum Concentration (ug/m^3)**	**Scaled AERMOD Concentration (ug/m^3)**	**Available PSD Increment (ug/m^3)**
24-Hour	7.95	8.43	9
Annual	1.86	1.97	4

Appendix E:

AERMET Friction Velocity Methodology

September 25, 2015

Appendix E - Justification for Processing Meteorological Data with Adjust Ustar Option

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In light of widely recognized deficiencies in AERMOD under low wind speed conditions, Ramboll Environ processed meteorological data with the beta U* option within AERMET (AJDU* option).

USEPA's work on refining AERMOD under low winds speed conditions dates back to at least 2007. At USEPA's 2007 Modeling Workshop, Randy Robinson and Roger Brode of USEPA put at the top of their list of mandatory work:

> 1. Light winds. Revise AERMOD's treatment of light winds to avoid unrealistically high concentrations.[1]

At USEPA's 9th annual modeling conference in 2011, George Schewe, on behalf of the Air & Waste Management Association, Air Pollution Meteorology (AB-3) Committee, noted:

> Many investigators report that the worst-case AERMOD impacts occur for very low wind speeds, especially for low-level sources.[2]

On July 14, 2015, USEPA signed a proposal to revise the *Guideline on Air Quality Models*. At USEPA's 11th annual modelling conference in 2015 and in the Notice of Proposed Rulemaking, USEPA has proposed that the AJDU* option be incorporated into the regulatory versions of AERMOD and AERMET.

In version 12345 of AERMET, USEPA released a beta option modifying the calculation of U* (the surface friction velocity) at low wind speeds. USEPA cited as justification for the beta option the peer-reviewed work of W. Qian and A. Venkatram.[3]

AERMET estimates U* from the wind speed measured at a given height, estimated surface heat flux, and the estimated surface roughness length.[3] AERMOD uses U* in estimating the horizontal and vertical spread of the plume, as a surrogate for mechanical turbulence, to calculate the mechanical mixing height and in the vertical profiles for many variables.. Ultimately, concentrations are estimated by the weighted average of the Gaussian plume and of a random spread state. Based on the work of Qian and Venkatram, the beta adjusted U* option applies an empirical modification to the calculation of U* at low wind speed stable conditions.

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[1] Robinson, R., and R. Brode, 2007: AERMOD Implementation Workgroup. 2007 EPA R/S/L Modeler's Workshop. May 15. Available online at: http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/archive/2007/Meeting.htm

[2] Schewe, G., 2008: 9th Conference on Air Quality Modeling – A&WMA AB-3 Comments on AERMOD. October 10. Available online at: http://www.epa.gov/ttn/scram/9thmodconf.htm

[3] Qian, W., and A. Venkatram, 2011: Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions. Boundary-Layer Meteorology, 138, 475-491. Available online at: http://link.springer.com/article/10.1007/s10546-010-9565-1

When USEPA introduced AERMOD versions 12345 and 13350 in introductory webinars, they also provided results comparing the default option and the adjusted U* option to observed concentrations from several tracer studies.[4,5] (Note comparisons between the default option and the adjusted U* option using version 12345 are also presented in Appendix F of the AERMOD User Guide.) In creating these comparisons, EPA modeled releases for both Oak Ridge and Idaho Falls.[6]

For both sites with observation data, the adjusted U* option provides less biased concentration estimates than the default calculation of U* as detailed in Attachment 1. Note the application of this option still provided conservative estimates relative to the observed concentrations at near-field receptors.

In Appendix W to 40 CFR Part 51 (Section 3.2), EPA establishes three different scenarios under which an alternative model may be approved for use:

> (1) If a demonstration can be made that the model produces concentration estimates equivalent to the estimates obtained using a preferred model;
>
> (2) if a statistical performance evaluation has been conducted using measured air quality data and the results of that evaluation indicate the alternative model performs better for the given application than a comparable model in Appendix A; or
>
> (3) if the preferred model is less appropriate for the specific application, or there is no preferred model. Any one of these three separate conditions may make use of an alternative model acceptable.

In our current study the higher 1-hour and 24-hour concentrations are driven by the predictions during low wind speed conditions. This can be demonstrated by examining hourly NO_X over a five year modeling period (project only concentrations). We chose NO_X as our tested pollutant because it was the most sensitive pollutant with respect to NAAQS. At each receptor in the modeling domain, we took the highest hourly concentration (for each of the five years) and plotted it with respect to wind speed as shown in the chart below.

