AIR QUALITY CONFORMITY ASSESSMENT
661 BEAR VALLEY TENTATIVE SUBDIVISION MAP
ESCONDIDO, CA

Submitted to:

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INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The proposed 661 Bear Valley Tentative Subdivision Map (APN's 237-131-01, 02) consists of approximately 40.9 gross acres, located in the North County Area of San Diego County in the City of Escondido, as shown in Figure 1 on the following page. Regional access to the site is obtained from Bear Valley Parkway as shown in Figure 2 on Page 3 of this report. Surrounding land uses consist of single-family residential lots, limited commercial uses, and undeveloped open space. These features, as well as the proposed site plan configuration, can be seen in Figure 3 on Page 4 of this report.

The project site resides as a fully disturbed land use (i.e., a past extractive/mining use), and currently has one single-family residential structure onsite. Elevations across the property range from approximately 530 feet to 675 feet above mean sea level (MSL).

Project Description

The 661 Bear Valley Tentative Subdivision Map would construct fifty five (55), approximately 10,000 square-foot, single family residential lots as shown in Figure 4 on Page 5 of this report. The project would also include necessary roadway and drainage improvements as well as the dedication of approximately 1.2 acres for improvements to Bear Valley Parkway.

Air Quality Definitions

Air quality is defined by ambient air concentrations of specific pollutants determined by the Environmental Protection Agency (EPA) to be of concern with respect to the health and welfare of the public.[1] The subject pollutants, which are monitored by the EPA, are Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Ozone (O_3), respirable 10- and 2.5-micron particulate matter (PM_{10}), Volatile Organic Compounds (VOC), Reactive Organic Gasses (ROG), Hydrogen Sulfide (H_2S), sulfates, lead, and visibility reducing particles. Examples of these EPA monitored pollutant sources and their effects on localized air quality are discussed below:

- **Carbon Monoxide (CO):** Carbon monoxide is a colorless, odorless, tasteless and toxic gas resulting from the incomplete combustion of fossil fuels. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria air pollutant.

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[1] Per the Federal Clean Air Act of 1970 (United States Code, Title 42, Chapter 85) and subsequent amendments.

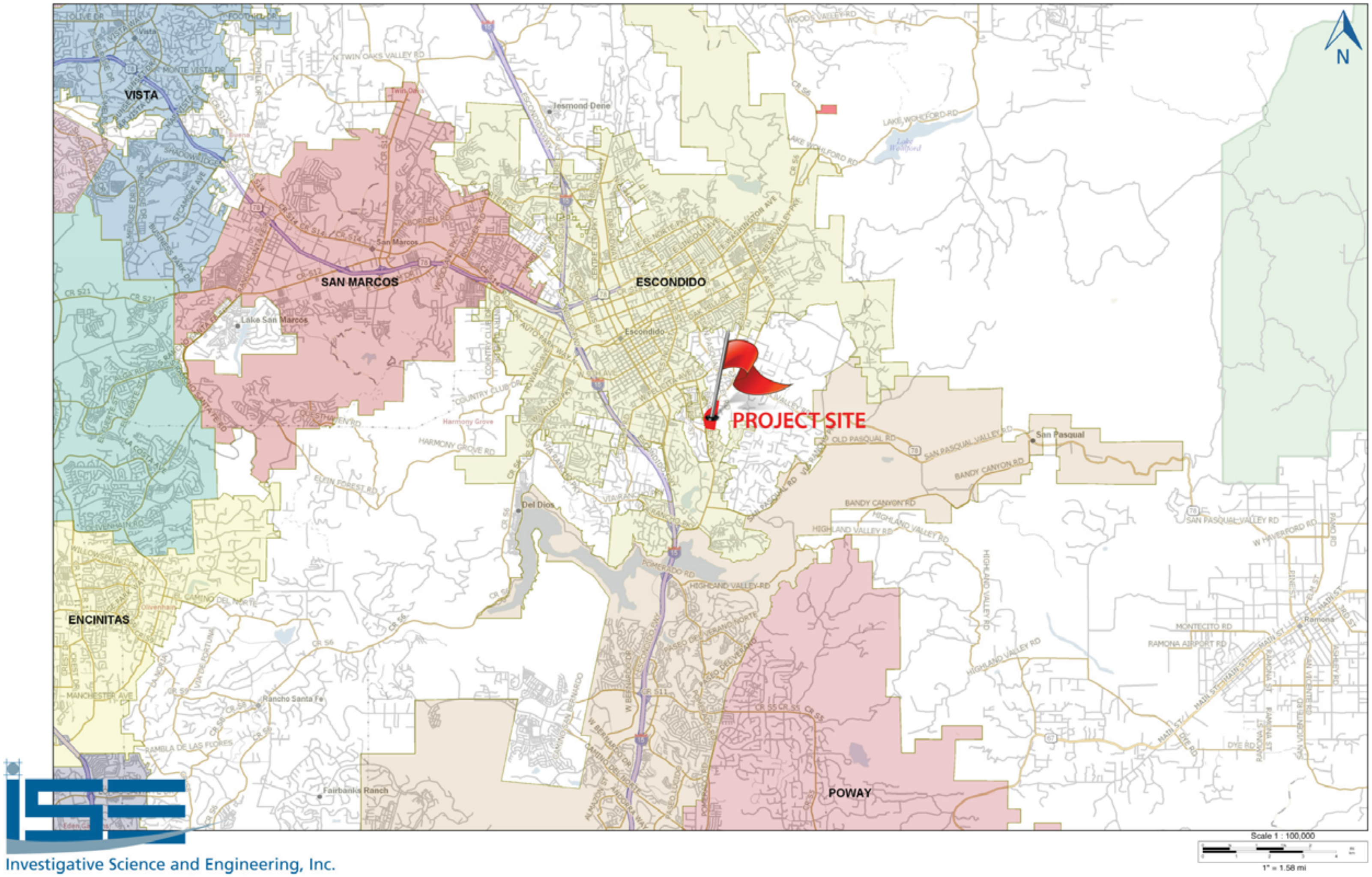

FIGURE 1: Project Study Area Vicinity Map (ISE 12/14)

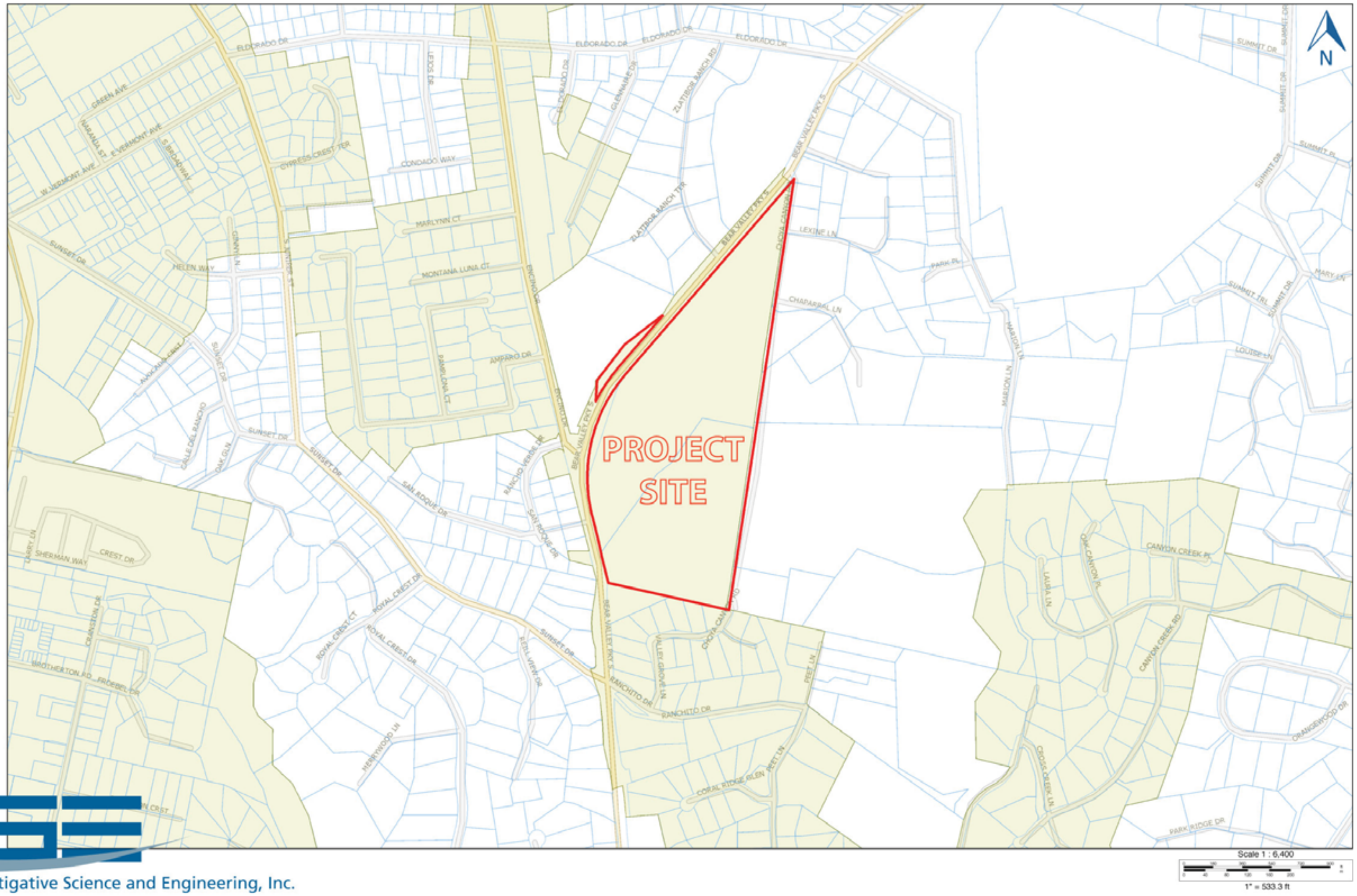

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FIGURE 2: Project Study Area Parcel Map (ISE 12/14)

FIGURE 3: Aerial Image Showing 661 Bear Valley Development and Surrounding Uses (ISE 12/14)

FIGURE 4: Proposed 661 Bear Valley Site Development Map (Hunsaker & Associates 12/14)

- **Oxides of Sulfur (SO_x):** Typically strong smelling, colorless gases that are formed by the combustion of fossil fuels. SO_2 and other sulfur oxides contribute to the problem of acid deposition. SO_2 is a criteria pollutant.

- **Nitrogen Oxides (Oxides of Nitrogen, or NO_x):** Nitrogen oxides (NO_x) consist of nitric oxide (NO), nitrogen dioxide (NO_2), and nitrous oxide (N_2O); these are formed when nitrogen (N_2) combines with oxygen (O_2). Their lifespans in the atmosphere range from one to seven days for nitric oxide and nitrogen dioxide, and 170 years for nitrous oxide. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects. It absorbs blue light, resulting in a brownish-red cast to the atmosphere and reduced visibility.

- **Ozone (O_3):** A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer, as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

- **PM_{10} (Particulate Matter less than 10 microns):** A major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and aerosols. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the lungs, where they may be deposited, resulting in adverse health effects. PM_{10} also causes visibility reduction and is a criteria air pollutant.

- **$PM_{2.5}$ (Particulate Matter less than 2.5 microns):** A similar air pollutant consisting of tiny solid or liquid particles which are 2.5 microns or smaller (often referred to as fine particles). These particles are formed in the atmosphere from primary gaseous emissions that include sulfates formed from SO_2 release from power plants and industrial facilities, and nitrates that are formed from NO_x release from power plants, automobiles and other types of combustion sources. The chemical composition of fine particles highly depends on location, time of year, and weather conditions.

- **Volatile Organic Compounds (VOC):** Volatile organic compounds are hydrocarbon compounds (any compound containing various combinations of hydrogen and carbon atoms) that exist in the ambient air. VOC's contribute to the formation of smog through atmospheric photochemical reactions and/or may be toxic. Compounds of carbon (also known as organic compounds) have different levels of reactivity; that is, they do not react at the same speed or do not form ozone to the same extent, when exposed to photochemical processes. VOC's often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints. Exceptions to the VOC designation include: carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate.

- **Reactive Organic Gasses (ROG):** Similar to VOC, Reactive Organic Gasses (ROG) are also precursors in forming ozone, and consist of compounds containing methane, ethane, propane, butane, and longer chain hydrocarbons which are typically the result of some type of combustion/decomposition process. Smog is formed when ROG and nitrogen oxides react in the presence of sunlight.

- **Hydrogen Sulfide (H_2S):** A colorless, flammable, poisonous compound having a characteristic rotten-egg odor. It often results when bacteria break down organic matter in the absence of oxygen. High concentrations of 500-800 ppm can be fatal and lower levels cause eye irritation and other respiratory effects.

- **Sulfates:** An inorganic ion that is generally naturally occurring and is one of several classifications of minerals containing positive sulfur ions bonded to negative oxygen ions.

- **Lead:** A malleable, metallic element of bluish-white appearance that readily oxidizes to a grayish color. Lead is a toxic substance that can cause damage to the nervous system or blood cells. The use of lead in gasoline, paints, and plumbing compounds has been strictly regulated or eliminated, such that today it poses a very small risk.

- **Visibility Reducing Particles (VRP):** VRP's are just what the name implies, namely, small particles that occlude visibility and/or increase glare or haziness. Since sulfate emissions (notably SO_2) have been found to be a significant contributor to visibility-reducing particles, Congress mandated reductions in annual emissions of SO_2 from fossil fuels starting in 1995.

The EPA has established ambient air quality standards for these pollutants. These standards are called the National Ambient Air Quality Standards (NAAQS).[2] The California Air Resources Board (CARB) subsequently established the more stringent California Ambient Air Quality Standards (CAAQS).[3] Both sets of standards are shown in Figure 5 on the following page. Areas in California where ambient air concentrations of pollutants are higher than the state standard are considered to be in *"non-attainment"* status for that pollutant.

ENVIRONMENTAL SIGNIFICANCE THRESHOLDS

California Environmental Quality Act (CEQA) Thresholds

Section 15382 of the California Environmental Quality Act (CEQA) guidelines defines a significant impact as,

> *"… a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance."*

The minimum change in ambient air quality conditions within the City of Escondido, as identified by the San Diego Air Pollution Control District (SDAPCD), are outlined starting on Page 9 of this report.

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[2] Under the Federal Clean Air Act of 1970, U.S.C. Title 42, Chapter 85, as amended in 1977 and 1990.

[3] The new CARB eight-hour ozone standard became effective in early 2006. The new federal $PM_{2.5}$ standard became effective in early 2007.

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 μg/m^3)	Ultraviolet Photometry	–	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 μg/m^3)		0.075 ppm (147 μg/m^3)		
Respirable Particulate Matter (PM10)[8]	24 Hour	50 μg/m^3	Gravimetric or Beta Attenuation	150 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m^3		–		
Fine Particulate Matter (PM2.5)[8]	24 Hour	–	–	35 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m^3	Gravimetric or Beta Attenuation	12.0 μg/m^3	15 μg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	–	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	–	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		–	–	
Nitrogen Dioxide (NO_2)[9]	1 Hour	0.18 ppm (339 μg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 □g/m^3)	–	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)		0.053 ppm (100 μg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[10]	1 Hour	0.25 ppm (655 μg/m^3)	Ultraviolet Fluorescence	75 ppb (196 □g/m^3)	–	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	–		–	0.5 ppm (1300 μg/m^3)	
	24 Hour	0.04 ppm (105 μg/m^3)		0.14 ppm (for certain areas)[10]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas)[10]	–	
Lead[11,12]	30 Day Average	1.5 μg/m^3	Atomic Absorption	–	–	High Volume Sampler and Atomic Absorption
	Calendar Quarter	–		1.5 μg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	–		0.15 μg/m^3		
Visibility Reducing Particles[13]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 μg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[11]	24 Hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

FIGURE 5: Ambient Air Quality Standards Matrix (after CARB/EPA, updated 6/4/13)

CEQA Air Quality Screening Standards

The City of Escondido uses Appendix G.III of the State CEQA guidelines as thresholds of significance, and recognizes the SDAPCD's established screening thresholds for air quality emissions (*Rules 20.1 et. seq.*) as screening standards. These standards focus on the following potential impact areas, namely, would the project:

- Conflict with or obstruct implementation of the applicable air quality plan?
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation?
- Result is a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?
- Expose sensitive receptors to substantial pollutant concentrations?
- Create objectionable odors affecting a substantial number of people?

These screening standards will be applied throughout this air quality conformity assessment for the basis of determination of both regional as well as localized air quality impacts due to the proposed project.

SDAPCD Criteria Pollutant Standards

Pursuant to the California Health & Safety Code, jurisdiction for regulation of air emissions from non-mobile sources within San Diego County has been delegated to the San Diego County Air Pollution Control District (SDAPCD).[4] As part of its air quality permitting process, SDAPCD has established thresholds for the preparation of *Air Quality Impact Assessments* (AQIA's) and/or *Air Quality Conformity Assessments* (AQCA's).

SDAPCD Rule 20.2, which outlines these screening level criteria, states that any project that results in an emission increase equal to or greater than any of these levels, must:

> "… demonstrate through an AQIA . . . that the project will not (A) cause a violation of a State or national ambient air quality standard anywhere that does not already exceed such a standard, nor (B) cause additional violations of a national ambient air quality standard anywhere the standard is already being exceeded, nor (C) cause additional violations of a State ambient air quality standard anywhere the standard is already being exceeded, nor (D) prevent or interfere with the attainment or maintenance of any State or national ambient air quality standard."

