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RESPONSE TO CEC STAFF DATA REQUEST SUPPLEMENTAL DATA RESPONSES 31-33

San Jose Data Center 04 (22-SPPE-02)

SUBMITTED TO: CALIFORNIA ENERGY COMMISSION
SUBMITTED BY: **Microsoft**

June 2023

DAYZEN LLC

Microsoft provides Supplemental Responses to CEC Data Request Set 1, Numbers 31 through 33.

DATA REQUESTS

Within a 6-mile radius of the project site:

31. Please use AERMOD or an equivalent model to provide an analysis of impacts due to total annual nitrogen deposition (from NOx and ammonia) from the testing and maintenance of the backup generators. The analysis should specify the amount of total annual nitrogen deposition in kilograms of nitrogen per hectare per year (kg N/ha/yr) at sensitive habitat such as serpentine formations and Northern Coastal Salt Marsh. Please provide complete citations for references used in determining this number.

RESPONSE TO DATA REQUEST 31

Current land use within the region is mixed, with urban dominating the regions around the project in all directions with rural/undeveloped land towards the east, north and southeast.

Air emissions from the project include nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulates (PM_{10}). Nitrogen oxide gases (NO, NO_2) convert to nitrate particulates in a form that is suitable for uptake by most plants. The effect of this nitrogen could be to promote plant growth that could potentially encourage nonnative plant species at the expense of native species.

To assess nitrogen deposition, AERMOD, which was used in the air quality permitting analysis to evaluate the project's air quality impacts, was also used in the deposition analysis[1]. As described previously, AERMOD is a steady-state, mass-conserving, nonreactive (i.e., no chemistry) plume dispersion model. The ability of AERMOD to overestimate impacts was expanded on by including several other assumptions with regards to nitrogen formation and deposition, in order to assess the potential for impacts from the SJC-04 project. These assumptions include:

- 100 percent conversion of oxides of nitrogen (NO_x) and ammonia (NH_3) into atmospherically derived nitrogen (ADN) within the engine stack(s) rather than allowing the conversion of NO_x and NH_3 to occur over distance and time within the atmosphere;

[1]For deposition analyses, AERMOD non-default keyword options were ALPHA, DEPOS, included both dry and wet deposition (DDEP and WDEP), as well as dry and wet depletion (DRYDPLT and WETDPLT). Other deposition inputs are described below.

- Depositional rates and parameters were based upon nitric acid (HNO_3) which, of all the depositional species, has the most affinity for impacts to soils and vegetation and the most tendency to "stick" to what it is deposited upon;
- Maximum settling velocities to produce maximum deposition rates;
- Maximum potential emissions for the SJC-04 facility were used rather than actual emissions in the calculation of nitrogen deposition;
- And, once it leaves the engine stack, nitrogen immediately begins to deposit in the surrounding lands.
- To produce conservative results (overestimates), modeling assumptions regarding the complex chemistry that occurs to produce nitrogen from NO_x, ammonia, and other pollutants were not used in this modeling analysis. As one example, it was assumed that the pollutants leaving the stack(s) would already be in the form of depositional nitrogen (nitrate and ammonium ions). To do this, the emissions of NO_x and ammonia were adjusted for the molecular weight of nitrogen and then summed for each individual source. Thus, all impacts would represent 100 percent conversion of combustion emissions into depositional nitrogen. This assumption leads to an exceedingly conservative estimation of nitrogen deposition, because areas with the highest nitrogen emissions do not necessarily experience the greatest deposition effects, which usually occur far from the original nitrogen source.

The AERMOD model calculates atmospheric deposition of nitrogen by calculating the wet and dry fluxes of total nitrogen. This deposition is accomplished by using a resistance model for the dry deposition part, and by assigning particle phase washout coefficients for the wet removal process from rainout. As discussed below, depositional parameters are input into the model in order to calculate the deposition of nitrogen. All depositional parameters were based on HNO_3.

In order to model gaseous deposition, the model requires land use characteristics and gas deposition resistance terms based on five seasonal categories. The seasonal categories are input into AERMOD on a month by month basis, corresponding to each summer, fall, winter, and spring seasons, based on Bay Area Air Quality Management District (BAAQMD) defaults for AERMET processing, as follows:

- Late autumn/winter without snow = November, December, and January;
- Transitional spring = February and March;
- Midsummer = April, May, June, and July; and
- Autumn = August, September, and October.

