UPDATED AIR DISPERSION MODELING REPORT

Algonquin Gas Transmission, LLC > Weymouth Compressor Station
Atlantic Bridge Project

Prepared For:

Algonquin Gas Transmission, LLC
Weymouth Compressor Station
50 Bridge Street
Weymouth, MA 02191

Prepared By:

TRINITY CONSULTANTS
153 Cordaville Rd, Suite 120
Southborough, MA 01772
(508) 273-8600

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1. INTRODUCTION

Algonquin Gas Transmission, LLC (Algonquin) is proposing to construct, install, own, operate, and maintain the Atlantic Bridge Project (AB Project). The AB Project will create additional firm pipeline capacity necessary to deliver natural gas supplies that will meet supply and load growth requirements in the Northeast market area. The AB Project will create additional capacity between a receipt point on Algonquin's system at Mahwah in Bergen County, New Jersey and various delivery points on the Algonquin system, including at Beverly, Massachusetts for further transportation and deliveries on the Maritimes system. Collectively, this project is referred to as the AB Project. As part of the AB Project, a new compressor station is proposed to be constructed in Weymouth, Massachusetts (Weymouth Compressor Station).

Algonquin's Weymouth Compressor Station will be located in Norfolk County, Massachusetts. As part of the AB Project, Algonquin is proposing to install the following emission units at the Weymouth Compressor Station:

- A new Solar Taurus 60-7802 natural gas-fired turbine-driven compressor unit;
- A new Waukesha VGF24GL natural gas-fired emergency generator;
- A new natural gas-fired turbine compressor fuel gas heater;
- Five (5) new natural gas-fired catalytic space heaters;
- A new parts washer;
- New separator vessels and storage tanks; and
- Fugitive Emission Sources (piping components, gas releases and truck loading).

There is an existing metering and regulating (M&R) station located approximately 100 meters from the proposed Weymouth Compressor Station. The existing equipment at the M&R station includes two natural gas-fired heaters, three natural gas-fired boilers, piping components, and gas releases. Algonquin is including the existing M&R station as part of the Non-Major CPA application and air dispersion modeling for the proposed Weymouth Compressor Station.

Algonquin submitted a non-major comprehensive plan approval (Non-Major CPA) application for the Weymouth Compressor Station, which included an air dispersion modeling analysis, on October 26, 2015. Various updates to this Non-Major CPA application were submitted in September 2016, January 2017 and May 2018. The September 2016 application also included updates to the modeling analysis. With this submittal, the air modeling is being updated again to reflect minor refinements to the facility emissions profile (air toxics) as well as more recent meteorological data, regional source data (i.e., black start engines at Fore River Energy Center) and background monitoring data. The revised modeling also incorporates revisions made to US EPA's AERMOD model and the accompanying guidance in Appendix W since the last modeling was conducted to identify the potential impacts of the proposed compressor station based on the best available data and modeling techniques.

The methodologies outlined in this modeling report are generally consistent with the original modeling protocol submitted to the MassDEP on August 21, 2015.[1] In addition, the modeling is consistent with the revisions approved by Mr. Glenn Pacheco (MassDEP) via emails dated April 18, 2018, and May 14, 2018 provided in Attachment C. Air dispersion modeling is relied upon to demonstrate that the AB Project complies with the applicable National Ambient Air Quality Standards (NAAQS) and Massachusetts' 24-hour Threshold Effect Exposure Limits (TELs) and annual Ambient Air Limits (AALs) for toxic air pollutants.

[1] Comments on this protocol were provided verbally by Mr. Glenn Pacheco (MassDEP). These comments have been incorporated into the final air dispersion modeling analysis and are reflected in this report.

Algonquin has included, as Attachment A to this modeling report, a CD containing all the files associated with the air dispersion modeling analysis. This CD includes those files associated with importing terrain elevations, building downwash, meteorological data, and AERMOD.

1.1. PROPOSED FACILITY LOCATION

The Weymouth Compressor Station will be located in Weymouth, Massachusetts (Norfolk County). Figure 2-1 presents an aerial map of the existing facility.

The Weymouth Compressor Station will be located at the following address:

50 Bridge Street
Weymouth, MA 02191

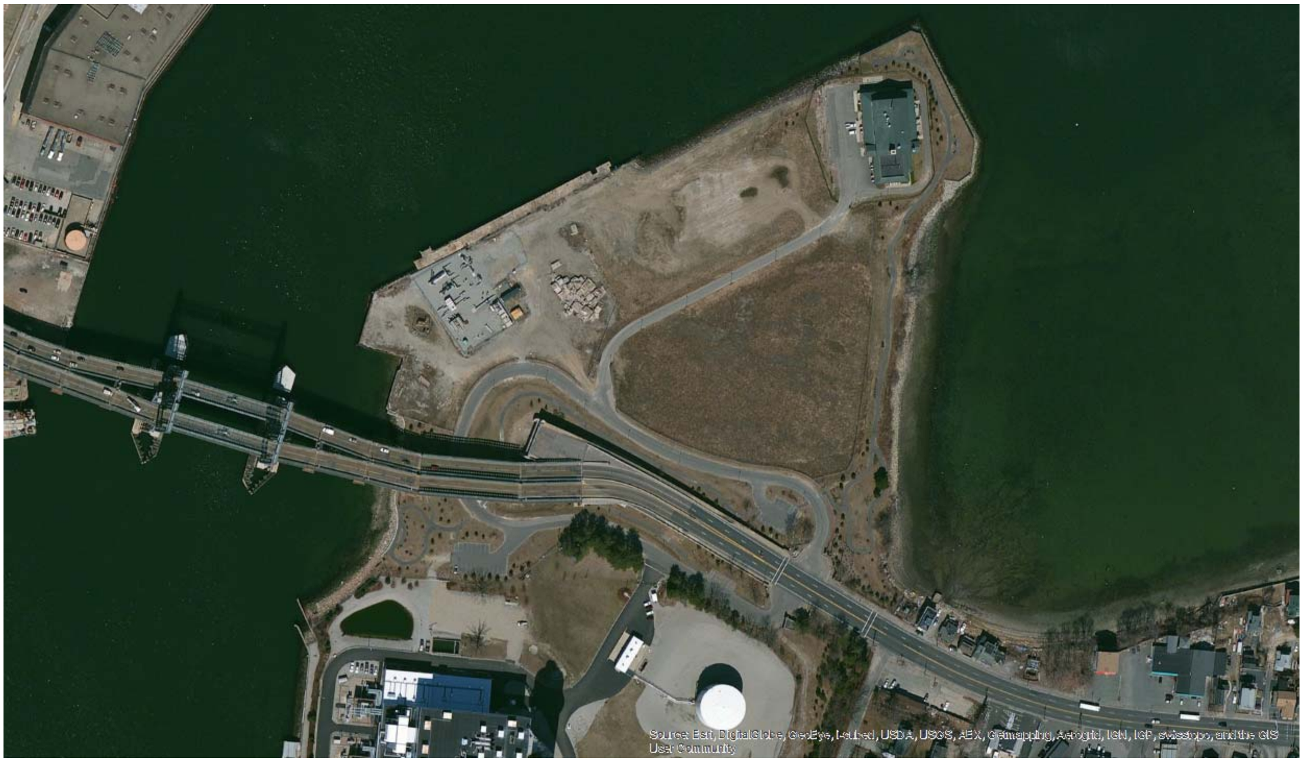
The M&R station is located at the following address:

6 Bridge Street
Weymouth, MA 02191

The following is the company contact information for the Weymouth Compressor Station:

Reagan Mayces
Enbridge
5400 Westheimer Court
Houston, TX 77056-5310
Office Phone: (713) 627-4790

Figure 1-1 Aerial Map of the Proposed Weymouth Compressor Station Location



The following sections outline the air dispersion modeling procedures used for this analysis.

2.1. SIGNIFICANCE ANALYSIS

As a first step in the air dispersion modeling analysis, a significance analysis was used to determine whether the calculated potential emissions from the proposed Weymouth Compressor Station will result in a significant impact upon the area surrounding the facility. For this project, a significance analysis was performed for each pollutant with an established Significant Impact Level (SIL).

SILs are ambient concentration thresholds that represent a fraction of the NAAQS and, based on U.S. Environmental Protection Agency (EPA) guidance, are deemed to indicate the level above which a particular facility may cause or contribute to air quality degradation.[2] In accordance with U.S. EPA and MassDEP guidance, predicted air quality impacts of a project in excess of the SILs indicate a need for further analysis to determine whether a project's emissions might cause or contribute to an exceedance of a NAAQS. In the significance analysis, the maximum-modeled ground-level concentrations are compared to the appropriate SIL established by the U.S. EPA (shown in Table 2-1).

Table 2-1. Significant Impact Levels

PSD Pollutant	Averaging Period	Federal Class II SIL (μg/m^3)
PM_{10}	24-hour	5
	Annual	1
$PM_{2.5}$	24-hour [A]	1.2
	Annual [A]	0.3
NO_2	1-hour [B]	7.5
	Annual	1
CO	1-hour	2,000
	8-hour	500
SO_2	1-hour [C]	7.8
	3-hour	25
	24-hour	5
	Annual	1

[A] The $PM_{2.5}$ SILs were effectively remanded and vacated as result of a United States Court of Appeals decision, *Sierra Club v. EPA,* No. 1—1413. However, the MassDEP recognizes the previously established $PM_{2.5}$ SILS for the purposes of significance modeling.[3] As such, the SILs were utilized in this modeling analysis.

[B] 1-hour NO_2 SIL has not been formally proposed. Algonquin used the interim SIL of 4 ppb (or 7.5 μg/m^3) presented in the June 28, 2010 Wood memo.[4]

[2] U.S. EPA Memorandum from Gerald Emison, U.S. EPA OAQPS, to Thomas Maslany, U. S EPA Air Management Division, *Air Quality Analysis for Prevention of Significant Deterioration (PSD)*, July 5, 1988.

[3] MassDEP Bureau of Waste Prevention, *Modeling Guidance for Significant Stationary Sources of Air Pollution*, June 2011.

[4] U.S. EPA Memorandum from Anna Marie Wood, General Guidance for Implementing the 1-hour NO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO_2 Significant Impact Level, June 28, 2010.

[C] The 1-hour SO_2 SIL has not been formally proposed. Algonquin used the interim SIL of 3 ppb (or 7.8 μg/m^3) presented in the August 23, 2010 Wood memo.[5]

Per MassDEP modeling guidance for new facilities, if maximum predicted impacts of a pollutant are below the applicable SILs, the facility's proposed emissions are considered to be in compliance with the NAAQS for that pollutant.[6]

The results of the significance analysis are outlined in Section 4.1.[7] Note that the modeled emission rates for criteria pollutants have not changed since the prior submittal (i.e., only air toxic rates had minor refinements).

2.2. BACKGROUND AIR QUALITY

In evaluating cumulative impacts with respect to the NAAQS, maximum modeled impacts were added to representative ambient background concentrations and compared to the applicable NAAQS. Representative background concentrations must be obtained from an EPA-approved network of ambient air quality monitors operated in accordance with the requirements outlined in 40 CFR Part 58 – Ambient Air Quality Surveillance. The latest assessment of the MassDEP's ambient monitoring network concluded that it meets or exceeds EPA's minimum monitoring requirements, that the network is well designed and operated, and that it adequately characterizes air quality in Massachusetts.[8] Selection of the existing monitoring station data that is "representative" of the ambient air quality in the area surrounding the proposed facility is determined based on the following three criteria: 1) monitor location, 2) data quality, and 3) data currentness. Key considerations based on the monitor location criteria include proximity to the significant impact area of the facility, similarity of emission sources impacting the monitor to the emission sources impacting the airshed surrounding the proposed compressor station, and the similarity of the land use and land cover (LULC) surrounding the monitor and proposed facility. The data quality criteria refers to the monitor being an approved State and Local Air Monitoring Station (SLAM) or similar monitor type subject to the quality assurance requirements in 40 CFR Part 58 Appendix A. Data currentness refers to the fact that the most recent three complete years of quality assured data are generally preferred.

The MassDEP provided the representative background concentrations from the Harrison Avenue site and the Von Hillern Street site to be used for the air quality analysis by weighing all of these factors.[9] The background concentrations used in this revised submittal have been updated to the latest, most representative, background concentrations from monitors in the area. The Von Hillern St. and Harrison Avenue ambient background monitors were used in this analysis. Both monitors are located in similar topographical settings, fairly flat terrain, to the area around the Weymouth compressor station and there are no significant terrain features between the station and the monitors. Furthermore, there are no significant sources of pollutants evaluated against the NAAQS near the Weymouth compressor station that are not accounted for in the regional inventory. Given this, and the lack of large emitting industrial sources near the two ambient monitors, the monitors provide

[5] Ibid.
[6] MassDEP Bureau of Waste Prevention, *Modeling Guidance for Significant Stationary Sources of Air Pollution*, June 2011.
[7] The modeled emissions from the project have not changed since the previous submittal of September 2016. In addition, the NAAQS analysis was completed using the full receptor grid and the impact of updated meteorological data. Use of the updated AERMOD and AERMET v18081 and current Appendix W guidance on the SIL modeling analysis is expected to be minimal. Therefore, the SIL modeling analysis is not being updated in this submission. MassDEP provided concurrence to this approach in an email from Mr. Glenn Pacheco (MassDEP) to Ms. Kate Brown (Enbridge) on May 14, 2018, included in Attachment C to this report.
[8] *"Massachusetts Ambient Air Monitoring Network Assessment – 2015,"* October 9, 2015, MassDEP Bureau of Air and Waste, Air Assessment Branch, http://www.mass.gov/eea/docs/dep/public/net5yr.pdf.
[9] Email from Mr. Glenn Pacheco (MassDEP) to Ms. Kate Brown (Enbridge) on April 18, 2018, included in Attachment C to this report.

a representative background concentration.[10] The monitors are also both the closest available ambient monitors for the pollutants of interest evaluated for each monitor. The Von Hillern St. monitor is located approximately 11.7 km from the facility and the Harrison Avenue monitor site is located approximately 13.6 km from the facility. While the Blue Hills monitor location is closer than the Harrison Avenue monitor (approximately 13 km from the subject site), the Blue Hills monitor does not measure ambient background concentrations of SO_2 and PM_{10}, the two pollutants used in the analysis from the Harrison Avenue monitor. Therefore, the closest EPA approved monitor as part of the MassDEP's ambient monitoring network was utilized to establish ambient background concentrations for the criteria pollutants evaluated.[11]

The updated background concentrations used in this modeling analysis are shown in Table 2-2.

Table 2-2 Selected Background Concentrations

PSD Pollutant	Averaging Period	2014-2016 Monitor Background Concentration (μg/m³)	Metric	Monitor Location
PM_{10}	24-hour	61	3-yr average of second-high	Harrison Ave
$PM_{2.5}$	24-hour	15.3	3-yr average of 98th percentile	Von Hillern St.
	Annual	6.5	3-yr arithmetic mean average	
NO_2	1-hour	94.63	3-yr average of 98th percentile	Von Hillern St.
	Annual	32.88	3-yr arithmetic mean maximum	
SO_2	1-hour	22.7	3-yr average of 99th percentile	Harrison Ave
	3-hour	56.3	Highest-second-high (H2H)	
	24-hour	13.4	H2H	
	Annual	2.8	3-yr arithmetic mean maximum	
CO	1-hour	1,832	H2H	Von Hillern St.
	8-hour	1,031	H2H	

2.3. NAAQS ANALYSIS

As discussed in the results section, the emissions increases from the proposed Weymouth Compressor Station were shown to have a significant impact (i.e., modeled ambient concentrations above the corresponding SILs) for 1-hour and annual average nitrogen dioxide (NO_2), 24-hour average sulfur dioxide (SO_2) and 24-hour and

[10] *Review of nearby emissions sources conducted using EPA's "Where You Live" website: https://www3.epa.gov/air/emissions/where.htm.*
[11] *https://www.mass.gov/service-details/massdep-ambient-air-quality-monitoring-network-annual-plan*

annual average particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$). As such, a NAAQS analysis was conducted.

