MODELING PROTOCOL
Kenmore Plant

Cadman, Inc. / Kenmore, WA

Prepared By:

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1. INTRODUCTION

Cadman, Inc. (Cadman) operates an asphalt batch plant located at 6431 NE 175th Street, Kenmore, WA 98028 (the Kenmore plant). The plant has operated since the 1960s under various owners. Cadman purchased the plant in July 2017 from CEMEX. Equipment at the Kenmore plant has operated under three prior Orders of Approval (OACs) issued by the Puget Sound Clean Air Agency (PSCAA).

- OAC 939 (issued April 4, 1973): Installation of particulate emission controls (baghouse with cyclones) to control batch plant emissions;
- OAC 1938 (issued August 8, 1979): Installation of fume scavenging system to control emissions from flight conveyor and two storage silos; and
- OAC 3536 (issued June 14, 1990): Approved use of nuisance soils in raw materials of the asphalt batch plant.

Over many years, the Kenmore plant has made various changes to its aggregate dryer, including the following changes that have recently been the subject of discussions with PSCAA:

- Replacement of the existing 103 MMBtu/hr dryer burner with a new 100 MMBtu/hr burner in 2003
- Alterations to the existing dryer baghouse to accommodate longer bags (2006), to replace the exhaust fan (2007), and to replace the tube sheet and shorten the baghouse body (2016);
- Routing the scavenger duct from truck loading process to the dryer baghouse in 2009; and
- Replacement of the dryer shell and several internal stages in 2018.

In an August 17, 2020 email from Brian Renninger, PSCAA stated its opinion that because the primary emission creating components of the dryer (drum shell and burner) were replaced, it considers the dryer itself to be replaced and to have triggered New Source Review (i.e., the Notice of Construction (NOC) permitting process).

On January 21, 2021, Cadman submitted NOC application #11861 for the aggregate dryer to PSCAA. Cadman received an information request from PSCAA on February 16, 2021. The requested information was provided to PSCAA on May 20, 2021. Cadman then received an incompleteness response from Brian Renninger (PSCAA) on June 16, 2021, which indicated AERMOD modeling is needed for criteria pollutants and should also be used for updated toxic air pollutant (TAP) modeling. The email specified that modeling should be completed for the following criteria pollutants: particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), $PM_{2.5}$, nitrogen oxides (NO_X), and carbon monoxide (CO) because PSCAA's extrapolation of the TAP AERSCREEN results indicated these criteria pollutant screening concentrations could exceed their Significant Impact Levels (SILs). A SIL modeling analysis for the above pollutants will be conducted using AERMOD. If the SIL is exceeded for any of the pollutants, a National Ambient Air Quality Standard (NAAQS) modeling analysis will be conducted.

This report serves as Cadman's dispersion modeling protocol using refined modeling techniques, for submittal to PSCAA. This protocol describes the proposed methodologies that will be used in the air dispersion modeling analysis to demonstrate compliance with the respective 1-hour, 24-hour, and annual ambient air quality standards for PM_{10}, $PM_{2.5}$, NO_X, and CO established by the United States Environmental Protection Agency (EPA) and for compliance with the Acceptable Source Impact Levels (ASILs) under WAC 173-460.

2. MODELING METHODOLOGY

This section of the modeling protocol presents the procedures that will be utilized to perform the air dispersion modeling analysis.

2.1 Model Selection

The latest version (21112) of the AERMOD model will be used to estimate maximum ground-level concentrations in the air dispersion analysis. AERMOD is a refined, steady-state, multi-source, air dispersion model to be used for industrial sources.[1]

2.2 Meteorological Data

The modeling analysis is performed using five years of representative meteorological data (2011 to 2015) for the AERMOD dispersion model. The meteorological data is processed using the AERMET version 18081 with all regulatory default options. Data were obtained from the following sources:

- Surface meteorological data (wind speed, wind direction, temperature) correspond to readings from the meteorological station at the Paine Filed Airport (Station ID 24222).
- Upper air data correspond to the nearest upper air station, Quillayute State Airport (Station ID 94240).