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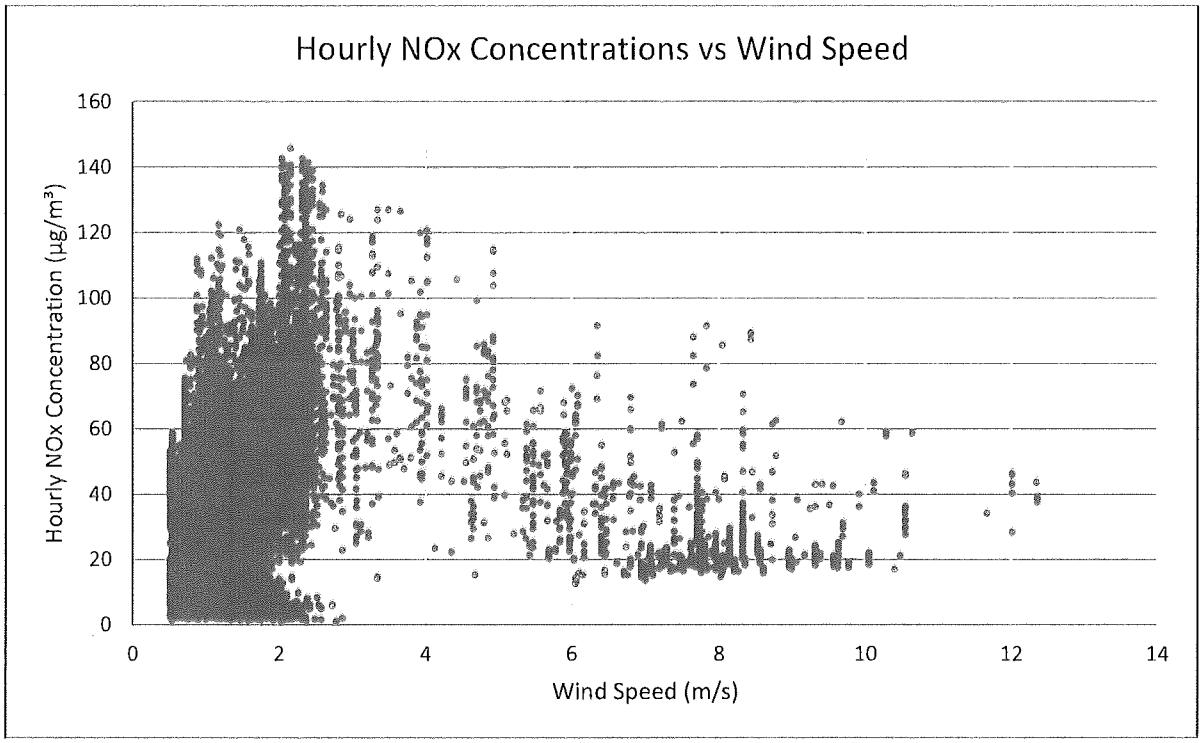
[4] Brode, R., 2013: AERMOD Modeling System Update. 2013 EPA R/S/L Modeler's Workshop. April 23. Available online at: http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/archive/2007/Meeting.htm

[5] EPA, 2014: Webinar: AERMOD Modeling System Update. January 14. Available online at: http://www.epa.gov/ttn/scram/webinar/AERMOD_13350_Update/AERMOD_System_Update_Webinar_01-14-2014_FINAL.pdf

[6] Paine, B., and J. Connors. 2013: AERMOD Low Wind Speed Issues: Review of New Model Release. 2013 EPA R/S/L Modeler's Workshop. April 2013. Available online at: http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/

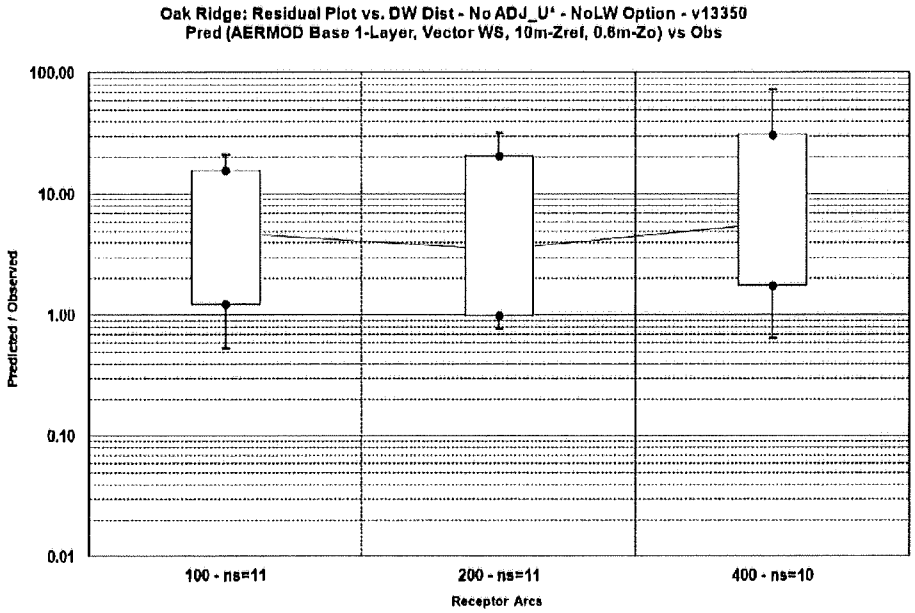


The chart shows a general trend of concentrations decreasing with greater wind speeds after roughly 3 m/s. This indicates that our highest concentrations tend occur under periods of relatively low wind speeds (sub 3 m/s), while greater wind speeds tend to result in reduced concentrations. To classify a "low wind speed", we looked at the Beaufort Wind Scale (http://www.spc.noaa.gov/faq/tornado/beaufort.html) which classifies anything under 6 knots (~3.08 m/s) as a "light breeze". A classification of "moderate breeze" would not occur until ~5.6 m/s.