The primary NAAQS are the maximum concentration ceilings, measured in terms of total concentration of a pollutant in the atmosphere, which define the "levels of air quality which the U.S. EPA judges are necessary, with an adequate margin of safety, to protect the public health."[12] Secondary NAAQS define the levels that "protect the public welfare from any known or anticipated adverse effects of a pollutant." The primary and secondary NAAQS addressed in this air dispersion modeling analysis are shown in Table 2-3.

Table 2-3. Applicable Primary and Secondary NAAQS

Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)
NO_2	1-hour	188 (100 ppb) [A]	--
	Annual	100 (0.053 ppm) [B]	--
SO_2	24-hour [C]	365 (0.14 ppm) [D]	--
$PM_{2.5}$	24-hour	35 [E]	35[D]
	Annual	12 [F]	15[E]

[A] The 3-year average of the 98th percentile of the daily maximum 1-hr average.
[B] Annual arithmetic average.
[C] The 24-hour SO_2 NAAQS will be revoked one year after the effective date in areas with a designated status for the 1-hour SO_2 NAAQS.
[D] Not to be exceeded more than once per calendar year.
[E] 3-year average of the 98th percentile 24-hour average concentration.
[F] 3-year average of the annual arithmetic average concentration.

In the NAAQS analysis, the potential emissions from all proposed and existing emission units at the Weymouth Compressor Station and M&R station combined with the maximum allowable emissions of sources included in the regional inventory (see Section 3.8.4) were modeled together to compute the modeled cumulative impact.

The objective of the NAAQS analysis is to demonstrate through air dispersion modeling that emissions from the proposed Weymouth Compressor Station and existing M&R station do not cause or contribute to an exceedance of the NAAQS at any ambient location at which the impact from the facility is greater than the SIL. The modeled cumulative impacts are added to appropriate background concentrations (see Section 2.2) and assessed against the applicable NAAQS to demonstrate compliance.

The following modeling results were used to determine the design concentration in the NAAQS analysis:

- **24-hour $PM_{2.5}$:** Maximum five-year average of the 98th percentile [approximated by the highest eighth-high (H8H)] modeled 24-hour average concentration;
- **Annual $PM_{2.5}$:** Modeled arithmetic mean concentration averaged over the full five years of meteorological data;
- **24-hour SO_2**: Highest second-high (H2H) 24-hour average modeled concentration of each year;
- **1-hour NO_2:** Maximum five-year average of the 98th percentile [approximated by the H8H] modeled 1-hour daily maximum concentration; and
- **Annual NO_2:** Maximum arithmetic annual mean modeled concentration.

[12] 40 CFR §50.2(b).

2.4. TOXICS ANALYSIS

During review of the application, MassDEP requested an air dispersion modeling analysis for toxic pollutants. For the toxics analysis, all proposed and existing sources at the Weymouth Compressor Station and M&R station were modeled and the maximum modeled concentration results were compared to Massachusetts' 24-hour Threshold Effect Exposure Limits (TELs) and annual Ambient Air Limits (AALs). The applicable TELs and AALs are provided in Table 2-4.

Table 2-4. MassDEP TELs and AALs

Pollutant	TEL ($\mu g/m^3$)	AAL ($\mu g/m^3$)
Acetaldehyde	30.00	0.40
Acrolein	0.07	0.07
Benzene	0.60	0.10
1,3-Butadiene	1.20	0.003
Carbon Tetrachloride	85.52	0.07
Chlorobenzene	93.88	6.26
Chloroform	132.76	0.04
Dichloromethane (Methylene Chloride)	100.00	60.00
Diphenyl (Biphenyl)	0.34	0.09
Ethylbenzene	300.00	300.00
Formaldehyde	2.00	0.08
Methanol	7.13	7.13
2-Methylnaphthalene	14.25	14.25
Naphthalene	14.25	14.25
Phenol	52.33	52.33
Propylene Oxide	6.00	0.30
Styrene	200.00	2.00
1,1,2,2-Tetrachloroethane	18.67	0.02
Toluene	80.00	20.00
1,1,2-Trichloroethane	14.84	0.06
Vinyl Chloride	3.47	0.38
Xylenes (m-,o-,p- isomers)	11.80	11.80

In a toxics analysis, a facility's emissions are modeled and resulting concentrations are compared to the appropriate TEL and AAL. No regional sources or background concentration data is incorporated into the modeling analysis for toxics, consistent with MassDEP guidance. The TELs and AALs are set at levels deemed appropriate by the MassDEP for emissions from a single facility to achieve ambient air concentrations at levels protective of human health and the environment which are much higher than the TELs and AALs.

3. MODELING METHODOLOGY

The air dispersion modeling analyses were generally conducted in accordance with the following guidance documents:

- U.S. EPA's *Guideline on Air Quality Models* 40 CFR Part 51, Appendix W (Revised, January 17, 2017) (*Guideline*) [13];
- MassDEP's *Modeling Guidance for Significant Stationary Sources of Air Pollution (June 2011);*
- U.S. EPA's *AERMOD Implementation Guide* http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf;
- U.S. EPA's *New Source Review Workshop Manual* (Draft, October, 1990);
- U.S. EPA, Office of Air Quality Planning and Standards, Memorandum from Mr. Tyler Fox to Regional Air Division Directors. *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard* (March 1, 2011);
- U.S. EPA, Office of Air Quality Planning and Standards, Memorandum from Mr. Tyler Fox to Regional Air Division Directors. *Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard* (August 23, 2010); and
- U.S. EPA, Office of Air Quality Planning and Standards, Memorandum from Mr. R. Chris Owen and Roger Brode to Regional Air Modeling Contacts. *Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard* (September 30, 2014).

3.1. MODEL SELECTION

Dispersion models predict ambient pollutant concentrations by simulating the evolution of the pollutant plume over time and space given data inputs including the quantity of emissions, stack exhaust parameters (e.g., velocity, flowrate, and temperature) and weather data. Building structures that obstruct wind flow near emission points may cause stack discharges to become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. These effects generally cause higher ground-level pollutant concentrations since building downwash inhibits dispersion from elevated stack discharges. For this reason, building downwash algorithms are considered an integral component of the selected air dispersion model.

The v18081 of the AERMOD model was used to estimate the maximum ground-level concentrations in all air pollutant analyses conducted for this application. AERMOD is a refined, steady-state, multiple source dispersion model that was promulgated in December 2005 as the U.S. EPA-preferred model to use for industrial sources in this type of air dispersion modeling analysis.[14] Following procedures outlined in the *Guideline*, the AERMOD modeling was performed using regulatory default options except as otherwise noted in this report. The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as input were determined by the Building Profile Input Program, PRIME version (BPIP PRIME), version 04274.[15] Table 3-1 summarizes the model control options that were utilized in this analysis.

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[13] While the revisions to Appendix W include guidance regarding evaluation of secondary $PM_{2.5}$ impacts and ozone, the emission levels from this project of NOx, VOC, and SO_2 are so small that secondary $PM_{2.5}$ and ozone impacts will be minimal.

[14] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD), November 9, 2005.

[15] Earth Tech, Inc., Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model, Concord, MA, November 1997.

Table 3-1. Model Selection Options

Control Option	Option Selected	Justification
Pollutant ID	CO, NO_2, PM_{10}, $PM_{2.5}$, SO_2, Other	--
Terrain	Elevated, Meters	The receptor grid covers varying terrain elevations; as such, the elevated option was selected.
Flagpole Receptors	N/A	--
Run or Not	Run	--
Averaging Times	1-hour, 3-hour, 8-hour, 24-hour, and annual	Algonquin selected the appropriate averaging periods for each pollutant modeled
Model	PRIME	The PRIME algorithms are default.
Dispersion	Concentration, Rural, Regulatory Default Option	This modeling analysis is assessing compliance with concentration standards. Algonquin is located in a predominantly rural area (refer to Section 3.3). The regulatory default option was selected as it is recommended in Appendix W.
NO_2 Model Options	N/A	The ambient ratio method 2 (ARM2) was utilized. Refer to Section 3.9 for specifics on this modeling mechanism.
Particulate Model Options	N/A	Algonquin did not utilize particle deposition or depletion options for particulate modeling.
Output Files	.aml	Model output file from Breeze User Interface

3.2. METEOROLOGICAL DATA

Site-specific dispersion models require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, readily available data are commonly used from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data that includes hourly records of the following parameters:

- Wind speed;
- Wind direction;
- Air temperature;
- Micrometeorological Parameters (e.g., friction velocity, Monin-Obukhov length);
- Mechanical mixing height; and
- Convective mixing height.

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insulation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network, are almost always found at airports, and are typically operated by the NWS. Upper air stations are fewer in number than surface observing points since the upper atmosphere is less vulnerable to local effects caused by terrain or other land influences and is therefore less variable. The NWS operates virtually all available upper air measurement stations in the United States.

MassDEP provided the AERMOD-ready processed meteorological data for updated period 2012-2016 for this modeling analysis.[16] The meteorological data was processed through AERMET (v16216) with the adjust u* option and to include upper air measurements from the Gray, Maine National Weather Service site (WBAN ID# 74389) and surface data from the Logan International Airport (WBAN ID# 14739).[17] Per consultation with the MassDEP, use of AERMET (v18081) was not required for this updated modeling analysis, as recent updates to AERMET would not impact the meteorological data for use in this analysis.[18]

3.3. RURAL/URBAN OPTION SELECTION

AERSURFACE (13016) was used to determine whether the rural or urban option within AERMOD should be used for this modeling analysis. Based on the AERSURFACE user's guide, the analysis for land use utilized 1992 National Land Cover Data (NLCD) and a three kilometer radius around the Weymouth Compressor Station. The center of the analysis was based on the location of the turbine stack, the largest source included in this analysis. Landuse categories 22 (high intensity residential) and 23 (commercial/industrial/transportation) are the only urban classifications under NLCD 1992. The results of the AERSURFACE analysis for the Weymouth Compressor Station are presented in Table 3-2. As shown in this table, the area surrounding the Weymouth Compressor Station is only 13.8 percent urban. Although the area has become more urbanized since 1992, the change is not significant enough to make the area predominantly urban. As such, the rural option was utilized within AERMOD. This is also consistent with MassDEP's previous modeling evaluations that have indicated that the area around the Weymouth Compressor Station is best defined as "rural" for air dispersion modeling purposes.[19]

[16] Email from Mr. Glenn Pacheco (MassDEP) to Ms. Kate Brown (Enbridge) on April 5, 2018.

[17] The Logan Airport is a more representative surface station than any other nearby meteorological station (Blue Hills) due to the comparable surface elevations of the Logan airport and the Weymouth facility (coastal zone) when compared to the Blue Hills site. The ADJ_U* option was incorporated by U.S. EPA to address issues with model over prediction of ambient concentrations from sources associated with under prediction of the surface friction velocity (u*) during light wind, stable conditions. The ADJ_U* option allows the friction velocity to be adjusted using the methods of Qian and Venkatram to better account for turbulence in the atmosphere during low wind speed stable conditions. This option was updated to incorporate a modified Bulk Richardson Number methodology in version 13350, was further modified to adjust u* for low solar elevation angles with version 14134, and was most recently used to modify the calculation of the turbulence measure, Monin-Obukhov length in version 15181. Beginning with version 16216, U.S. EPA adopted the ADJ_U* option in AERMET as a regulatory option for use in AERMOD for sources using standard National Weather Service airport meteorological data, site-specific meteorological data without turbulence parameters, or prognostic meteorological inputs derived from prognostic meteorological models.

[18] E-mail from Mr. Glenn Pacheco (MassDEP) to Enbridge and Trinity on May 14, 2018.

[19] Email from Mr. Glenn Pacheco (MassDEP) to Ms. Kate Brown (Enbridge) on April 5, 2018.

Table 3-2 Urban/Rural Determination Results

NLCD 1992 Category		
Code	**Description**	**# of Cells**
11	Open Water:	9317
12	Perennial Ice/Snow:	0
21	Low Intensity Residential:	13389
22	High Intensity Residential:	1704
23	Commercial/Industrial/Transp:	2637
31	Bare Rock/Sand/Clay:	18
32	Quarries/Strip Mines/Gravel:	0
33	Transitional:	3
41	Deciduous Forest:	1606
42	Evergreen Forest:	190
43	Mixed Forest:	1085
51	Shrubland:	0
61	Orchards/Vineyard/Other:	1
71	Grasslands/Herbaceous:	0
81	Pasture/Hay:	0
82	Row Crops:	21
83	Small Grains:	0
84	Fallow:	0
85	Urban/Recreational Grasses:	336
91	Woody Wetlands:	249
92	Emergent Herbaceous Wetlands:	843
	Total	**31399**
	Total (Urban)	**4341**
	% Urban	**13.8**

3.4. TREATMENT OF TERRAIN

Through the use of the AERMOD terrain preprocessor (AERMAP), AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor that could lead to plume recirculation and other terrain interaction.[20]

Receptor, facility sources and building terrain elevations input to the model were interpolated from 1/3 arc second National Elevation Dataset (NED) data obtained from the USGS. The array elevations were interpolated using AERMAP (v11103).[21] Elevations for regional sources were provided by the MassDEP.

[20] U.S. EPA, *Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, EPA-454/B-03-003, Research Triangle Park, NC, October 2004.

[21] AERMAP v18018 was released by the EPA in April 2018. However, a review of the model change bulletin for v18081 indicates the only change to AERMAP was a bug fix associated with Linux systems (that would not influence results previously evaluated), and providing the option of specifying different file input and output names (that would also not influence results previously evaluated). Therefore, previously derived elevation data from AERMAP v11103 was utilized (https://www3.epa.gov/ttn/scram/models/aermod/aermap/aermap_mcb4.txt)

3.5. RECEPTOR GRIDS

For this air dispersion modeling analysis, ground-level concentrations were calculated along the facility boundaries and also within a Cartesian receptor grid. As an area of concern, the facility boundaries were lined with boundary receptors spaced 25 meters apart starting at an arbitrary point on each boundary. The Cartesian grid used the following receptors spacing:

- 25 meter-spaced receptors from the edge of the facility boundaries out to 1 kilometer;
- 100 meter-spaced receptors from 1 to 2.5 kilometers;
- 500 meter-spaced receptors from 2.5 to 5 kilometers; and
- 1,000 meter-spaced receptors from 5 to 10 kilometers.

In general, the receptors covered a region extending from all edges of the facility boundaries to the point where impacts from the project are no longer expected to be significant. The boundaries were defined as all areas that are fenced and/or not accessible to the general public. The proposed Weymouth Compressor Station and existing M&R station will be separated by a public road which was treated as ambient air in this modeling analysis. Figures 3-1 and 3-2 depict the receptor grid to be used in the modeling analysis.

The NAAQS analysis conservatively utilized a full receptor grid out to 10 km from the subject facility. Although this distance and number of receptors would not be required to be evaluated under common modeling procedures and EPA guidance (e.g. only modeling receptors within that distance for which the pollutant has a significant impact), the full 10 km receptor grid provides additional conservatism to the analysis.

