4.3 AIR QUALITY

This section describes the study area's existing air quality conditions and applicable air quality regulations, and analyzes potential short-term and long-term air quality impacts that could result from implementation of the project.

4.3.1 Environmental Setting

The project site is located in Yolo County, California, which is within the Sacramento Valley Air Basin (SVAB). The SVAB also includes all of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba Counties; and the eastern portion of Solano County.

The ambient concentrations of air pollutant emissions are determined by the amount of emissions released by the sources of air pollutants and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and sunlight. Therefore, existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the amount of emissions released by existing air pollutant sources, as discussed separately below.

CLIMATE, METEOROLOGY, AND TOPOGRAPHY

The SVAB is a relatively flat area bordered by the north Coast Ranges to the west and the northern Sierra Nevada to the east. Air flows into the SVAB through the Carquinez Strait, the only breach in the western mountain barrier, and moves across the Sacramento–San Joaquin Delta (Delta) from the San Francisco Bay area.

The Mediterranean climate type of the SVAB is characterized by hot, dry summers and cool, rainy winters. During the summer, daily temperatures range from 50 degrees Fahrenheit (°F) to more than 100°F. The inland location and surrounding mountains shelter the area from most of the ocean breezes that keep the coastal regions moderate in temperature. Most precipitation in the area results from air masses that move in from the Pacific Ocean, usually from the west or northwest, during the winter months. More than half the total annual precipitation falls during the winter rainy season (November through February); the average winter temperature is a moderate 49°F. Also characteristic of SVAB winters are periods of dense and persistent low-level fog, which are most prevalent between storms. The prevailing winds are moderate in speed and vary from moisture-laden breezes from the south to dry land flows from the north.