[4] Source: *California Health & Safety Code, Division 26, Part 3, Chapter 1, Section §40002.*

The applicable standards are shown in Table 1 below. For projects whose stationary-source emissions are below these criteria, no AQIA is typically required, and project level emissions are presumed to be less than significant. The City of Escondido accepts the use of these "screening criteria" as *"Thresholds of Significance"* by projects for the purposes of CEQA analysis.

TABLE 1: Thresholds of Significance for Air Quality Impacts

Pollutant	Thresholds of Significance (Pounds per Day)	Clean Air Act *less than significant* Levels (Tons per Year)
Carbon Monoxide (CO)	**550**	100
Oxides of Nitrogen (NO_x)	**250**	50
Oxides of Sulfur (SO_x)	**250**	100
Particulate Matter (PM_{10})	**100**	100
Particulate Matter ($PM_{2.5}$)	**55**	100
Volatile Organic Compounds (VOC's) Reactive Organic Gasses (ROG's)	**75**	50

Source: SDAPCD Rule 1501, 20.2(d)(2), 1995; EPA 40 CFR 93, 1993.

- Threshold for VOC's based on the threshold of significance for reactive organic gases (ROG's) from Chapter 6 of the CEQA Air Quality Handbook of the South Coast Air Quality Management District.
- Threshold for ROG's in the eastern portion of the County based on the threshold of significance for reactive organic gases (ROG's) from Chapter 6 of the CEQA Air Quality Handbook of the Southeast Desert Air Basin.
- Thresholds are applicable for either construction or operational phases of a project action.
- The PM2.5 threshold is based upon the proposed standard identified in the, *"Final – Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds"*, published by SCAQMD in October 2006.

These standards are compatible with those utilized elsewhere in the State (such as South Coast Air Quality Management District standards, etc.) as part of CEQA guidance documents. In the event that project emissions may approach or exceed these screening level criteria, modeling would be required to demonstrate that the project's ground-level concentrations, including appropriate background levels, are below the Federal and State Ambient Air Quality Standards.

The existing ambient conditions are compared for the with- and without-project cases. If emissions exceed the allowable thresholds, additional analysis is conducted to determine whether the emissions would exceed an ambient air quality standard (i.e., the CAAQS values previously shown in Figure 5). Determination of significance considers both localized impacts (such as CO hotspots) and cumulative impacts. In the event that any criteria pollutant exceeds the threshold levels, the proposed action's impact on air quality is considered significant and mitigation measures would be required.

For CEQA purposes, these screening criteria are used as numeric methods to demonstrate that a project's total emissions (e.g. stationary and fugitive emissions, as well as emissions from mobile sources) would not result in a significant impact to air quality. Since SDAPCD does not have AQIA thresholds for emissions of volatile organic compounds (VOC's), the use of the screening level for reactive organic compounds (ROC) from the CEQA Air Quality Handbook for the South Coast Air Basin (SCAB), which has stricter standards for emissions of ROC's/VOC's than San Diego's, is appropriate. No differentiation is made between construction and operation emission thresholds.

Finally, under the General Conformity Rule, the EPA has developed a set of *de minimis* thresholds for all proposed federal actions in a non-attainment area for evaluating the significance of air quality impacts. It should be noted that the State (i.e., SDAPCD) standards are equal to, or more stringent than, the Federal Clean Air standards.[5] Development of the proposed project would therefore fall under the stricter SDAPCD guidelines.

Combustion Toxics Risk Factors

When fuel burns in an engine, the resulting exhaust is made up of soot and gases representing hundreds of different chemical substances. The predominant constituents are:

- Nitrous Oxide
- Formaldehyde
- Sulfur Dioxide
- Carbon Dioxide
- Nitrogen Dioxide
- Benzene
- Hydrogen Sulfide
- Carbon Monoxide

Over ninety-percent (90%) of the exhaust emissions from an engine consist of soot particles whose size is equal to, or less than, 10-microns in diameter. Particles of this size can easily be inhaled and deposited in the lungs. Diesel exhaust contains roughly 20 to 100 times more emissive particles than gasoline exhaust. Of principal concern are particles of cancer causing substances known as *polynuclear aromatic hydrocarbons* (PAH's).[6]

There are inherent uncertainties in risk assessment with regard to the identification of compounds as causing cancer or other adverse health effects in

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[5] A fact that can be verified through multiplication of the SDAPCD standards by 365 days and dividing by 2,000 pounds.

[6] Polynuclear aromatic hydrocarbons (PAH's) are hydrocarbon compounds with multiple benzene rings. PAH's are a group of approximately 10,000 compounds which result predominately from the incomplete burning of carbon-containing materials like oil, wood, garbage or coal.

humans, the cancer potencies and Reference Exposure Levels (REL's)[7] of compounds, and the exposure that individuals receive. It is common practice to use conservative (health protective) assumptions with respect to uncertain parameters. The uncertainties and conservative assumptions must be considered when evaluating the results of risk assessments.

Since the potential health effects of contaminants are commonly identified based on animal studies, there is uncertainty in the application of these findings to humans. In addition, for many compounds it is uncertain whether the health effects observed at higher exposure levels in the laboratory or in occupational settings will occur at lower environmental exposure levels. In order to ensure that potential health impacts are not underestimated, it is commonly assumed that effects seen in animals, or at high exposure levels, could potentially occur in humans following low-level environmental exposure.

Estimates of potencies and REL's are derived from experimental animal studies, or from epidemiological studies of exposed workers or other populations.[8] Uncertainty arises from the application of potency, or REL values derived from this data, to the general human population. There is debate as to the appropriate levels of risk assigned to diesel particulates, since the USEPA has not yet declared diesel particulates as a toxic air contaminant.

Using the CARB threshold, a risk concentration level of one in one million (1:1,000,000) of continuous 70-year exposure is considered less than significant. A risk exposure level of ten in one million (10:1,000,000) is acceptable if *Toxic Best Available Control Technologies* (T-BACT's) are used. It should be noted that this type of reporting is only strictly applicable to large populations (such as entire air basins), where the sample group is sizeable, and the exposure time is long (which is not the case for project-level construction projects).

For purposes of analysis under this report, and to be consistent with the approaches used for other toxic pollutants, a functional comparison of the aforementioned risk probability per individual person exposed to construction contaminants will be examined. This approach has the advantage of not needing to quantify the population of the statistical group adjacent to the construction (which could yield false values), as well as allowing the per-person risk to be expressed as a final percentage (with a percentage level of 100% being equal to the impact threshold). Of course, for a large enough population sample (i.e., a million people or more) the results are identical to CARB's prediction methodology.

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[7] The exposure level at which there are no biologically significant increases in the frequency or severity of adverse effects between the exposed population and the control group. Some effects may be produced at this level, but they are not considered adverse or precursors to adverse effects.

[8] Source: *CalEPA, USEPA, SCAQMD, 2001 et. seq.*

APPROACH AND METHODOLOGY

The analysis criteria for air quality impacts are based upon the approach recommended by the *South Coast Air Quality Management District's (SCAQMD) CEQA Handbook*.[9] The handbook establishes aggregate emission calculations for determining the potential significance of a proposed action. In the event that the emissions exceed the established thresholds, air dispersion modeling may be conducted to assess whether the proposed action results in an exceedance of an air quality standard. The City of Escondido has adopted this methodology.

Ambient Air Quality Data Collection

<u>CARB Air Monitoring Station Data within Project Vicinity</u>

The California Air Resources Board (CARB) monitors ambient air quality at approximately 250 air-monitoring stations across the state. Air quality monitoring stations usually measure pollutant concentrations 10 feet above ground level; therefore, air quality is often referred to in terms of ground-level concentrations. Ambient air pollutant concentrations are measured at 10 air-quality-monitoring stations operated by the SDAPCD.

The ambient air-quality-monitoring station (denoted by the symbol in Figure 6 on Page 15 of this report), which is in relative close proximity to the project site, and would be representative of ambient air toxics under both onshore and offshore atmospheric wind conditions, is located within the City of Escondido approximately 2.3 miles from the project site.[10] Other stations within the project vicinity present either incomplete or redundant data or were determined not to be representative of localized ambient air quality conditions present at the project site.

Finally, due to the type of equipment employed at each station, not every station is capable of recording the entire set of criteria pollutants previously identified in Table 1. Periodic audits are conducted to ensure calibration conformance.[11]

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[9] The SCAQMD CEQA Handbook is a reference volume containing an extensive list of semi-empirical (quantified experimental) curve-fit equations describing various emissive sources having important context under CEQA. The equations are not perfect (in that they would not constitute an *'exact solution'* in a scientific sense), but are nonetheless a reasonable approximation of the physical problem. In the same light, programs which utilize the SCAQMD semi-empirical methodology (such as *URBEMIS 2007* and the like) provide no greater problem understanding than using the equations directly. Such programs are still subject to all of the same limitations as the methods and equations on which they rely.

[10] Escondido - E Valley Parkway Station (600 E Valley Parkway, Escondido CA 92019) – ARB Station ID 80115.

[11] Calibration of CARB equipment is performed in accordance with the *U.S. Environmental Protection Agency's 40 CFR, Part 58, Appendix A* protocol with all equipment traceable to National Institute of Standards and Technology (NIST) standards. The typical accuracy of the equipment is ±15% for gasses (such as CO, NO_x, etc.) and ±10% for PM_{10}.

Onsite Air Quality Monitoring and Analysis

Additionally, an ambient air quality sample was collected at an elevated location with respect to the project development area at a height of 5.0-feet above ground level using a negative pressure sampling apparatus. The sampling location is shown in Figure 7 on Page 16 of this report. Each air sample was collected in a 0.7-liter Teflon (Tedlar) sample bag, and sealed upon completion of the testing.

Onsite testing conditions indicated an ambient dry-bulb air temperature of 72.1 degrees Fahrenheit and a relative humidity of 34.5 percent. Wind speeds were light from the southwest, and the average barometric pressure was 29.50 in-Hg. The sample was maintained under *Standard Temperature and Pressure Conditions* (STP) during transit to the ISE test facility.

The bagged samples were tested for airborne toxics, as well as molecular composition using a Stanford Research Systems 300 atomic-mass-unit (AMU) Universal Gas Analyzer (or UGA).[12] This device, which consists of a Faraday cup quadrupole mass spectrometer, analyzes incoming gasses (or any material that can be aerosolized) for content based upon its atomic distribution. In this manner, the UGA analyzes any substance based solely upon its elemental composition. The typical test setup is shown in Figure 8 on Page 17 of this report.

Data from the UGA was then post processed using a process known as *spectral deconvolution* to determine the relative composition of any toxics of interest. A final screening of the data against 191,436 different compounds was performed using the 2008 National Institute of Standards and Technology (NIST11) Mass Spectral Library search program.[13]

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[12] The designator AMU stands for Atomic Mass Unit, and is a measure of the atomic weight of a particular element (i.e., the combined nuclear weight of an element's protons and neutrons).

[13] Source: NIST/EPA/NIH Mass Spectral Database (NIST 11) and NIST Mass Spectral Search Program (Version 2.0g), National Institute of Standards and Technology, U.S. Department of Commerce, 5/11.

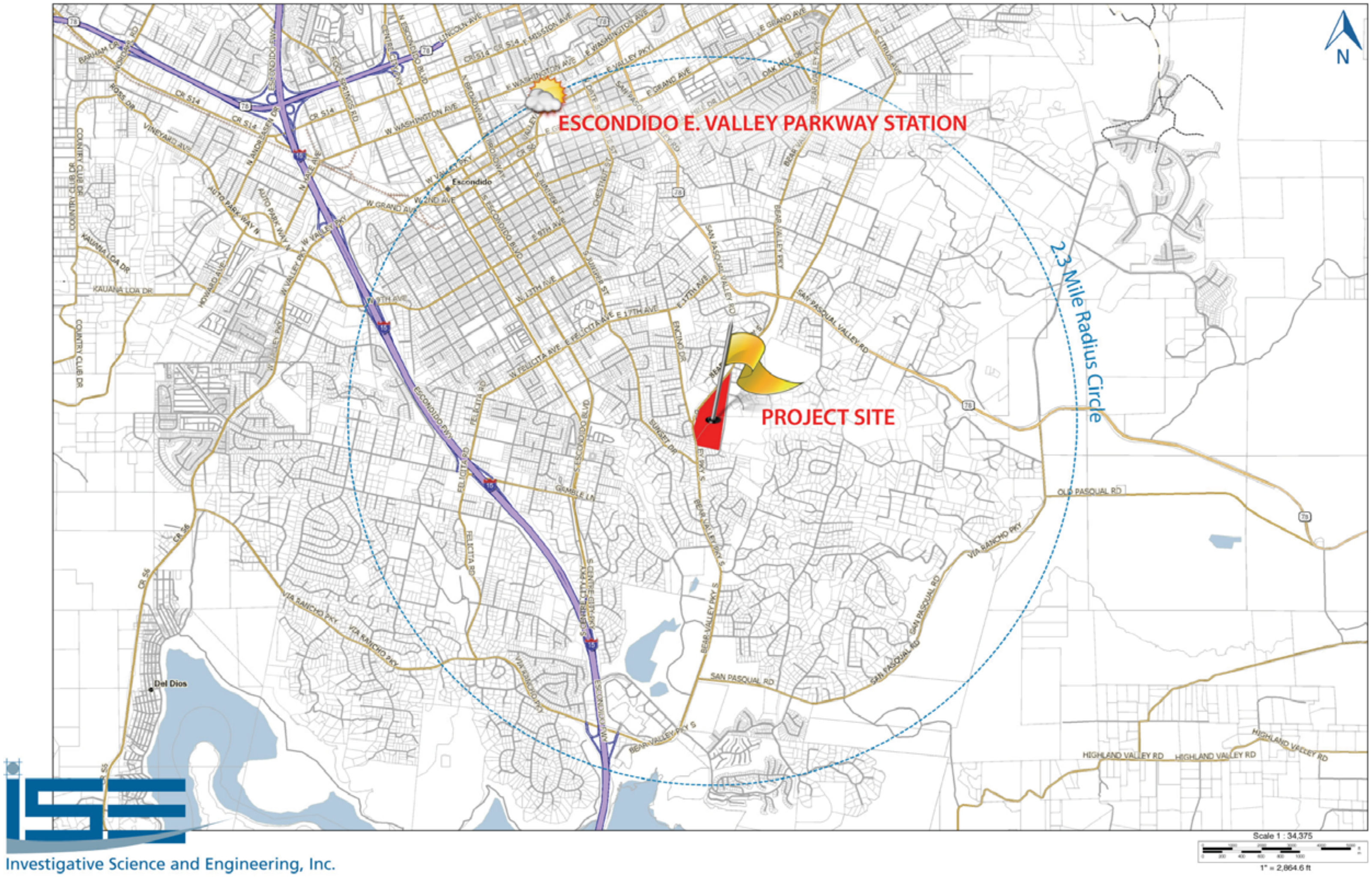

FIGURE 6: Ambient Air Quality Monitoring Station Location Map (ISE 8/15)

FIGURE 7: Ambient Air Quality Sampling Location (ISE 12/14)

FIGURE 8: Laboratory Mass Spectrometry Test Setup (ISE 12/14)

Construction Air Quality Modeling

Construction Vehicle Emission Modeling (CO, NO_x, SO_x, PM_{10}, $PM_{2.5}$, ROG)

Primary construction vehicle pollutant emission generators expected within the 661 Bear Valley site would consist predominately of diesel-powered grading and earthwork equipment required for grading activities, underground work, and surface paving. The analysis methodology utilized in this report is based upon the EPA AP-42 tiered emissions report for the various classes of diesel construction equipment.[14,15]

The maximum generation rates of typical equipment would constitute the baseline (unmitigated) construction emission rates as mandated by the EPA. Estimates of daily load factors (i.e., the amount of time during a day that any piece of equipment is under load) were based upon past ISE engineering experience with similar operations, and consultation with the project applicant. In cases where the required construction equipment aggregate does not comply with the applicable standards for a pollutant under examination, mitigation is imposed by requiring cleaner (i.e., higher tiered)

[14] The EPA allowable maximum CO emissions from Tier 2 equipment is 0.0082 pounds per horsepower-hour (lb/HP-hr) for equipment with power ratings between 50 and 175 HP, and 0.0057 lb/HP-hr for equipment with power ratings over 175 HP. Tier 3 ratings only apply between 50 to 750 HP and are identical to Tier 2 requirements. Tier 4 requirements (to be phased-in between 2008 and 2015) set a sliding scale on CO limits ranging from 0.0132 lb/HP-hr for small engines, to 0.0057 lb/HP-hr for engines up to 750 HP.

[15] The EPA allowable maximum NO_x and PM_{10} emissions from Tier 2 equipment are 0.0152 and 0.0003 lb/HP-hr regardless of the engine size. Tier 3 emissions must meet the Tier 2 requirement. Tier 4 standards further reduce this level to 0.0006 lb/HP-hr for NO_x, and 0.00003 lb/HP-hr for PM_{10} for engines over 75 HP.

equipment, as required under the Federal Clean Air Act.[16,17]

Finally, fine particulate dust generation ($PM_{2.5}$) from construction equipment was analyzed using the methodology identified by the SCAQMD.[18] This approach, which utilizes the *California Emission Inventory Development and Reporting System* (CEIDARS) database, estimates $PM_{2.5}$ emissions as a fractional percentage of the aggregate PM_{10} emissions. For diesel construction equipment, the fractional emission factor is 0.920 $PM_{2.5}$ / PM_{10}.