Figure 3-1 Receptor Grid

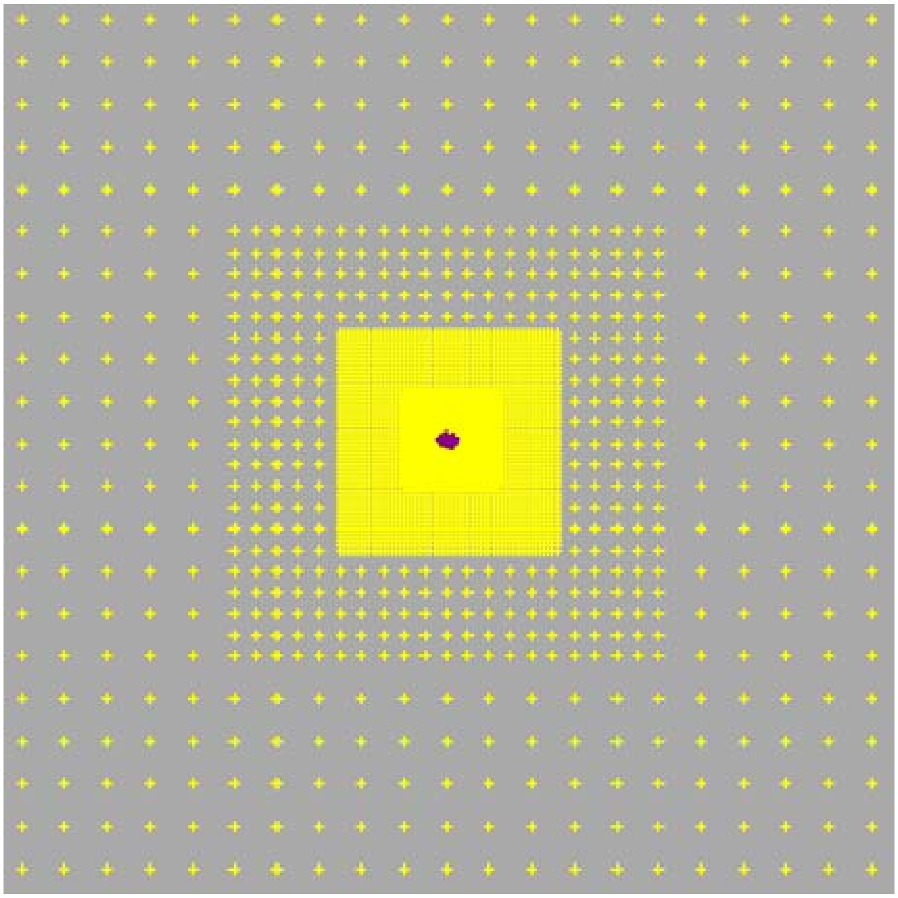
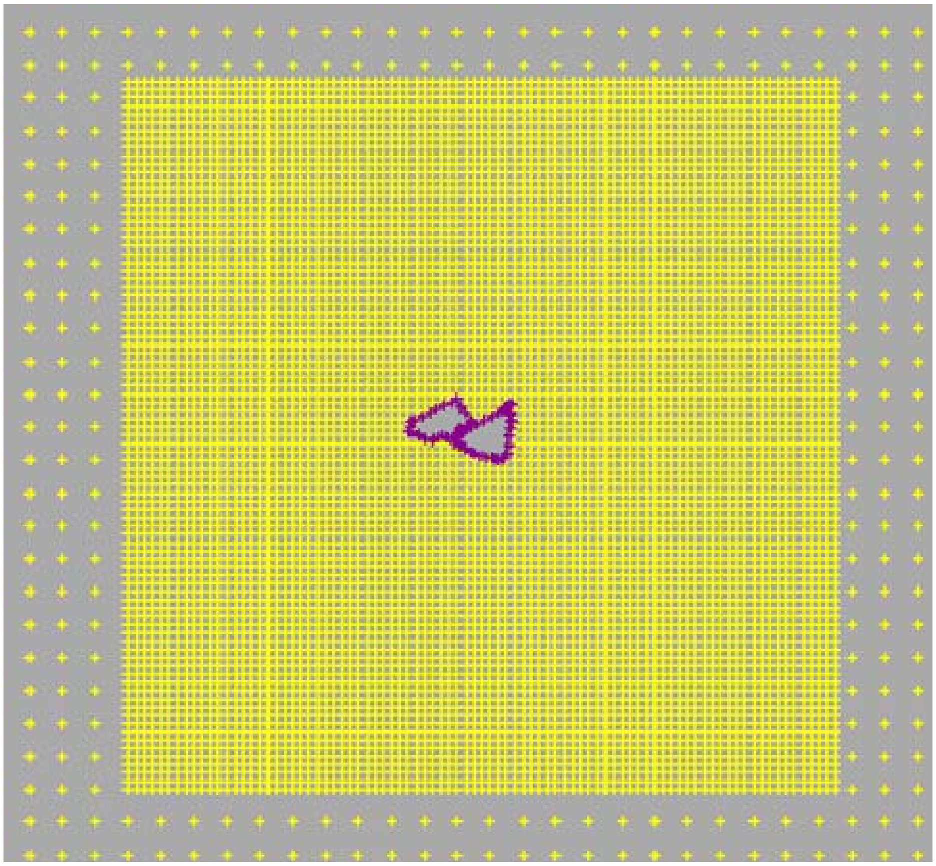


Figure 3-2 Receptor Grid (Zoom In)



3.6. BUILDING DOWNWASH

The emissions units were evaluated in terms of their proximity to nearby structures. The site buildings were digitized in the model using detailed project drawings. The purpose of the building downwash evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures, leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent.

All stacks modeled in this analysis were evaluated for cavity and wake effects from building downwash. The current version of the AERMOD dispersion model treats the trajectory of the plume near the building and uses the position of the plume relative to the building to calculate interactions with the building wake. AERMOD calculates fields of turbulence intensity, wind speed, and slopes of the mean streamlines as a function of the projected building dimensions.

The direction-specific building dimensions used as input to the AERMOD model were calculated using BPIP-PRIME (version 04274).[22] BPIP-PRIME is sanctioned by the U.S. EPA and is designed to incorporate the concepts and procedures expressed in the "Good Engineering Practice" (GEP) Technical Support document, the Building Downwash Guidance document, and other related documents.[23]

The BPIP program only considers downwash influences to facility stacks within a certain distance from that stack. If a stack is greater in distance than 5L from a building or structure (L being the lesser of the height or projected width of the building or structure), then the stack is not considered within the zone of downwash influence of the building or structure, and not evaluated within the analysis. .[24] A review of all buildings and structures for the Weymouth Compressor Station sources was conducted, and the appropriate buildings and structures were included in the modeling analysis.

3.7. GEP STACK HEIGHT ANALYSIS

The U.S. EPA has promulgated stack height regulations that restrict the use of stack heights in excess of GEP in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$$H_{GEP} = H + 1.5L \quad \text{(Eq. 3-1)}$$

Where:

H_{GEP}	=	Minimum GEP stack height	(meters)
H	=	Structure height	(meters)
L	=	Lesser dimension of the structure (height or projected width)	(meters)

The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP-PRIME. In general, the lowest GEP stack height for any source is 65 meters by default.[25] A source may construct a stack that exceeds GEP, but is limited to the GEP stack height in the air quality analysis demonstration. All proposed stacks at the Weymouth Compressor Station are less than 65 meters tall and therefore meet the requirements of GEP.

[22] U.S. EPA, *User's Guide to the Building Profile Input Program*, (Research Triangle Park, NC: U.S. EPA), EPA-454/R-93-038, Revised February 8, 1995.

[23] U.S. EPA, Office of Air Quality Planning and Standards, Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised), (Research Triangle Park, NC: U.S. EPA), EPA 450/4-80-023R, June 1985.

[24] https://dnr.mo.gov/env/apcp/docs/bldgdownwashandgep10-29-12.pdf

[25] 40 CFR §51.100(ii).

3.8. REPRESENTATION OF EMISSION SOURCES

3.8.1. Coordinate System

In all modeling analysis data files, the location of emission sources, structures, and receptors, are represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The datum for this modeling analysis is based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all reside within UTM Zone 19.

3.8.2. Source Types

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. In these air dispersion modeling analyses, all emission units were modeled as point sources except for the piping components and five catalytic space heaters. The piping components were modeled as two volume sources, one for the Weymouth Compressor Station and one for the existing M&R station, covering the general area where piping components are located because a volume source is the most representative way to characterize the gas potentially released from the numerous piping components located throughout the facility. The five catalytic space heaters vent into the compressor building. As such, these five heaters were modeled using six equally-spaced volume sources to divide the compressor building into approximately square portions and accurately represent the emissions from the heaters.

3.8.3. Source Parameters and Emission Rates

The source parameters and emissions utilized in this analysis are included in Attachment B. Intermittently operating sources located at the Weymouth Compressor Station (i.e., the emergency generator) were modeled in the 1-hour NO_2 and 1-hour sulfur dioxide (SO_2) modeling analyses at their long-term average emission rate in accordance with the March 1, 2011 U.S. EPA memo with regards to modeling of NO_2 and guidance provided by the MassDEP.

Modeling should contain sufficient detail to determine the maximum ambient concentration of the pollutant under consideration. As such, the modeling analysis for the proposed Weymouth Compressor Station and existing M&R station considered the combustion turbine operating at various loads. Algonquin included 50% and 100% load scenarios in this air dispersion modeling analysis. For each operating scenario, emission rates during normal, low temperature, and high temperature conditions were also evaluated. These scenarios encompass the variations in stack exit temperature and flow potentially resulting from reduced loading and varying temperatures. Specifically, Algonquin modeled the following scenarios:

- **Scenario 1** – Maximum Hourly "Normal" Operation under 100% load;
- **Scenario 2** – Maximum Hourly "Low Temperature" Operation under 100% load;
- **Scenario 3** – Maximum Hourly "High Temperature" Operation under 100% load;
- **Scenario 4** – Maximum Hourly "Normal" Operation under 50% load;
- **Scenario 5** – Maximum Hourly "Low Temperature" Operation under 50% load; and
- **Scenario 6** – Maximum Hourly "High Temperature" Operation under 50% load.

In this analysis, the "normal" operating condition represent an ambient air temperature of 46.65 degrees Fahrenheit (°F) which represents the annual average temperature at the proposed site location. The "low temperature" operating condition represents an ambient air temperature of -20 °F which is the assumed minimum temperature that would be recorded at the proposed site location. The "high temperature" operating condition represents an ambient air temperature of 100 °F which represent the high point of the temperature range for which manufacturer's data is available.

With respect to modeling 1-hour NO_2 for turbine "low temperature" operation (Scenarios 2 and 5), these scenarios represent intermittent emissions and are therefore assessed in accordance with the USEPA's March 1, 2011 memo entitled *"Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard"* guidance. For NO_2 emission rates, Algonquin has assumed that low temperature operations will occur for 12 hours per year in the potential emission calculations. As such, the calculated weighted average hourly low temperature emission rate is the low temperatures emission rate times 12/8760 (i.e., the fraction of the year that low temperature operation is assumed), with the normal emission rate occurring for the balance of the hours (8748/8760).

Since this averaging technique applies to NO_2 emission rates only, all other modeled emission rates represent maximum values for each scenario (i.e. averaging was not employed).

3.8.4. Regional Source Inventory

For any off-site impact calculated in the PSD Significance Analysis that is greater than the SIL for a given pollutant, a NAAQS analysis incorporating nearby sources is required. Algonquin and the MassDEP identified four nearby sources which could potentially significantly interact with the proposed Weymouth Compressor Station and existing M&R station as follows:

- Fore River Energy Center, located approximately 0.4 km south of the Weymouth Compressor Station;[26]
- Braintree Electric Light Department, located approximately 1.2 km south of the Weymouth Compressor Station;
- Twin Rivers Technologies, located approximately 0.4 km northwest of the Weymouth Compressor Station; and
- Massachusetts Water Resources Authority (MWRA) Sludge Processing Facility, located approximately 0.7 km southwest of the Weymouth Compressor Station.

As part of the updated analysis, Algonquin incorporated two (2) additional emissions sources, black start engines, at the Fore River Energy Center. The model inputs for these sources were based on modeling data provided by MassDEP via email on April 5, 2018 provided in Attachment C. Emission rates and stack parameters of regional sources were provided by the MassDEP and are also included in Attachment B.[27]

3.9. NO_2 MODELING APPROACH

Algonquin utilized the Ambient Ratio Method 2 (ARM2) for modeling NO_2. ARM2 is the EPA default AERMOD option designed to consider the conversion of nitrogen oxide (NO_X) emissions to NO_2 in the atmosphere. ARM2 derives an appropriate ambient ratio to apply to baseline Tier 1 modeling results, with a default maximum ratio value of 0.9 and a default minimum ratio of 0.5 applied.[28] .

[26] Updated sources, emission rates and stack parameters for Fore River Energy Center were provided by Mr. Glenn Pacheco (MassDEP) to Ms. Kate Brown (Enbridge) via email on April 5, 2018.
[27] Emails from Mr. Glenn Pacheco (MassDEP) to Ms. Susan Barnes (Trinity Consultants) on October 2 and 7, 2015.
[28] https://www3.epa.gov/ttn/scram/appendix_w-2016.htm

This section presents the results of the significant impact and NAAQS modeling analyses performed following the procedures outlined in Sections 2 and 3. Electronic input and output files for all AERMOD model runs are included in Attachment A.

4.1. SIGNIFICANT IMPACT ANALYSIS RESULTS

Emissions from the proposed Weymouth Compressor Station were modeled and compared to the appropriate SILs. The SILs are used to determine the level of impact associated with the station. This analysis was conducted to determine if refined NAAQS modeling analyses would be required.

The results of the Significant Impact Analysis are shown in Tables 4-1 through 4-12.[29]

[29] The modeled emissions from the project at Weymouth Compressor Station have not changed since the previous submittal of September 2016. In addition, the NAAQS analysis was completed using the full receptor grid and the impact of updated meteorological data on SIL modeling analysis is expected to be minimal. Therefore, the SIL modeling analysis is not being updated in this submission. MassDEP provided concurrence to this approach by an e-mail from Mr. Glenn Pachecho (MassDEP) to Enbridge and Trinity on May 14, 2018. .

Table 4-1. Modeling Results - PM_{10} 24-Hour Significance

Scenario	H1H Modeled Concentration (μg/m³)					SIL (μg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	2.6	2.3	2.2	2.3	2.3	5	Yes
#2 – 100% load, low temperature	2.6	2.3	2.1	2.3	2.3		Yes
#3 – 100% load, high temperature	2.3	2.0	2.1	2.0	2.1		Yes
#4 – 50% load, normal temperature	2.2	1.9	2.1	2.0	2.0		Yes
#5 – 50% load, low temperature	2.2	1.9	2.1	2.0	2.0		Yes
#6 – 50% load, high temperature	1.9	1.8	2.1	2.0	1.9		Yes

Table 4-2. Modeling Results – PM_{10} Annual Significance

Scenario	1st High Modeled Concentration (μg/m³)					SIL (μg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	0.3	0.4	0.3	0.3	0.4	5	Yes
#2 – 100% load, low temperature	0.3	0.4	0.3	0.3	0.4		Yes
#3 – 100% load, high temperature	0.3	0.4	0.3	0.3	0.3		Yes
#4 – 50% load, normal temperature	0.3	0.4	0.3	0.3	0.3		Yes
#5 – 50% load, low temperature	0.3	0.4	0.3	0.3	0.3		Yes
#6 – 50% load, high temperature	0.3	0.4	0.3	0.3	0.3		Yes

Table 4-3. Modeling Results – $PM_{2.5}$ 24-Hour Significance

Scenario/ Load	5-year Average H1H Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
#1 – 100% load, normal temperature	2.3	1.2	No
#2 – 100% load, low temperature	2.3		No
#3 – 100% load, high temperature	2.0		No
#4 – 50% load, normal temperature	2.0		No
#5 – 50% load, low temperature	1.9		No
#6 – 50% load, high temperature	1.9		No

Table 4-4. Modeling Results – $PM_{2.5}$ Annual Significance

Scenario/ Load	1st High Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
#1 – 100% load, normal temperature	0.35	0.3	No
#2 – 100% load, low temperature	0.35		No
#3 – 100% load, high temperature	0.33		No
#4 – 50% load, normal temperature	0.34		No
#5 – 50% load, low temperature	0.33		No
#6 – 50% load, high temperature	0.31		No

Table 4-5. Modeling Results – SO_2 1-Hour Significance

Scenario/ Load	5-year Average H1H Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
#1 – 100% load, normal temperature	6.5	7.8	Yes
#2 – 100% load, low temperature	6.5		Yes
#3 – 100% load, high temperature	5.6		Yes
#4 – 50% load, normal temperature	5.4		Yes
#5 – 50% load, low temperature	5.4		Yes
#6 – 50% load, high temperature	4.6		Yes

Table 4-6. Modeling Results – SO_2 3-Hour Significance

Scenario/ Load	H1H Modeled Concentration (µg/m³)					SIL (µg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	6.0	6.1	6.0	6.2	6.2	25	Yes
#2 – 100% load, low temperature	6.0	6.1	6.1	6.3	6.3		Yes
#3 – 100% load, high temperature	5.2	5.2	5.1	5.4	5.4		Yes
#4 – 50% load, normal temperature	5.0	5.0	5.0	5.2	5.2		Yes
#5 – 50% load, low temperature	4.9	5.0	4.9	5.1	5.1		Yes
#6 – 50% load, high temperature	4.3	4.2	4.2	4.4	4.4		Yes