The 1-min ASOS data is used wherever available. Note that the 2011 through 2015 dataset is proposed, because the National Weather Service (NWS) has identified a calibration error in wind data starting November 29, 2016 at 12 PM through 2 PM March 19, 2019. Trinity contacted the modeler with Washington State Department of Ecology (Ecology), Dr. Ranil Dhammapala, and confirmed that 2011 through 2015 would be the most appropriate years. Email confirmation from Dr. Ranil Dhammapala is provided in Appendix A.

2.3 Coordinate System

The location of emission source, structures and receptors will be represented in the Universal Transverse Mercator (UTM) coordinate system using the North American 1983, Continental U.S. projection. 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). UTM coordinates for this analysis will be based on UTM Zone 10. The location of the Kenmore plant is approximately 5,289,658 Northing and 555,789 Easting in UTM zone 10.

2.4 Terrain Elevations

Terrain elevations for receptors, buildings, and sources are determined using National Elevation Dataset (NED) supplied by the United States Geological Survey (USGS). The NED is a seamless dataset with the best available raster elevation data of the contiguous United States. NED data retrieved for this model have a grid spacing of 1/3 arc-second or 10 m. The AERMOD preprocessor, AERMAP version 18081, is used to compute model object elevations from the NED grid spacing. AERMAP also calculates hill height data for all receptors. All data obtained from the NED files are checked for completeness and spot-checked for accuracy.