The EPA findings (as presented in Attachment 1) clearly indicate that AERMOD along with the adjusted U* option is less biased towards over-prediction than AERMOD applied using default options. Ramboll Environ believes this satisfies scenario (2) above.

Attachment 1: Comparisons Between AERMOD and Observation Data

Oak Ridge – Base Model



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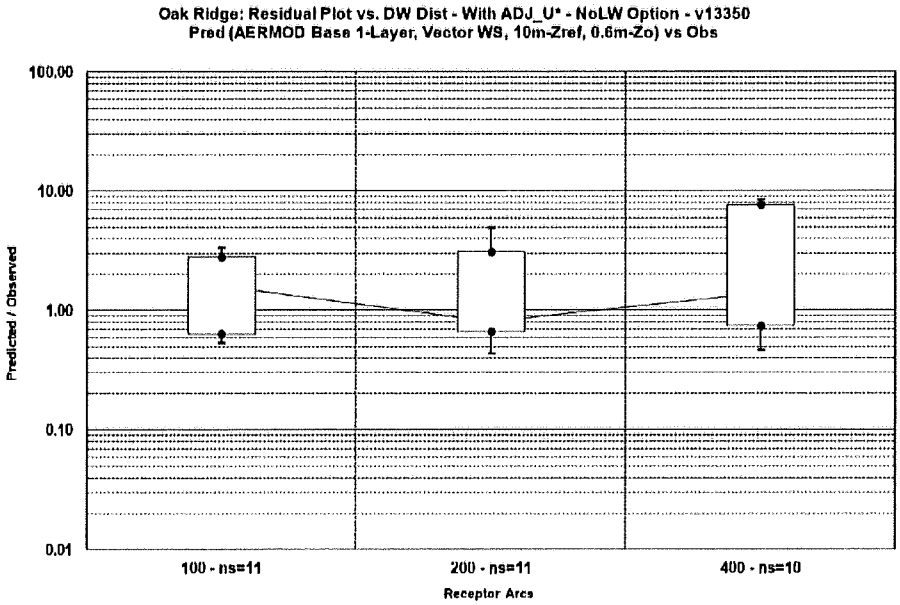
Oak Ridge – ADJ_U* Option



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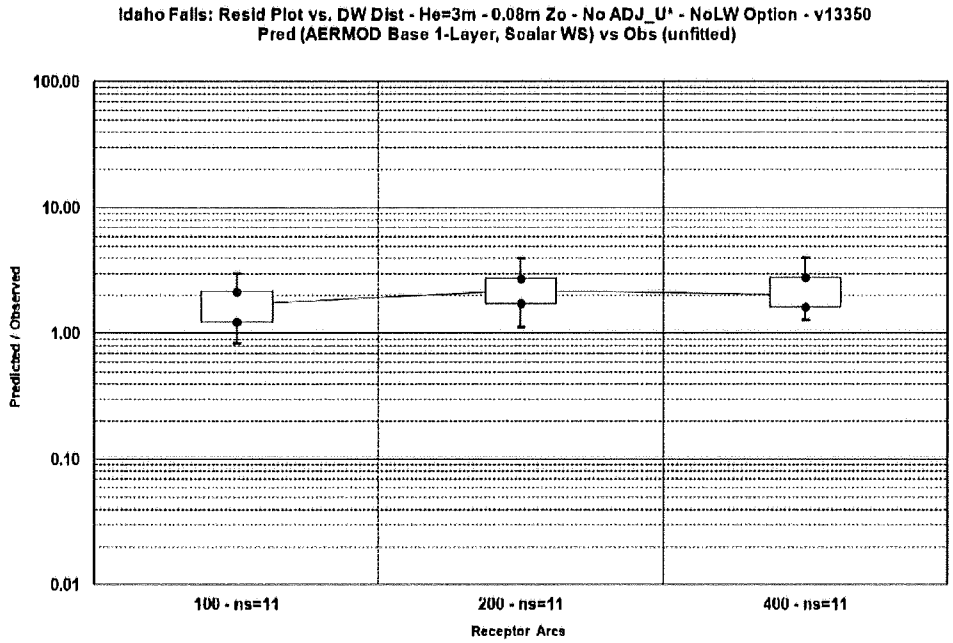
Source: EPA. 2014. Webinar: AERMOD Modeling System Update. January 14.