Table 4-7. Modeling Results – SO_2 24-Hour Significance

Scenario/ Load	H1H Modeled Concentration (µg/m³)					SIL (µg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	5.5	4.9	4.5	4.9	4.9	5	No
#2 – 100% load, low temperature	5.4	4.9	4.5	4.9	4.9		No
#3 – 100% load, high temperature	4.7	4.2	4.0	4.3	4.3		Yes
#4 – 50% load, normal temperature	4.6	4.0	3.9	4.1	4.2		Yes
#5 – 50% load, low temperature	4.5	4.0	3.8	4.0	4.1		Yes
#6 – 50% load, high temperature	3.9	3.4	3.4	3.5	3.6		Yes

Table 4-8. Modeling Results – SO_2 Annual Significance

Scenario/ Load	1st High Modeled Concentration (µg/m³)					SIL (µg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	0.7	0.8	0.6	0.6	0.7	1	Yes
#2 – 100% load, low temperature	0.7	0.8	0.6	0.6	0.7		Yes
#3 – 100% load, high temperature	0.6	0.8	0.6	0.5	0.6		Yes
#4 – 50% load, normal temperature	0.6	0.8	0.6	0.5	0.6		Yes
#5 – 50% load, low temperature	0.6	0.8	0.6	0.5	0.6		Yes
#6 – 50% load, high temperature	0.6	0.7	0.5	0.5	0.6		Yes

Table 4-9. Modeling Results – NO_2 1-Hour Significance

Scenario/ Load	5-year Average H1H Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
#1 – 100% load, normal temperature	14.4	7.5	No
#2 – 100% load, low temperature	14.4		No
#3 – 100% load, high temperature	14.4		No
#4 – 50% load, normal temperature	14.4		No
#5 – 50% load, low temperature	14.4		No
#6 – 50% load, high temperature	14.4		No

Table 4-10. Modeling Results – NO_2 Annual Significance

Scenario/ Load	1st High Modeled Concentration (µg/m³)					SIL (µg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	1.5	2.0	1.4	1.3	1.6	1	No
#2 – 100% load, low temperature	1.5	2.0	1.5	1.4	1.6		No
#3 – 100% load, high temperature	1.4	1.9	1.4	1.3	1.5		No
#4 – 50% load, normal temperature	1.4	1.9	1.4	1.3	1.5		No
#5 – 50% load, low temperature	1.4	1.9	1.4	1.3	1.5		No
#6 – 50% load, high temperature	1.3	1.8	1.3	1.2	1.4		No

Table 4-11. Modeling Results – CO 1-Hour Significance

Scenario/ Load	H1H Modeled Concentration (µg/m³)					SIL (µg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	116.3	122.8	118.6	120.7	120.4	2,000	Yes
#2 – 100% load, low temperature	116.3	122.8	118.6	120.7	120.4		Yes
#3 – 100% load, high temperature	116.3	122.8	118.6	120.7	120.4		Yes
#4 – 50% load, normal temperature	116.3	122.8	118.6	120.7	120.4		Yes
#5 – 50% load, low temperature	116.3	122.8	118.6	120.7	120.4		Yes
#6 – 50% load, high temperature	116.3	122.8	118.6	120.7	120.4		Yes

Table 4-12. Modeling Results – CO 8-Hour Significance

Scenario/ Load	H1H Modeled Concentration (μg/m³)					SIL (μg/m³)	Below SIL?
	2009	2010	2011	2012	2013		
#1 – 100% load, normal temperature	93.0	79.8	89.3	95.8	101.0	500	Yes
#2 – 100% load, low temperature	93.0	79.8	89.3	95.8	101.0		Yes
#3 – 100% load, high temperature	93.0	79.8	89.3	95.8	101.0		Yes
#4 – 50% load, normal temperature	93.0	79.8	89.3	95.8	101.0		Yes
#5 – 50% load, low temperature	93.0	79.8	89.3	95.8	101.0		Yes
#6 – 50% load, high temperature	93.0	79.8	89.3	95.8	101.0		Yes

As shown above in Tables 4-1 through 4-12, the maximum modeled impacts were above the SILs for 1-hour and annual NO_2, 24-hour SO_2 and 24-hour and annual $PM_{2.5}$. As such, a NAAQS analysis was conducted for all applicable averaging periods for these pollutants. The regional source inventories used in these analyses are included in Attachment B.

4.2. ISOPLETHS

MassDEP modeling guidance requires maps with 1 microgram per cubic meter (µg/m^3) annual average isopleths for SO_2, $PM_{2.5}$ and NO_2 to help identify Section 107 areas where minor source baseline would be triggered. SO_2 and $PM_{2.5}$ annual modeling for the proposed Weymouth Compressor Station did not result in any concentrations greater than 1 µg/m^3. Therefore, no isopleths were created for SO_2 or $PM_{2.5}$. NO_2 annual modeling for the proposed Weymouth Compressor Station resulted in too few receptors with concentrations greater than 1 µg/m^3 to make an isopleth. Therefore, the figures below show the receptors with annual average NO_2 concentrations greater than 1 µg/m^3 for the worst-case year from each scenario for the modeling analyses conducted for the Weymouth Compressor Station. The exceeding receptors are displayed in yellow and the corresponding concentration is indicated. The fence-line, sources, and buildings at the proposed Weymouth Compressor Station and existing M&R station are displayed in white.

Figure 4-1. Scenario 1 Annual NO_2 Receptors Greater than 1 µg/m³ (2010)

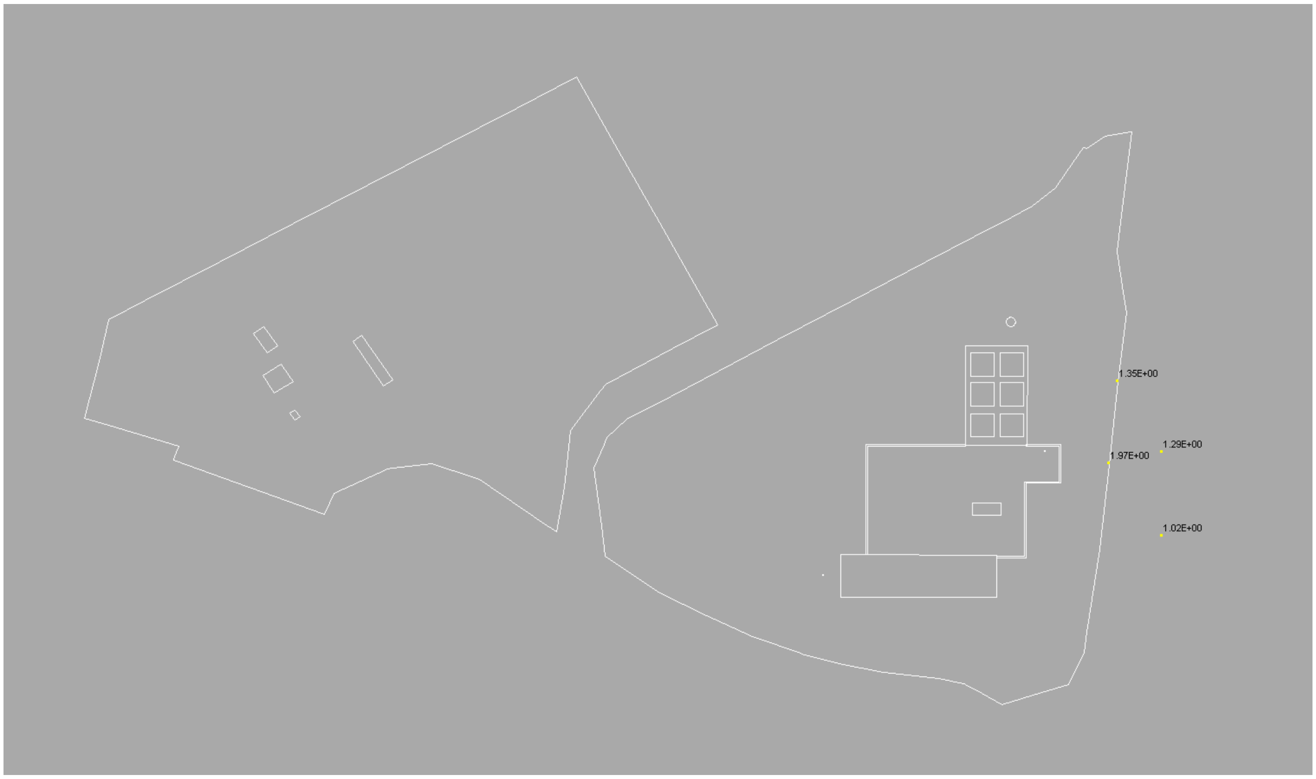


Figure 4-2. Scenario 2 Annual NO_2 Receptors Greater than 1 µg/m³ (2010)

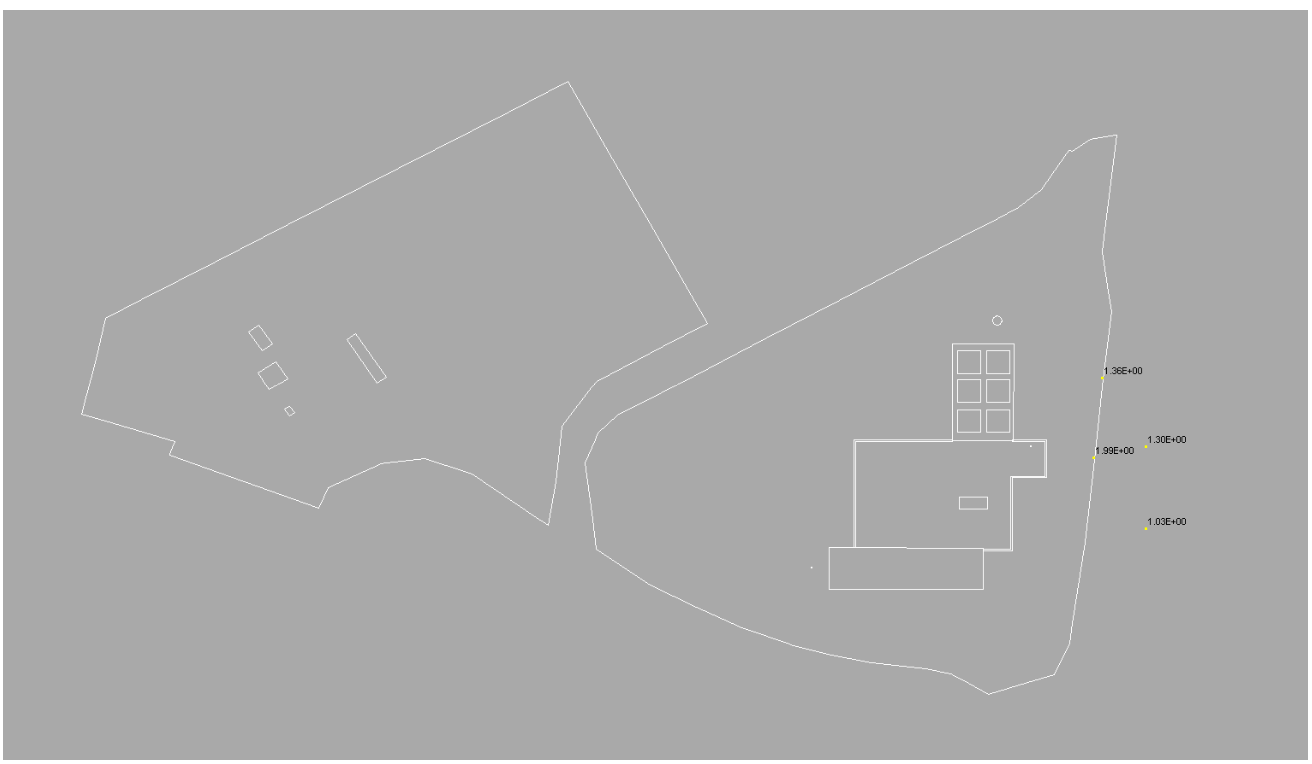


Figure 4-3. Scenario 3 Annual NO_2 Receptors Greater than 1 µg/m³ (2010)

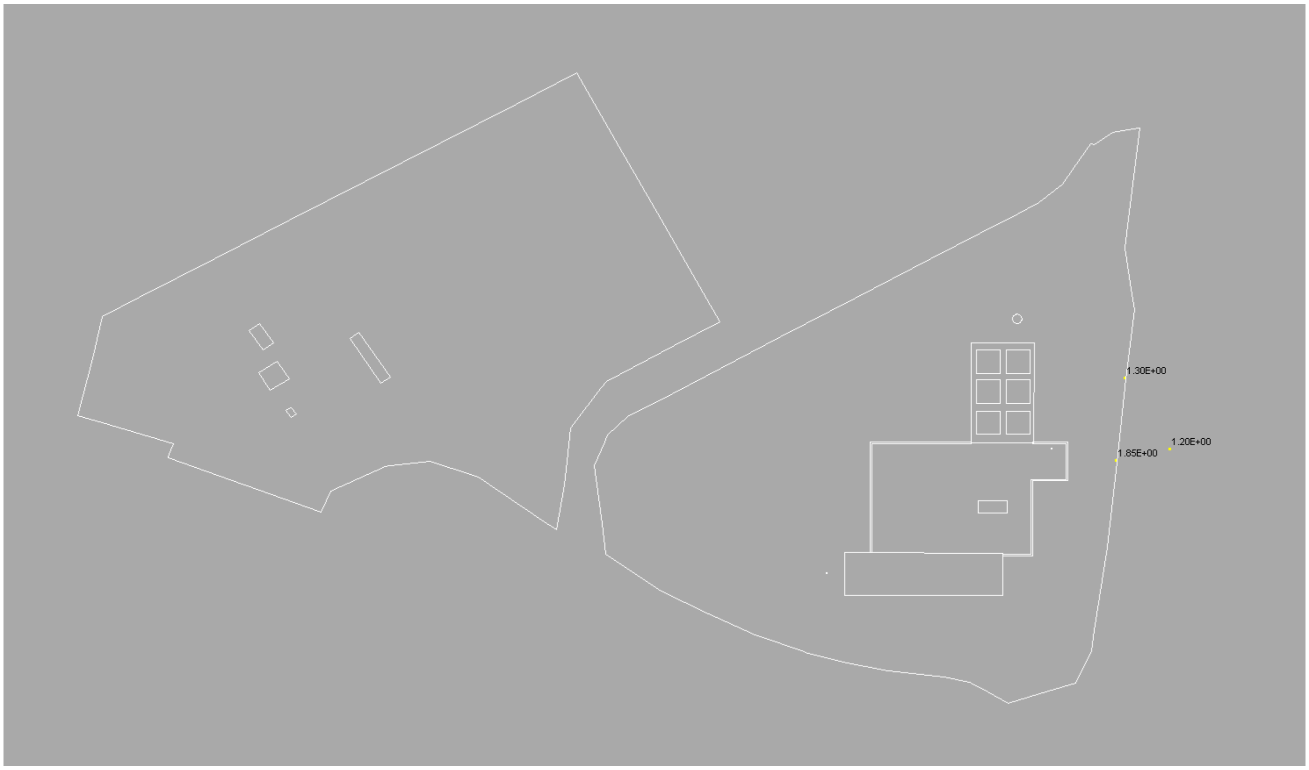


Figure 4-4. Scenario 4 Annual NO_2 Receptors Greater than 1 µg/m³ (2010)