Fugitive Dust Emission Modeling (PM_{10}, $PM_{2.5}$)

Fugitive dust generation from the proposed remedial grading plan was analyzed using the methodology recommended in the SCAQMD CEQA Handbook guidelines for calculating 10-micron Particulate Matter (PM_{10}) due to earthwork movement and stockpiling. The analysis assumed low-wind speeds and active wet suppression control. Aggregate levels of PM_{10}, based upon the best available surface grading estimates, were calculated in pounds per day and compared to the applicable significance criteria previously shown in Table 1.

For surface grading operations, the fractional emission factor is 0.208 $PM_{2.5}$ / PM_{10} based upon the SCAQMD approach. For unpaved road travel, the fractional emission factor is 0.212 $PM_{2.5}$ / PM_{10}.

Combustion-Fired Health-Risk Emission Modeling (PM_{10}, $PM_{2.5}$)

For the purposes of this analysis, worst-case construction vehicle pollutant emission generators would consist entirely of construction activities associated with grading and site preparation of each residential pad, as well as construction of the connecting roadways. The analysis methodology utilized in this report is based upon EPA and CARB guidelines for construction operations. Construction emissions were based upon initial Tier 3 generation rates for the various classes of diesel construction equipment.

A screening risk assessment of diesel-fired toxics from construction equipment was performed using the *SCREEN3* dispersion model developed by the *EPA's Office of Air Quality Planning and Standards*.[19] The SCREEN3 model uses a Gaussian plume

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[16] Source: *US Code of Federal Regulations, Title 40, Part 89 [40 CFR Part 89].*

[17] In most cases the federal regulations for diesel construction equipment also apply in California, whose authority to set emission standards for new diesel engines is limited. The federal Clean Air Act Amendments of 1990 (CAA) preempt California's authority to control emissions from both new farm and construction equipment under 175 hp *[CAA Section 209(e)(1)(A)]* and require California to receive authorization from the federal EPA for controls over other off-road sources *[CAA Section 209 (e)(2)(A)]*.

[18] The $PM_{2.5}$ emission factors are based upon the SCAQMD document, *"Final – Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds"*, 10/06. The correction factor for diesel equipment of this type is 0.920.

[19] The methodology is based upon the *Industrial Source Complex (ISC3)* source dispersion approach as outlined in the *EPA-454/B-95-003b* technical document. The SCREEN3 model is used within the State of California and is typically more restrictive than the ISC3 model.

dispersion algorithm that incorporates source-related and meteorological factors to estimate pollutant concentration from continuous sources.

Modeling under SCREEN3 assumes that the pollutant in question does not undergo any chemical reactions, and that no other removal processes, such as wet or dry deposition, act on the plume during its transport from the source. Using the concentrations obtained from the screening model, the diesel toxic risk can be defined as shown below:

$$Risk = \frac{F_{wind} \cdot EMFAC \cdot URF_{70}}{Dilution}$$

Where, *Risk* is the excess cancer risk (probability in one-million), F_{wind} is the frequency of the wind blowing from the exhaust source to the receptor (the default value is 1.0), *EMFAC* is the exhaust particulate emission factor (the level from the screening model), URF_{70} is the Air Resource Board unit risk probability factor (300 x 10^{-6}, or 300 in a million cancer risk per µg/m^3 of diesel combustion generated PM_{10} inhaled in a 70-year lifetime,[20] and, *Dilution* is the atmospheric dilution ratio during source-to-receptor transport (the default value of 1.0 assumes no dilution).

Given the above assumptions for wind frequency and atmospheric dilution ratio, and substituting the CARB recommended value for the unit risk probability factor, gives the following expression:

$$Risk = \frac{\cancel{1.0} \cdot EMFAC \cdot 300x10^{-6}}{\cancel{1.0}} = 300x10^{-6} \cdot EMFAC \text{ per person}$$

Thus, the percentage of risk of cancer to any given person, being exposed to a concentration of pollution equal to EMFAC (in µg/m^3) over a continuous period of 70-years, would be:

$$Risk_{\%} = \left(300x10^{-6} \cdot EMFAC\right) \cdot 100 = 300x10^{-4} \cdot EMFAC \text{ per person}$$

Where it can be directly stated that a risk percentage of, say, 25% would indicate a 25% probability of inhaled cancer risk for the given level of exposure if consumed continuously for a period of 70-years. A 50% probability would correspond to a 50:50 chance of inhaled cancer risk if consumed continuously for a period of 70-years, and so on.

[20] Based upon the ARB 1999 Scientific Review Panel staff report on diesel toxic emissions.

For the construction-related diesel-fired toxics analysis, an area-source consistent in dimensions with the proposed grading area will be assumed. A simplified elevated terrain model (which is consistent with the area surrounding the project site) with no building downwash corrections and a worst-case wind direction was utilized.

VOC Emissions from Architectural Coatings Methodology

Volatile Organic Compound (VOC) emissions from architectural coatings such as painting will be analyzed within this report using the *SCAQMD CEQA Handbook Method A11-13* based upon an expected maximum total square-footage being painted per day. It will be assumed for the purposes of this assessment that all solvents used are water based with a maximum 50-percent by weight solids content, and are capable of generating the maximum CARB level of 250 grams of VOC per liter regardless of the application method.

Aggregate Vehicle Emission Air Quality Modeling

Motor vehicle emissions associated with proposed 661 Bear Valley subdivision project were calculated by multiplying the appropriate emission factor (in grams per mile) times the estimated trip length and the total number of vehicles. Appropriate conversion factors were then applied to provide aggregate emission units of pounds per day.

CARB estimates on-road motor vehicle emissions by using a series of models called the *Motor Vehicle Emission Inventory* (MVEI) Models. Four computer models, which form the MVEI, are *CALIMFAC, WEIGHT, EMFAC*, and *BURDEN*.[21] They function as follows:

- ***CALIMFAC*** produces base emission rates for each model year when a vehicle is new and as it accumulates mileage and the emission controls deteriorate.
- ***WEIGHT*** calculates the relative weighting each model year should be given in the total inventory, and each model year's accumulated mileage.
- ***EMFAC*** uses these pieces of information, along with the correction factors and other data, to produce fleet composite emission factors, and,
- ***BURDEN*** combines the emission factors with county-specific activity data to produce to emission inventories.

[21] The module named *EMFAC* should not be confused with the entire EMFAC 2007 program itself (which calls the subroutines *CALIMFAC, WEIGHT, EMFAC, and BURDEN* to determine the final emission inventory for a particular area).

For the current analysis, the *EMFAC 2011* of the MVEI[22] was run using input conditions specific to the San Diego air basin to predict operational vehicle emissions from the project based upon a project completion year 2015 scenario.[23] The aggregate emission factors from the EMFAC model are provided as an attachment at the end of this report. A mix ratio consistent with the 2010 Caltrans ITS Transportation Project-Level Carbon Monoxide Protocol was used.[24]

Finally, fine particulate dust generation ($PM_{2.5}$) from motor vehicle operation was again analyzed using the aforementioned CEIDARS database. For operational vehicular traffic, the fractional emission factor is 0.998 $PM_{2.5}$ / PM_{10} based upon both the SCAQMD and EMFAC approaches.

Traffic Segment Pollutant Concentration Modeling

A traffic segment hotspot conformity analysis was performed on all project-related roadway segments, using the *California Line Source Emissions Model Version 4* (CALINE4)[25] air dispersion model methodology in order to quantify near term cumulative plus project pollutant concentrations within this portion of the project air basin. CALINE4 is the accepted line source dispersion model within the State of California.

For the hotspot analysis, horizon traffic volumes for all affected roadway segments were used based upon near-term cumulative values provided by the project traffic engineer.[26] Worst case mean running speeds of 45 MPH and a 10% ADT level were used for all potentially impacted roadway segments. Additionally, worst-case wind speed, aggregate emissions class data, and meteorological assumptions were created and run for various traffic scenarios.

Ambient CO and PM_{10} concentrations were determined through the previously discussed field monitoring effort. Levels for NO_x precursors were set to basin-wide levels. The NO_2 photolysis rate was taken at a default atmospheric solar value of 0.004/sec.[27] The CALINE4 solution space is provided as an attachment to this report.

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[22] This is the most current CARB emissions model approved for use within the State of California.

[23] This is a worst-case assumption, since implementation of cleaner vehicle controls ultimately reduces emissions under future year conditions. By applying near-term emission factors to the complete project, an upper bound on project-related emissions is obtained.

[24] This consisted of the following air standard Otto-Cycle engine vehicle distribution percentages: Light Duty Auto (LDA) = 69.0%, Light Duty Truck (LDT1) = 19.4%, Medium Duty Truck (LHD1) = 6.4%, Heavy Duty Truck Gasoline (MH GAS) = 1.2%, Heavy Duty Truck Diesel (MH DSL) = 3.6%, Motorcycle (MCY) = 0.4%.

[25] CALINE4 is a Gaussian line dispersion model, developed by Caltrans, which is used to predict localized vehicle emissions from mobile sources. The model uses source strength, meteorological data, and site geometry to predict pollutant concentrations within 1,500 feet of the roadway.

[26] Source: Traffic Impact Analysis: 661 Bear Valley – Escondido, CA, Linscott, Law & Greenspan, Engineers, 12/17/14.

[27] Photolysis is the process by which a chemical compound undergoes a change in valence as the result of the absorption of a photon (i.e., light). This process is also called photodecomposition, photochemical reaction, or photo-oxidation.

Fixed Source Emissions Modeling

Fixed emission sources under the analysis context within this report would consist predominantly of small gasoline engines used with landscaping equipment, and emissive sources from natural gas powered appliances (such as stoves, hot water heaters, etc.) as well as proposed fireplace usage. An analysis of these emission sources, consistent with the *SCAQMD CEQA Handbook* and current EPA protocols, will be quantified with the total aggregate emission levels identified at the end of this report.[28]

CONFORMITY FINDINGS

Existing Climate Conditions

The climate within the region surrounding the proposed 661 Bear Valley development site is characterized by warm, dry summers and mild, wet winters; it is dominated by a semi-permanent high-pressure cell located over the Pacific Ocean. This high-pressure cell maintains clear skies over the air basin for much of the year. It also drives the dominant onshore circulation, as can be seen in Figure 9 on the following page, and helps to create two types of temperature inversions, subsidence and radiation, that contribute to local air quality degradation.

Subsidence inversions occur during the warmer months, as descending air associated with the Pacific high-pressure cell meets cool marine air. The boundary between the two layers of air represents a temperature inversion that traps pollutants below it. Radiation inversion typically develops on winter nights, when air near the ground cools by radiation, and the air aloft remains warm. A shallow inversion layer that can trap pollutants is formed between the two layers.

In the area of the proposed project site, the maximum and minimum average temperatures are 89º F and 42º F, respectively.[29] Precipitation in the area averages 15.1 inches annually, 90 percent of which falls between November and April. Fog can occasionally develop during the winter.

[28] The analysis presented herein uses the same methodology identified in the CARB *URBEMIS* model, although providing a greater level of detail. The technical details are provided in the SCAQMD CEQA Handbook Tables A9-12 and A9-12A, -B as well as the EPA's AP-42 emission generation document previously referenced.

[29] Source: *National Weather Service (NWS) / National Oceanographic and Atmospheric Administration (NOAA), 2015.*

FIGURE 9: Project Air Basin Aerial Map (Google Earth 2014, ISE 12/14)

The prevailing wind direction at the project site is from the west-southwest, with an annual mean speed of 3 to 5 miles per hour. Frequently, the strongest winds in the basin occur during the night and morning hours due to the absence of onshore sea breezes. The overall result is a noticeable degradation in local air quality.[30]

Existing Air Quality Levels

<u>CARB Aerometric Station Data within Project Vicinity</u>

The project site is located in the north central portion of the San Diego Air Basin. The Basin continues to have a transitional-attainment status of federal standards for Ozone (O_3) and PM_{10}. The Basin is either in attainment or unclassified for federal standards of CO, SO_2, and NO_2. Factors affecting ground level pollutant concentrations include the rate at which pollutants are emitted to the atmosphere, the height from which they are released, and topographic and meteorological features.

Tables 2a through -c, starting on the following page, provide a summary of the highest pollutant levels recorded at the previously identified monitoring station for the last year available (2014), based upon the latest data from the CARB Aerometric Data Analysis and Management (ADAM) System database.[31] Upon examination it can be seen that closest monitoring station reported slight air quality exceedances for the subject criteria pollutants O_3, PM_{10} and $PM_{2.5}$.[32]

<u>Onsite Air Pollutant Concentration Findings</u>

The atomic mass distribution of the onsite ambient air-monitoring sample is shown in Figure 10 on Page 28 of this report.[33] Spectral deconvolution indicated ambient air pollution concentrations, by mass percentage, as shown in Table 3 on Page 29.

Given these findings, no significant ambient air quality impacts are indicated. No respirable 10- and 2.5-micron particulate matter (PM_{10} and $PM_{2.5}$) was indicated in the sample. Toxicity screening against the NIST spectral database indicated no unusual compounds present.

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[30] Occasionally during the months of October through February, offshore flow becomes a dominant factor in the regional air quality. These periods, known as “Santa Ana Conditions”, are typically maximal during the month of December with wind speeds from the north to east approaching 35 knots and gusting to over 50 knots. This air movement is caused by clockwise pressure circulation over the Great Basin (i.e., the high plateau east of the Sierra Mountains and west of the Rocky Mountains including most of Nevada and Utah), which results in significant downward air motion towards the ocean. Stronger Santa Ana winds can have gusts greater than 60 knots over widespread areas and gusts greater than 100 knots in canyon areas.

[31] Averages for O_3 and CO are expressed in parts-per-million, NO_X is expressed in parts-per-billion, and particulate matter is shown in $\mu g/m^3$. CAAQS exceedances are denoted in yellow, while NAAQS exceedances are shown in orange.

[32] Monitoring for lead was discontinued entirely in 1998.

[33] The plot in this figure indicates the partial atmospheric pressure (in Torr) as a function of the atomic mass unit. The larger the vertical bar, the greater the concentration of a particular atom (or diatomic form). The unit of Torr is a very small pressure unit - one atmosphere equals 760 Torr.

TABLE 2a: CARB Aerometric Data Analysis – Escondido Monitoring Station (Panel 1)

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Ozone Averages

at Escondido-E Valley Parkway — iADAM

	2012		2013		2014	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National:						
First High:	Oct 1	0.073	May 3	0.074	May 2	0.079
Second High:	Apr 8	0.070	May 13	0.074	May 3	0.079
Third High:	Sep 30	0.068	Apr 20	0.073	Sep 13	0.077
Fourth High:	Oct 2	0.068	May 12	0.072	Sep 14	0.076
California:						
First High:	Oct 1	0.074	May 13	0.075	May 2	0.080
Second High:	Apr 8	0.071	May 3	0.074	May 3	0.080
Third High:	Sep 30	0.069	Apr 20	0.073	Sep 13	0.077
Fourth High:	Oct 2	0.069	May 12	0.072	Oct 5	0.077
National:						
# Days Above the Standard:		0		0		5
Nat'l Standard Design Value:		0.070		0.069		0.072
National Year Coverage:		87		96		92
California:						
# Days Above the Standard:		2		4		8
California Designation Value:		0.077		0.075		0.077
Expected Peak Day Concentration:		0.078		0.076		0.079
California Year Coverage:		86		94		88

Highest 4 Daily Maximum 8-Hour Ozone Averages

Top 4 Summary: Highest 4 Daily Maximum Hourly Ozone Measurements

at Escondido-E Valley Parkway — iADAM

	2012		2013		2014	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Oct 1	0.084	May 13	0.084	Sep 14	0.099
Second High:	Sep 30	0.079	Apr 20	0.081	May 2	0.089
Third High:	Oct 2	0.079	Mar 15	0.080	Oct 5	0.087
Fourth High:	Sep 22	0.077	May 3	0.078	May 3	0.085
California:						
# Days Above the Standard:		0		0		1
California Designation Value:		0.09		0.09		0.09
Expected Peak Day Concentration:		0.089		0.085		0.086
National:						
# Days Above the Standard:		*0*		*0*		*0*
Nat'l Standard Design Value:		*0.091*		*0.086*		*0.085*
Year Coverage:		89		97		97

Highest 4 Daily Maximum Hourly Ozone Measurements

Source: CARB ADAM Ambient Air Quality Inventory – 7/15

TABLE 2b: CARB Aerometric Data Analysis – Escondido Monitoring Station (Panel 2)

Top 4 Summary: Highest 4 Daily 24-Hour PM2.5 Averages

at Escondido-E Valley Parkway

	2012		2013		2014	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Jan 1	70.7	Jan 1	56.3	Jan 1	77.5
Second High:	Jan 7	26.9	Dec 31	33.4	Jan 12	30.4
Third High:	Dec 8	19.9	Oct 26	32.4	Dec 31	30.4
Fourth High:	Nov 3	19.5	Dec 25	29.8	Jan 11	27.8
California:						
First High:	Jan 1	70.7	Jan 1	56.3	Jan 1	82.3
Second High:	Jan 7	26.9	Dec 31	33.4	Jan 11	34.1
Third High:	Dec 8	19.9	Oct 26	32.4	Jan 12	30.4
Fourth High:	Nov 3	19.5	Dec 25	29.8	Dec 31	30.4
National:						
Estimated # Days > 24-Hour Std:		3.1		1.1		1.0
Measured # Days > 24-Hour Std:		1		1		1
24-Hour Standard Design Value:		21		22		23
24-Hour Standard 98th Percentile:		19.9		23.0		26.1
Annual Standard Design Value:		10.5		10.7		10.5
Annual Average:		10.5		11.0		9.9
California:						
Annual Std Designation Value:		10		11		11
Annual Average:		*		10.5		9.6
Year Coverage:		96		100		100