Idaho Falls – Base Model



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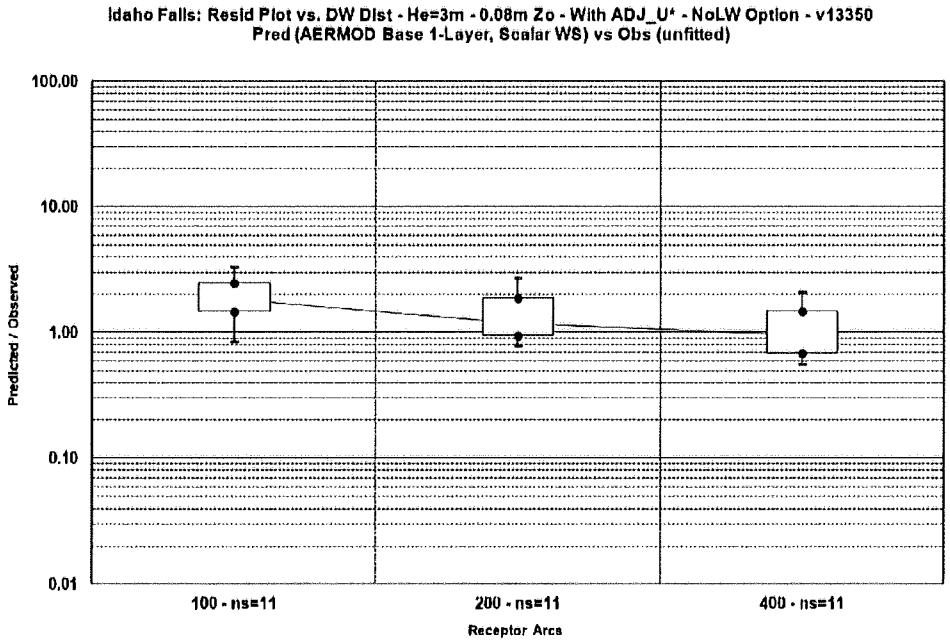
Idaho Falls – ADJ_U* Option



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Source: EPA. 2014. Webinar: AERMOD Modeling System Update. January 14.

Appendix F:

Regional Analysis

Nearby Source Emission Inventory Development

When seeking a prevention of significant deterioration (PSD) permit, an assessment of compliance with ambient air quality standards and PSD increments for air permitting is typically accomplished using an air quality dispersion model. In cases where the significant impact level (SIL) for a given pollutant is exceeded, EPA requires a more comprehensive analysis (called a "Full Impact Analysis") that includes contributions from nearby industrial sources and background. To make that analysis possible, a nearby source emission inventory of industrial sources expected to cause a significant concentration gradient of the pollutant(s) of concern in the vicinity of the project is assembled. To assess compliance with an ambient standard, the Full Impact Analysis should address the maximum emission rate that could potentially be emitted by each of the nearby industrial sources (the "allowable" emission rate). For the increment analysis, the actual emissions from sources that began operation after the minor source baseline date should be addressed.

This air quality assessment evaluates the addition of 8 production lines to the existing facility in Moses Lake, Washington. The modeling developed in support of the assessment indicates the 1-hour average nitrogen dioxide (NO_2), 24-hour average particulate matter greater than 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$), and annual average NO_2 and $PM_{2.5}$ concentrations exceed the applicable SILs. A nearby source emission inventory of existing industrial sources that emit NO_2, PM_{10}, and $PM_{2.5}$ was assembled for the Full Impact Analysis.

Emission inventory development began by identifying the counties likely to contain industrial facilities likely to emit NOx, PM_{10}, and $PM_{2.5}$ that could potentially influence concentrations of those pollutants in the same areas as the proposed ACF project. The following counties were identified: Grant, Lincoln, Adams, Franklin, Douglas, Kittitas, and Chelan. Based on this list of counties of interest, Ramboll Environ obtained the 2012 Large Business Modeling Inventory from Washington State Department of Ecology,[1] as well as lists of minor sources from the Department of Ecology's Eastern Regional Office (ERO) and Central Regional Office (CRO), and the Benton Clean Air Agency (BCCA).

The only major source within the 50 km radius was the REC Solar Grade Silicon, LLC (REC) facility located in Moses Lake, Washington. Both Eastern and Central Regional Offices provided lists of minor sources within their jurisdiction (~500 facilities) and the recently reported actual emission rates for each source.[2] Sources deemed too distant and to be not significant emitters of NOx or $PM_{2.5}$ were eliminated from further examination. The remaining sources (~100 facilities) were screened using a more formal process.