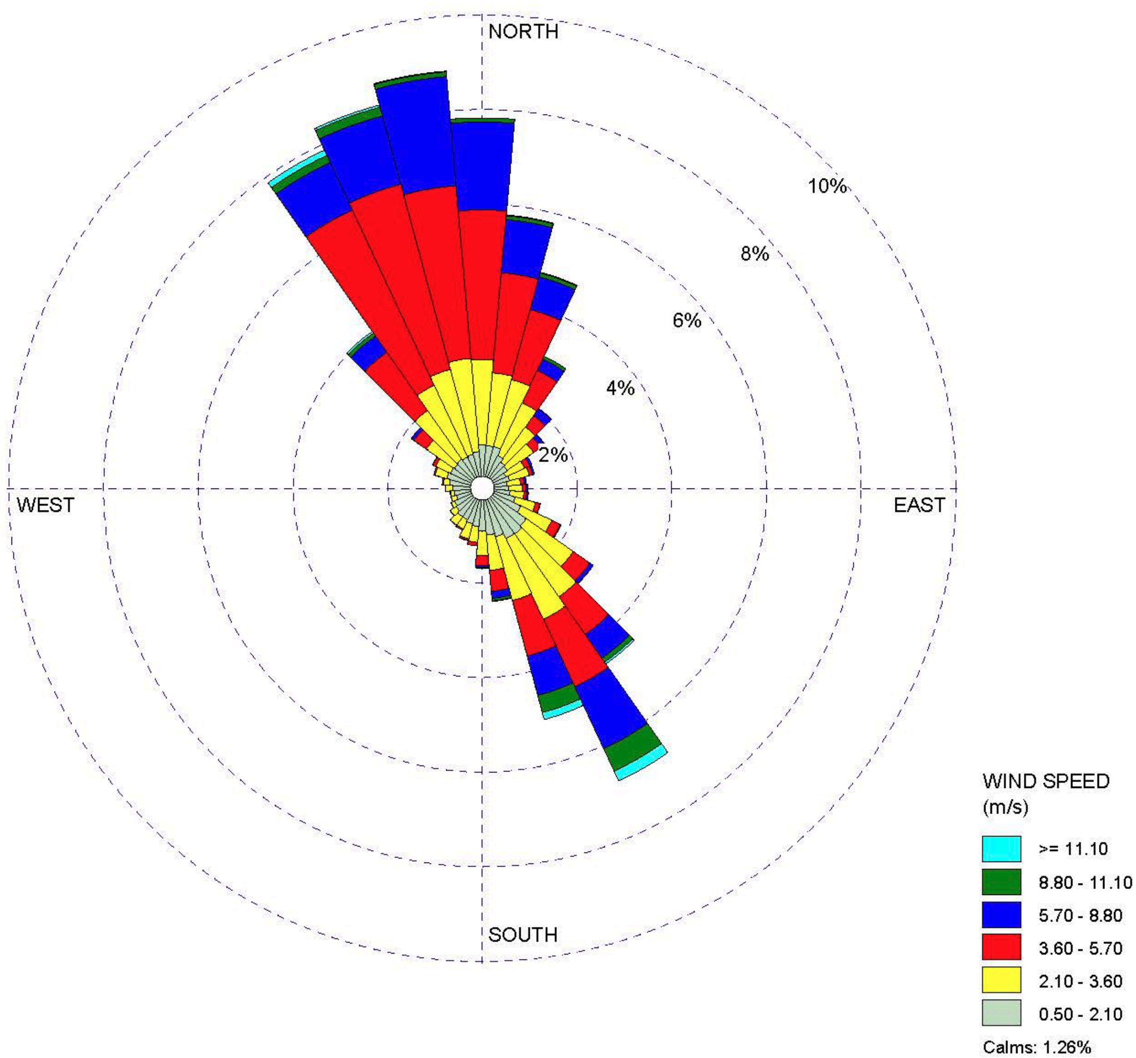
The mountains surrounding the SVAB create a barrier to airflow, which entraps air pollutants when meteorological conditions are unfavorable for transport and dilution. Poor air movement is most frequent in the fall and winter when high-pressure cells are present over the SVAB. The lack of surface wind during these periods, combined with the reduced vertical flow caused by a decline in surface heating, reduces the influx of air and leads to the concentration of air pollutants under stable metrological conditions. Surface concentrations of air pollutant emissions are highest when these conditions occur in combination with agricultural burning activities or with temperature inversions, which hamper dispersion by creating a ceiling over the area and trapping air pollutants near the ground.

May through October is ozone season in the SVAB. This period is characterized by poor air movement in the mornings until the arrival of the Delta sea breeze from the southwest in the afternoons. In addition, longer daylight hours provide a plentiful amount of sunlight to fuel photochemical reactions between reactive organic gases (ROG) and oxides of nitrogen (NO_X), which result in ozone formation. Typically, the Delta breeze transports air pollutants northward out of the SVAB; however, a phenomenon known as the Schultz Eddy prevents this from occurring during approximately half of the time from July to September. The Schultz

Eddy phenomenon causes the wind to shift southward and blow air pollutants back into the SVAB. This phenomenon exacerbates the concentration of air pollutant emissions in the area and contributes to the area violating the ambient air quality standards.

The local meteorology of the project site and surrounding area is represented by measurements recorded at the "Davis 2 WSW Exp Farm" weather station located in Davis, CA. The normal annual precipitation is approximately 17 inches. January temperatures range from a normal minimum of 37°F to a normal maximum of 54°F. July temperatures range from a normal minimum of 54°F to a normal maximum of 94°F (Western Regional Climate Center 2015a). The predominant wind direction and speed, measured at the Sacramento Executive Airport, is from the south at 7 miles per hour (Western Regional Climate Center 2015b, 2015c). Wind data were not available from the "Davis 2 WSW Exp Farm" weather station.