Highest 4 Daily 24-Hour PM2.5 Averages

Top 4 Summary: Highest 4 Daily 24-Hour PM10 Averages

at Escondido-E Valley Parkway

	2012		2013		2014	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Dec 11	33.0	Feb 27	80.0	Jan 11	43.0
Second High:	Jun 8	31.0	Dec 24	41.0	May 11	38.0
Third High:	May 9	30.0	Nov 12	40.0	Jan 17	37.0
Fourth High:	May 21	29.0	Oct 25	39.0	Dec 31	37.0
California:						
First High:	Dec 11	33.0	Feb 27	82.0	Jan 11	44.0
Second High:	Jun 8	31.0	Nov 12	41.0	Dec 31	39.0
Third High:	May 9	30.0	Dec 24	41.0	May 11	38.0
Fourth High:	May 21	29.0	Oct 25	39.0	Jan 17	37.0
National:						
Estimated # Days > 24-Hour Std:		0.0		0.0		0.0
Measured # Days > 24-Hour Std:		0		0		0
3-Yr Avg Est # Days > 24-Hr Std:		0.0		0.0		0.0
Annual Average:		*18.0*		*23.2*		*21.6*
3-Year Average:		*19*		*20*		*21*
California:						
Estimated # Days > 24-Hour Std:		0.0		6.0		0.0
Measured # Days > 24-Hour Std:		0		1		0
Annual Average:		18.1		23.1		21.5
3-Year Maximum Annual Average:		21		23		23
Year Coverage:		99		100		100

Highest 4 Daily 24-Hour PM10 Averages

Source: CARB ADAM Ambient Air Quality Inventory – 7/15

TABLE 2c: CARB Aerometric Data Analysis – Escondido Monitoring Station (Panel 3)

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Carbon Monoxide Averages

at Escondido-E Valley Parkway — iADAM

	2012		2013		2014	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National:						
First High:	Jan 1	3.61		*		*
Second High:	Jan 5	2.07		*		*
Third High:	Jan 2	1.81		*		*
Fourth High:	Jan 14	1.76		*		*
California:						
First High:	Jan 1	3.70		*		*
Second High:	Jan 5	2.07		*		*
Third High:	Jan 13	1.76		*		*
Fourth High:	Jan 4	1.71		*		*
National:						
# Days Above the Standard:		0		0		0
California:						
# Days Above the Standard:		0		0		0
Expected Peak Day Concentration:		2.32				
Year Coverage:		48		*		*

Highest 4 Daily Maximum 8-Hour Carbon Monoxide Averages

Top 4 Summary: Highest 4 Daily Maximum Hourly Nitrogen Dioxide Measurements

at Escondido-E Valley Parkway — iADAM

	2012		2013		2014	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Oct 17	62.0	Nov 13	61.0	Oct 3	63.0
Second High:	Nov 15	53.0	Feb 27	56.0	Jan 13	59.0
Third High:	Jan 4	52.0	Feb 14	53.0	Feb 14	57.0
Fourth High:	Oct 16	52.0	Nov 9	53.0	Oct 24	57.0
California:						
First High:	Oct 17	62	Nov 13	61	Oct 3	63
Second High:	Nov 15	53	Feb 27	56	Jan 13	59
Third High:	Jan 4	52	Feb 14	53	Feb 14	57
Fourth High:	Oct 16	52	Nov 9	53	Oct 24	57
National:						
1-Hour Standard Design Value:		51		50		52
1-Hour Standard 98th Percentile:		51.0		51.0		55.0
# Days Above the Standard:		0		0		0
Annual Standard Design Value:		13		12		11
California:						
1-Hour Std Designation Value:		60		60		60
Expected Peak Day Concentration:		61		59		62
# Days Above the Standard:		0		0		0
Annual Std Designation Value:		14		13		13
Annual Average:		13		13		11
Year Coverage:		95		83		88

Highest 4 Daily Maximum Hourly Nitrogen Dioxide Measurements

Source: CARB ADAM Ambient Air Quality Inventory – 7/15

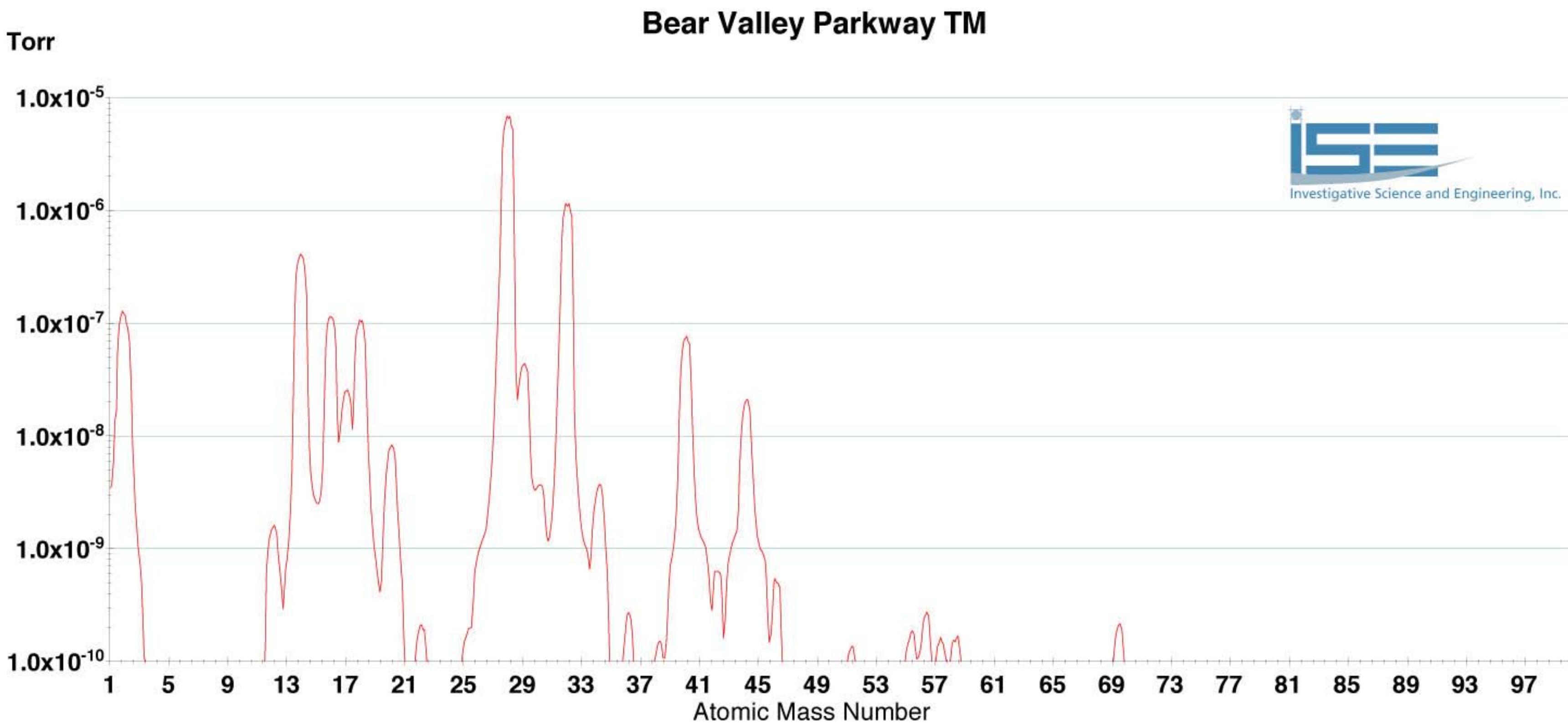

FIGURE 10: Spectral Content of Ambient Air Sample AQ 1 (ISE 12/14)

TABLE 3: Ambient Air Quality Monitoring Results

Chemical Compound Examined	Air Sample Composition (% by wt.)	
	Lab Standard Air Sample (Dry N_2 Mix)	Measured Field Sample (AQ 1)
Ammonia (NH_3)	0.0	0.0
Benzene (C_6H_6)	0.0	0.0
Carbon Dioxide (CO_2)	0.1	0.5
Carbon Monoxide (CO)	0.0	0.0
Hydrogen Sulfide (H_2S)	0.0	0.0
Nitric Oxide (NO)	0.0	0.1
Nitrogen Dioxide (NO_2)	0.0	0.0
Nitrous Oxide (N_2O)	0.0	0.0
Free Nitrogen (N_2)	97.8	81.6
Free Oxygen (O_2)	1.3	15.9
Sulfur Dioxide (SO_2)	0.0	0.0
Water Vapor (H_2O)	0.8	1.9

Partial Pressure Mass Fractions by Percent. Data Margin ± 0.1 percent.

Project Construction Emission Findings

The proposed 661 Bear Valley project site would be cleared and graded over the course of approximately 180 working days for all construction phases.[34] Given this, the following construction findings were indicated.

[34] The typical construction phases for land development, which are independent of the specific project being developed, are as follows:

Construction Phase	Work Performed	Typical Tasks
Rough Grading	Site clearing, grubbing, and general pad and road alignment formation.	Site mobilization, scraper hauls/finishing, and additional site finishing work.
Underground Utility Construction	General trench-work, pipe laying with associated base material and cover, and ancillary earthwork required to facilitate placement of sewer lift stations, manholes, etc.	This is typically performed as a single task.
Paving Activities	Movement of any remaining material as well as necessary curb and gutter work, road base material placement and blacktop.	This is typically performed as a single task.

Construction Vehicle Emissions (CO, NO_x, SO_x, PM_{10}, $PM_{2.5}$, ROG)

The estimated worst-case diesel exhaust emissions due to construction vehicle operation are provided in Table 4 on Page 31 of this report inclusive of any powered haulage. Based upon the findings, no significant construction vehicle air quality impacts are expected.

Fugitive Dust Emission Levels (PM_{10}, $PM_{2.5}$)

Construction activities are also a source of fugitive dust emissions that may have a substantial, but temporary, impact on local air quality. These emissions are typically associated with land clearing, excavating, and construction of a proposed action. Substantial dust emissions also occur when vehicles travel on paved and unpaved surfaces, and haul trucks lose material.

Dust emissions and impacts vary substantially from day to day, depending on the level of activity, the specific operation being conducted, and the prevailing meteorological conditions. Wet dust suppression techniques, such as watering and/or applying chemical stabilization, would be used during construction to suppress the fine dust particulates from leaving the ground surface and becoming airborne through the action of mechanical disturbance or wind motion.

Grading operations are anticipated as being no greater than a worst-case 342,750 cubic-yards (cy) of cut/fill material moved over an anticipated 180-day earthwork period. For alluvium-type material, the project earthwork would have a total working weight of,

$$\text{Working Weight} = 342{,}750 \text{ cubic yards} \times \frac{1.3 \text{ tons}}{\text{cubic yard}} = 445{,}575.0 \text{ tons}$$

Out of the total quantity identified above, it is estimated that roughly 80-percent of the working weight would be capable of generating PM_{10}. Thus, for the purposes of analysis, the working weight of earthwork material capable of generating some amount of PM_{10} would be 356,460.0 tons. Thus, the average mass grading earthwork fill movement per day over the total 180 working days would be 1,980.3 tons/day.

TABLE 4: Predicted Worst-Case Diesel Construction Engine Emissions

Equipment Type Model	Selected EPA Tier Level	Quantity Used (#)	Engine Power Rating (HP)	Average Load Factor (%)	Duty Cycle (hrs/day)	Aggregate SDAPCD Criteria Pollutants (Pounds/Day)					
						CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	ROG
Push Dozer D10T	3	2	580	40	8	21.3	56.5	7.4	1.2	1.1	8.2
Dozer D9R	3	1	410	50	8	9.4	24.9	3.3	0.5	0.5	3.6
Dozer D6T LGP	3	1	200	40	8	3.7	9.7	1.3	0.2	0.2	1.4
Scraper- 657G Tractor	3	2	1050	30	4	14.4	38.3	5.0	0.8	0.8	5.6
Motor Grader 120K	3	2	125	50	8	8.2	15.2	2.0	0.5	0.4	2.2
Water Truck	3	1	200	40	8	3.7	9.7	1.3	0.2	0.2	1.4
Hydraulic Excavator 349EL	3	1	400	60	8	11.0	29.2	3.8	0.6	0.6	4.2
	Sum:	**10**				**71.6**	**183.6**	**24.1**	**4.1**	**3.8**	**26.6**
			SDAPCD Significance Threshold:			**550**	**250**	**250**	**100**	**55**	**75**

Following the analysis procedure identified in the *SCAQMD CEQA Handbook* for PM_{10} emissions from fugitive dust gives the following semi-empirical relationship for aggregate respirable dust generation,

$$PM_{10} = 0.00112 \cdot \left[\frac{\left(\frac{WS}{5}\right)^{1.3}}{\left(\frac{SMC}{2}\right)^{1.4}} \right] \cdot ET \text{ (in Pounds)}$$

Where, PM_{10} = Fugitive dust emissions in pounds, WS = Ambient wind speed, SMC = Surface Moisture Content, generally defined as the weight of the water (W_w) divided by the weight of the soil (W_s) as measured at the surface in grams per gram, and, ET = Earthwork Tonnage moved per day.

Substituting a minimum SMC value of 0.25 (which is extremely conservative for an ambient dirt/sand condition), and a maximum credible wind speed scenario of 12 MPH (WS = 12), gives the following result,

$$\text{PM}_{10} = 0.00112 \times \left[\frac{\left(\frac{12}{5}\right)^{1.3}}{\left(\frac{0.25}{2}\right)^{1.4}} \right] \times 1980.3 = 127.1 \text{ Pounds}$$

or, a level of 127.1 pounds of PM_{10} generated per day. It should be noted that surface wetting will be utilized during all phases of earthwork operations at a minimum level of three times per day; thus a control efficiency of 34% to 68% reduction in fugitive dust can be applied per the SCAQMD methodology.

Assuming a median 60% control efficiency, due to the aforementioned watering yields,

$$\text{PM}_{10} = (1 - 0.6) \cdot 127.1 = 50.9 \text{ Pounds}$$

or a total fugitive dust generated load of 50.9 pounds per day. This level is below the 100 pounds per day threshold established by the SDAPCD. Therefore, no impacts are expected from this phase of construction. The commensurate $PM_{2.5}$ level would be 10.6 pounds per day, which is also below the proposed threshold of significance of 55 pounds per day for this pollutant.

Additionally, following the analysis methods identified in the *SCAQMD CEQA Handbook* for PM_{10} emissions due to unpaved haul roads gives the following semi-empirical relationship for aggregate respirable dust generation,

$$PM_{10} = VMT \times \left[2.1 \left(\frac{SLP}{12} \right) \left(\frac{MVS}{30} \right) \left(\frac{MVW}{3} \right)^{0.7} \left(\frac{NW}{4} \right)^{0.5} \left(\frac{365 - RD}{365} \right) \right] \text{(in Pounds)}$$

Where, PM_{10} = Fugitive dust emissions in pounds due to haulage on unpaved roads, VMT = Vehicle Miles Traveled per day, SLP = Soil Silt Loading in Percent, MVS = Mean Vehicle Speed in miles per hour, MVW = Mean Vehicle Weight in tons, NW = Number of Wheels on the vehicle, and, RD = Mean number of Rain Days with at least 0.01 inches of precipitation.

Unpaved road travel due to construction activities is also unknown at this time. For the purposes of analysis, it will be assumed that contractors' vehicles moving onsite would traverse a total of 30 miles per day (VMT) during the earthwork and site preparation phases. Substituting the applicable project values of VMT = 30, SLP = 6.0 (sand/gravel road with watering), MVS = 5 miles per hour, MVW = 20 tons (gross vehicular weight), NW = 10 wheels (average number of wheels), and RD[35] = 44.0 (rain days), gives the following result,

$$\text{PM}_{10} = 30.0 \times \left[2.1 \left(\frac{6}{12} \right) \left(\frac{5}{30} \right) \left(\frac{20}{3} \right)^{0.7} \left(\frac{10}{4} \right)^{0.5} \left(\frac{365 - 44}{365} \right) \right] = 27.5 \text{ Pounds}$$

or, a level of 27.5 pounds of PM_{10} generated per day. This activity alone would not generate a significant impact. The commensurate $PM_{2.5}$ level would be 5.8 pounds per day, which is also below the proposed threshold of significance identified above.

Combustion-Fired Health-Risk Emission Levels (PM_{10}, $PM_{2.5}$)

Onsite construction equipment was found to generate worst-case aggregate daily pollutant levels during the rough grading phase. These emissions are assumed to occur over any given 24-hour day (thereby providing an upper bound on expected emission concentrations) and direct comparison with CAAQS standards. Although all stable criteria pollutants are provided, it should be noted that for cancer-risk potential, only combustion-fired PM_{10} particulates are considered with $PM_{2.5}$ concentrations being determined through the aforementioned fractional emission estimates.

[35] Based upon U.S. Weather Service average precipitation year data for Escondido, CA.