To be considered for inclusion in the nearby source emission inventory to be used in the Full Impact Analyses to assess compliance with ambient standards and increments, a given source's emissions must be predicted to contribute significantly (i.e., exceed the SIL) at one or more receptors that the proposed project is predicted to contribute significantly. Allowable emission rates are needed for each source to

[1] Large Business Modeling Inventory provided by Sally Otterson of Department of Ecology. June 10, 2014.
[2] Air Quality Access Database provided by Shawn Nolph of Department of Ecology: Central Regional Office. June 12, 2014. Minor Source Facility List provided by Greg Flibbert and Randall Ruddick of Department of Ecology: Eastern Regional Office. July 21, 2014. Benton County Minor Source Facility List provided by Rob Rodger of Benton Clean Air Agency. June 10, 2014.

make this determination. However, the emission inventory compiled from the information provided by Ecology[3] included only actual reported emission rates, not allowable emission rates. Allowable emission rates are based on either permit limits, or the physical limitations of each source. Rather than obtain permits and physical descriptions of each emission unit at each of the ~100 identified sources, a representative subset of sources was selected to develop scaling factors that would be used to estimate allowable emissions based on actual emissions.

The representative subset of sources was determined by selecting all sources located within 50 kilometers (km) of the SGL facility with a facility-wide actual NOx, PM_{10}, or $PM_{2.5}$ emission rate greater than 10 tons per year (tpy). This resulted in the following list of 19 sources.

1. Imerys Minerals California, Inc.
2. Basic American Foods, Inc.
3. McCain Foods USA, Inc.
4. REC Solar Grade Silicon LLC
5. ConAgra Foods Lamb Weston, Inc. – Quincy
6. JR Simplot – Othello Facility
7. JR Simplot – Moses Lake Facility
8. D & L Foundry and Supply, Inc.
9. Terex Washington, Inc
10. Seminis Vegetable Seeds, Inc.
11. Perfect Blend Organics
12. Whitby Ag Enterprises LLC
13. TK Holdings, Inc.
14. Chemi-Con Materials Corporation
15. Washington Potato Company
16. Akzo Nobel Functional Chemicals LLC
17. Microsoft Corporation – Columbia Data Center
18. ConAgra Foods Lamb Weston, Inc. – Warden
19. Moses Lake Industries, Inc.

Ramboll Environ requested permits and technical support documents (TSDs) from the ERO for each of the 19 facilities. These materials were reviewed, and, where possible, facility-wide allowable annual NOx, PM_{10}, and $PM_{2.5}$ emission rates were identified. To be conservative, PM_{10} and $PM_{2.5}$ were assumed to be the same for all sources (hereafter referred to as "PM"). These allowable annual emission rates were combined with the actual annual emission rates to identify an allowable-to-actual emission rate ratio for each source. Based on a graphical representation of the annual allowable-to-actual emission rate ratios (see Figures 1 and 2), a scaling factor of 3.16 was selected for both NOx and PM with assistance from Clint Bowman of Ecology.

[3] All sources in the materials provided by BCCA were deemed too distant and/or insignificant for inclusion in the inventory.