Additionally, land use data is input based on wind direction. As described below, rangeland (land use category 3) was used for wind directions between 10^o and 160^o, urban (land use category 1) for wind directions between 170° and 290° and non-forested wetlands for wind directions 300° through 360°. Nitric acid was chosen to represent total nitrogen deposition since nitric acid has the greatest potential for depositional effects.

For both wet and dry deposition, AERMOD requires the following additional inputs:

- The molecular diffusivity (D_a) for the pollutant being modeled [0.1628 square centimeters per second (cm^2/s)];
- The diffusivity in water (D_w) for the pollutant being modeled [2.98E-5 square centimeters per second (cm^2/s)];
- The cuticular resistance to uptake by lipids for individual leaves (rcl) for the pollutant [1.0E+5 seconds per centimeter (s/cm)]; and
- The Henry's Law constant (Henry) for the pollutant [8.0E-8 Pascal-cubic meters per mole (Pa-m^3/mol)].

In addition to the above inputs, the dry and wet deposition algorithm also requires surface roughness length (cm), friction velocity (meters per second), Monin-Obukhov length (meters), surface pressure, precipitation type, and precipitation rate. For AERMOD, the meteorology used in this analysis was the same meteorological data set that was provided by the BAAQMD and used for the Small Power Plant Exemption.

The serpentine critical habitat area was assigned a land use best described as rangeland (AERMOD land use category 3) to model deposition, including the surface roughness length, leaf-area index, and plant-growth state. The Northern Coastal Salt Marsh land use was assigned non-forested wetlands.

Results of the wet and dry nitrogen deposition modeling are summed by AERMOD to produce annual deposition rates in units of grams per square meter (g/m^2) for the entire 5-year meteorological period modeled, which are converted to kilograms per hectare per year (kg/ha/yr) for presentation in this report. As the critical habitats cover a variety of elevations and distances, the annual average deposition rates calculated for all receptors modeled in the critical habitat areas were used for comparison to threshold levels. The maximum project impacts on nitrogen deposition rates would be 0.0197 kg/ha/yr immediately adjacent to the facility. In the serpentine habitat area, the average deposition rates are on the order of 0.002 kg/ha-yr and in the salt marsh area, it is 0.004 kg/ha-yr.

A threshold at which harmful effects from nitrogen deposition on plant communities has not been firmly established. However, a value of 5 kilograms per hectare per year (kg/ha/yr) is often used for comparing nitrogen deposition among plant communities. Research conducted in the South San Francisco Bay Area indicates that intensified annual grass invasions can occur in areas with nitrogen deposition levels of 11–20 kg/ha/yr, with limited invasions at levels of 4–5 kg/ha/yr (Weiss 2006a and Weiss 2007, as cited in CEC 2007). The maximum and average levels of nitrogen deposition from the project in the sensitive areas are far below levels necessary to cause adverse effects.

Furthermore, the level of nitrogen deposition from the project emissions on plant-available nitrogen would actually be less than the calculated amount because the deposition will be distributed in small amounts during the year and not all of the nitrogen added to the soil during each deposition event is available for plant use because of losses associated with soil processes. Therefore, it is unlikely that there would be significant impacts to biological resources from nitrogen deposition.

32. Please provide an isopleths graphic over topographical maps of the direct total annual nitrogen deposition rates caused by the backup generators. This will be a graphical depiction of the project's nitrogen deposition contribution. Label the location of the proposed project and sensitive habitat such as serpentine, Northern coastal salt marsh, etc., and ensure that modeled nitrogen deposition rates in each sensitive habitat are clearly marked.

RESPONSE TO DATA REQUEST 32

Please see the attached Figure 1 that identifies the areas of concern.

33. Please also provide files corroborating nitrogen emissions calculation, model inputs and outputs (with plot files) for staff to review.

RESPONSE TO DATA REQUEST 33

The modeling files will be supplied to the CEC Staff.

Figure 1
Microsoft SJC04
Annual Nitrogen Deposition