The proposed 661 Bear Valley project site has a maximum working footprint of roughly 1,781,604 square-feet (165,516 m^2) based upon data obtained from the project site plans. The aggregate emission rates for the various criteria pollutants, in grams per second, and grams per square-meter (m^2) per second, are shown in Table 5 below.[36] The expected combustion-fired construction emission concentrations from the *SCREEN3* modeling are shown in Table 6 on the following page. The output model results are provided as an attachment to this report.

Based upon the model results, all criteria pollutants were below the recommended health risk level with a PM_{10} risk probability of 0.100% per 70-year exposure duration, assuming the implementation of T-BACT. Given this, no significant carcinogenic impact potential is expected due to proposed grading operations. Additionally, the analysis identified a worst-case PM_{10} level of 3.34 $\mu g/m^3$ occurring at a distance of 640 meters (2,099 feet) from the project site. This pollutant concentration is below the California Ambient Air Quality Standard (CAAQS) of 50 $\mu g/m^3$ established by the State for any given 24-hour exposure period.

TABLE 5: Predicted Onsite Diesel-Fired Construction Emission Rates

Criteria Pollutant	Max Daily Emissions (pounds)	Daily Site Emission Rates (grams/second)	Average Area Emission Rates (grams/m^2/second)
CO	71.6	0.3760	2.2717E-06
NO_x	183.6	0.9641	5.8247E-06
SO_x	24.1	0.1268	7.6581E-07
PM_{10}	**4.1**	**0.0218**	**1.3152E-07**
$PM_{2.5}$	3.8	0.0200	1.2100E-07

Total averaging time is 24 hours x 60 minutes/hour x 60 seconds/minute = 86,400 seconds per CAAQS standards.

The area emission rates are shown in scientific notation and are expressed in the form of *mantissa-exponent* to base 10.

One pound-mass = 453.592 grams.

[36] As a required input parameter for the SCREEN3 model.

TABLE 6: SCREEN3 Predicted Diesel-Fired Emission Concentrations

Criteria Pollutant	Pollutant Concentration ($\mu g/m^3$)	Pollutant Concentration (ppm)	Pollutant Risk Probability (percent risk per person for 70-year exposure)	Significant?
CO	57.66	0.0501	n/a	No
NO_x	147.80	0.0786	n/a	No
SO_x	19.44	0.0074	n/a	No
PM_{10}	**3.34**	**- -**	**0.100%**	**No**
$PM_{2.5}$	3.07	- -	n/a	No

Diesel risk calculation based upon ARB 1999 Staff Report from the Scientific Review Panel (SRP) on Diesel Toxics inhaled in a 70-year lifetime.

Conversion Factors (approximate):

CO: 1 ppm = 1,150 $\mu g/m^3$ @ 25 deg-C STP, NO_x: 1 ppm = 1,880 $\mu g/m^3$ @ 25 deg-C STP
SO_x: 1 ppm = 2,620 $\mu g/m^3$ @ 25 deg-C STP, PM_{10} and $PM_{2.5}$: 1 ppm = 1 g/m^3 (solid)

$PM_{2.5}$ levels based upon the CEIDARS database fractional emission factor for diesel construction equipment of 0.920 $PM_{2.5}$ / PM_{10}.

The predicted diesel-fired PM_{10} dispersion pattern as a function of distance from the site can be seen in Figure 11 on the following page. No cumulative contribution from the site would be physically possible beyond the extents identified in this figure.[37]

Finally, anticipated diesel-fired $PM_{2.5}$ levels would not be expected to exceed 3.1 $\mu g/m^3$, which is also below the Federal NAAQS 24-hour threshold of 35 $\mu g/m^3$ (there are no State thresholds for this pollutant). No cumulative contribution of $PM_{2.5}$ from the site would be physically possible due to the reasons cited above.

[37] Which, assuming a standard Gaussian distribution, would yield an effective 'no impact' distance of 8,396 feet (or 1.59 miles).

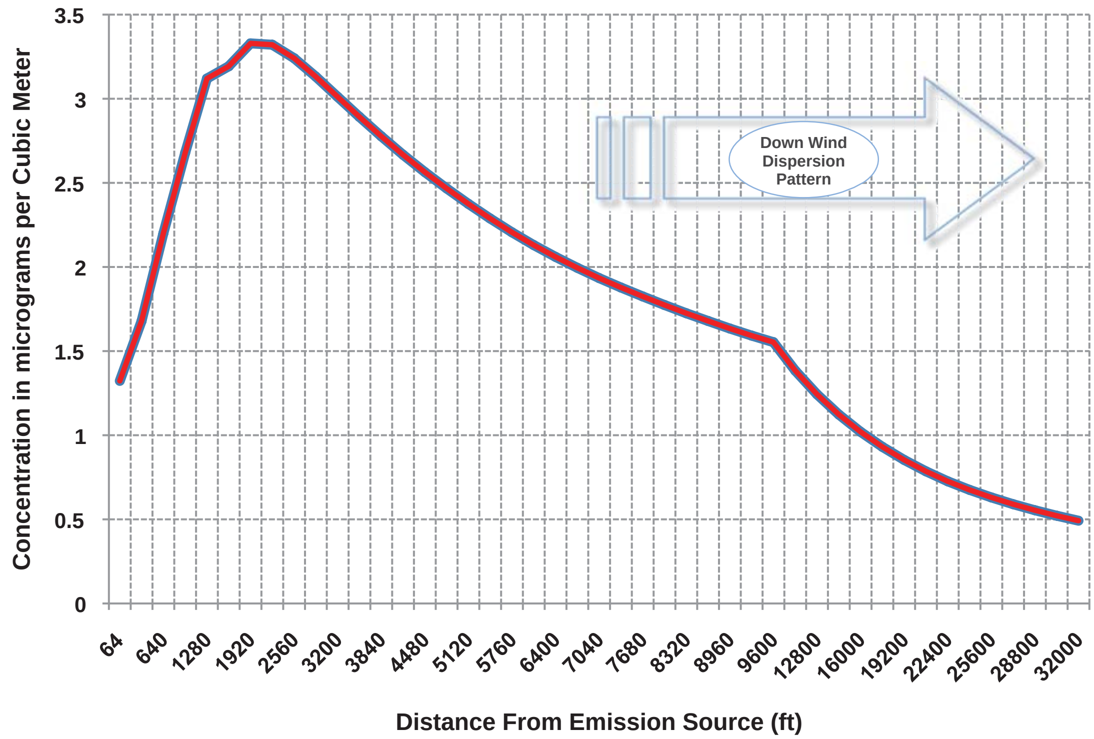

FIGURE 11: Predicted Combustion-Fired Diesel PM_{10} Dispersion Pattern (ISE 8/15)

VOC Emission Potential from Architectural Coatings

Following the analysis methods identified in the *SCAQMD CEQA Handbook* for Volatile Organic Compound (VOC) emissions due to architectural coatings gives the following semi-empirical relationship for aggregate emission levels,

$$VOC_{arch} = \left[\frac{WT \times A}{1000} \right] \times CT$$

Where, VOC = Total pounds of Volatile Reactive Organic Compounds per day, WT = Specific VOC weight in pounds per mil per 1,000 square-foot application area, A = Total exterior and/or interior area to be coated in square-feet, and, CT = Required paint thickness in mils.

Due to the nature of the project design at this point, exact painting quantities are unknown. It is expected that the proposed 661 Bear Valley contractors could completely finish paint[38] a maximum of 5,000 square-feet (denoted as A) of usable surface area every day (denoted as ΔT). This yields the following modified expression:

$$\mathrm{VOC}_{\mathrm{arch}} = \left[\frac{\frac{WT}{\Delta T} \times A}{1000} \right] \times CT$$

Substituting the applicable unmitigated project values of WT = 7.12 pounds of VOC per 1,000 square-feet of painted area[39], ΔT = 1 day, A = 5,000 square-feet, CT = 2.0 mils (as the default value for two fast passes using an HVLP[40]) gives the following result,

$$\mathrm{VOC}_{\mathrm{arch}} = \left[\frac{7.12 \times 5000}{1000 \times 1} \right] \times 2.0 = 71.2 \text{ Pounds}$$

This yields a total unmitigated architectural-generated VOC level of 71.2 pounds per day. It can be shown that the VOC load can be reduced by a factor of 2.56 / 7.12 = 0.36 through the application of Low VOC paints. This would produce final VOC levels of 0.36 x 71.2 = 25.6 pounds of VOC per day. No remedial impacts would be expected.

Odor Impact Potential from Proposed Site

The inhalation of VOC's causes smell sensations in humans. These odors can affect human health in four primary ways:

- The VOC's can produce toxicological effects;
- The odorant compounds can cause irritations in the eye, nose, and throat;
- The VOC's can stimulate sensory nerves that can cause potentially harmful health effects; and,
- The exposure to perceived unpleasant odors can stimulate negative cognitive and emotional responses based on previous experiences with such odors.

[38] Finish painting implies, in the context of this report, complete surface area painting consisting of two coats as well as any required trim work. The referenced square-footage is the floor area square-footage per SCAQMD.

[39] Per SCAQMD CEQA Handbook, Table A11-13-C.

[40] HVLP = High-Volume, Low-Pressure painting system.

Development of the proposed project site could generate trace amounts (less than 1 $\mu g/m^3$) of substances such as ammonia, carbon dioxide, hydrogen sulfide, methane, dust, organic dust, and endotoxins (i.e., bacteria are present in the dust).[41]

It should be noted that odor generation impacts due to the project are not expected to be significant, since any odor generation would be intermittent and would terminate upon completion of the construction phase of the project. As a result, no significant air quality impacts are expected to surrounding residential receptors. No mitigation for odors is identified.

Project Vehicular Emission Levels

The 661 Bear Valley site development project is expected to have a worst-case trip generation level of 550 ADT based upon the cumulative trip generation produced for the proposed project.[42,43] The average one-way trip length would be 20.0 miles given the average service radius of the proposed facility.[44]

The CARB EMFAC 2011 running emission factors are shown in Table 7a on the following page for a median speed of 45 MPH (which is consistent with travel patterns observed by ISE). The calculated operational daily emissions due to travel to, and from the project site, are shown in Table 7b on Page 40. Based upon the findings, no significant impacts for any criteria pollutants were identified.

Predicted Traffic Segment Pollutant Concentration Levels

Tables 8a through –f, starting on page 41, lists the roadway segments identified by the traffic engineer for the existing conditions, and existing conditions plus project scenario, as well as the predicted peak hour traffic volume, and the expected CO, NO_x, PM_{10}, and $PM_{2.5}$ emissions at 100 feet from the road centerline (minimum possible standing receptor distance).

Based upon the dispersion model findings, no localized criteria pollutant impacts were identified for any roadway segment examined. The roadway segments examined were found to comply with the CAAQS and NAAQS standards.

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[41] Additionally, proposed onsite uses could generate substances such as volatile organic acids, alcohols, aldehydes, amines, fixed gases, carbonyls, esters, sulfides, disulfides, mercaptans, and nitrogen heterocycles.

[42] Source: *Traffic Impact Analysis: 661 Bear Valley – Escondido, CA, Linscott, Law & Greenspan, Engineers, 12/17/14*.

[43] Motor vehicles are the primary source of emissions associated with the proposed project area. Typically, uses such as the proposed project do not directly emit significant amounts of air pollutants from onsite activities. Rather, vehicular trips to and from these land uses are the significant contributor.

[44] The average assumed trip length is the average travel distance to or from the site. It is anticipated that some end trips will be shorter, and some longer, but for the purposes of analysis, the average value is given.

TABLE 7a: CARB EMFAC 2011 Year 2020 Emission Rates

	Criteria Pollutants Under Examination (in grams per mile)					
EMFAC 2011 Year 2020 Emission Rates	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**ROG**
Light Duty Auto (LDA)	0.799	0.088	0.003	0.001	0.001	0.018
Light Duty Truck (LDT1)	1.472	0.152	0.003	0.002	0.002	0.027
Medium Duty Truck (LHD1)	0.790	0.392	0.005	0.001	0.001	0.039
Heavy Duty Truck Gasoline (MH GAS)	1.483	0.552	0.013	0.001	0.001	0.044
Heavy Duty Truck Diesel (MH DSL)	0.503	5.781	0.000	0.125	0.115	0.109
Motorcycle (MCY)	17.790	1.168	0.002	0.000	0.000	2.033

TABLE 7b: Project Trip Generated Emissions – 661 Bear Valley Tentative Subdivision Map

		Criteria Pollutants Under Examination (in pounds per day)					
Proposed Project Action Emissions	**ADT**	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**ROG**
Light Duty Auto (LDA)	380	13.36	1.47	0.05	0.02	0.0	0.30
Light Duty Truck (LDT1)	107	6.92	0.72	0.01	0.01	0.0	0.12
Medium Duty Truck (LHD1)	35	1.23	0.61	0.01	0.00	0.0	0.06
Heavy Duty Truck Gasoline (MH GAS)	7	0.43	0.16	0.00	0.00	0.0	0.01
Heavy Duty Truck Diesel (MH DSL)	20	0.44	5.05	0.00	0.11	0.1	0.09
Motorcycle (MCY)	2	1.73	0.11	0.00	0.00	0.0	0.20
Total:	**550**	**24.1**	**8.1**	**0.1**	**0.1**	**0.1**	**0.8**
SDAPCD Significance Threshold:		**550**	**250**	**250**	**100**	**55**	**75**

TABLE 8a: Incremental Traffic Segment Pollutant Increases (Existing Conditions)

Roadway	Segment	LOS	ADT	Δ CO (ppm)	Δ NO_X (pphm)	Δ PM_{10} (ppm)	Δ $PM_{2.5}$ (ppm)
Bear Valley Parkway	Eldorado Drive to Zlatibor Ranch Road	F	20,600	0.1	0.7	0.6	0.6
	Zlatibor Ranch Road to Encino Drive	F	20,110	0.1	0.7	0.5	0.5
	Encino Drive to Sunset Drive	F	21,770	0.1	0.7	0.6	0.6
	Sunset Drive to Las Palmas Avenue	F	30,600	0.1	0.8	0.7	0.7
	Las Palmas Avenue to Mary Lane	C	27,300	0.1	0.8	0.7	0.7
	Mary Lane to San Pasqual Road	D	29,430	0.1	0.8	0.7	0.7
Encino Drive	West of Bear Valley Parkway	A	1,420	0.0	0.3	0.1	0.1
Sunset Drive	West of Bear Valley Parkway	B	7,450	0.0	0.5	0.3	0.3

TABLE 8b: Incremental Traffic Segment Pollutant Increases (Existing + Project Conditions)

Roadway	Segment	LOS	ADT	Δ CO (ppm)	Δ NO_X (pphm)	Δ PM_{10} (ppm)	Δ $PM_{2.5}$ (ppm)
Bear Valley Parkway	Eldorado Drive to Zlatibor Ranch Road	F	20,721	0.1	0.7	0.6	0.6
	Zlatibor Ranch Road to Encino Drive	F	20,539	0.1	0.7	0.6	0.6
	Encino Drive to Sunset Drive	F	22,073	0.1	0.7	0.6	0.6
	Sunset Drive to Las Palmas Avenue	F	30,793	0.1	0.8	0.8	0.8
	Las Palmas Avenue to Mary Lane	D	27,465	0.1	0.8	0.7	0.7
	Mary Lane to San Pasqual Road	D	29,595	0.1	0.8	0.7	0.7
Encino Drive	West of Bear Valley Parkway	A	1,547	0.0	0.3	0.1	0.1
Sunset Drive	West of Bear Valley Parkway	B	7,560	0.0	0.5	0.3	0.3

TABLE 8c: Incremental Traffic Segment Pollutant Increases (Cumulative Conditions)

Roadway	Segment	LOS	ADT	Δ CO (ppm)	Δ NO_X (pphm)	Δ PM_{10} (ppm)	Δ $PM_{2.5}$ (ppm)
Bear Valley Parkway	Eldorado Drive to Zlatibor Ranch Road	F	25,880	0.1	0.8	0.7	0.7
	Zlatibor Ranch Road to Encino Drive	F	24,040	0.1	0.7	0.6	0.6
	Encino Drive to Sunset Drive	F	25,810	0.1	0.8	0.7	0.7
	Sunset Drive to Las Palmas Avenue	F	34,340	0.1	0.8	0.8	0.8
	Las Palmas Avenue to Mary Lane	D	31,670	0.1	0.8	0.8	0.8
	Mary Lane to San Pasqual Road	E	34,920	0.1	0.9	0.8	0.8
Encino Drive	West of Bear Valley Parkway	A	1,890	0.0	0.3	0.1	0.1
Sunset Drive	West of Bear Valley Parkway	B	7,650	0.0	0.5	0.3	0.3

TABLE 8d: Incremental Traffic Segment Pollutant Increases (Cumulative + Project Conditions)

Roadway	Segment	LOS	ADT	Δ CO (ppm)	Δ NO_X (pphm)	Δ PM_{10} (ppm)	Δ $PM_{2.5}$ (ppm)
Bear Valley Parkway	Eldorado Drive to Zlatibor Ranch Road	F	26,001	0.1	0.8	0.7	0.7
	Zlatibor Ranch Road to Encino Drive	F	24,469	0.1	0.7	0.6	0.6
	Encino Drive to Sunset Drive	F	26,113	0.1	0.8	0.7	0.7
	Sunset Drive to Las Palmas Avenue	F	34,533	0.1	0.9	0.8	0.8
	Las Palmas Avenue to Mary Lane	D	31,835	0.1	0.8	0.8	0.8
	Mary Lane to San Pasqual Road	E	35,085	0.1	0.9	0.8	0.8
Encino Drive	West of Bear Valley Parkway	A	2,017	0.0	0.3	0.1	0.1
Sunset Drive	West of Bear Valley Parkway	B	7,760	0.0	0.5	0.3	0.3