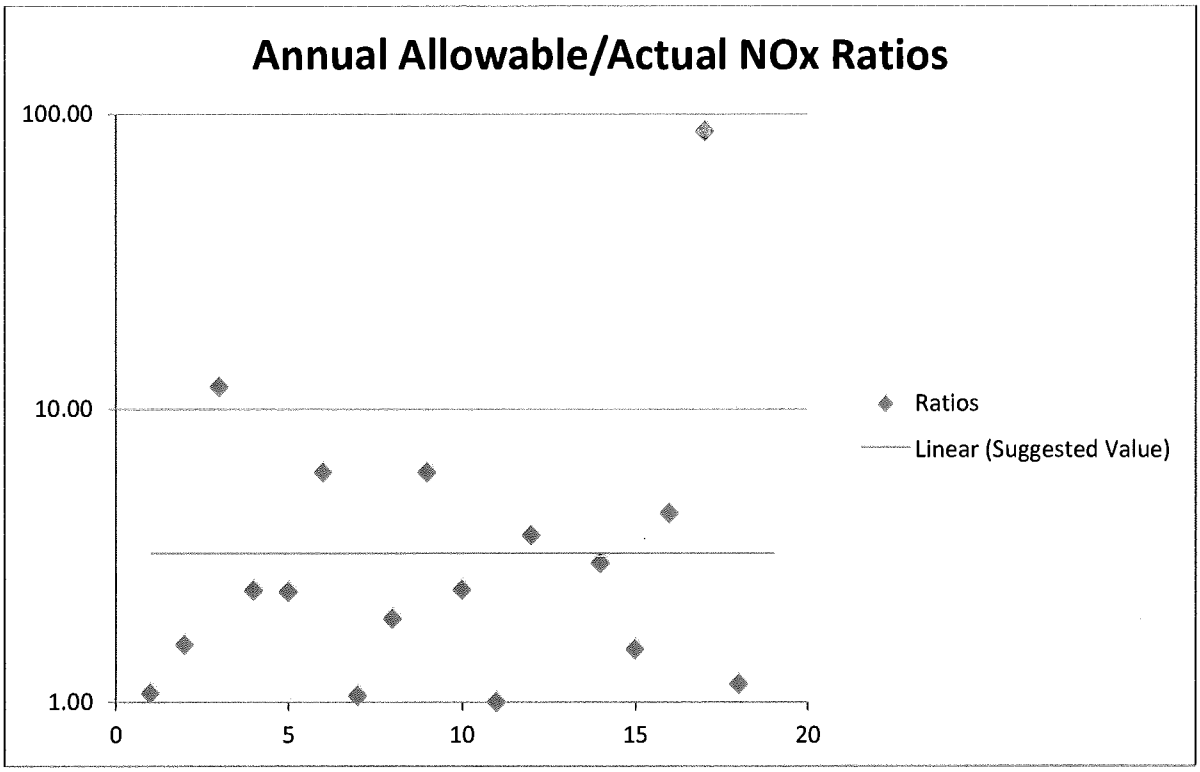

Figure 1. Plot of the Allowable-to-Actual NOx Ratios, and Selected Representative Ratio

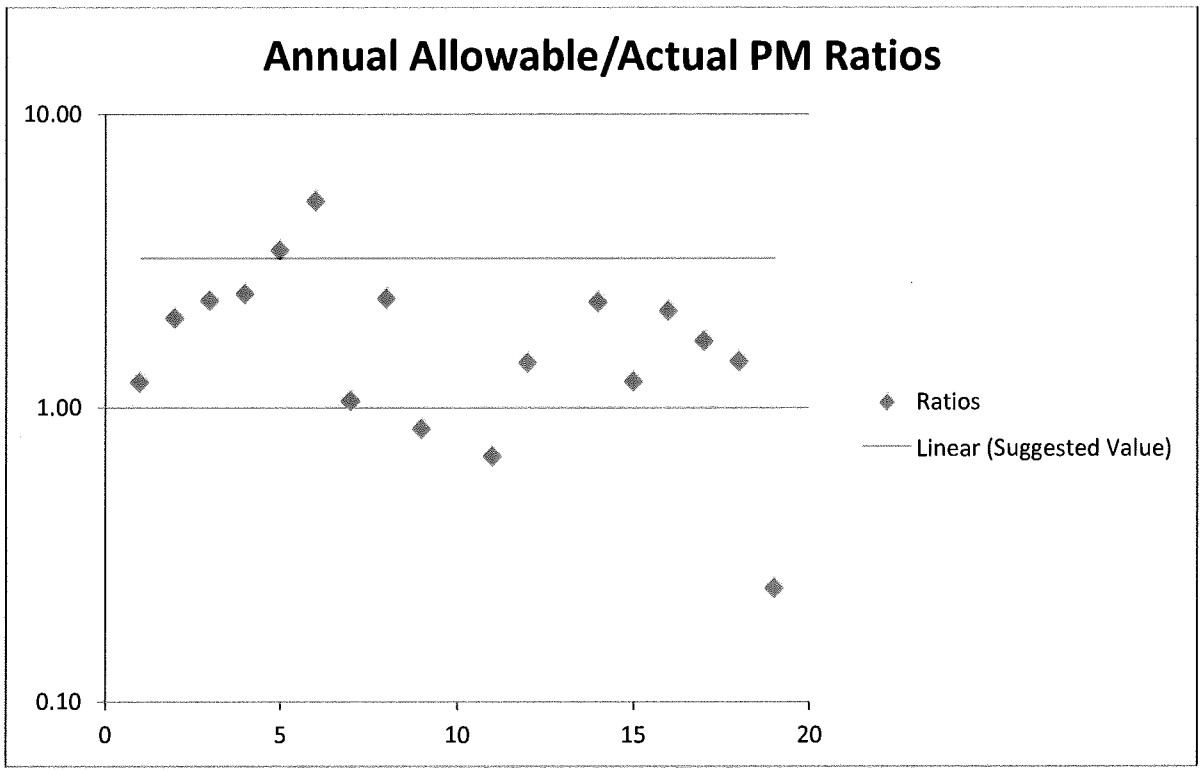

Figure 2. Plot of the Allowable-to-Actual PM Ratios, and Selected Representative Ratio

Annual hours of operation, provided by ERO for each source, were used to calculate short-term allowable emission rates (i.e., hourly for NOx and daily average for PM) from the scaled annual allowable emission rates. When available, allowable short-term emission rates for the 19 listed sources were obtained from the permitting materials provided by ERO. Short-term and annual average concentrations were predicted by combining the estimated allowable emission rates with the modeling methodology developed to predict ambient concentrations attributable to the proposed project. The allowable emission rates summarized in the attached Table 7, and the generic stack parameters summarized in Table 1 were used to represent each source in the model.