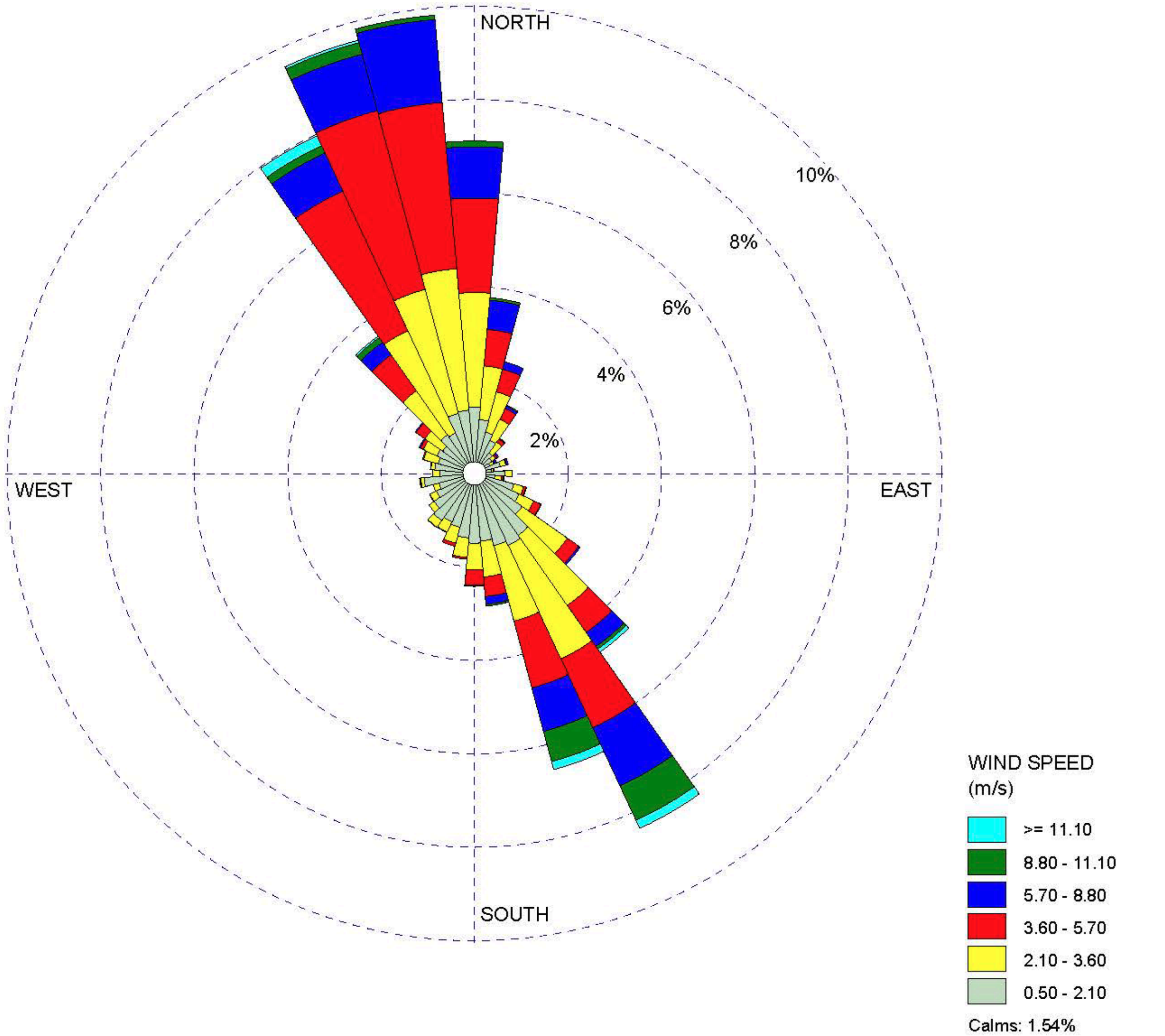
Figure 4.3-1 shows the predominant wind direction and wind speeds (in meters per second [m/s]) in the project area based on five years of meteorological data collected at the Sacramento International Airport.