TABLE 8e: Incremental Traffic Segment Pollutant Increases (General Plan Build Out Conditions)

Roadway	Segment	LOS	ADT	Δ CO (ppm)	Δ NO_X (pphm)	Δ PM_{10} (ppm)	Δ $PM_{2.5}$ (ppm)
Bear Valley Parkway	Eldorado Drive to Zlatibor Ranch Road	E	35,470	0.1	0.9	0.8	0.8
	Zlatibor Ranch Road to Encino Drive	F	37,620	0.1	0.9	0.9	0.9
	Encino Drive to Sunset Drive	F	45,610	0.1	0.9	1.0	1.0
	Sunset Drive to Las Palmas Avenue	E	45,610	0.1	0.9	1.0	1.0
	Las Palmas Avenue to Mary Lane	E	44,590	0.1	0.9	1.0	1.0
	Mary Lane to San Pasqual Road	F	50,940	0.2	1.0	1.1	1.1
Encino Drive	West of Bear Valley Parkway	A	3,180	0.0	0.4	0.2	0.2
Sunset Drive	West of Bear Valley Parkway	C	8,300	0.0	0.5	0.3	0.3

TABLE 8f: Incremental Traffic Segment Pollutant Increases (General Plan Build Out + Project Conditions)

Roadway	Segment	LOS	ADT	Δ CO (ppm)	Δ NO_X (pphm)	Δ PM_{10} (ppm)	Δ $PM_{2.5}$ (ppm)
Bear Valley Parkway	Eldorado Drive to Zlatibor Ranch Road	E	35,899	0.1	0.9	0.8	0.8
	Zlatibor Ranch Road to Encino Drive	F	37,923	0.1	0.9	0.9	0.9
	Encino Drive to Sunset Drive	F	45,803	0.1	0.9	1.0	1.0
	Sunset Drive to Las Palmas Avenue	E	45,803	0.1	0.9	1.0	1.0
	Las Palmas Avenue to Mary Lane	E	44,755	0.1	0.9	1.0	1.0
	Mary Lane to San Pasqual Road	F	51,105	0.2	1.0	1.1	1.1
Encino Drive	West of Bear Valley Parkway	A	3,307	0.0	0.4	0.2	0.2
Sunset Drive	West of Bear Valley Parkway	C	8,410	0.0	0.5	0.3	0.3

Predicted Operational Emission Levels

As previously discussed, fixed emission sources under this context would consist entirely of small gasoline engines used with lawn mowers and landscaping equipment as well as emissive sources from natural gas powered appliances (such as hot water heaters, stoves, etc.), and fireplace utilization. Each of these sources is discussed in detail below.

Small Gasoline Engine Emission Sources

Landscaping equipment utilized in the course of maintenance of the 661 Bear Valley project site typically would consist of a five horsepower four-stroke lawnmower and a small weed trimmer having a two-stroke engine with approximately 30 to 50 cubic-centimeters of displacement.[45]

For the purposes of analysis, the project site will be treated as a {CARB-classified} single-family residential area consisting of an aggregate of 55 lots. This equates to the following fixed emission levels in pounds per day for the aggregate of the proposed project development plan:

Land Use Type	CO	NO_x	SO_x	PM_{10}	ROG
Single-Family Use Space	0.3	0.0	0.0	0.0	0.0

These sources would be classified as insignificant emission sources and would not generate an air quality impact.

[45] Assuming cleaner burning engines purchased new by the ultimate user, the following emissions rates are projected by CARB:

Pollutant	Single-Family Emissions Per Unit (lb/day)	Multi-Family/Retail Emissions Per Unit (lb/day)
CO	0.00576	0.276
NO_x	0.00014	0.005
SO_x	0.0002	0.0001
PM_{10}	0.000005	0.00037
ROG	0.00054	0.0315

It should be noted that these emission factors are also the identical emission factors utilized by the URBEMIS model.

Natural Gas Emission Sources

Natural gas consumption (typically due to usage of central heating units and water heaters) would produce the following approximate total pounds of combustion emissions:

$$CP_{combustion} = ER \times \left[\frac{NU \times UR}{30} \right] \times 1x10^{-6}$$

Where, CP = The criteria pollutant under examination (i.e., CO, NO_x, PM_{10}, or ROG), ER = Emissions rate of criteria pollutant per million-cubic-feet of natural gas consumed (e.g., CO = 40 pounds/MM Cubic-feet, NO_x = 94 pounds/MM Cubic-feet, PM_{10} = 0.18 pounds/MM Cubic-feet, ROG = 7.26 pounds/MM Cubic-feet), NU = Total number of units per land use type (i.e., residential/commercial), and UR = Specific natural gas usage rate per development type (Single-Family = 6,665 ft^3/month, Multi-family = 4,011.5 ft^3/month, Retail Space = 2.9 ft^3/SF/month).

As before, the proposed project site will be treated as a single-family residential area consisting of an aggregate of 55 lots. This equates to the following fixed emission levels in pounds per day for the aggregate of the proposed development plan:

Land Use Type	CO	NO_x	SO_x	PM_{10}	ROG
Single-Family Use Space	0.5	1.1	- -	0.0	0.1

These sources would be classified as insignificant emission sources and would not generate an air quality impact.

Fireplace and Wood-Burning Stove Emission Sources

In 1988, the EPA adopted a *New Source Performance Standards* (NSPS) for woodstoves and small wood burning devices based upon Particulate Emission levels (the largest emitted criteria pollutant). It was noted that fireplaces and woodstoves are not equivalent devices since a typical fireplace produces much more particulate matter (PM_{10}) per hour or in a typical evening's use than a typical woodstoves because of the fireplace's higher burn rate (amount of wood burned per hour). "*Equivalence*" between standards for fireplaces and woodstoves was found not to be possible. Thus, the EPA's NSPS does not apply to all fireplaces or other devices that do not meet the definition of "*affected facility*" in the NSPS.

These fireplace units would consist of:

- Traditional masonry fireplaces. These are the traditional site-built fireplaces constricted of masonry. Though normally built from bricks, several manufacturers now offer factory-made cast masonry core components around which a masonry fireplace can be constructed. Two such devices are the Frisch-Rosin and Buckley-Rumford fireplaces. Masonry fireplaces are extremely expensive and are generally found only in high-end new construction. In addition, they raise significant seismic concerns, which add to cost.
- Zero-clearance fireplaces. These are metal fireplaces designed to be installed into wood framing. They are sometimes called "factory-built fireplaces" or "builder boxes." They are open fireplaces and do not meet the EPA definition of woodstove because they have an air to fuel ratio greater than 35 to 1. They are cheap and extremely common in new construction. Nationally, 80% of the 27 million U.S. fireplaces are zero-clearance fireplaces.
- Masonry heaters. Masonry heaters are a traditional northern European means of heating using a small open firebox set in a massive masonry structure with horizontal and downward flues though which gases are channeled before reaching the chimney. Masonry heaters store the heat from intermittent rapid fires and radiate, it back to the building. Unlike the three categories above, masonry heaters may have relatively hi thermal efficiency and may be used for heating purposes rather than aesthetic or recreational purposes.

There are two types of devices commonly called fireplaces that are subject to the woodstove NSPS or, in the case of some pellet-burning devices with air to fuel ratios greater than 35 to 1, which can meet the NSPS emission limits. These units are called *Certified Fireplace Inserts* (i.e., woodstove units, including some pellet stoves, designed to be retrofitted into a traditional masonry fireplace), and, *Certified EPA Fireplaces* (i.e., woodstoves designed to be installed into wood framing in the same manner as a zero-clearance fireplace). Unlike a zero clearance fireplace, these devices meet the woodstove definition in the NSPS.[46]

The AP-42 particulate emission factor for wood-burning fireplaces is 17.3 grams per kilogram of wood burned. This equates to an average emission level of 53.0 g/hr for typical fireplaces consistent with the NSPS.[47] The fractional emission factor is 0.95 $PM_{2.5}$ / PM_{10}. The maximum allowable PM_{10} emission levels for the proposed residential development due to combined fireplace operation within each of the 55 buildable lots is 100 pounds per day.[48]

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[46] In addition to the above wood-burning devices, there are two other types of gas-burning devices that are called "fireplaces." which are not subject to the NSPS. They are *Gas-burning Fireplaces* (i.e., factory-built fireplaces that are available as inserts or zero-clearance models and with several different venting arrangements, and, *Gas Logs* (i.e., gas burners installed in a masonry or factory-built fireplace to replicate the look of a traditional wood-burning fireplace).

[47] The source findings can be found in the following technical papers: Reitz (1993), Jaasma (1992), Colorado and Shelton (1987), Dasch (1982), and the US EPA (1975). The findings showed the following hourly particulate emission rates (in grams), respectively: 80, 32 to 44, 53, 33, and 76.

[48] Based upon EPA 40CFR93, 1993.

If half of all the wood-burning fireplaces within the development area were running simultaneously (a highly improbable, but reasonable and foreseeable condition under CEQA) with a nominal burn time of four hours, the pollution generation rate would be 5,830.0 grams (5.8 kilograms) of PM_{10}. This equates to 12.9 pounds of PM_{10} (12.2 pounds of $PM_{2.5}$) per evening. Thus, operational emissions would not be deemed impactive in this context (since $PM_{2.5}$ emissions from fireplaces are not currently regulated by CARB).

CONCLUSIONS AND RECOMMENDATIONS

The aggregate emission levels produced by the proposed 661 Bear Valley site development plan are shown in Table 9 below. Based upon the findings, no construction or operational air quality impacts are anticipated due to the project.

TABLE 9: Aggregate Emissions Synopsis – 661 Bear Valley Tentative Subdivision Map

	Aggregate Emissions for Criteria Pollutants					
SCENARIO EXAMINED	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$[49]**	**ROG**
Construction Grading Operations (pounds per day)						
Construction Grading Vehicle Emissions	71.6	183.6	24.1	4.1	3.8	26.6
Surface Grading Dust Generation	- -	- -	- -	50.9	10.6	- -
Powered Haulage Dust Generation	0.0	0.0	0.0	27.5	5.8	0.0
Total (Σ)	**71.6**	**183.6**	**24.1**	**82.5**	**20.2**	**26.6**
Construction Building Operations (pounds per day)						
Architectural Coating Application						71.2
Unmitigated Total (Σ)	- -	- -	- -	- -	- -	71.2
With Low VOC Paint Application (Σ)	- -	- -	- -	- -	- -	25.6
Project Operations (pounds per day)						
Vehicular Traffic Generation	24.1	8.1	0.1	0.1	0.1	0.8
Fixed Source #1 (Small Engine Usage - SF)	0.3	0.0	0.0	0.0	- -	0.0
Fixed Source #2 (Natural Gas - SF)	0.5	1.1	- -	0.0	- -	0.1
Fixed Source #3 (Fireplace/Wood Burning)	- -	- -	- -	12.9	12.2	- -
Total (Σ)	**24.9**	**9.3**	**0.1**	**13.0**	**12.3**	**0.9**
SDAPCD Significance Threshold:	**550**	**250**	**250**	**100**	**55**	**75**

[49] Values shown in this column are for informational purposes only. $PM_{2.5}$ emissions are not currently regulated by CARB. The 55 pound-per-day level shown is a proposed standard that has not been adopted.

CERTIFICATION OF ACCURACY AND QUALIFICATIONS

This report was prepared by Investigative Science and Engineering, Inc. (ISE), located at 1134 D Street, Ramona, CA 92065. The members of its professional staff contributing to the report are listed below:

Rick Tavares *(rtavares@ise.us)*	Ph.D. Civil Engineering M.S. Structural Engineering M.S. Mechanical Engineering B.S. Aerospace Engineering / Engineering Mechanics
Karen Tavares *(ktavares@ise.us)*	B.S. Electrical Engineering

ISE affirms to the best of its knowledge and belief that the statements and information contained herein are in all respects true and correct as of the date of this report. Content and information contained within this report is intended only for the subject project and is protected under 17 U.S.C. §§ 101 through 810.

Should the reader have any questions regarding the findings and conclusions presented in this report, please do not hesitate to contact ISE at (760) 787-0016.

Approved as to Form and Content:

Rick Tavares, Ph.D.

Project Principal
Investigative Science and Engineering, Inc. (ISE)

APPENDICIES AND SUPPLEMENTAL INFORMATION

SCREEN3 Model Output for Criteria Pollutants: CO, NO_x, SO_x, and PM_{10}

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

661 BEAR VALLEY GRADING AND SITE PREPARATION - CO

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE                 =        AREA
   EMISSION RATE (G/(S-M**2))  =      .227170E-05
   SOURCE HEIGHT (M)           =       3.0000
   LENGTH OF LARGER SIDE (M)   =     406.8000
   LENGTH OF SMALLER SIDE (M)  =     406.8000
   RECEPTOR HEIGHT (M)         =      10.0000
   URBAN/RURAL OPTION          =        RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)    STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
    20.   22.85        3     1.0    1.0   320.0    3.00     45.
   100.   29.01        4     1.0    1.0   320.0    3.00     43.
   200.   38.00        4     1.0    1.0   320.0    3.00     45.
   300.   46.26        5     1.0    1.0 10000.0    3.00     45.
   400.   53.90        5     1.0    1.0 10000.0    3.00     45.
   500.   55.15        6     1.0    1.0 10000.0    3.00     45.
   600.   57.50        6     1.0    1.0 10000.0    3.00     45.
   700.   57.37        6     1.0    1.0 10000.0    3.00     45.
   800.   55.99        6     1.0    1.0 10000.0    3.00     45.
   900.   54.07        6     1.0    1.0 10000.0    3.00     45.
  1000.   52.01        6     1.0    1.0 10000.0    3.00     45.
  1100.   49.95        6     1.0    1.0 10000.0    3.00     45.
  1200.   47.96        6     1.0    1.0 10000.0    3.00     45.
  1300.   46.07        6     1.0    1.0 10000.0    3.00     45.
  1400.   44.29        6     1.0    1.0 10000.0    3.00     45.
  1500.   42.61        6     1.0    1.0 10000.0    3.00     45.
```