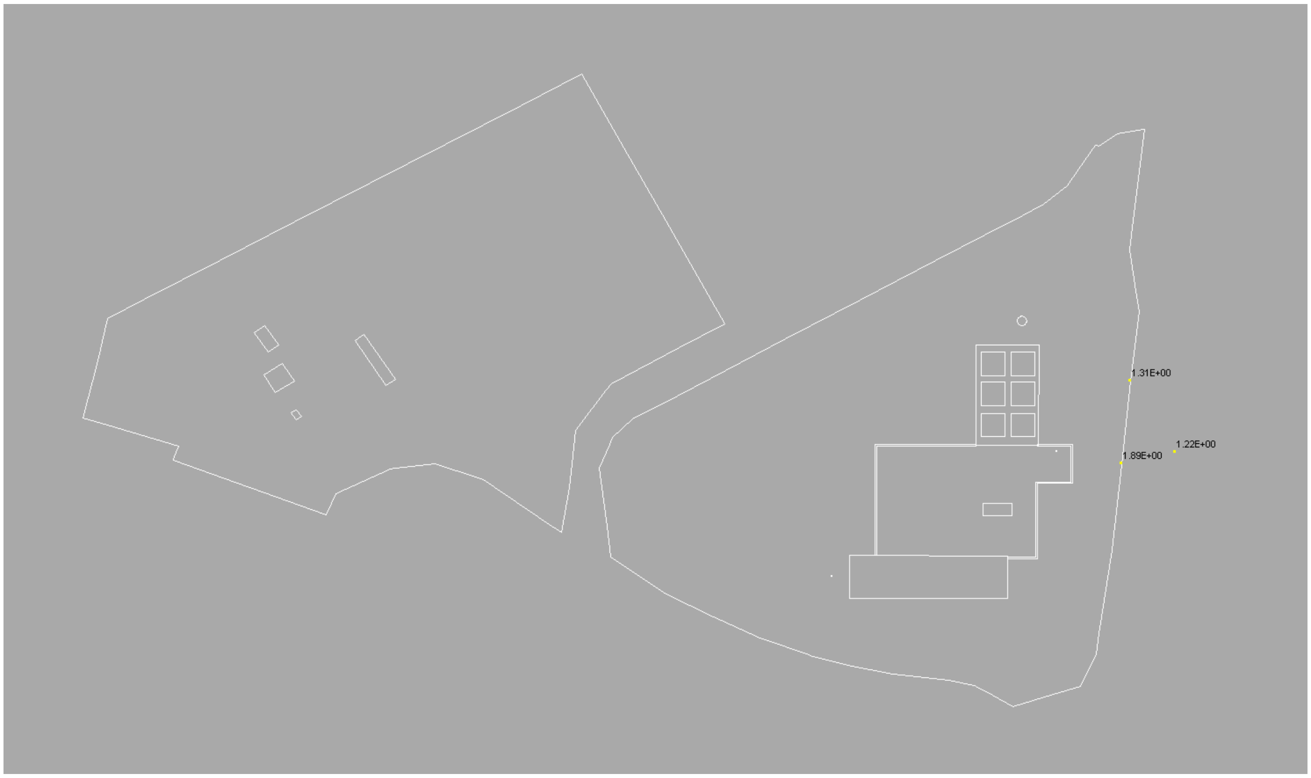


Figure 4-5. Scenario 5 Annual NO_2 Receptors Greater than 1 μg/m³ (2010)

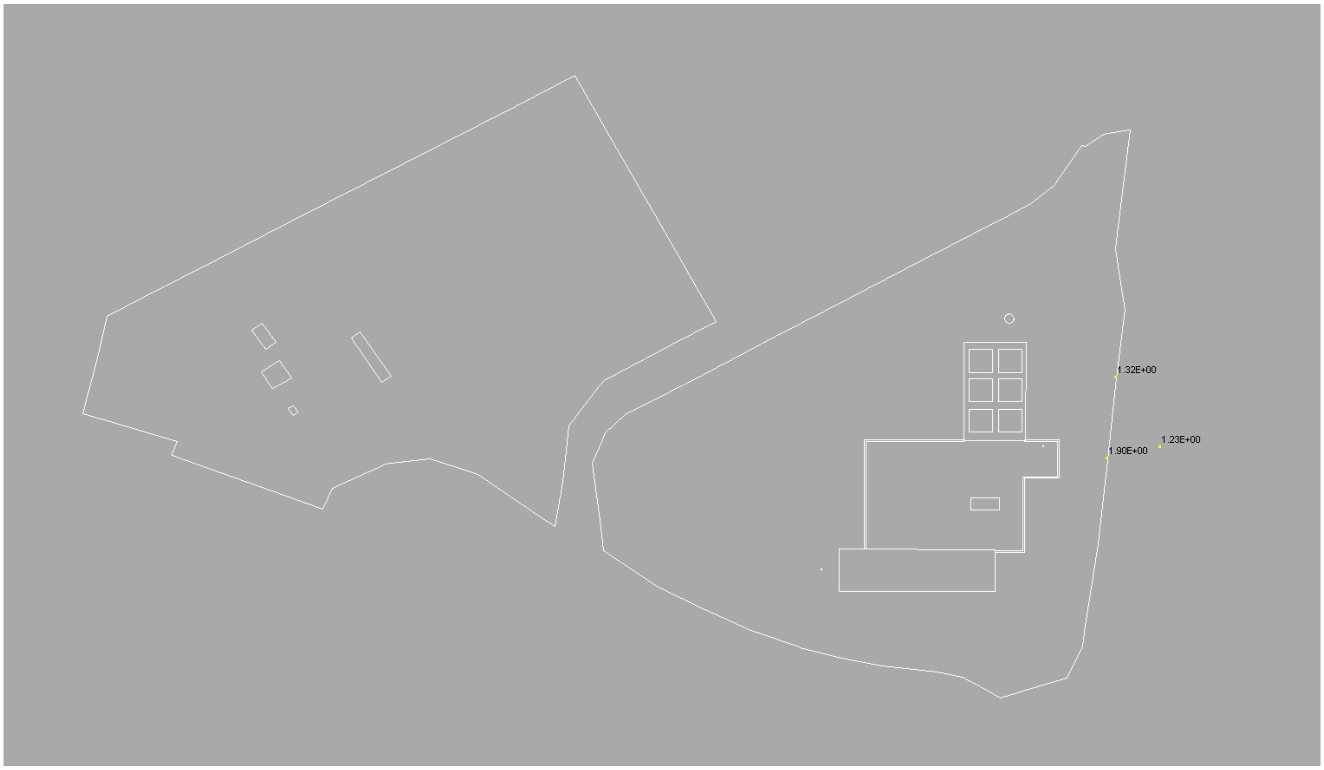
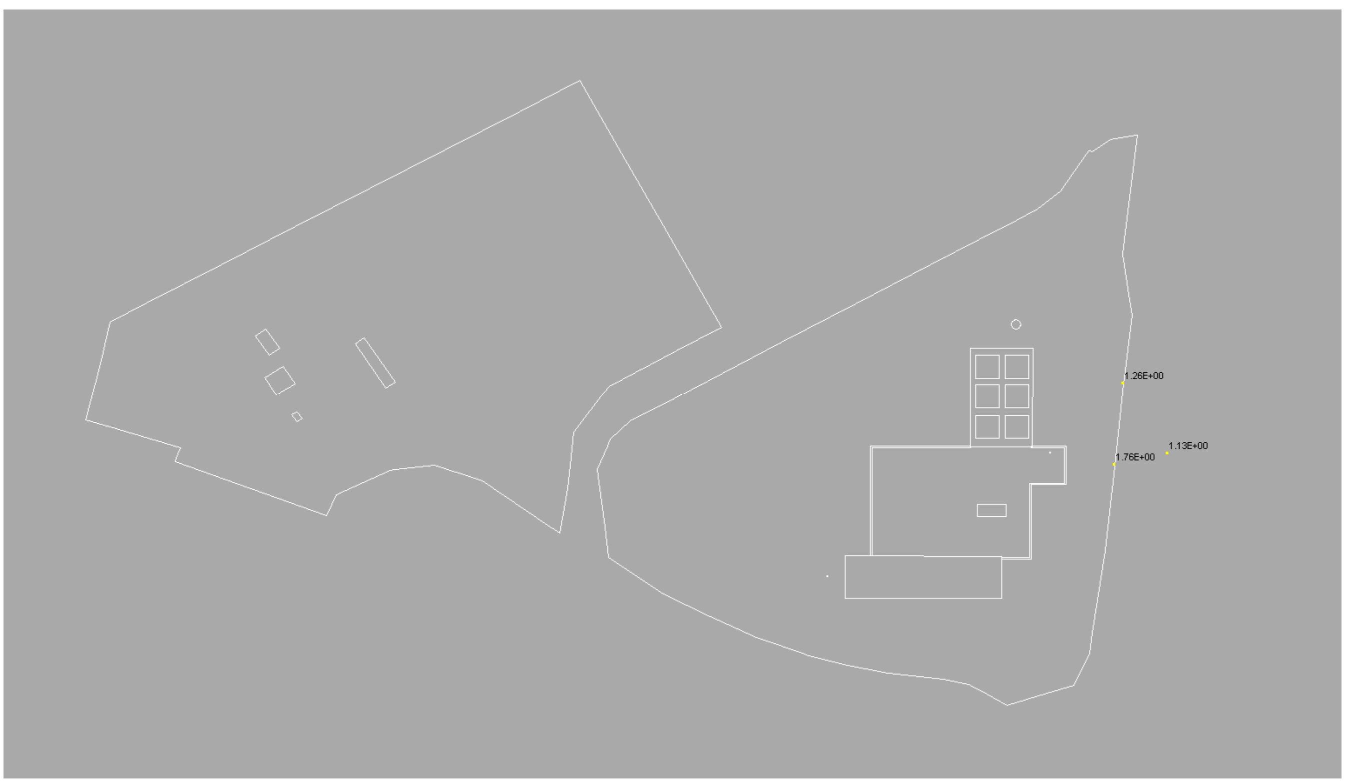


Figure 4-6. Scenario 6 Annual NO_2 Receptors Greater than 1 μg/m³ (2010)



4.3. NAAQS ANALYSIS RESULTS

The results of the NAAQS analysis are provided in Tables 4-13 to 4-17.

Table 4-13. Modeling Results – $PM_{2.5}$ 24-Hour NAAQS

Scenario/ Load	5-year Average H8H Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Below NAAQS?
#1 – 100% load, normal temperature	7.13	15.3	22.43	35	Yes
#2 – 100% load, low temperature	7.13		22.43		Yes
#3 – 100% load, high temperature	7.13		22.43		Yes
#4 – 50% load, normal temperature	7.13		22.43		Yes
#5 – 50% load, low temperature	7.13		22.43		Yes
#6 – 50% load, high temperature	7.13		22.43		Yes

Table 4-14. Modeling Results – $PM_{2.5}$ Annual NAAQS

Scenario/ Load	5-year Average Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Below NAAQS?
#1 – 100% load, normal temperature	1.47	6.5	7.97	12	Yes
#2 – 100% load, low temperature	1.47		7.97		Yes
#3 – 100% load, high temperature	1.47		7.97		Yes
#4 – 50% load, normal temperature	1.47		7.97		Yes
#5 – 50% load, low temperature	1.47		7.97		Yes
#6 – 50% load, high temperature	1.47		7.97		Yes

Table 4-15. Modeling Results - SO_2 24-hour NAAQS

Scenario/ Load	H2H Modeled Concentration (µg/m³)						Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Below NAAQS?
	2012	2013	2014	2015	2016	Max.				
#1 – 100% load, normal temperature	18.41	16.05	16.21	16.75	16.59	18.41	13.40	31.81	365	Yes
#2 – 100% load, low temperature	18.41	16.06	16.21	16.76	16.55	18.41		31.81		Yes
#3 – 100% load, high temperature	17.81	15.35	15.70	16.63	16.50	17.81		31.21		Yes
#4 – 50% load, normal temperature	17.75	15.49	15.68	16.62	16.51	17.75		31.15		Yes
#5 – 50% load, low temperature	17.64	15.33	15.68	16.61	16.50	17.64		31.04		Yes
#6 – 50% load, high temperature	17.20	15.36	15.59	16.50	16.47	17.20		30.60		Yes

Table 4-16. Modeling Results – NO_2 1-Hour NAAQS

Scenario/ Load	5-year Average H8H Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Below NAAQS?
#1 – 100% load, normal temperature	81.41	94.63	176.04	188	Yes
#2 – 100% load, low temperature	81.41		176.04		Yes
#3 – 100% load, high temperature	81.41		176.04		Yes
#4 – 50% load, normal temperature	81.41		176.04		Yes
#5 – 50% load, low temperature	81.41		176.04		Yes
#6 – 50% load, high temperature	81.40		176.03		Yes

Table 4-17. Modeling Results – NO_2 Annual NAAQS

Scenario/ Load	1st High Modeled Concentration (µg/m³)						Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Below NAAQS?
	2012	2013	2014	2015	2016	Max.				
#1 – 100% load, normal temperature	8.29	8.52	8.49	7.84	8.21	8.52	32.88	41.40	100	Yes
#2 – 100% load, low temperature	8.29	8.52	8.49	7.85	8.21	8.52		41.40		Yes
#3 – 100% load, high temperature	8.28	8.51	8.48	7.84	8.20	8.51		41.39		Yes
#4 – 50% load, normal temperature	8.29	8.51	8.49	7.84	8.21	8.51		41.39		Yes
#5 – 50% load, low temperature	8.29	8.51	8.49	7.84	8.21	8.51		41.39		Yes
#6 – 50% load, high temperature	8.28	8.50	8.48	7.84	8.20	8.50		41.38		Yes

The results of the analysis indicate that the predicted ambient impacts from the proposed Weymouth Compressor Station and existing M&R station, combined with the regional sources identified by the MassDEP as potentially significantly interacting with the emissions from the facility are lower than the NAAQS for $PM_{2.5}$, SO_2 and NO_2.

4.4. TOXICS ANALYSIS RESULTS

The results of the toxics modeling analysis are provided in Tables 4-18 through 4-23 below.

Table 4-18. Modeling Results - Toxics Analysis - Scenario 1

Regulated Pollutant	Averaging Period	Limit (µg/m³)	Modeled Concentration (µg/m³)	Below limit?	Percent (%)
Acetaldehyde	24-hour	30.00	6.01E-02	Yes	0.2%
Acrolein		0.07	3.71E-02	Yes	53.0%
Benzene		0.60	2.17E-01	Yes	36.2%
1,3-Butadiene		1.20	1.93E-03	Yes	0.2%
Carbon Tetrachloride		85.52	2.60E-04	Yes	0.0%
Chlorobenzene		93.88	2.20E-04	Yes	0.0%
Chloroform		132.76	2.10E-04	Yes	0.0%
Dichloromethane (Methylene Chloride)		100.00	1.40E-04	Yes	0.0%
Diphenyl (Biphenyl)		0.34	1.53E-03	Yes	0.5%
Ethylbenzene		300.00	7.87E-02	Yes	0.0%
Formaldehyde		2.00	3.86E-01	Yes	19.3%
Methanol		7.13	1.80E-02	Yes	0.3%
2-Methylnaphthalene		14.25	2.40E-04	Yes	0.0%
Naphthalene		14.25	1.28E-03	Yes	0.0%
Phenol		52.33	1.70E-04	Yes	0.0%
Propylene Oxide		6.00	2.09E-02	Yes	0.3%
Styrene		200.00	1.70E-04	Yes	0.0%
1,1,2,2-Tetrachloroethane		18.67	3.10E-04	Yes	0.0%
Toluene		80.00	5.60E-01	Yes	0.7%
1,1,2-Trichloroethane		14.84	2.30E-04	Yes	0.0%
Vinyl Chloride		3.47	1.10E-04	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	7.86E-01	Yes	6.7%
Acetaldehyde	Annual	0.40	7.99E-03	Yes	2.0%
Acrolein		0.07	4.92E-03	Yes	7.0%
Benzene		0.10	4.26E-02	Yes	42.6%
1,3-Butadiene		0.00	2.60E-04	Yes	8.7%
Carbon Tetrachloride		0.07	4.00E-05	Yes	0.1%
Chlorobenzene		6.26	3.00E-05	Yes	0.0%
Chloroform		0.04	3.00E-05	Yes	0.1%
Dichloromethane (Methylene Chloride)		60.00	2.00E-05	Yes	0.0%
Diphenyl (Biphenyl)		0.09	2.00E-04	Yes	0.2%
Ethylbenzene		300.00	1.53E-02	Yes	0.0%
Formaldehyde		0.08	5.54E-02	Yes	69.3%
Methanol		7.13	2.39E-03	Yes	0.0%
2-Methylnaphthalene		14.25	3.00E-05	Yes	0.0%
Naphthalene		14.25	2.10E-04	Yes	0.0%
Phenol		52.33	2.00E-05	Yes	0.0%
Propylene Oxide		0.30	2.15E-03	Yes	0.7%
Styrene		2.00	2.00E-05	Yes	0.0%
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	Yes	0.2%
Toluene		20.00	1.10E-01	Yes	0.6%
1,1,2-Trichloroethane		0.06	3.00E-05	Yes	0.1%
Vinyl Chloride		0.38	1.00E-05	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	1.53E-01	Yes	1.3%