Source: Ascent Environmental. Based on meteorological date from the Sacramento International Airport, 2009-2013.

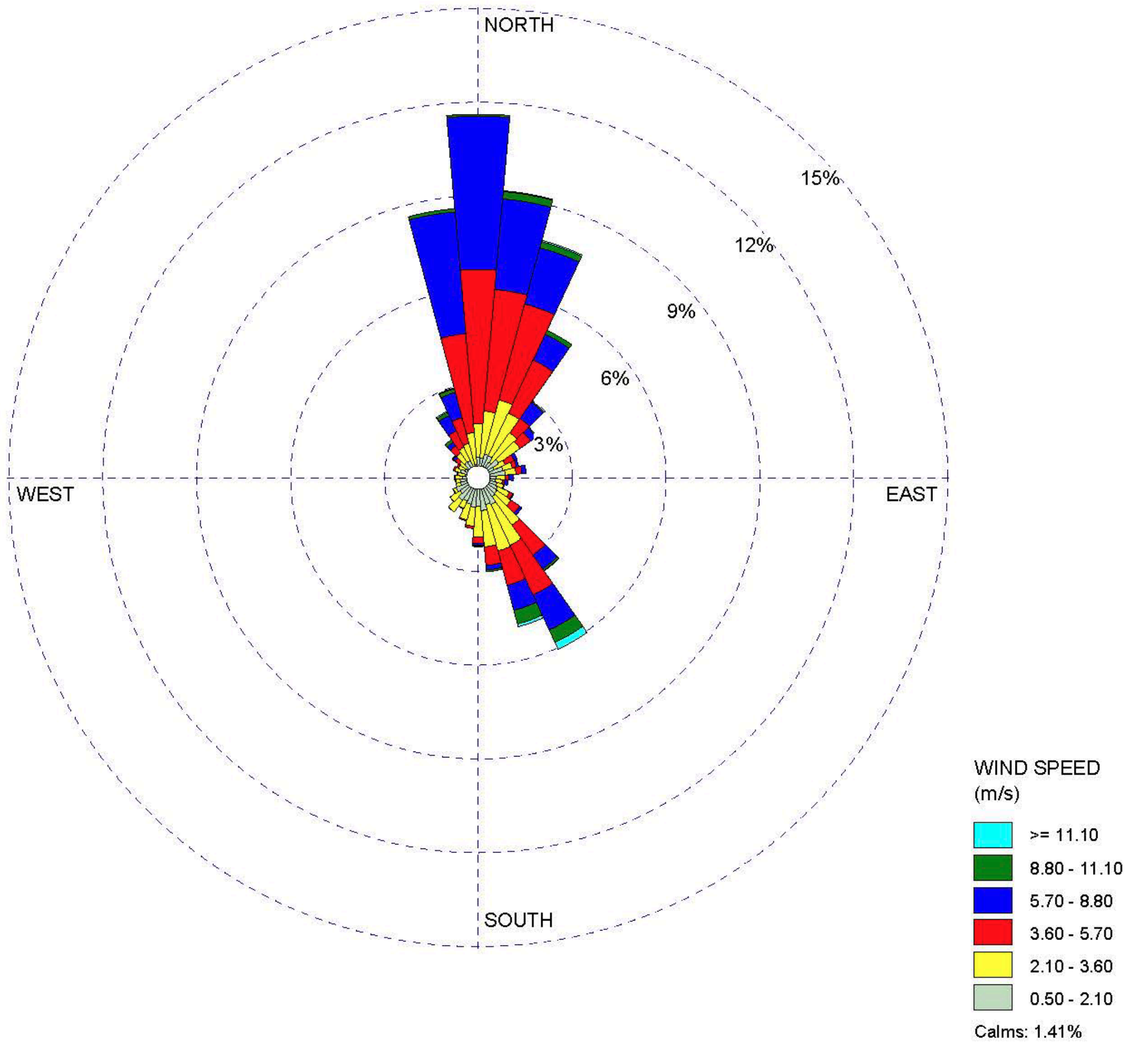
Figure 4.3-1 **Wind Speed (meters/second) Flow Vector (24-hour, blowing to)**

Based on the same data, Figures 4.3-2 and 4.3-3 show the predominant wind directions and wind speeds (in m/s) during the morning and afternoon peak commute times of day, when hourly traffic volumes on nearby Interstate 80 (I-80) are highest.