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

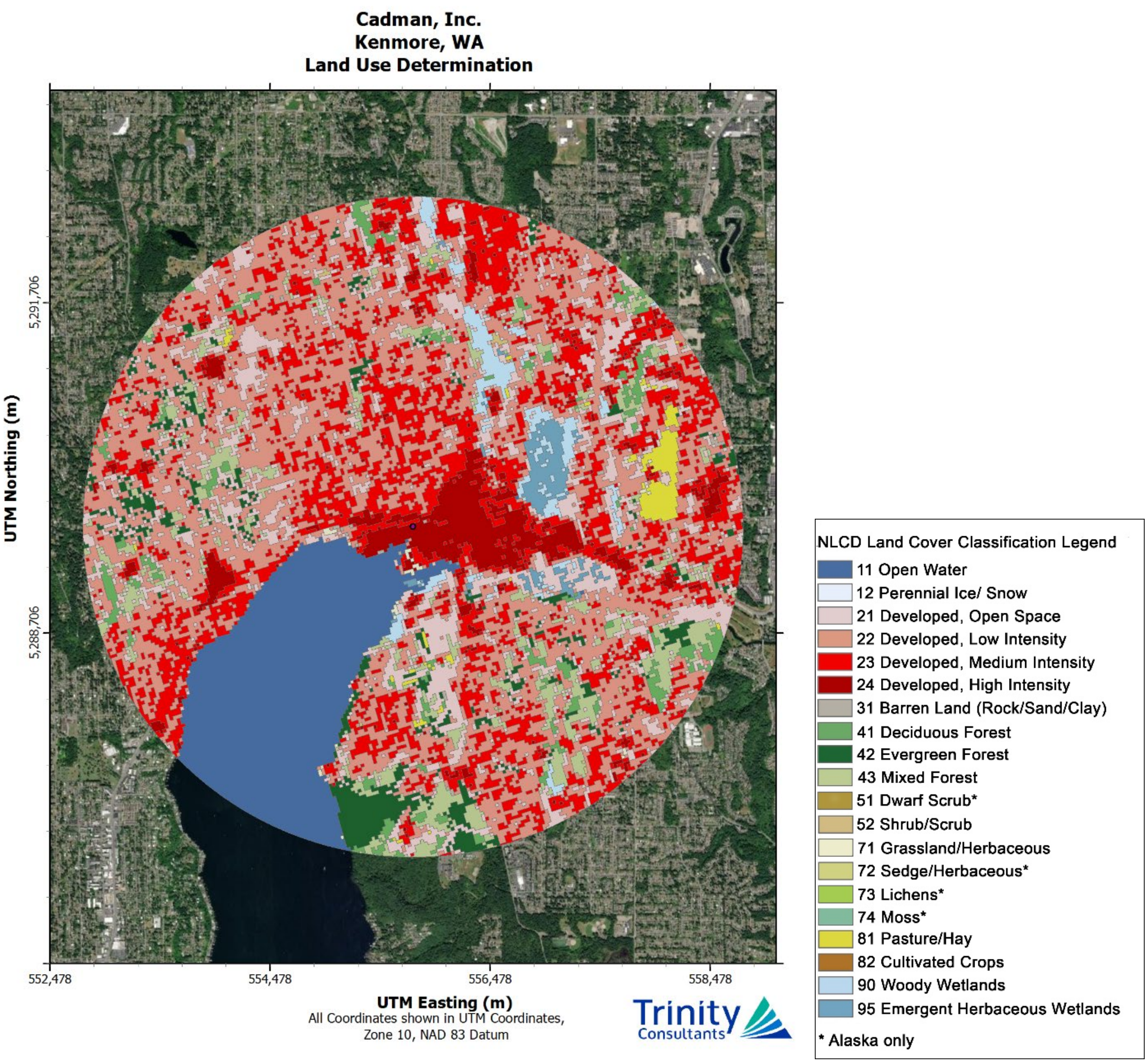
2.5 Urban/Rural Determination

The Multi-Resolution Land Characteristics Consortium National 2019 Land Cover Database (NLCD) was reviewed to determine whether the site location should be classified as urban or rural.

In accordance with 40 CFR Part 51 Appendix W, Section 7.2.1.1(b)(i), the land use is classified based on a 3-kilometer radius circle around the facility center. Developed, high intensity and developed, medium intensity areas are considered urban, and all other areas are considered rural.

The NLCD2019 data map demonstrates that 26% of the land use within a 3-kilometer radius of the facility is considered urban (i.e., 26% of the land is classified as either *developed, high intensity* or *developed, medium intensity*) as shown in Figure 2-1 below. Therefore, since less than 50% of the land use is urban, AERMOD's urban option will not be selected.

Figure 2-1. Urban/Rural Determination



2.6 Receptor Grids

A square Cartesian receptor grid with 25-meter spacing extending 2,000 meters, as well as receptors placed on the facility's property boundary (fence line boundary) at 25-meter intervals, will be used for the dispersion modeling analysis. The Kenmore facility is shown below in Figure 2-2 with the fenceline represented by the solid white outline surrounding the yellow highlighted area.[2] Additionally, a medium grid with 250-meter spaced receptors extending 5,000 meters from the center of the facility is also included. Note that highest air concentrations from the baghouse are expected near the fenceline; if significant concentrations occur beyond 2,000 meters, the receptor grid will be extended, or nested fine grids will be added in hot spots.

Figure 2-2. Facility Fenceline

2.7 Building Downwash

Emissions from the source is evaluated in terms of its proximity to nearby structures. The purpose of this evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures. See Figure 2-2 above for the locations of significant structures at the Kenmore plant. Wind blowing around a building creates zones of turbulence that are greater than if the buildings were absent.

[2] The fenceline is established to align with Cadman's lease boundary, which also includes a physcial fence on the northern boundary along NE 176th Street. A travel pathway between the two Cadman equipment areas is owned by CalPortland; however, Cadman has an easment to use the pathway for truck traffic. Gates are located at facility access points that are closed when the site is not operating.

The concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents are applied.

2.8 Source Types and Parameters

Emissions from the dryer will be represented in the model as a point source. Stack parameters are summarized in table below.

Table 2-1. Model Source Parameters

Source	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Emission Rate (g/s)	Stack Height (m)	Stack Temperature (k)	Stack Velocity (m/s)	Stack Diameter (m)
Dryer Stack	555760.1	5289680.9	9.23	1	5.49	394.3	39.58	1.016

3. MODELING ANALYSIS

Dispersion modeling will be conducted to demonstrate compliance with SILs for PM_{10}, $PM_{2.5}$, NO_X, and CO. If the SIL models do not demonstrate compliance for any of the given pollutants, then dispersion modeling will be conducted to demonstrate compliance with NAAQS. Table 3-1 below shows the applicable SIL and NAAQS.

Table 3-1. SIL and NAAQS Standards

Pollutant	Averaging Period	SILs (μg/m³)	NAAQS (μg/m³)	Modeled Design Value Used
PM_{10}	24-hour	5	150	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	Annual	0.2	12	Annual arithmetic mean from single or multiple monitors, averaged over 3 years
	24-hour	12	35	98th percentile of concentrations in a given year, averages over 3 years
NO_2	Annual	1	100	Annual arithmetic mean
	1-hour	7.5 [a]	188	3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations
CO	8-hour	500	10,000	Not to be exceeded more than once per calendar year
	1-hour	2,000	40,000	Not to be exceeded more than once per calendar year

a. Significant Impact Levels for NO_2 standards have not yet been proposed. However, interim levels were provided by EPA in a general guidance implementation memo on June 28, 2010.