```
  1600.   41.02        6     1.0     1.0 10000.0    3.00     45.
  1700.   39.52        6     1.0     1.0 10000.0    3.00     45.
  1800.   38.11        6     1.0     1.0 10000.0    3.00     45.
  1900.   36.80        6     1.0     1.0 10000.0    3.00     45.
  2000.   35.58        6     1.0     1.0 10000.0    3.00     45.
  2100.   34.46        6     1.0     1.0 10000.0    3.00     45.
  2200.   33.41        6     1.0     1.0 10000.0    3.00     45.
  2300.   32.44        6     1.0     1.0 10000.0    3.00     45.
  2400.   31.52        6     1.0     1.0 10000.0    3.00     45.
  2500.   30.64        6     1.0     1.0 10000.0    3.00     45.
  2600.   29.80        6     1.0     1.0 10000.0    3.00     45.
  2700.   29.00        6     1.0     1.0 10000.0    3.00     45.
  2800.   28.23        6     1.0     1.0 10000.0    3.00     45.
  2900.   27.50        6     1.0     1.0 10000.0    3.00     45.
  3000.   26.82        6     1.0     1.0 10000.0    3.00     45.
  3500.   23.90        6     1.0     1.0 10000.0    3.00     45.
  4000.   21.47        6     1.0     1.0 10000.0    3.00     44.
  4500.   19.40        6     1.0     1.0 10000.0    3.00     44.
  5000.   17.62        6     1.0     1.0 10000.0    3.00     44.
  5500.   16.08        6     1.0     1.0 10000.0    3.00     45.
  6000.   14.74        6     1.0     1.0 10000.0    3.00     45.
  6500.   13.57        6     1.0     1.0 10000.0    3.00     45.
  7000.   12.54        6     1.0     1.0 10000.0    3.00     45.
  7500.   11.66        6     1.0     1.0 10000.0    3.00     45.
  8000.   10.89        6     1.0     1.0 10000.0    3.00     45.
  8500.   10.19        6     1.0     1.0 10000.0    3.00     42.
  9000.   9.569        6     1.0     1.0 10000.0    3.00     42.
  9500.   9.007        6     1.0     1.0 10000.0    3.00     45.
 10000.   8.498        6     1.0     1.0 10000.0    3.00     45.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   640.   57.66        6     1.0     1.0 10000.0    3.00     45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC     DIST TO    TERRAIN
  PROCEDURE         (UG/M**3)     MAX (M)     HT (M)
--------------     -----------    -------    -------
SIMPLE TERRAIN       57.66          640.          0.
```

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

661 BEAR VALLEY GRADING AND SITE PREPARATION - NOX

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE                =        AREA
   EMISSION RATE (G/(S-M**2)) =     .582470E-05
   SOURCE HEIGHT (M)          =      3.0000
   LENGTH OF LARGER SIDE (M)  =    406.8000
   LENGTH OF SMALLER SIDE (M) =    406.8000
   RECEPTOR HEIGHT (M)        =     10.0000
   URBAN/RURAL OPTION         =       RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC           U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
    20.   58.58        3     1.0    1.0   320.0    3.00     45.
   100.   74.38        4     1.0    1.0   320.0    3.00     43.
   200.   97.43        4     1.0    1.0   320.0    3.00     45.
   300.   118.6        5     1.0    1.0 10000.0    3.00     45.
   400.   138.2        5     1.0    1.0 10000.0    3.00     45.
   500.   141.4        6     1.0    1.0 10000.0    3.00     45.
   600.   147.4        6     1.0    1.0 10000.0    3.00     45.
   700.   147.1        6     1.0    1.0 10000.0    3.00     45.
   800.   143.6        6     1.0    1.0 10000.0    3.00     45.
   900.   138.6        6     1.0    1.0 10000.0    3.00     45.
  1000.   133.4        6     1.0    1.0 10000.0    3.00     45.
  1100.   128.1        6     1.0    1.0 10000.0    3.00     45.
  1200.   123.0        6     1.0    1.0 10000.0    3.00     45.
  1300.   118.1        6     1.0    1.0 10000.0    3.00     45.
  1400.   113.6        6     1.0    1.0 10000.0    3.00     45.
  1500.   109.2        6     1.0    1.0 10000.0    3.00     45.
```

```
  1600.   105.2       6     1.0     1.0 10000.0    3.00     45.
  1700.   101.3       6     1.0     1.0 10000.0    3.00     45.
  1800.   97.71       6     1.0     1.0 10000.0    3.00     45.
  1900.   94.35       6     1.0     1.0 10000.0    3.00     45.
  2000.   91.23       6     1.0     1.0 10000.0    3.00     45.
  2100.   88.34       6     1.0     1.0 10000.0    3.00     45.
  2200.   85.67       6     1.0     1.0 10000.0    3.00     45.
  2300.   83.18       6     1.0     1.0 10000.0    3.00     45.
  2400.   80.81       6     1.0     1.0 10000.0    3.00     45.
  2500.   78.56       6     1.0     1.0 10000.0    3.00     45.
  2600.   76.41       6     1.0     1.0 10000.0    3.00     45.
  2700.   74.35       6     1.0     1.0 10000.0    3.00     45.
  2800.   72.38       6     1.0     1.0 10000.0    3.00     45.
  2900.   70.52       6     1.0     1.0 10000.0    3.00     45.
  3000.   68.77       6     1.0     1.0 10000.0    3.00     45.
  3500.   61.27       6     1.0     1.0 10000.0    3.00     45.
  4000.   55.04       6     1.0     1.0 10000.0    3.00     44.
  4500.   49.74       6     1.0     1.0 10000.0    3.00     44.
  5000.   45.17       6     1.0     1.0 10000.0    3.00     44.
  5500.   41.22       6     1.0     1.0 10000.0    3.00     45.
  6000.   37.78       6     1.0     1.0 10000.0    3.00     45.
  6500.   34.78       6     1.0     1.0 10000.0    3.00     45.
  7000.   32.15       6     1.0     1.0 10000.0    3.00     45.
  7500.   29.90       6     1.0     1.0 10000.0    3.00     45.
  8000.   27.91       6     1.0     1.0 10000.0    3.00     45.
  8500.   26.13       6     1.0     1.0 10000.0    3.00     42.
  9000.   24.53       6     1.0     1.0 10000.0    3.00     42.
  9500.   23.09       6     1.0     1.0 10000.0    3.00     45.
 10000.   21.79       6     1.0     1.0 10000.0    3.00     45.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   640.   147.8       6     1.0     1.0 10000.0    3.00     45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC     DIST TO    TERRAIN
  PROCEDURE         (UG/M**3)     MAX (M)     HT (M)
--------------     -----------    -------    -------
SIMPLE TERRAIN      147.8           640.         0.
```

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

661 BEAR VALLEY GRADING AND SITE PREPARATION - SOX

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE                 =        AREA
   EMISSION RATE (G/(S-M**2))  =     .765810E-06
   SOURCE HEIGHT (M)           =      3.0000
   LENGTH OF LARGER SIDE (M)   =    406.8000
   LENGTH OF SMALLER SIDE (M)  =    406.8000
   RECEPTOR HEIGHT (M)         =     10.0000
   URBAN/RURAL OPTION          =       RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC             U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
    20.   7.702        3     1.0    1.0   320.0    3.00     45.
   100.   9.779        4     1.0    1.0   320.0    3.00     43.
   200.   12.81        4     1.0    1.0   320.0    3.00     45.
   300.   15.59        5     1.0    1.0 10000.0    3.00     45.
   400.   18.17        5     1.0    1.0 10000.0    3.00     45.
   500.   18.59        6     1.0    1.0 10000.0    3.00     45.
   600.   19.38        6     1.0    1.0 10000.0    3.00     45.
   700.   19.34        6     1.0    1.0 10000.0    3.00     45.
   800.   18.87        6     1.0    1.0 10000.0    3.00     45.
   900.   18.23        6     1.0    1.0 10000.0    3.00     45.
  1000.   17.53        6     1.0    1.0 10000.0    3.00     45.
  1100.   16.84        6     1.0    1.0 10000.0    3.00     45.
  1200.   16.17        6     1.0    1.0 10000.0    3.00     45.
  1300.   15.53        6     1.0    1.0 10000.0    3.00     45.
  1400.   14.93        6     1.0    1.0 10000.0    3.00     45.
  1500.   14.36        6     1.0    1.0 10000.0    3.00     45.
```

```
  1600.   13.83        6     1.0     1.0 10000.0    3.00     45.
  1700.   13.32        6     1.0     1.0 10000.0    3.00     45.
  1800.   12.85        6     1.0     1.0 10000.0    3.00     45.
  1900.   12.40        6     1.0     1.0 10000.0    3.00     45.
  2000.   11.99        6     1.0     1.0 10000.0    3.00     45.
  2100.   11.62        6     1.0     1.0 10000.0    3.00     45.
  2200.   11.26        6     1.0     1.0 10000.0    3.00     45.
  2300.   10.94        6     1.0     1.0 10000.0    3.00     45.
  2400.   10.63        6     1.0     1.0 10000.0    3.00     45.
  2500.   10.33        6     1.0     1.0 10000.0    3.00     45.
  2600.   10.05        6     1.0     1.0 10000.0    3.00     45.
  2700.   9.775        6     1.0     1.0 10000.0    3.00     45.
  2800.   9.517        6     1.0     1.0 10000.0    3.00     45.
  2900.   9.271        6     1.0     1.0 10000.0    3.00     45.
  3000.   9.041        6     1.0     1.0 10000.0    3.00     45.
  3500.   8.056        6     1.0     1.0 10000.0    3.00     45.
  4000.   7.237        6     1.0     1.0 10000.0    3.00     44.
  4500.   6.539        6     1.0     1.0 10000.0    3.00     44.
  5000.   5.939        6     1.0     1.0 10000.0    3.00     44.
  5500.   5.420        6     1.0     1.0 10000.0    3.00     45.
  6000.   4.967        6     1.0     1.0 10000.0    3.00     45.
  6500.   4.573        6     1.0     1.0 10000.0    3.00     45.
  7000.   4.227        6     1.0     1.0 10000.0    3.00     45.
  7500.   3.932        6     1.0     1.0 10000.0    3.00     45.
  8000.   3.670        6     1.0     1.0 10000.0    3.00     45.
  8500.   3.436        6     1.0     1.0 10000.0    3.00     42.
  9000.   3.226        6     1.0     1.0 10000.0    3.00     42.
  9500.   3.036        6     1.0     1.0 10000.0    3.00     45.
 10000.   2.865        6     1.0     1.0 10000.0    3.00     45.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   640.   19.44        6     1.0     1.0 10000.0    3.00     45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC     DIST TO   TERRAIN
  PROCEDURE         (UG/M**3)     MAX (M)    HT (M)
--------------     -----------    -------   -------
SIMPLE TERRAIN      19.44           640.        0.
```

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

661 BEAR VALLEY GRADING AND SITE PREPARATION - PM10

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE                  =        AREA
   EMISSION RATE (G/(S-M**2))   =     .131520E-06
   SOURCE HEIGHT (M)            =      3.0000
   LENGTH OF LARGER SIDE (M)    =    406.8000
   LENGTH OF SMALLER SIDE (M)   =    406.8000
   RECEPTOR HEIGHT (M)          =     10.0000
   URBAN/RURAL OPTION           =       RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC           U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
    20.   1.323        3     1.0    1.0   320.0    3.00     45.
   100.   1.679        4     1.0    1.0   320.0    3.00     43.
   200.   2.200        4     1.0    1.0   320.0    3.00     45.
   300.   2.678        5     1.0    1.0 10000.0    3.00     45.
   400.   3.120        5     1.0    1.0 10000.0    3.00     45.
   500.   3.193        6     1.0    1.0 10000.0    3.00     45.
   600.   3.329        6     1.0    1.0 10000.0    3.00     45.
   700.   3.321        6     1.0    1.0 10000.0    3.00     45.
   800.   3.241        6     1.0    1.0 10000.0    3.00     45.
   900.   3.131        6     1.0    1.0 10000.0    3.00     45.
  1000.   3.011        6     1.0    1.0 10000.0    3.00     45.
  1100.   2.892        6     1.0    1.0 10000.0    3.00     45.
  1200.   2.777        6     1.0    1.0 10000.0    3.00     45.
  1300.   2.667        6     1.0    1.0 10000.0    3.00     45.
  1400.   2.564        6     1.0    1.0 10000.0    3.00     45.
  1500.   2.467        6     1.0    1.0 10000.0    3.00     45.
```

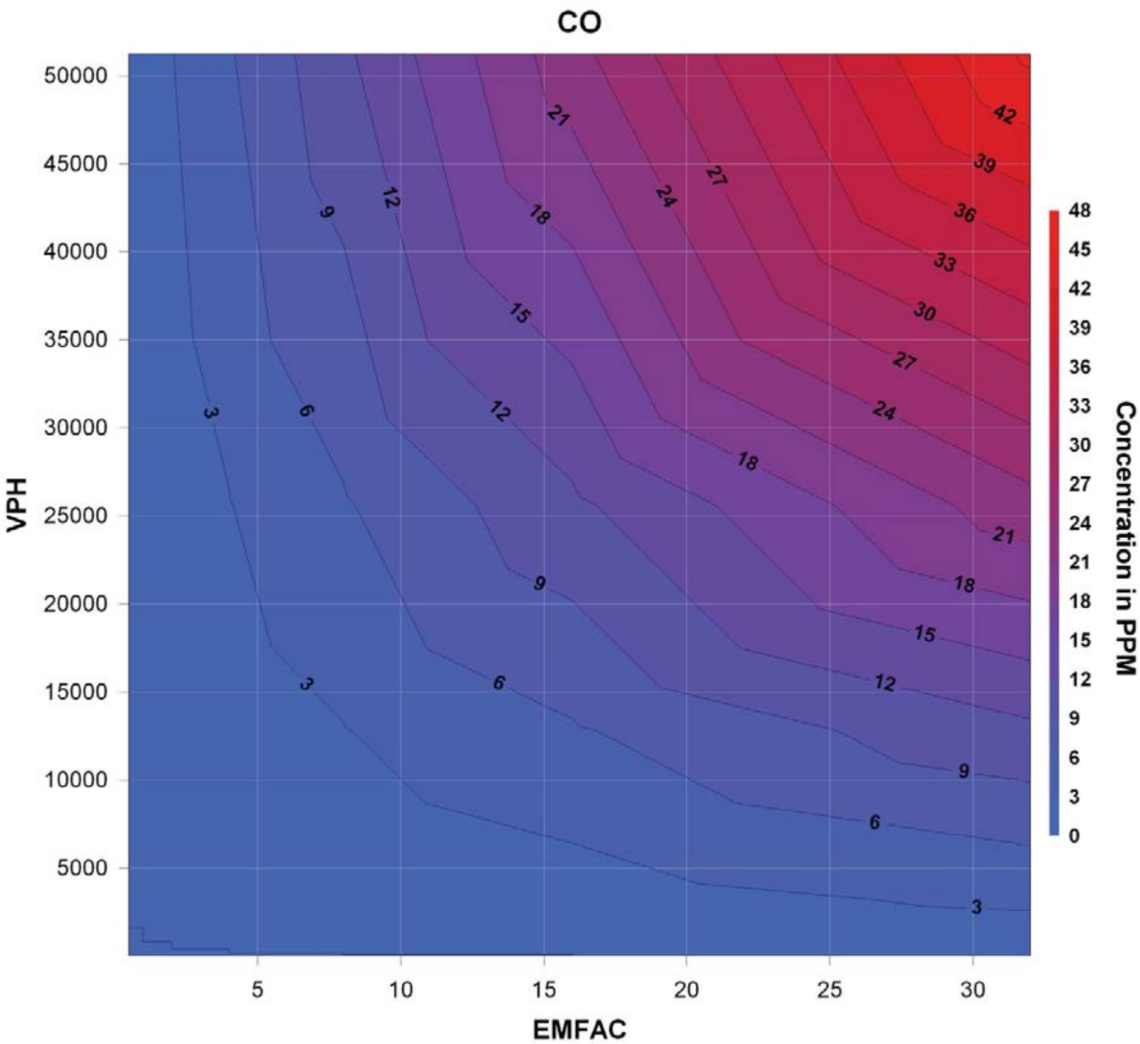
```
   1600.  2.375        6     1.0     1.0 10000.0    3.00     45.
   1700.  2.288        6     1.0     1.0 10000.0    3.00     45.
   1800.  2.206        6     1.0     1.0 10000.0    3.00     45.
   1900.  2.130        6     1.0     1.0 10000.0    3.00     45.
   2000.  2.060        6     1.0     1.0 10000.0    3.00     45.
   2100.  1.995        6     1.0     1.0 10000.0    3.00     45.
   2200.  1.934        6     1.0     1.0 10000.0    3.00     45.
   2300.  1.878        6     1.0     1.0 10000.0    3.00     45.
   2400.  1.825        6     1.0     1.0 10000.0    3.00     45.
   2500.  1.774        6     1.0     1.0 10000.0    3.00     45.
   2600.  1.725        6     1.0     1.0 10000.0    3.00     45.
   2700.  1.679        6     1.0     1.0 10000.0    3.00     45.
   2800.  1.634        6     1.0     1.0 10000.0    3.00     45.
   2900.  1.592        6     1.0     1.0 10000.0    3.00     45.
   3000.  1.553        6     1.0     1.0 10000.0    3.00     45.
   3500.  1.384        6     1.0     1.0 10000.0    3.00     45.
   4000.  1.243        6     1.0     1.0 10000.0    3.00     44.
   4500.  1.123        6     1.0     1.0 10000.0    3.00     44.
   5000.  1.020        6     1.0     1.0 10000.0    3.00     44.
   5500.  .9308        6     1.0     1.0 10000.0    3.00     45.
   6000.  .8531        6     1.0     1.0 10000.0    3.00     45.
   6500.  .7854        6     1.0     1.0 10000.0    3.00     45.
   7000.  .7260        6     1.0     1.0 10000.0    3.00     45.
   7500.  .6752        6     1.0     1.0 10000.0    3.00     45.
   8000.  .6303        6     1.0     1.0 10000.0    3.00     45.
   8500.  .5900        6     1.0     1.0 10000.0    3.00     42.
   9000.  .5540        6     1.0     1.0 10000.0    3.00     42.
   9500.  .5215        6     1.0     1.0 10000.0    3.00     45.
  10000.  .4920        6     1.0     1.0 10000.0    3.00     45.

 MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
    640.  3.338        6     1.0     1.0 10000.0    3.00     45.

      ***************************************
      *** SUMMARY OF SCREEN MODEL RESULTS ***
      ***************************************

  CALCULATION         MAX CONC    DIST TO   TERRAIN
   PROCEDURE         (UG/M**3)    MAX (M)    HT (M)
 --------------     -----------   -------   -------
 SIMPLE TERRAIN       3.338          640.        0.
```

EMFAC 2011 EMISSION FACTOR TABULATIONS – SCENARIO YEAR 2020

EMFAC2011 Emission Rates
Region Type: County
Region: San Diego
Calendar Year: 2020
Season: Annual
Vehicle Classification: EMFAC2011 Categories