Table 1. Generic Stack Parameters Used for Each Source

Stack Height (m)	Exit Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
18.3	346	1.9	1.4

There are seven data centers within 50 km of the facility that use large diesel-powered generators to guarantee a constant power supply in case of an outage. To ensure that these generators will be available during an emergency, they are tested periodically, which results in NOx and PM emissions. Short-term and annual emission rates were obtained for each data center from permits, 2nd and 3rd Tier toxics analysis documents, and technical support documents. Short-term emission rates were based on the assumption that the worst-case emergency generator would be tested at any given hour (for 1-hour average NOx), or that multiple worst-case generators would be tested during a given day, depending upon the number of generators at the data center. The generic stack parameters summarized in Table 1 were used for the data centers located in Quincy, Washington, but site-specific stack parameters were used for the two data centers located in Moses Lake, Washington (i.e., Titan and Ask.com). The emission rates used to represent the data centers in the screening modeling are summarized in Table 2.

Table 2. Nearby Data Centers Included in the Screening Modeling Analysis

Data Center	Hourly NOx (g/s)	Annual NOx (g/s)	Hourly PM (g/s)	Annual PM (g/s)
Intuit	4.82	0.220	0.00206	0.00188
Yahoo	3.88	1.32	0.0460	0.0106
Vantage	1.30	0.168	0.00633	0.00254
Dell	7.57	0.572	0.0204	0.0611
Sabey	5.28	0.848	0.0233	0.00945
Titan	7.81	0.227	0.00547	0.0126
Ask.com	5.05	0.194	0.00111	0.00121

The results of the screening modeling indicated that none of the nearby sources contributed significantly at receptors within the revised Lines 3-10 project's significant impact area (SIA) for annual average NO_2. Nearby sources that contributed significantly at receptors within the revised Lines 3-10 project's SIA for 1-hour average NO_2, 24-hour and annual average $PM_{2.5}$, and 24-hour PM_{10} are summarized in Tables 3, 4, 5, and 6, respectively.

Table 3. Results of the 1-Hour Average NO_2 Nearby Source Screening Analysis

Nearby Source	1-Hour Average NO_2 ($\mu g/m^3$)
Ask.Com Data Center	152.0
Titan Data Center	116.9
REC Solar Grade Silicon, LLC	99.6
JR Simplot - Moses Lake	47.5
Terex Washington. Inc.	31.8
Basic American Foods Moses Lake	24.9
Moses Lake Industries, Inc.	18.6
Dell Marketing, LP	14.7
Sabey Data Center	12.4
Akzo Nobel Functional Chemicals, LLC	10.2
Intuit Data Center	9.5
Chemi-Con	9.4

Table 4. Results of the 24-Hour Average $PM_{2.5}$ Nearby Source Screening Analysis

Nearby Source	24-Hour Average $PM_{2.5}$ ($\mu g/m^3$)
Terex Washington. Inc.	7.3
D & L Foundry, Inc.	1.4
El Oro Cattle Feeders	1.3

Table 5. Results of the Annual Average $PM_{2.5}$ Nearby Source Screening Analysis

Nearby Source	Annual Average $PM_{2.5}$ ($\mu g/m^3$)
Terex Washington. Inc.	0.34

Table 6. Results of the 24-Hour Average PM_{10} Nearby Source Screening AnalysisNearby Source	24-Hour Average PM_{10} ($\mu g/m^3$)
Terex Washington. Inc.	6.2

Table 7. Nearby Sources Included in the Screening Modeling Analysis

Facility Name	NOx		PM	
	Annual Allowable (g/s)	Hourly Allowable (g/s)	Annual Allowable (g/s)	Hourly Allowable (g/s)
AAA Ready Mix – Hiawatha Batch Pl	--	--	0.11	0.13
AAA Ready Mix – Rd M.2	--	--	0.002	0.002
AAA Ready Mix Stratford	--	--	0.018	0.020
Agrex Inc	--	--	0.10	0.11
Agron Corporation	0.039	0.042	0.004	0.004
Akzo Nobel Functional Chemical Llc Cellulosic Spe	0.31	0.31	0.12	0.12
Ardell Feedlot	--	--	0.16	0.17
B & G Farms Inc	0.28	0.29	0.014	0.015
Basic American Foods Moses Lake	1.0	1.0	2.5	2.8
Beef Nw Feeders Quincy	--	--	1.5	1.6
Bills Body & Paint Shop Inc	--	--	0.001	0.001
Celite Corp – Mine	--	--	5.5	6.0
Central Wa Concrete – Moses Lake	--	--	0.11	0.12
Central Washington Asphalt Inc – Rocky Reach	0.063	0.067	0.15	0.16
Central Washington Concrete/Othello	--	--	0.034	0.037
Chemi-Con	0.21	0.21	0.079	0.079
Colley Mint	0.041	0.043	0.006	0.007
Columbia Basin Sand Blasting & Painting	--	--	0.0002	0.0002
Con Agra Lamb Weston/Bsw-Warden	0.42	0.42	0.22	0.24
Con Agra Foods Lamb Weston Inc – Quincy	1.5	1.5	2.9	3.2
Coulee Cattle Feeders	--	--	0.97	1.1
D & L Foundry Inc	0.023	0.032	1.5	2.1
Emc – Quincy Wwtp	0.43	0.45	0.29	0.33
Epl Feed Llc	0.050	0.053	0.18	0.20
El Oro Cattle	--	--	5.1	5.7