Table 4-19. Modeling Results - Toxics Analysis - Scenario 2

Regulated Pollutant	Averaging Period	Limit (µg/m³)	Modeled Concentration (µg/m³)	Below limit?	Percent (%)
Acetaldehyde	24-hour	30.00	6.01E-02	Yes	0.2%
Acrolein		0.07	3.71E-02	Yes	53.0%
Benzene		0.60	2.17E-01	Yes	36.2%
1,3-Butadiene		1.20	1.93E-03	Yes	0.2%
Carbon Tetrachloride		85.52	2.60E-04	Yes	0.0%
Chlorobenzene		93.88	2.20E-04	Yes	0.0%
Chloroform		132.76	2.10E-04	Yes	0.0%
Dichloromethane (Methylene Chloride)		100.00	1.40E-04	Yes	0.0%
Diphenyl (Biphenyl)		0.34	1.53E-03	Yes	0.5%
Ethylbenzene		300.00	7.87E-02	Yes	0.0%
Formaldehyde		2.00	3.86E-01	Yes	19.3%
Methanol		7.13	1.80E-02	Yes	0.3%
2-Methylnaphthalene		14.25	2.40E-04	Yes	0.0%
Naphthalene		14.25	2.91E-03	Yes	0.0%
Phenol		52.33	1.70E-04	Yes	0.0%
Propylene Oxide		6.00	6.37E-02	Yes	1.1%
Styrene		200.00	1.70E-04	Yes	0.0%
1,1,2,2-Tetrachloroethane		18.67	3.10E-04	Yes	0.0%
Toluene		80.00	5.60E-01	Yes	0.7%
1,1,2-Trichloroethane		14.84	2.30E-04	Yes	0.0%
Vinyl Chloride		3.47	1.10E-04	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	7.86E-01	Yes	6.7%
Acetaldehyde	Annual	0.40	8.04E-03	Yes	2.0%
Acrolein		0.07	4.94E-03	Yes	7.1%
Benzene		0.10	4.27E-02	Yes	42.7%
1,3-Butadiene		0.00	2.60E-04	Yes	8.7%
Carbon Tetrachloride		0.07	4.00E-05	Yes	0.1%
Chlorobenzene		6.26	3.00E-05	Yes	0.0%
Chloroform		0.04	3.00E-05	Yes	0.1%
Dichloromethane (Methylene Chloride)		60.00	2.00E-05	Yes	0.0%
Diphenyl (Biphenyl)		0.09	2.00E-04	Yes	0.2%
Ethylbenzene		300.00	1.55E-02	Yes	0.0%
Formaldehyde		0.08	5.56E-02	Yes	69.5%
Methanol		7.13	2.39E-03	Yes	0.0%
2-Methylnaphthalene		14.25	3.00E-05	Yes	0.0%
Naphthalene		14.25	3.70E-04	Yes	0.0%
Phenol		52.33	2.00E-05	Yes	0.0%
Propylene Oxide		0.30	6.43E-03	Yes	2.1%
Styrene		2.00	2.00E-05	Yes	0.0%
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	Yes	0.2%
Toluene		20.00	1.11E-01	Yes	0.6%
1,1,2-Trichloroethane		0.06	3.00E-05	Yes	0.1%
Vinyl Chloride		0.38	1.00E-05	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	1.54E-01	Yes	1.3%

Table 4-20. Modeling Results - Toxics Analysis - Scenario 3

Regulated Pollutant	Averaging Period	Limit (µg/m³)	Modeled Concentration (µg/m³)	Below limit?	Percent (%)
Acetaldehyde	24-hour	30.00	6.01E-02	Yes	0.2%
Acrolein		0.07	3.71E-02	Yes	53.0%
Benzene		0.60	2.17E-01	Yes	36.2%
1,3-Butadiene		1.20	1.93E-03	Yes	0.2%
Carbon Tetrachloride		85.52	2.60E-04	Yes	0.0%
Chlorobenzene		93.88	2.20E-04	Yes	0.0%
Chloroform		132.76	2.10E-04	Yes	0.0%
Dichloromethane (Methylene Chloride)		100.00	1.40E-04	Yes	0.0%
Diphenyl (Biphenyl)		0.34	1.53E-03	Yes	0.5%
Ethylbenzene		300.00	7.87E-02	Yes	0.0%
Formaldehyde		2.00	3.86E-01	Yes	19.3%
Methanol		7.13	1.80E-02	Yes	0.3%
2-Methylnaphthalene		14.25	2.40E-04	Yes	0.0%
Naphthalene		14.25	1.28E-03	Yes	0.0%
Phenol		52.33	1.70E-04	Yes	0.0%
Propylene Oxide		6.00	1.71E-02	Yes	0.3%
Styrene		200.00	1.70E-04	Yes	0.0%
1,1,2,2-Tetrachloroethane		18.67	3.10E-04	Yes	0.0%
Toluene		80.00	5.60E-01	Yes	0.7%
1,1,2-Trichloroethane		14.84	2.30E-04	Yes	0.0%
Vinyl Chloride		3.47	1.10E-04	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	7.86E-01	Yes	6.7%
Acetaldehyde	Annual	0.40	7.99E-03	Yes	2.0%
Acrolein		0.07	4.92E-03	Yes	7.0%
Benzene		0.10	4.26E-02	Yes	42.6%
1,3-Butadiene		0.00	2.60E-04	Yes	8.7%
Carbon Tetrachloride		0.07	4.00E-05	Yes	0.1%
Chlorobenzene		6.26	3.00E-05	Yes	0.0%
Chloroform		0.04	3.00E-05	Yes	0.1%
Dichloromethane (Methylene Chloride)		60.00	2.00E-05	Yes	0.0%
Diphenyl (Biphenyl)		0.09	2.00E-04	Yes	0.2%
Ethylbenzene		300.00	1.53E-02	Yes	0.0%
Formaldehyde		0.08	5.54E-02	Yes	69.3%
Methanol		7.13	2.39E-03	Yes	0.0%
2-Methylnaphthalene		14.25	3.00E-05	Yes	0.0%
Naphthalene		14.25	2.10E-04	Yes	0.0%
Phenol		52.33	2.00E-05	Yes	0.0%
Propylene Oxide		0.30	1.86E-03	Yes	0.6%
Styrene		2.00	2.00E-05	Yes	0.0%
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	Yes	0.2%
Toluene		20.00	1.10E-01	Yes	0.6%
1,1,2-Trichloroethane		0.06	3.00E-05	Yes	0.1%
Vinyl Chloride		0.38	1.00E-05	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	1.53E-01	Yes	1.3%

Table 4-21. Modeling Results - Toxics Analysis - Scenario 4

Regulated Pollutant	Averaging Period	Limit (µg/m³)	Modeled Concentration (µg/m³)	Below limit?	Percent (%)
Acetaldehyde	24-hour	30.00	6.01E-02	Yes	0.2%
Acrolein		0.07	3.71E-02	Yes	53.0%
Benzene		0.60	2.17E-01	Yes	36.2%
1,3-Butadiene		1.20	1.93E-03	Yes	0.2%
Carbon Tetrachloride		85.52	2.60E-04	Yes	0.0%
Chlorobenzene		93.88	2.20E-04	Yes	0.0%
Chloroform		132.76	2.10E-04	Yes	0.0%
Dichloromethane (Methylene Chloride)		100.00	1.40E-04	Yes	0.0%
Diphenyl (Biphenyl)		0.34	1.53E-03	Yes	0.5%
Ethylbenzene		300.00	7.87E-02	Yes	0.0%
Formaldehyde		2.00	3.86E-01	Yes	19.3%
Methanol		7.13	1.80E-02	Yes	0.3%
2-Methylnaphthalene		14.25	2.40E-04	Yes	0.0%
Naphthalene		14.25	1.28E-03	Yes	0.0%
Phenol		52.33	1.70E-04	Yes	0.0%
Propylene Oxide		6.00	1.64E-02	Yes	0.3%
Styrene		200.00	1.70E-04	Yes	0.0%
1,1,2,2-Tetrachloroethane		18.67	3.10E-04	Yes	0.0%
Toluene		80.00	5.60E-01	Yes	0.7%
1,1,2-Trichloroethane		14.84	2.30E-04	Yes	0.0%
Vinyl Chloride		3.47	1.10E-04	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	7.86E-01	Yes	6.7%
Acetaldehyde	Annual	0.40	7.99E-03	Yes	2.0%
Acrolein		0.07	4.92E-03	Yes	7.0%
Benzene		0.10	4.26E-02	Yes	42.6%
1,3-Butadiene		0.00	2.60E-04	Yes	8.7%
Carbon Tetrachloride		0.07	4.00E-05	Yes	0.1%
Chlorobenzene		6.26	3.00E-05	Yes	0.0%
Chloroform		0.04	3.00E-05	Yes	0.1%
Dichloromethane (Methylene Chloride)		60.00	2.00E-05	Yes	0.0%
Diphenyl (Biphenyl)		0.09	2.00E-04	Yes	0.2%
Ethylbenzene		300.00	1.53E-02	Yes	0.0%
Formaldehyde		0.08	5.54E-02	Yes	69.3%
Methanol		7.13	2.39E-03	Yes	0.0%
2-Methylnaphthalene		14.25	3.00E-05	Yes	0.0%
Naphthalene		14.25	2.10E-04	Yes	0.0%
Phenol		52.33	2.00E-05	Yes	0.0%
Propylene Oxide		0.30	1.90E-03	Yes	0.6%
Styrene		2.00	2.00E-05	Yes	0.0%
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	Yes	0.2%
Toluene		20.00	1.10E-01	Yes	0.6%
1,1,2-Trichloroethane		0.06	3.00E-05	Yes	0.1%
Vinyl Chloride		0.38	1.00E-05	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	1.53E-01	Yes	1.3%

Table 4-22. Modeling Results - Toxics Analysis - Scenario 5

Regulated Pollutant	Averaging Period	Limit (µg/m³)	Modeled Concentration (µg/m³)	Below limit?	Percent (%)
Acetaldehyde	24-hour	30.00	6.01E-02	Yes	0.2%
Acrolein		0.07	3.71E-02	Yes	53.0%
Benzene		0.60	2.17E-01	Yes	36.2%
1,3-Butadiene		1.20	1.93E-03	Yes	0.2%
Carbon Tetrachloride		85.52	2.60E-04	Yes	0.0%
Chlorobenzene		93.88	2.20E-04	Yes	0.0%
Chloroform		132.76	2.10E-04	Yes	0.0%
Dichloromethane (Methylene Chloride)		100.00	1.40E-04	Yes	0.0%
Diphenyl (Biphenyl)		0.34	1.53E-03	Yes	0.5%
Ethylbenzene		300.00	7.87E-02	Yes	0.0%
Formaldehyde		2.00	3.86E-01	Yes	19.3%
Methanol		7.13	1.80E-02	Yes	0.3%
2-Methylnaphthalene		14.25	2.40E-04	Yes	0.0%
Naphthalene		14.25	2.29E-03	Yes	0.0%
Phenol		52.33	1.70E-04	Yes	0.0%
Propylene Oxide		6.00	4.97E-02	Yes	0.8%
Styrene		200.00	1.70E-04	Yes	0.0%
1,1,2,2-Tetrachloroethane		18.67	3.10E-04	Yes	0.0%
Toluene		80.00	5.60E-01	Yes	0.7%
1,1,2-Trichloroethane		14.84	2.30E-04	Yes	0.0%
Vinyl Chloride		3.47	1.10E-04	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	7.86E-01	Yes	6.7%
Acetaldehyde	Annual	0.40	8.04E-03	Yes	2.0%
Acrolein		0.07	4.94E-03	Yes	7.1%
Benzene		0.10	4.26E-02	Yes	42.6%
1,3-Butadiene		0.00	2.60E-04	Yes	8.7%
Carbon Tetrachloride		0.07	4.00E-05	Yes	0.1%
Chlorobenzene		6.26	3.00E-05	Yes	0.0%
Chloroform		0.04	3.00E-05	Yes	0.1%
Dichloromethane (Methylene Chloride)		60.00	2.00E-05	Yes	0.0%
Diphenyl (Biphenyl)		0.09	2.00E-04	Yes	0.2%
Ethylbenzene		300.00	1.55E-02	Yes	0.0%
Formaldehyde		0.08	5.56E-02	Yes	69.5%
Methanol		7.13	2.39E-03	Yes	0.0%
2-Methylnaphthalene		14.25	3.00E-05	Yes	0.0%
Naphthalene		14.25	3.20E-04	Yes	0.0%
Phenol		52.33	2.00E-05	Yes	0.0%
Propylene Oxide		0.30	5.45E-03	Yes	1.8%
Styrene		2.00	2.00E-05	Yes	0.0%
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	Yes	0.2%
Toluene		20.00	1.11E-01	Yes	0.6%
1,1,2-Trichloroethane		0.06	3.00E-05	Yes	0.1%
Vinyl Chloride		0.38	1.00E-05	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	1.54E-01	Yes	1.3%

Table 4-23. Modeling Results - Toxics Analysis - Scenario 6

Regulated Pollutant	Averaging Period	Limit (µg/m³)	Modeled Concentration (µg/m³)	Below limit?	Percent (%)
Acetaldehyde	24-hour	30.00	6.01E-02	Yes	0.2%
Acrolein		0.07	3.71E-02	Yes	53.0%
Benzene		0.60	2.17E-01	Yes	36.2%
1,3-Butadiene		1.20	1.93E-03	Yes	0.2%
Carbon Tetrachloride		85.52	2.60E-04	Yes	0.0%
Chlorobenzene		93.88	2.20E-04	Yes	0.0%
Chloroform		132.76	2.10E-04	Yes	0.0%
Dichloromethane (Methylene Chloride)		100.00	1.40E-04	Yes	0.0%
Diphenyl (Biphenyl)		0.34	1.53E-03	Yes	0.5%
Ethylbenzene		300.00	7.87E-02	Yes	0.0%
Formaldehyde		2.00	3.86E-01	Yes	19.3%
Methanol		7.13	1.80E-02	Yes	0.3%
2-Methylnaphthalene		14.25	2.40E-04	Yes	0.0%
Naphthalene		14.25	1.28E-03	Yes	0.0%
Phenol		52.33	1.70E-04	Yes	0.0%
Propylene Oxide		6.00	1.33E-02	Yes	0.2%
Styrene		200.00	1.70E-04	Yes	0.0%
1,1,2,2-Tetrachloroethane		18.67	3.10E-04	Yes	0.0%
Toluene		80.00	5.60E-01	Yes	0.7%
1,1,2-Trichloroethane		14.84	2.30E-04	Yes	0.0%
Vinyl Chloride		3.47	1.10E-04	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	7.86E-01	Yes	6.7%
Acetaldehyde	Annual	0.40	7.99E-03	Yes	2.0%
Acrolein		0.07	4.92E-03	Yes	7.0%
Benzene		0.10	4.26E-02	Yes	42.6%
1,3-Butadiene		0.00	2.60E-04	Yes	8.7%
Carbon Tetrachloride		0.07	4.00E-05	Yes	0.1%
Chlorobenzene		6.26	3.00E-05	Yes	0.0%
Chloroform		0.04	3.00E-05	Yes	0.1%
Dichloromethane (Methylene Chloride)		60.00	2.00E-05	Yes	0.0%
Diphenyl (Biphenyl)		0.09	2.00E-04	Yes	0.2%
Ethylbenzene		300.00	1.53E-02	Yes	0.0%
Formaldehyde		0.08	5.54E-02	Yes	69.3%
Methanol		7.13	2.39E-03	Yes	0.0%
2-Methylnaphthalene		14.25	3.00E-05	Yes	0.0%
Naphthalene		14.25	2.10E-04	Yes	0.0%
Phenol		52.33	2.00E-05	Yes	0.0%
Propylene Oxide		0.30	1.61E-03	Yes	0.5%
Styrene		2.00	2.00E-05	Yes	0.0%
1,1,2,2-Tetrachloroethane		0.02	4.00E-05	Yes	0.2%
Toluene		20.00	1.10E-01	Yes	0.6%
1,1,2-Trichloroethane		0.06	3.00E-05	Yes	0.1%
Vinyl Chloride		0.38	1.00E-05	Yes	0.0%
Xylenes (m-,o-,p- isomers)		11.80	1.53E-01	Yes	1.3%

As shown in Tables 4-18 through 4-23, maximum modeled concentrations of toxic pollutants are below the applicable TELs and AALs.