Source: Ascent Environmental. Based on meteorological date from the Sacramento International Airport, 2009-2013.

Figure 4.3-2 Wind Speed Flow Vector (blowing to) for the Morning Commute Period (7:00–10:00 a.m.)



Source: Ascent Environmental. Based on meteorological date from the Sacramento International Airport, 2009-2013.

Figure 4.3-3 Wind Speed Flow Vector (blowing to) for the Afternoon Commute Period (4:00-7:00 p.m.)

CRITERIA AIR POLLUTANTS

Concentrations of ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$), and lead are used as indicators of ambient air quality conditions and are referred to as criteria air pollutants (CAPs). CAPs are air pollutants for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set by the U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB).

A brief description of each CAP's source types and health effects is provided below in Table 4.3-1. Additional information, including future trends and monitoring data at those monitoring stations located closest to the project site, is provided for ozone, NO_2, and PM, the key CAPs associated with the project analysis.

Table 4.3-1 Sources and Health Effects of Criteria Air Pollutants

Pollutant	Sources	Acute[1] Health Effects	Chronic[2] Health Effects
Ozone	Secondary pollutant resulting from reaction of ROG and NO_X in presence of sunlight. ROG emissions result from incomplete combustion and evaporation of chemical solvents and fuels; NO_X results from the combustion of fuels	Increased respiration and pulmonary resistance; cough, pain, shortness of breath, lung inflammation	Permeability of respiratory epithelia, possibility of permanent lung impairment
Carbon monoxide (CO)	Incomplete combustion of fuels; motor vehicle exhaust	Reduced capacity to pump oxygenated blood; headache, dizziness, fatigue, nausea, vomiting, death	Permanent heart and brain damage
Nitrogen dioxide (NO_2)	Combustion devices (e.g., boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines), industrial processes, and fires	Coughing, difficulty breathing, vomiting, headache, eye irritation, chemical pneumonitis or pulmonary edema; aggravation of existing heart disease leading to death	Chronic bronchitis, emphysema, decreased lung function
Sulfur dioxide (SO_2)	Combustion devices (e.g., boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines), industrial processes, and fires	Irritation of upper respiratory tract, increased asthma symptoms, aggravation of existing heart disease leading to death	Chronic bronchitis, emphysema
Respirable particulate matter (PM_{10}), Fine particulate matter ($PM_{2.5}$)	Fugitive dust, soot, smoke, mobile and stationary sources, construction, fires and natural windblown dust, and formation in the atmosphere by condensation and/or transformation of SO_2 and ROG	Breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, premature death	Alterations to the immune system, carcinogenesis
Lead	Metal processing, piston-engine aircraft or other vehicles operating on leaded fuel	Reproductive/developmental effects (fetuses and children)	Numerous effects including neurological, endocrine, and cardiovascular effects

Notes: NO_X = oxides of nitrogen; ROG = reactive organic gases
[1] "Acute" refers to effects of short-term exposures to criteria air pollutants, usually at fairly high concentrations.
[2] "Chronic" refers to effects of long-term exposures to criteria air pollutants, usually at lower, ambient concentrations.
Source: EPA 2014a

Ozone

Ozone is a photochemical oxidant (a substance whose oxygen combines chemically with another substance in the presence of sunlight) and the primary component of smog. Ozone is not directly emitted into the air in large amounts, but is formed through complex chemical reactions between precursor emissions of (ROG and NO_X in the presence of sunlight (EPA 2014a). ROG are volatile organic compounds that are photochemically reactive. ROG emissions result primarily from incomplete combustion and the evaporation of chemical solvents and fuels. NO_X are a group of gaseous compounds of nitrogen and oxygen that result from the combustion of fuels. Emissions of the ozone precursors ROG and NO_X have decreased over the past two decades because of more stringent motor vehicle standards and cleaner burning fuels (ARB 2014:3-4 and 4-46).