Facility Name	NOx		PM	
	Annual Allowable (g/s)	Hourly Allowable (g/s)	Annual Allowable (g/s)	Hourly Allowable (g/s)
Feeders				
Eldorado Stone Llc	--	--	0.085	0.093
Ferguson Concrete & Excavation, Inc Fka Royal Read	--	--	0.034	0.037
General Dynamics Ots	--	--	0.13	0.15
Hawley Collision Repair	--	--	0.001	0.001
Imerys Minerals California Inc	1.2	1.3	2.2	2.5
Inland Body & Paint	--	--	0.001	0.001
International Paper Co	--	--	0.21	0.23
Jack Gilbert & Sons Shop	0.034	0.036	0.01	0.01
Jet Farms	0.082	0.087	0.01	0.02
Jr Simplot – Moses Lake Facility	2.4	2.4	0.82	0.82
Jr Simplot - Othello	1.4	1.4	0.66	0.66
Kayser's Chapel Of Memories	0.0009	0.001	0.003	0.003
L & G Christensen Farms Inc	0.019	0.020	0.003	0.003
Lenroc Company - Mormans Inc Feed Plant	--	--	0.09	0.09
Mjm Farms	0.17	0.18	0.01	0.02
Matthey Laney Dba Ephrata Collision Center	--	--	0.001	0.001
Mccain Foods USA – Othello	2.6	2.6	2.65	2.97
Monsanto Co – Dh Production	0.007	0.007	0.0004	0.0004
Monsanto Co – Othello	0.18	0.19	0.02	0.02
Moses Lake Collision Repair Inc	--	--	0.001	0.001
Moses Lake Industries Inc	0.42	0.42	--	--
National Frozen Foods Corp	0.14	0.15	0.01	0.01
National Frozen	0.14	0.15	0.004	0.004

Facility Name	NOx		PM	
	Annual Allowable (g/s)	Hourly Allowable (g/s)	Annual Allowable (g/s)	Hourly Allowable (g/s)
Foods Corp – Quincy				
Ochoa Farms Distillery	0.010	0.011	0.002	0.002
Pacific Coast Canola Llc	0.007	0.008	0.30	0.33
Par 4 Cattle Feeders	--	--	1.15	1.27
Para Livestock	--	--	0.40	0.44
Perfect Blend	0.062	0.13	0.15	0.21
Performix Nutrition Systems Llc	0.005	0.006	0.004	0.005
Pioneer Memorial Services	--	--	0.001	0.001
Phillips 66 CO	0.065	0.070	--	--
Quincy Auto Body Rebuild	--	--	0.001	0.001
Quincy Foods Llc	0.13	0.14	0.03	0.03
Rec	1.5	5.2	1.7	1.7
Royal Ridge Fruit & Cold Storage	0.15	0.16	0.01	0.01
Royal Turf Farm	--	--	0.04	0.04
Schutte Farms	0.020	0.021	0.004	0.004
Seminis Vegetable Seeds Inc – Warden	0.32	0.72	0.18	0.98
SIMPLOT GROWER SOLUTIONS Fka SIMPLOT SOILBUILDERS	--	--	0.04	0.05
Steves Body Shop	--	--	0.001	0.001
Suncure Pellet & Dehydrator	0.001	0.001	0.09	0.10
Svz, Usa Inc	0.31	0.33	0.02	0.03
T K Holdings Inc	0.025	0.025	0.25	0.25
Terex Washington Inc	0.53	1.0	0.55	1.06
Transmessis Columbia Plateau Llc	0.034	0.036	0.03	0.04
Trout Lake Farm E (Tlfe)-Herb Drying	0.13	0.14	0.01	0.01
Trout Lake Farm-E Mill/Pkg (Nutrilite)	--	--	0.004	0.004

Facility Name	NOx		PM	
	Annual Allowable (g/s)	Hourly Allowable (g/s)	Annual Allowable (g/s)	Hourly Allowable (g/s)
V P Auto Body & Paint	--	--	0.0005	0.001
Whb Frank Farms	0.014	0.014	0.002	0.002
Washington Potato Company	0.36	0.36	0.08	0.08
Western Polymer Corporation	0.17	0.18	0.01	0.01
Whitby Ag Enterprises Llc	--	--	0.15	0.08

Appendix G:
Dispersion Modeling Files

Electronic modeling files available upon request.
kajo461@ecy.wa.gov