Dispersion modeling will be conducted to demonstrate compliance with the Washington TAP program in WAC 173-460. All TAPs must be below the respective ASIL listed in WAC 1703-460-150 in order to demonstrate compliance.

3.1 SIL Modeling

For the SIL analysis, each given pollutant will be compared to the SILs in Table 3-1 using the modeled design value. Only the changes in emissions associated with the proposed project will be modeled in the SIL analysis. Impacts from nearby and other sources, including background concentration, will not be considered in the SIL analysis. If the modeled impacts are below the SILs, no further analysis will be required. If modeled impacts exceed the SIL for any given pollutant, a cumulative NAAQS analysis will be performed to demonstrated that the project will not cause or significantly contribute to a violation of any ambient air quality standard.

3.2 NAAQS Modeling

In a cumulative NAAQS analysis, the scope of the analysis is expanded from the significant impact analysis to include impacts from all other sources at the facility and background concentrations. All emission sources at the Kenmore plant will be included in the NAAQS analysis. If a full NAAQS analysis is required, the modeled impacts will be added to background concentrations obtained from NW Airquest[3] and nearby facilities including the adjacent CalPortland facility.[4]

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[3] NW Airquest is housed through Idaho Department of Environmental Quality. It provides criteria pollutant background concentrations through model and monitoring data from July 2014 through June 2017. https://idahodeq.maps.arcgis.com/apps/MapSeries/index.html?appid=0c8a006e11fe4ec5939804b873098dfe

[4] If NAAQS modeling is necessary, PSCAA will be consulted to confirm the nearby source inventory and whether any sources in addition to CalPortland need to be included in the NAAQS model.

APPENDIX A. METEOROLOGICAL DATA REVIEW

From:	Dhammapala, Ranil (ECY)
To:	Hui Cheng
Cc:	Anna Henolson; Brian Holland
Subject:	RE: Paine Field Met Data Question
Date:	Wednesday, March 20, 2019 4:36:33 PM

Hi Hui,

Great work figuring this out! My strong recommendation is to use the older 5-yr data set ending in 2015. KPAE has 1-minute ASOS data so plan on running AERMINUTE to minimize calms.

I will check with NWS Seattle if they plan to back correct the data.

Regards

~*~
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~*~

From: Hui Cheng [mailto:hcheng@trinityconsultants.com]
Sent: Wednesday, March 20, 2019 4:25 PM
To: Dhammapala, Ranil (ECY) <rdha461@ecy.wa.gov>
Cc: Anna Henolson <AHenolson@trinityconsultants.com>; Brian Holland <bholland@trinityconsultants.com>
Subject: Paine Field Met Data Question

Hi Ranil,

Thanks for your time to discuss this issue we have! As discussed, I am working on a dispersion modeling project for a site located in Everett, WA that is basically on a dock. We have determined that most representative data would be from Paine Field Airport. During our review of the NWS data we discovered an issue with the wind data – the dominant wind direction has shifted starting 2017, while previous years remain a very consistent pattern in the wind roses. Please see attached the PPTX file with more details on it.

We reached out to NWS, and confirmed that the data was off since 11/29/2016 at 12 pm and stayed that way until 2 PM yesterday (3/19/2019). We have a couple of options in order to complete the modeling analysis for our project, but I would like to confirm with you which option makes more sense for permitting purposes.

1. Correct the wind data based on our best knowledge. See the email attached with our correspondence with our NWS contact. However, I am not sure whether NWS knows

exactly how different that was for the entire period starting 11/29/2016.

2. Use an older 5-year period for this project (i.e., 2011-2015 vs. 2014-2018). Given the consistencies in the wind patterns for older years, I think older dataset should still be representative in estimating the project impact.

We understand that further review may be warranted for the data starting late 2016 and corrections (if any) should be carefully performed. Can you please confirm that using older dataset (option 2) would be your preference for our project of interest?

We would also be interested in knowing whether NWS would consider back-correct the data in the archive. If you could keep us in the loop with any further development on this topic, that would be great! Thanks!

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