Nitrogen Dioxide

NO_2 is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO_2 are combustion devices, such as boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines. Combustion devices emit primarily nitric oxide (NO), which reacts through oxidation in the atmosphere to form NO_2. The combined emissions of NO and NO_2 are referred to as NO_X and are reported as equivalent NO_2. Because NO_2 is formed and depleted by reactions associated with photochemical smog (ozone), the NO_2 concentration in a particular geographical area may not be representative of the local sources of NO_X emissions (EPA 2014a).

Particulate Matter

Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. PM_{10} consists of particulate matter emitted directly into the air, such as fugitive dust, soot, and smoke from mobile and stationary sources, construction operations, fires and natural windblown dust, and particulate matter formed in the atmosphere by reaction of gaseous precursors (ARB 2014:1-13 and 3-6). Fine particulate matter ($PM_{2.5}$) includes a subgroup of smaller particles that have an aerodynamic diameter of 2.5 micrometers or less. PM_{10} emissions are dominated by emissions from area sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, farming operations, construction and demolition, and particles from residential fuel combustion. Direct emissions of PM_{10} have increased slightly over the last 20 years, and are projected to continue to increase slightly through 2035 (ARB 2014:3-7). $PM_{2.5}$ emissions have remained relatively steady over the last 20 years and are projected to decrease slightly through 2035 (ARB 2014:3-6).

Monitoring Station Data and Attainment Area Designations

CAP concentrations are measured at several monitoring stations in the SVAB. The Davis-University of California at Davis (UC Davis) campus station is located approximately 1.5 miles west of the central northwestern border of the project site and is the closest monitoring station with recent data for ozone and $PM_{2.5}$. The next closest monitoring station that reports PM_{10} concentrations is the Woodland-Gibson Road monitoring station located approximately 8.5 miles north and upwind of the project site. In general, the local ambient air quality measurements from this station are representative of the air quality near the project given its similar meteorological conditions and urban surroundings. Table 4.3-2 summarizes the air quality data for the three most recent calendar years for which data are available (2011-2013).

Table 4.3-2 Summary of Annual Data on Local Ambient Air Quality (2012-2014)

	2012	2013	2014
OZONE[1]			
Maximum concentration (1-hr/8-hr avg, ppm)	0.092/0.076	0.075/0.063	0.081/0.067
Number of days state standard exceeded (1-hr/8-hr)	0/4	0/0	0/0
Number of days national standard exceeded (8-hr)	1	0	0
FINE PARTICULATE MATTER ($PM_{2.5}$)[1]			
Maximum concentration (µg/m^3)	33.9	31.0	27.9
Number of days national standard exceeded (calculated[2])	*	*	*
RESPIRABLE PARTICULATE MATTER (PM_{10})[2]			
Maximum concentration (µg/m^3)	56.8	61.5	47.5
Number of days state standard exceeded (calculated[3])	1	4	0
Number of days national standard exceeded (calculated[3])	0	0	0

Notes: µg/m^3 = micrograms per cubic meter; ppm = parts per million * There was insufficient (or no) data available to determine the value.

1 Measurements from the Davis-UCD Campus monitoring station.

2 Measurements from the Woodland-Gibson Road monitoring station.

3 Measured days are those days that an actual measurement was greater than the level of the state daily standard or the national daily standard. Measurements are typically collected every 6 days. Calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.