4.5. CONCLUSIONS

This analysis demonstrates that $PM_{2.5}$, 24-hour SO_2 and NO_2 emissions from the proposed Weymouth Compressor Station and existing M&R station will have maximum estimated impacts below the NAAQS. Furthermore, the analysis demonstrated that particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), carbon monoxide (CO) and 1-hour, 3-hour and annual SO_2 emissions from the proposed Weymouth Compressor Station are insignificant. In accordance with U.S. EPA and MassDEP guidance, this modeling analysis demonstrates that the proposed project will not cause or significantly contribute to an exceedance of the NAAQS.

In addition, this analysis demonstrates that the proposed and existing emissions from the Weymouth Compressor Station and M&R station will not cause toxic pollutant concentrations above MassDEP's TELs or AALs.

ATTACHMENT A. MODELING FILES CD

ATTACHMENT B. SOURCE PARAMETERS AND EMISSION RATES

Weymouth Compressor Station
Stack Parameters

Weymouth Model Inputs - Point Source Parameters (CO, PM, SO_2, Toxics)

Model ID	Description	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Diameter (m)
WEMG01	New Emergency Generator	338008.4	4678763.5	4.42	9.14	724.26	29.57	0.25
WFHTR01	New Fuel Gas Heater	338074.7	4678800.3	3.95	4.60	510.93	10.07	0.20
WTBC01H	New Turbine - 1 High Temp 100%	338064.6	4678838.7	4.13	18.31	810.37	7.58	2.75
WTBC01H5	New Turbine - 1 High Temp 50%	338064.6	4678838.7	4.13	18.31	810.37	6.39	2.75
WTBC01L	New Turbine - 1 Low Temp 100%	338064.6	4678838.7	4.13	18.31	735.91	8.59	2.75
WTBC01L5	New Turbine - 1 Low Temp 50%	338064.6	4678838.7	4.13	18.31	727.58	7.73	2.75
WTBC01N	New Turbine - 1 Normal 100%	338064.6	4678838.7	4.13	18.31	779.37	8.27	2.75
WTBC01N5	New Turbine - 1 Normal 50%	338064.6	4678838.7	4.13	18.31	774.85	7.02	2.75
MGHTR1_1	Bigger heater at M&R Station_Flue1	337830.5	4678846.4	1.74	8.79	433.15	3.24	0.58
MGHTR1_2	Bigger heater at M&R Station_Flue2	337831.1	4678845.2	1.88	8.79	433.15	3.24	0.58
MGHTR2_1	Smaller heater at M&R Station_Flue1	337837.3	4678840.4	2.46	5.18	433.15	4.23	0.43
MGHTR2_2	Smaller heater at M&R Station_Flue2	337838.2	4678839.4	2.54	5.18	433.15	4.23	0.43
MBLR_1	Boiler 1 at M&R Station	337875.7	4678824.2	3.09	4.57	433.15	1.89	0.36
MBLR_2	Boiler 2 at M&R Station	337876.2	4678823.4	3.08	4.57	433.15	1.89	0.36
MBLR_3	Boiler 3 at M&R Station	337876.7	4678822.8	3.08	4.57	433.15	1.89	0.36

Weymouth Model Inputs - Point Source Parameters (NO_2)

Model ID	Description	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Diameter (m)
WEMG01	New Emergency Generator	338008.4	4678763.5	4.42	9.14	724.26	29.57	0.25
WFHTR01	New Fuel Gas Heater	338074.7	4678800.3	3.95	4.60	510.93	10.07	0.20
WTBC01H	New Turbine - 1 High Temp 100%	338064.6	4678838.7	4.13	18.31	810.37	7.58	2.75
WTBC01H5	New Turbine - 1 High Temp 50%	338064.6	4678838.7	4.13	18.31	810.37	6.39	2.75
WTBC01L	New Turbine - 1 Low Temp 100%	338064.6	4678838.7	4.13	18.31	779.31	8.27	2.75
WTBC01L5	New Turbine - 1 Low Temp 50%	338064.6	4678838.7	4.13	18.31	774.78	7.02	2.75
WTBC01N	New Turbine - 1 Normal 100%	338064.6	4678838.7	4.13	18.31	779.37	8.27	2.75
WTBC01N5	New Turbine - 1 Normal 50%	338064.6	4678838.7	4.13	18.31	774.85	7.02	2.75
MGHTR1_1	Bigger heater at M&R Station_flue1	337830.5	4678846.4	1.74	8.79	433.15	3.24	0.58
MGHTR1_2	Bigger heater at M&R Station_flue2	337831.1	4678845.2	1.88	8.79	433.15	3.24	0.58
MGHTR2_1	Smaller heater at M&R Station_Flue1	337837.3	4678840.4	2.46	5.18	433.15	4.23	0.43
MGHTR2_2	Smaller heater at M&R Station_Flue2	337838.2	4678839.4	2.54	5.18	433.15	4.23	0.43
MBLR_1	Boiler 1 at M&R Station	337875.7	4678824.2	3.09	4.57	433.15	1.89	0.36
MBLR_2	Boiler 2 at M&R Station	337876.2	4678823.4	3.08	4.57	433.15	1.89	0.36
MBLR_3	Boiler 3 at M&R Station	337876.7	4678822.8	3.08	4.57	433.15	1.89	0.36

Weymouth Model Inputs - Volume Source Parameters [1]

Model ID	Description	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Release Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
WSHTRV1	New Space Heaters	338056.2	4678826.0	3.87	6.89	6.42	6.98
WSHTRV2	New Space Heaters	338065.0	4678826.0	3.87	6.89	6.42	6.98
WSHTRV3	New Space Heaters	338056.2	4678817.2	3.87	6.89	6.42	6.98
WSHTRV4	New Space Heaters	338065.0	4678817.2	3.87	6.89	6.42	6.98
WSHTRV5	New Space Heaters	338056.2	4678808.0	3.87	6.89	6.42	6.98
WSHTRV6	New Space Heaters	338065.0	4678808.0	3.87	6.89	6.42	6.98
W_PIPING[2]	Piping at Compressor Station	338032.9	4678796.6	3.95	1.22	60.00	0.28
M_PIPE[2]	Piping at M&R Station	337845.4	4678841.7	2.66	1.22	30.00	0.28

[1] The five space heaters exhaust inside of the compressor building and as such are modeled as volume sources. The compressor building was split into six approximately square portions and each is represented by a single volume source. Emissions from the five space heaters were divided evenly between these six volume sources.
[2] Piping only included in Toxics modeling.

Weymouth Model Inputs - Emission Rates (g/s)

Model ID	CO (1-hr, 8-hr)	NO_2 (1-hr, annual)	$PM_{2.5}$ (24-hr, annual)	PM_{10} (24-hr)	SO_2 (1-hr)	SO_2 (3-hr, 24-hr, annual)
WEMG01	2.11E-01	1.11E-02	5.80E-03	5.80E-03	2.79E-04	8.15E-03
WFHTR01	4.27E-03	2.80E-03	2.16E-04	2.16E-04	4.09E-04	4.09E-04
WTBC01H	2.02E-02	2.39E-01	4.97E-02	4.97E-02	1.06E-01	1.06E-01
WTBC01H5	1.48E-02	1.76E-01	3.66E-02	3.66E-02	7.77E-02	7.77E-02
WTBC01L	1.56E-01	3.05E-01	6.23E-02	6.23E-02	1.32E-01	1.32E-01
WTBC01L5	1.17E-01	2.28E-01	4.73E-02	4.73E-02	1.00E-01	1.00E-01
WTBC01N	2.54E-02	3.00E-01	6.10E-02	6.10E-02	1.29E-01	1.29E-01
WTBC01N5	1.89E-02	2.24E-01	4.57E-02	4.57E-02	9.69E-02	9.69E-02
MGHTR1_1	N/A	5.79E-02	4.47E-03	N/A	N/A	8.40E-03
MGHTR1_2	N/A	5.79E-02	4.47E-03	N/A	N/A	8.40E-03
MGHTR2_1	N/A	4.14E-02	3.19E-03	N/A	N/A	6.00E-03
MGHTR2_2	N/A	4.14E-02	3.19E-03	N/A	N/A	6.00E-03
MBLR_1	N/A	8.21E-03	1.69E-03	N/A	N/A	3.18E-03
MBLR_2	N/A	8.21E-03	1.69E-03	N/A	N/A	3.18E-03
MBLR_3	N/A	8.21E-03	1.69E-03	N/A	N/A	3.18E-03
WSHTRV1	2.97E-04	6.98E-04	5.51E-05	5.51E-05	1.06E-04	1.06E-04
WSHTRV2	2.97E-04	6.98E-04	5.51E-05	5.51E-05	1.06E-04	1.06E-04
WSHTRV3	2.97E-04	6.98E-04	5.51E-05	5.51E-05	1.06E-04	1.06E-04
WSHTRV4	2.97E-04	6.98E-04	5.51E-05	5.51E-05	1.06E-04	1.06E-04
WSHTRV5	2.97E-04	6.98E-04	5.51E-05	5.51E-05	1.06E-04	1.06E-04
WSHTRV6	2.97E-04	6.98E-04	5.51E-05	5.51E-05	1.06E-04	1.06E-04
W_PIPING	N/A	N/A	N/A	N/A	N/A	N/A
M_PIPE	N/A	N/A	N/A	N/A	N/A	N/A

Weymouth Model Inputs - Toxics Emission Rates (g/s)

Model ID	Acetaldehyde	Acrolein	Benzene	Chlorobenzene	Butadiene (1,3-)	Carbon Tetrachloride	Diphenyl (Biphenyl)	Chloroform
WTBC01N	2.42E-04	9.68E-05	1.81E-04	0.00E+00	6.50E-06	0.00E+00	0.00E+00	0.00E+00
WEMG01	1.67E-04	1.03E-04	8.80E-06	6.10E-07	5.35E-06	7.34E-07	4.26E-06	5.70E-07
WFHTR01	0.00E+00	0.00E+00	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WTBC01N5	1.80E-04	7.23E-05	1.36E-04	0.00E+00	4.85E-06	0.00E+00	0.00E+00	0.00E+00
WTBC01L	7.42E-04	2.97E-04	5.57E-04	0.00E+00	1.99E-05	0.00E+00	0.00E+00	0.00E+00
WTBC01H	1.92E-04	7.70E-05	1.44E-04	0.00E+00	5.18E-06	0.00E+00	0.00E+00	0.00E+00
WTBC01L5	5.59E-04	2.24E-04	4.20E-04	0.00E+00	1.50E-05	0.00E+00	0.00E+00	0.00E+00
WTBC01H5	1.42E-04	5.68E-05	1.06E-04	0.00E+00	3.82E-06	0.00E+00	0.00E+00	0.00E+00
MGHTR1_1	0.00E+00	0.00E+00	5.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MGHTR1_2	0.00E+00	0.00E+00	5.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MGHTR2_1	0.00E+00	0.00E+00	4.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MGHTR2_2	0.00E+00	0.00E+00	4.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MBLR_1	0.00E+00	0.00E+00	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MBLR_2	0.00E+00	0.00E+00	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MBLR_3	0.00E+00	0.00E+00	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSHTRV1	0.00E+00	0.00E+00	1.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSHTRV2	0.00E+00	0.00E+00	1.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSHTRV3	0.00E+00	0.00E+00	1.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSHTRV4	0.00E+00	0.00E+00	1.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSHTRV5	0.00E+00	0.00E+00	1.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSHTRV6	0.00E+00	0.00E+00	1.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W_PIPING	0.00E+00	0.00E+00	4.16E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
M_PIPE	0.00E+00	0.00E+00	1.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Weymouth Model Inputs - Toxics Emission Rates, Continued (g/s)

Model ID	Ethylbenzene	Formaldehyde	Methanol	Methylene Chloride	Methylnaphthalene (2-)	Naphthalene	Phenol	Propylene Oxide
WTBC01N	4.84E-04	1.07E-03	0.00E+00	0.00E+00	0.00E+00	1.97E-05	0.00E+00	4.38E-04
WEMG01	7.94E-07	1.06E-03	5.01E-05	4.00E-07	6.64E-07	1.49E-06	4.80E-07	0.00E+00
WFHTR01	0.00E+00	9.92E-06	0.00E+00	0.00E+00	3.17E-09	8.07E-08	0.00E+00	0.00E+00
WTBC01N5	3.62E-04	8.01E-04	0.00E+00	0.00E+00	0.00E+00	1.47E-05	0.00E+00	3.28E-04
WTBC01L	1.49E-03	3.29E-03	0.00E+00	0.00E+00	0.00E+00	6.03E-05	0.00E+00	1.35E-03
WTBC01H	3.84E-04	8.54E-04	0.00E+00	0.00E+00	0.00E+00	1.57E-05	0.00E+00	3.49E-04
WTBC01L5	1.12E-03	2.48E-03	0.00E+00	0.00E+00	0.00E+00	4.55E-05	0.00E+00	1.02E-03
WTBC01H5	2.84E-04	6.30E-04	0.00E+00	0.00E+00	0.00E+00	1.16E-05	0.00E+00	2.58E-04
MGHTR1_1	0.00E+00	2.05E-04	0.00E+00	0.00E+00	6.55E-08	1.66E-06	0.00E+00	0.00E+00
MGHTR1_2	0.00E+00	2.05E-04	0.00E+00	0.00E+00	6.55E-08	1.66E-06	0.00E+00	0.00E+00
MGHTR2_1	0.00E+00	1.46E-04	0.00E+00	0.00E+00	4.67E-08	1.19E-06	0.00E+00	0.00E+00
MGHTR2_2	0.00E+00	1.46E-04	0.00E+00	0.00E+00	4.67E-08	1.19E-06	0.00E+00	0.00E+00
MBLR_1	0.00E+00	1.75E-05	0.00E+00	0.00E+00	5.61E-09	1.42E-07	0.00E+00	0.00E+00
MBLR_2	0.00E+00	1.75E-05	0.00E+00	0.00E+00	5.61E-09	1.42E-07	0.00E+00	0.00E+00
MBLR_3	0.00E+00	1.75E-05	0.00E+00	0.00E+00	5.61E-09	1.42E-07	0.00E+00	0.00E+00
WSHTRV1	0.00E+00	5.84E-07	0.00E+00	0.00E+00	1.87E-10	4.75E-09	0.00E+00	0.00E+00
WSHTRV2	0.00E+00	5.84E-07	0.00E+00	0.00E+00	1.87E-10	4.75E-09	0.00E+00	0.00E+00
WSHTRV3	0.00E+00	5.84E-07	0.00E+00	0.00E+00	1.87E-10	4.75E-09	0.00E+00	0.00E+00
WSHTRV4	0.00E+00	5.84E-07	0.00E+00	0.00E+00	1.87E-10	4.75E-09	0.00E+00	0.00E+00
WSHTRV5	0.00E+00	5.84E-07	0.00E+00	0.00E+00	1.87E-10	4.75E-09	0.00E+00	0.00E+00
WSHTRV6	0.00E+00	5.84E-07	0.00E+00	0.00E+00	1.87E-10	4.75E-09	0.00E+00	0.00E+00
W_PIPING	1.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
M_PIPE	5.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Weymouth Model Inputs - Toxics Emission Rates, Continued (g/s)