Region	CalYr	Season	Veh_Class	Fuel	MdlYr	Speed (miles/hr)	VMT (miles/day)	ROG_RUNEX (gms/mile)	TOG_RUNEX (gms/mile)	CO_RUNEX (gms/mile)	NOX_RUNEX (gms/mile)	CO2_RUNEX (gms/mile)	CO2_RUNEX (Pavley I+LCFS) (gms/mile)	PM10_RUNEX (gms/mile)	PM2_5_RUNEX (gms/mile)
San Diego	2020	Annual	**LDA**	**GAS**	Aggregated	45	2242464.381	**0.01800885**	0.025991442	**0.7986615**	**0.08782155**	**283.227013**	**194.62056**	**0.00126358**	**0.001171756**
San Diego	2020	Annual	LDA	DSL	Aggregated	45	9838.147339	0.01573353	0.017911578	0.105103646	0.325845762	297.0356277	210.0277084	0.010881138	0.010010647
San Diego	2020	Annual	**LDT1**	**GAS**	Aggregated	45	322328.281	**0.02655532**	0.039937004	**1.47168894**	**0.15242977**	**327.75106**	**237.40794**	**0.00212512**	**0.001970814**
San Diego	2020	Annual	LDT1	DSL	Aggregated	45	395.3592352	0.028245423	0.032155538	0.143171582	0.37188977	301.7745459	208.1108486	0.022104445	0.02033609
San Diego	2020	Annual	LDT2	GAS	Aggregated	45	838126.6583	0.013177188	0.022497407	0.905772897	0.101977931	385.6305209	290.7469134	0.001247809	0.001157444
San Diego	2020	Annual	LDT2	DSL	Aggregated	45	363.5267772	0.019196041	0.021853415	0.119984215	0.391812714	298.9794062	223.0104307	0.013076198	0.012030102
San Diego	2020	Annual	**LHD1**	**GAS**	Aggregated	45	38808.18589	**0.03897162**	0.048331048	**0.78990108**	**0.39245016**	**452.055847**	**406.85026**	**0.00067839**	**0.000628938**
San Diego	2020	Annual	LHD1	DSL	Aggregated	45	44121.07623	0.111091742	0.126470564	0.560391725	2.606862687	521.200403	469.0803627	0.024710919	0.022734047
San Diego	2020	Annual	LHD2	GAS	Aggregated	45	3218.236203	0.01898113	0.025698977	0.42556526	0.297729368	452.0558068	406.8502261	0.000469757	0.000435111
San Diego	2020	Annual	LHD2	DSL	Aggregated	45	11310.33045	0.101947139	0.116060039	0.536482048	2.420907045	521.2157497	469.0941748	0.023506878	0.021626329
San Diego	2020	Annual	**MCY**	**GAS**	Aggregated	45	28802.32646	**2.03328051**	2.217487704	**17.789901**	**1.16787867**	**138.859592**	**124.97363**	**0.00026983**	**0.000225994**
San Diego	2020	Annual	MDV	GAS	Aggregated	45	573432.1342	0.032021219	0.048593237	1.599921091	0.205190013	492.0704299	390.3938572	0.001449769	0.00134079
San Diego	2020	Annual	MDV	DSL	Aggregated	45	633.2175404	0.019479433	0.022176038	0.115337298	0.319248347	297.5623732	233.6758465	0.015085251	0.013878431
San Diego	2020	Annual	**MH**	**GAS**	Aggregated	45	27371.31064	**0.04404313**	0.056990031	**1.48338751**	**0.55198233**	**452.055858**	**406.85027**	**0.00079062**	**0.000731121**
San Diego	2020	Annual	**MH**	**DSL**	Aggregated	45	3680.803695	**0.10878148**	0.123840481	**0.50298745**	**5.78100093**	**1070.66408**	**963.59767**	**0.12465464**	**0.114682275**
San Diego	2020	Annual	Motor Coach	DSL	Aggregated	45	7985.095821	0.15703997	0.178778052	0.834478884	3.138282148	1624.513043	1462.061739	0.065009578	0.059808812
San Diego	2020	Annual	OBUS	GAS	Aggregated	45	6804.404885	0.072015507	0.08657315	1.536022561	0.850358956	452.0558271	406.8502444	0.000328518	0.000304494
San Diego	2020	Annual	SBUS	GAS	Aggregated	45	878.6398845	0.442762318	0.489092346	8.484772469	2.231064373	452.0558158	406.8502342	0.002306706	0.002095706
San Diego	2020	Annual	SBUS	DSL	Aggregated	45	2276.91643	0.072041767	0.082014067	0.333878476	7.748496101	1073.967436	966.5706926	0.041981697	0.038623161
San Diego	2020	Annual	T6 Ag	DSL	Aggregated	45	538.4805779	0.14236689	0.162073867	0.627616773	2.910517913	1054.347088	948.912379	0.097019827	0.089258241
San Diego	2020	Annual	T6 Public	DSL	Aggregated	45	3409.904163	0.051741473	0.058903729	0.243540937	2.469711818	1056.005237	950.4047137	0.027473686	0.025275791
San Diego	2020	Annual	T6 CAIRP heavy	DSL	Aggregated	45	59.69256382	0.068097095	0.077523359	0.321950143	1.726291417	1050.023396	945.0210567	0.035710913	0.03285404
San Diego	2020	Annual	T6 CAIRP small	DSL	Aggregated	45	204.1592338	0.070761999	0.080557149	0.334750841	0.94725344	1045.931635	941.3384718	0.03799426	0.034954719
San Diego	2020	Annual	T6 OOS heavy	DSL	Aggregated	45	34.22299142	0.068097095	0.077523359	0.321950143	1.726291415	1050.023396	945.0210567	0.035710913	0.03285404
San Diego	2020	Annual	T6 OOS small	DSL	Aggregated	45	117.0487455	0.070761999	0.080557149	0.334750841	0.94725344	1045.931635	941.3384718	0.03799426	0.034954719
San Diego	2020	Annual	tate construction	DSL	Aggregated	45	3647.965062	0.071390036	0.081272121	0.337220996	2.978218782	1056.264609	950.6381477	0.041341491	0.038034172
San Diego	2020	Annual	:tate construction	DSL	Aggregated	45	9928.102112	0.082181974	0.093557921	0.388774838	1.262302074	1047.806302	943.025672	0.050341205	0.046313909
San Diego	2020	Annual	T6 instate heavy	DSL	Aggregated	45	16711.92297	0.071247284	0.08110961	0.33663855	2.682795273	1054.879309	949.3913781	0.040452002	0.037215842
San Diego	2020	Annual	T6 instate small	DSL	Aggregated	45	47609.69556	0.079649614	0.090675022	0.376795109	1.189093728	1047.321584	942.5894257	0.047547703	0.043743887
San Diego	2020	Annual	T6 utility	DSL	Aggregated	45	399.9860169	0.052862786	0.060180258	0.250018935	1.565358189	1052.487807	947.2390264	0.026432401	0.024317809
San Diego	2020	Annual	T6TS	GAS	Aggregated	45	18147.57132	0.077482961	0.091832662	1.62625623	0.763625073	452.0558631	406.8502768	0.000443173	0.000409173
San Diego	2020	Annual	T7 Ag	DSL	Aggregated	45	2436.24535	0.235106843	0.267651244	1.279313014	5.263193311	1632.200553	1468.980498	0.135971057	0.125093372
San Diego	2020	Annual	T7 CAIRP	DSL	Aggregated	45	55275.3491	0.173364836	0.19736267	0.923002748	2.292113748	1617.644548	1455.880093	0.069945392	0.064349761
San Diego	2020	Annual	CAIRP constructi	DSL	Aggregated	45	4663.871851	0.173347807	0.197343283	0.922887885	2.331678434	1617.883124	1456.094812	0.069944363	0.064348814
San Diego	2020	Annual	T7 NNOOS	DSL	Aggregated	45	62182.70159	0.147621371	0.168055694	0.785748024	1.544245477	1615.130787	1453.617708	0.056661235	0.052128336
San Diego	2020	Annual	T7 NOOS	DSL	Aggregated	45	20129.87755	0.173285773	0.197272662	0.922577028	2.296076295	1617.651523	1455.886371	0.069920511	0.06432687
San Diego	2020	Annual	T7 other port	DSL	Aggregated	45	13112.69884	0.390150283	0.444156398	2.070463268	6.950142658	1666.491631	1499.842468	0.10839064	0.099719388
San Diego	2020	Annual	T7 POAK	DSL	Aggregated	45	0	0	0	0	0	0	0	0	0
San Diego	2020	Annual	T7 POLA	DSL	Aggregated	45	6990.380511	0.385313493	0.438650082	2.044795226	6.820262486	1664.806438	1498.325794	0.108292779	0.099629357
San Diego	2020	Annual	T7 Public	DSL	Aggregated	45	2813.335539	0.088506172	0.100757539	0.480395992	7.514561495	1650.005438	1485.004894	0.048882748	0.044972129
San Diego	2020	Annual	T7 Single	DSL	Aggregated	45	29620.85184	0.124895788	0.142184347	0.662753026	3.962537945	1630.680087	1467.612078	0.053059876	0.048815086
San Diego	2020	Annual	single constructi	DSL	Aggregated	45	12064.82284	0.124768128	0.142039016	0.662019851	4.107216905	1631.501795	1468.351616	0.053403728	0.049131429
San Diego	2020	Annual	T7 SWCV	DSL	Aggregated	45	8203.10902	0.093146698	0.106040425	0.498928617	7.400986083	1640.422869	1476.380582	0.046111126	0.042422236
San Diego	2020	Annual	T7 tractor	DSL	Aggregated	45	81660.41384	0.170999468	0.194669877	0.908669319	3.823461779	1626.178907	1463.561016	0.072371705	0.066581968
San Diego	2020	Annual	tractor construct	DSL	Aggregated	45	8995.217136	0.169711373	0.19320348	0.901537144	4.199918533	1627.956865	1465.161179	0.072863281	0.067034219
San Diego	2020	Annual	T7 utility	DSL	Aggregated	45	426.4867188	0.094546059	0.107633491	0.501668244	3.704094409	1632.120114	1468.908102	0.039991319	0.036792014
San Diego	2020	Annual	T7IS	GAS	Aggregated	45	3419.591346	0.437511938	0.525019232	22.53766349	4.8975608	452.0558544	406.850269	0.000285597	0.000262306
San Diego	2020	Annual	UBUS	GAS	Aggregated	45	1734.367182	0.298716401	0.326007237	3.613929472	2.201846498	452.0558754	406.8502879	0.000427296	0.000396461
San Diego	2020	Annual	UBUS	DSL	Aggregated	45	8477.237764	0.346767768	0.394772026	1.302938026	11.32342637	2499.936313	2249.942682	0.139671499	0.12849778
San Diego	2020	Annual	All Other Buses	DSL	Aggregated	45	4370.003165	0.077736952	0.088497603	0.367213193	2.680642702	1053.39159	948.0524307	0.043497025	0.040017263

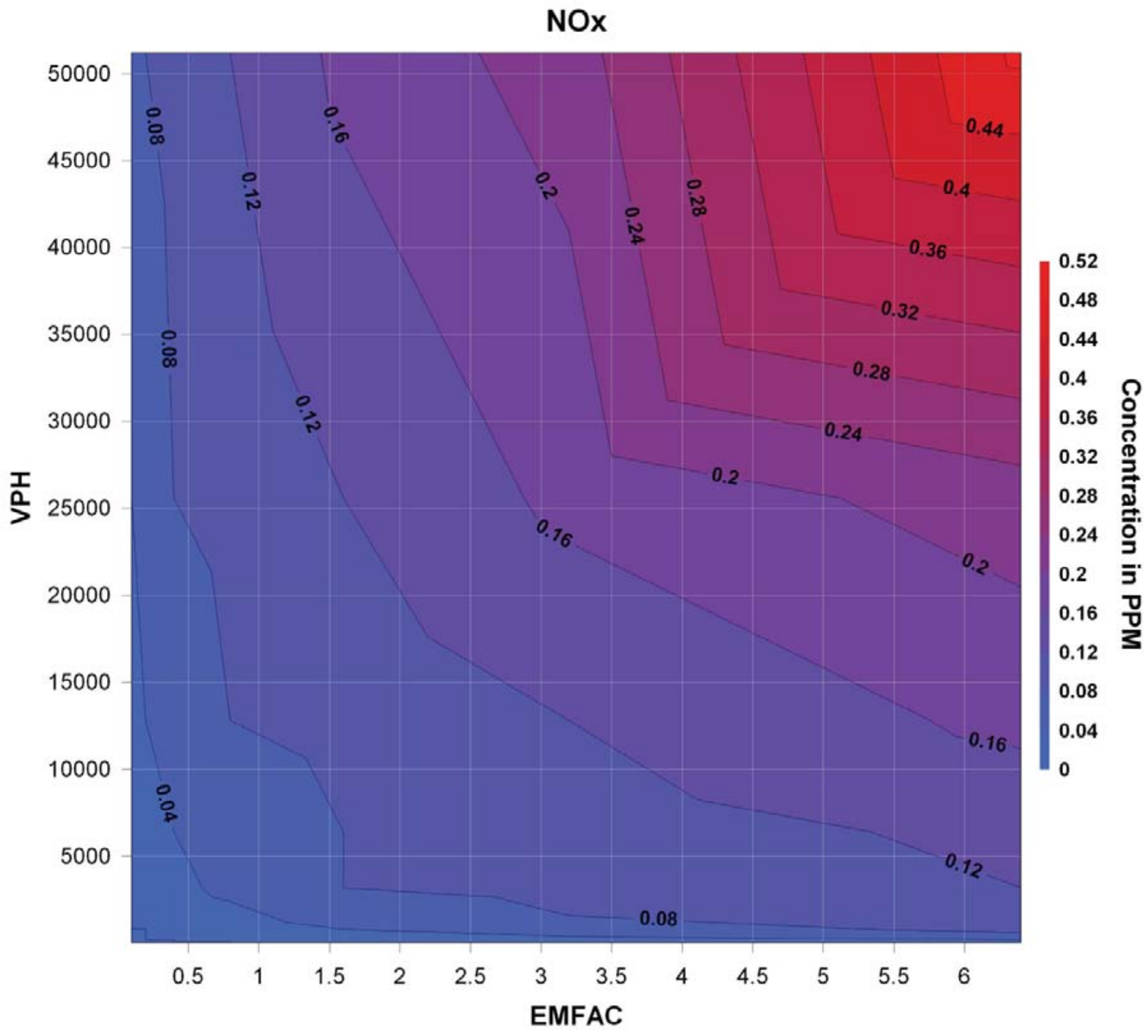
CALINE4 SOLUTION SPACE RESULTS – SCENARIO CO



Rank 1 Eqn 151232682 lnz=a+blnx+c(lny)^2

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.9997614637	0.9997516609	0.102880788	155075.68815

CALINE4 SOLUTION SPACE RESULTS – SCENARIO NO_X



Rank 1 Eqn 151232653 $\ln z = a + bx^{0.5} + c(\ln y)^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
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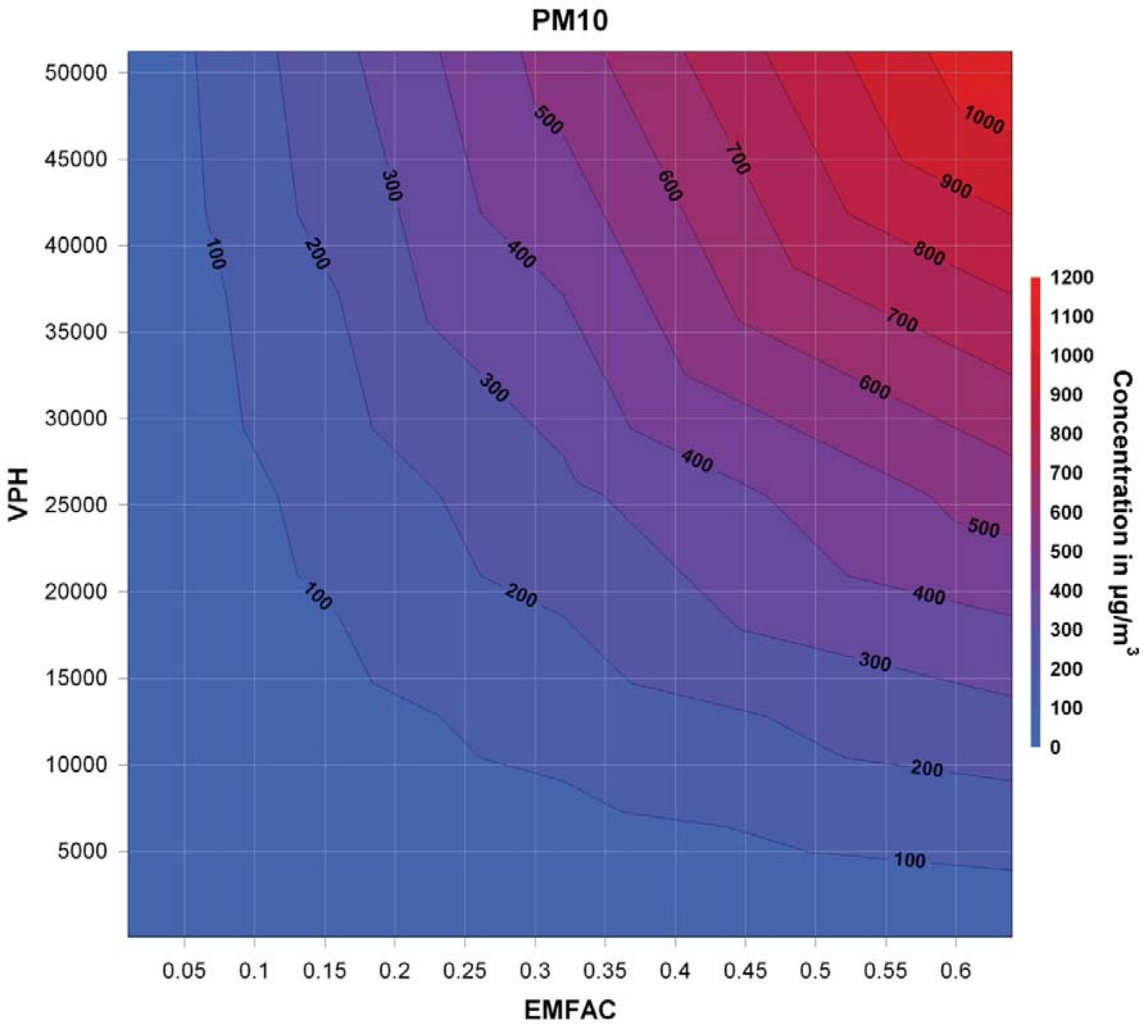
CALINE4 SOLUTION SPACE RESULTS – SCENARIO PM_{10}



Rank 1 Eqn 151232682 $lnz=a+blnx+c(lny)^2$

r^2 Coef Det	DF Adj r^2	Fit Std Err	F-value
0.9998185376	0.9998110803	2.1625247335	203862.00724

INDEX OF IMPORTANT TERMS