Source: ARB 2015, data compiled by Ascent Environmental in 2015.

Both ARB and EPA use this type of monitoring data to designate areas according to their attainment status for CAPs. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are “nonattainment,” “attainment,” and “unclassified.” “Unclassified” is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California designations include a subcategory of the nonattainment designation, called “nonattainment-transitional.” The nonattainment-transitional designation is given to nonattainment areas that are progressing and nearing attainment. Attainment designations for the year 2012 through 2014 in Yolo County are shown in Table 4.3-3 for each CAP.

Table 4.3-3 Ambient Air Quality Standards and Designations for Yolo County

Pollutant	Averaging Time	California		National Standards [1]	
		Standards[2, 3]	Attainment Status[4]	Primary[3]	Attainment Status[6]
Ozone	1-hour	0.09 ppm (180 μg/m^3)	N	–	N (Severe)
	8-hour	0.070 ppm (137 μg/m^3)		0.075 ppm (147 μg/m^3)	N (Severe)
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	U/A
	8-hour	9 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)	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)	A	0.053 ppm (100 μg/m^3)	U/A
	1-hour	0.18 ppm (339 μg/m^3)		0.100 ppm	
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	A	0.030 ppm (80 μg/m^3)	U
	24-hour	0.04 ppm (105 μg/m^3)		0.14 ppm (365 μg/m^3)	
	3-hour	–		0.5 ppm (1300 μg/m^3)[5]	
	1-hour	0.25 ppm (655 μg/m^3)		0.075 ppm	
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 μg/m^3	N	–	U
	24-hour	50 μg/m^3		150 μg/m^3	
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 μg/m^3	U	12.0 μg/m^3	N (Moderate)
	24-hour	–		35 μg/m^3	
Lead [7]	30-day Average	1.5 μg/m^3	A	–	–
	Calendar Quarter	–		1.5 μg/m^3	U/A
	Rolling 3-Month Avg	–		0.15 μg/m^3	U/A
Sulfates	24-hour	25 μg/m^3	A	No National Standards	
Hydrogen Sulfide	1-hour	0.03 ppm (42 μg/m^3)	U		
Vinyl Chloride [7]	24-hour	0.01 ppm (26 μg/m^3)	Not Available		
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient of 0.23 per kilometer –visibility of 10 mi or more	U		

Notes: μg/m^3 = micrograms per cubic meter; ppm = parts per million

1 National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM_{10} 24-hour standard is attained when 99 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The $PM_{2.5}$ 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current federal policies.

2 California standards for ozone, CO (except in the Lake Tahoe Basin), SO_2 (1- and 24-hour), NO_2, PM, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. California Ambient Air Quality Standards (CAAQS) are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

3 Concentration expressed first in units in which it was promulgated [i.e., parts per million (ppm) or micrograms per cubic meter (μg/m^3)]. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas. Secondary national standards are also available from EPA.

4 Unclassified (U): a pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment.

Attainment (A): a pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a 3-year period.

Nonattainment (N): a pollutant is designated nonattainment if there was a least one violation of a state standard for that pollutant in the area. Non-attainment designations for ozone are classified as marginal, serious, severe, or extreme depending on the magnitude of the highest 8-Hour ozone design value at a monitoring site in a non-attainment area.

Nonattainment/Transitional (NT): is a subcategory of the nonattainment designation. An area is designated nonattainment/transitional to signify that the area is close to attaining the standard for that pollutant.