Model ID	Styrene	Tetrachloroethane (1,1,2,2-)	Toluene	Trichloroethane (1,1,2-)	Vinyl Chloride	Xylenes (M,O&P, M-, O-, P-.....)
WTBC01N	0.00E+00	0.00E+00	1.97E-03	0.00E+00	0.00E+00	9.68E-04
WEMG01	4.72E-07	8.51E-07	8.17E-06	6.36E-07	2.99E-07	3.68E-06
WFHTR01	0.00E+00	0.00E+00	4.50E-07	0.00E+00	0.00E+00	0.00E+00
WTBC01N5	0.00E+00	0.00E+00	1.47E-03	0.00E+00	0.00E+00	7.23E-04
WTBC01L	0.00E+00	0.00E+00	6.03E-03	0.00E+00	0.00E+00	2.97E-03
WTBC01H	0.00E+00	0.00E+00	1.57E-03	0.00E+00	0.00E+00	7.70E-04
WTBC01L5	0.00E+00	0.00E+00	4.55E-03	0.00E+00	0.00E+00	2.24E-03
WTBC01H5	0.00E+00	0.00E+00	1.16E-03	0.00E+00	0.00E+00	5.68E-04
MGHTR1_1	0.00E+00	0.00E+00	9.26E-06	0.00E+00	0.00E+00	0.00E+00
MGHTR1_2	0.00E+00	0.00E+00	9.26E-06	0.00E+00	0.00E+00	0.00E+00
MGHTR2_1	0.00E+00	0.00E+00	6.61E-06	0.00E+00	0.00E+00	0.00E+00
MGHTR2_2	0.00E+00	0.00E+00	6.61E-06	0.00E+00	0.00E+00	0.00E+00
MBLR_1	0.00E+00	0.00E+00	7.94E-07	0.00E+00	0.00E+00	0.00E+00
MBLR_2	0.00E+00	0.00E+00	7.94E-07	0.00E+00	0.00E+00	0.00E+00
MBLR_3	0.00E+00	0.00E+00	7.94E-07	0.00E+00	0.00E+00	0.00E+00
WSHTRV1	0.00E+00	0.00E+00	2.65E-08	0.00E+00	0.00E+00	0.00E+00
WSHTRV2	0.00E+00	0.00E+00	2.65E-08	0.00E+00	0.00E+00	0.00E+00
WSHTRV3	0.00E+00	0.00E+00	2.65E-08	0.00E+00	0.00E+00	0.00E+00
WSHTRV4	0.00E+00	0.00E+00	2.65E-08	0.00E+00	0.00E+00	0.00E+00
WSHTRV5	0.00E+00	0.00E+00	2.65E-08	0.00E+00	0.00E+00	0.00E+00
WSHTRV6	0.00E+00	0.00E+00	2.65E-08	0.00E+00	0.00E+00	0.00E+00
W_PIPING	0.00E+00	0.00E+00	1.04E-03	0.00E+00	0.00E+00	1.46E-03
M_PIPE	0.00E+00	0.00E+00	4.21E-04	0.00E+00	0.00E+00	5.92E-04

Weymouth Model Inputs - Buildings

Model ID	Description	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Height (m)
AUX01	Auxilliary Building	338013.8	4678757	4.29	7.82
CLR01	Main Gas Coolers	338053	4678781.4	4.08	5.49
CB01	Compressor Building	338051	4678802	3.87	13.79
WWALL	West Courtyard Wall	338021.2	4678769.5	4.43	6.10
EWALL	East Courtyard Wall	338060.4	4678768.6	4.19	6.10
322_D	322 Data and Meter Building	337841.1	4678837.3	2.70	3.05
827_B	827 Data and Meter Building	337870.3	4678834.8	3.04	3.05
RTRD	Retired Data Building	337850.4	4678812.4	2.98	2.74
322_R	322 Regulator Building	337846.2	4678826.2	2.88	3.05

Regional Model Inputs - Point Source Parameters

Model ID	Description	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Diameter (m)
FRETRBS	Fore River Station - turbines	337896.07	4678549.97	6.40	77.72			8.84
FREBS1	FRE Black Start Engine 1	337874.86	4678450.25	6.40	7.62	Included in next table		0.56
FREBS2	FRE Black Start Engine 2	337880.82	4678449.57	6.40	7.62			0.56
BELDPII	Braintree Electric Light Department	337663.91	4677721.41	4.57	39.62	477.59	19.50	5.21
BELDWI	Braintree Electric Light Department	337734.23	4677773.90	4.27	30.48	660.37	37.63	3.35
BELDWII	Braintree Electric Light Department	337751.00	4677753.00	4.27	30.48	660.37	37.63	3.35
TRTST32	Twin Rivers Technologies	337706.83	4679142.82	3.61	77.72	505.15	12.19	1.22
TRTCLAY	Twin Rivers Technologies	337698.96	4679156.41	3.70	24.38	622.15	12.43	0.81
TRTCHP	Twin Rivers Technologies	337686.55	4679155.26	3.66	24.38	394.15	27.31	0.91
TRTRTO	Twin Rivers Technologies	337757.65	4679117.20	1.59	30.48	422.15	13.72	0.70
MWRA	MWRA Sludge Processing Facility	337340.00	4678469.00	4.57	64.92	418.71	23.16	1.01

Regional Model Inputs - Fore River Station Source Parameters

Model ID	Description	NO_2 and $PM_{2.5}$ (annual)		SO_2 and $PM_{2.5}$ (24-hr)		NO_2 (1-hr)	
		Stack Temp. (K)	Stack Velocity (m/s)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Temp. (K)	Stack Velocity (m/s)
FRETRBS	Fore River Station - turbines	366.48	13.76	366.48	19.21	366.48	22.84
FREBS1	FRE Black Start Engine 1	679.82	42.56	702.59	55.90	702.59	55.90
FREBS2	FRE Black Start Engine 2	679.82	42.56	702.59	55.90	702.59	55.90

Regional Model Inputs - Emission Rates (g/s)

Model ID	NO_2 (1-hr)	NO_2 (annual)	$PM_{2.5}$ (24-hr)	$PM_{2.5}$ (annual)	SO_2 (24-hr)
FRETRBS	5.49E+00	2.56E+00	6.89E+00	3.80E+00	1.44E+00
FREBS1	3.48E-01	2.83E-01	1.13E-02	6.77E-03	2.97E-04
FREBS2	3.48E-01	2.83E-01	1.13E-02	6.77E-03	2.97E-04
BELDPII	5.72E+01	5.72E+01	1.50E+01	1.50E+01	1.15E+00
BELDWI	1.28E+00	1.28E+00	1.82E+00	1.82E+00	1.00E-01
BELDWII	1.28E+00	1.28E+00	1.82E+00	1.82E+00	1.00E-01
TRTST32	5.37E+00	5.37E+00	5.97E-01	5.97E-01	1.79E+01
TRTCLAY	4.72E-01	4.72E-01	2.77E-01	2.77E-01	2.92E-01
TRTCHP	6.71E-02	6.71E-02	7.53E-02	7.53E-02	1.63E-02
TRTRTO	1.12E-02	1.12E-02	3.20E-03	3.20E-03	2.52E-04
MWRA	1.39E+00	1.39E+00	9.58E-01	9.58E-01	1.18E+00

ATTACHMENT C. MASSDEP EMAIL CONFIRMING REVISED PROTOCOL

From: Pacheco, Glenn (DEP) <Glenn.Pacheco@MassMail.State.MA.US>
Sent: Wednesday, April 18, 2018 3:49 PM
To: Kate Brown
Cc: Kerigan, Kathleen (DEP); Keith, Glenn (DEP); Cushing, Thomas (DEP); Child, Ralph
Subject: [External] RE: AGT Weymouth Compressor Station Modeling
Attachments: Fore River BSE AQ Background Table 5-3.pdf

Kate,

Attached please find the AQ background values to use in the updated modeling. These are the same values as used in the Fore River BSE analysis. If you require or want to use a "season by time of day" approach for any particular pollutant, you will need to download the validated hourly data from the EPA AIRS database, process accordingly, and submit for review.

The interactive source inputs previously used in the cumulative modeling are all still good to use without any changes. Should you want to use "Actuals" instead of "Allowables", this would likely only pertain to the annual pollutants – NO2 and PM2.5. Let us know if you think Actuals are warranted in this analysis. If you can show compliance with Allowables then we'd prefer that approach as it is a more conservative analysis to defend via-a-vis the public. Generally for short-term emissions, Actuals will equal Allowables…so it would have to be a compelling situation to approve a lower short-term modeling emission rate based on Actuals.

Finally, we do concur with the details summarized below as the path forward.

Please let me know if you have any questions or need additional information.

____

Glenn Pacheco
MassDEP
(617) 654-6580
glenn.pacheco@state.ma.us

From: Kate Brown [mailto:Kate.Brown@enbridge.com]
Sent: Wednesday, April 11, 2018 4:22 PM
To: Pacheco, Glenn (DEP)
Cc: Kerigan, Kathleen (DEP); Keith, Glenn (DEP); Cushing, Thomas (DEP); Child, Ralph
Subject: AGT Weymouth Compressor Station Modeling

Glenn,

Thank you for taking the time to review our proposed protocol for updating the modeling for the Weymouth Compressor Station project. As discussed, Algonquin submitted the modeling related to this project in September 2016. Algonquin proposes to update the modeling to incorporate more recent meteorological data and background monitoring data as well as the latest design for the proposed station. The revised modeling will also incorporate revisions made to US EPA's AERMOD model and the accompanying guidance in Appendix W since the original modeling was conducted to identify the potential impacts of the proposed compressor station based on the best available data and modeling techniques.

The following summarizes the proposed updates to the September 2016 analysis discussed during our April 5, 2018 call. Specifically, the analysis will:

- Consider emission changes due to refinement of the Weymouth Compressor Station design for the turbine scenarios considered in the September 2016 NAAQS and air toxics modeling analyses.
- Consider the same pollutants previously modeled relative to the NAAQS (i.e., those that were above the significance levels). These are the 1-hour average NO_2, annual average NO_2, 24-hr SO_2, 24-hr $PM_{2.5}$ and annual $PM_{2.5}$ standards. As the refinements in project design do not increase the previously modeled emission rates, the prior significance analysis is not impacted. The analysis will also consider the same air toxics addressed in the September 2016 submittal.
- Utilize the current version (v16216r) of the AERMOD model.
- Incorporate more recent meteorological data for the period 2012 through 2016, which will be provided by MassDEP. This update will allow for use of the current version of AERMET and will be consistent with the recent modeling submitted to MassDEP for nearby sources (i.e., Fore River Energy Center).
- Incorporate more recent ambient background concentrations for 2014 through 2016, which will be provided by MassDEP. Algonquin will rely on current EPA guidance regarding background concentrations such as seasonally varying background concentrations for select pollutants.
- Include revisions to align with the current version of Appendix W, including NO_2 modeling mechanisms (e.g., ARM2) and use of ADJ_U*.
- Include potential emissions from the proposed black start generators at Fore River Energy Center. The model inputs for the black start generators will be based on the model files provided by MassDEP on April 5, 2018. The worst-case load for the black start engines, as identified by the Fore River Energy Center modeling files and results summary, will be included in this updated analysis.

MassDEP will also review the other regional sources previously modeled to ensure that the list and modeled parameters are still accurate for this update. Please provide this feedback by no later than April 16, 2018. As discussed for regional sources, Algonquin will either use potential emissions data or, in accordance with revised Appendix W guidance, use actual emissions data.

Please let us know if you have any further questions or comments regarding the approach discussed during our April 5th call and documented above. Otherwise, we would appreciate an email confirming this path forward. Algonquin appreciates your review and support of the updated modeling analysis for the Weymouth Compressor Station.

Thank you,
Kate

Kate Brown
Consulting Scientist
Air Permitting
Assigned to: Enbridge
Employee of: TRC Environmental Corporation
—

ENBRIDGE
TEL: 207-274-2607 | CELL: 207-232-0095 | Kate.Brown@enbridge.com

enbridge.com
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From: Pacheco, Glenn (DEP) <glenn.pacheco@state.ma.us>
Sent: Monday, May 14, 2018 6:35 PM
To: Kate Brown
Cc: Kerigan, Kathleen (DEP); Keith, Glenn (DEP); Cushing, Thomas (DEP); Child, Ralph; Justin Fickas; Himani Gupta
Subject: [External] RE: AGT Weymouth Compressor Station Modeling
Attachments: FW: grandfathering v 18081

Hi Kate,

In follow-up to the May 3rd meeting in our office, I spoke with Justin Fickas last Tuesday. We went over the 5 modeling items included on the May 3 agenda and summarized herein.

1. New AERMOD released on April 24 – the updated modeling analysis will use the latest version of AERMOD (18081)
2. New AERMET released on April 24 and need to update met data – There is no need to update the met data. MassDEP practice for met data being utilized on ongoing projects when new versions of AERMET are released is, that unless the new release will result in changes to the met data, the met data in current use may continue to be used. This is standard practice among the agencies. I reviewed the AERMET changes in Model Change Bulletin No. 8 and concluded that the met data would not change. To confirm my findings, I contacted EPA Region 1 for concurrence. On May 7, Leiran Biton of Region 1 forwarded an email form EPA Region 2 addressing the same issue. The EPA email thread includes a response from OAQPS that confirms my own findings; i.e., the changes in AERMET version 18081 would not change met data from the previous version of AERMET unless the precipitation data was being used or the Bulk Richardson methodology was being used with on-site data. Neither of these apply to the met data under consideration. I have attached a copy of the email. Additionally, use of the met data supplied will be consistent with that used on the Calpine Plan Approval, leaving one less potential issue for which to challenge the analysis.
3. Rural/urban designation – The updated modeling will continue to utilize rural dispersion. I provided the history of this designation for Projects in the Fore River area to Justin, including the comprehensive analysis performed by the Calpine consultant that reconfirmed the rural designation.
4. Need to update SIL analysis related to implementation as ARM2 as the default Tier 2 NO2 modeling approach. Use of ARM2 has the potential to change the significant impact area (SIA) for 1-hour and annual NO2. However, the previous SIL analysis already resulted in 1-hour and annual NO2 moving to a cumulative modeling phase and some of the interactive sources pulled into the analysis were done so based not on being within the SIA, but being asked about by the public. Therefore there is no need to update the SIL analysis based on this item.
5. Need to update SIL analysis related to "inclusion of other sources" – not sure what was meant by this, but this would not affect the SIL analysis. All Project and interactive sources that need to be included in the analysis are known to the Project team and Trinity has the necessary inputs to use.

Please let me know if there are any outstanding items to address or any questions.

____

Glenn Pacheco
MassDEP
(617) 654-6580
glenn.pacheco@state.ma.us

From: Kate Brown [mailto:Kate.Brown@enbridge.com]
Sent: Wednesday, April 11, 2018 4:22 PM
To: Pacheco, Glenn (DEP)
Cc: Kerigan, Kathleen (DEP); Keith, Glenn (DEP); Cushing, Thomas (DEP); Child, Ralph
Subject: AGT Weymouth Compressor Station Modeling

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MassDEP will also review the other regional sources previously modeled to ensure that the list and modeled parameters are still accurate for this update. Please provide this feedback by no later than April 16, 2018. As discussed for regional sources, Algonquin will either use potential emissions data or, in accordance with revised Appendix W guidance, use actual emissions data.

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Thank you,
Kate

Kate Brown
Consulting Scientist
Air Permitting
Assigned to: Enbridge
Employee of: TRC Environmental Corporation
—
ENBRIDGE
TEL: 207-274-2607 | CELL: 207-232-0095 | Kate.Brown@enbridge.com

enbridge.com
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From: Pacheco, Glenn (DEP) <glenn.pacheco@state.ma.us>
Sent: Thursday, April 05, 2018 4:56 PM
To: Kate Brown (Kate.Brown@enbridge.com)
Cc: Himani Gupta
Subject: 2012-2016 Met Data for Updated Weymouth Compressor station modeling
Attachments: Met files for Weymouth compressor April 2018.7z

Kate,

Here are the met files for the modeling. They represent Boston Logan surface data coupled with Gray, Maine upper air data from 2012 to 2016. The adjust u* option was used in the processing. If you need a more detailed description of the pre-processing particulars, just let me know.

Updated modeling should reflect rural dispersion, which should be consistent with the original modeling.

I'll follow-up with the background AQ data soon (likely tomorrow).

At some point before you publish the final modeling report, please send me the draft text of the background AQ data write-up. We'll want to make sure it hits the mark concerning both the prescriptive regulatory modeling process (i.e., requirements) as well as concerns raised by the public.

Himani is copied on this email. Please forward to the rest of the modeling team.

Regards,

Glenn

____
Glenn M Pacheco
Senior Air Quality Modeling Specialist
Air & Climate Division
Bureau of Air and Waste

MassDEP
One Winter St. - 7th Floor
Boston, MA 02108

Phone:
(617) 292-5500 (main)
(617) 654-6580 (direct)
(617) 556-1049 (Fax)
(508) 243-5954 (mobile)

glenn.pacheco@state.ma.us

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