5 Secondary Standard

6 Nonattainment (N): any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

Attainment (A): any area that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable (U): any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

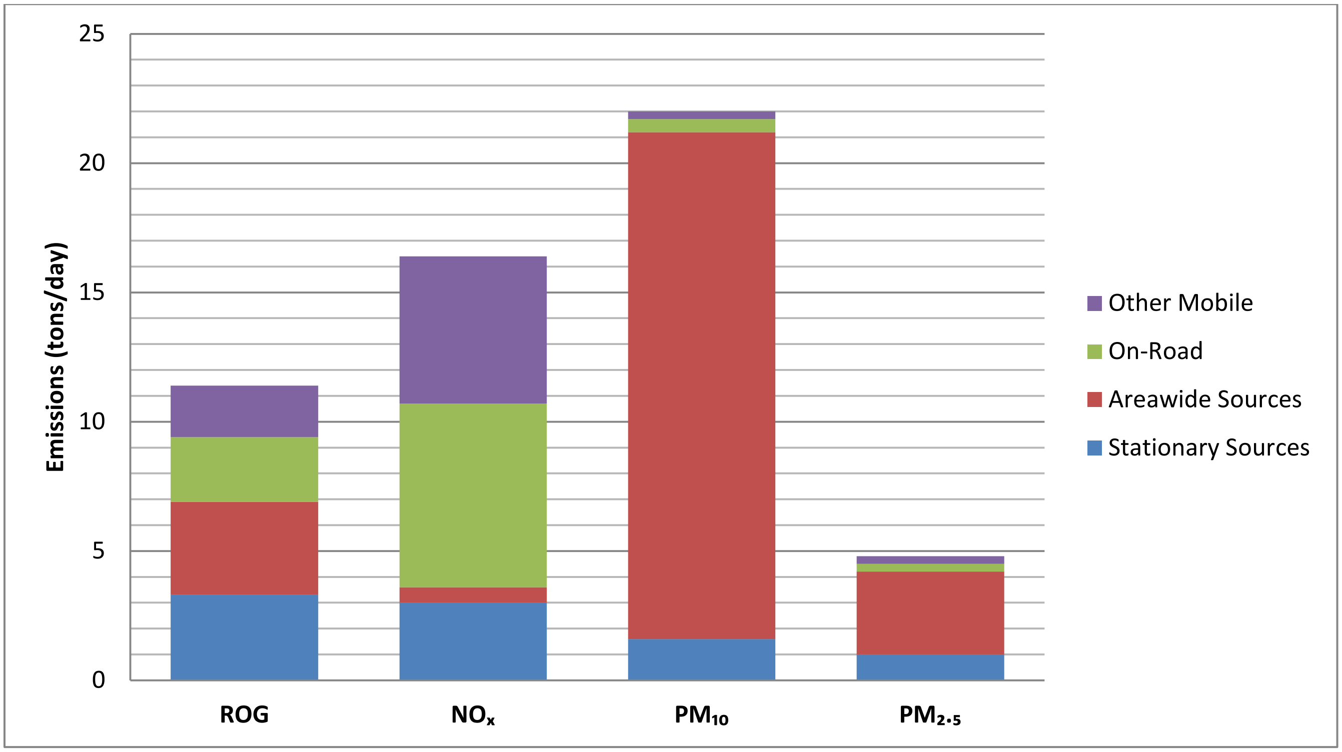
Maintenance (M): any area previously designated nonattainment pursuant to the CAAA of 1990 and subsequently redesignated to attainment subject to the requirement to develop a maintenance plan under Section 175A of the CAA, as amended.

7 ARB has identified lead and vinyl chloride as toxic air contaminants with no threshold of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: ARB 2013a, ARB 2013b, EPA 2015; data compiled by Ascent Environmental in 2015.

Emissions Inventory

Figure 4.3-4 summarizes an estimated emissions inventory of CAPs within Yolo County for various source categories in 2012. According to the emissions inventory, mobile sources are the largest contributor to the estimated daily air pollutant levels of ROG and NO_X, accounting for approximately 40 percent and 78 percent of the total daily emissions, respectively. Area-wide sources (i.e., sources that occur over a large area rather than at a point source [e.g., smoke stack] or mobile-source [e.g., tailpipe]) account for approximately 89 percent and 67 percent of the county's PM_{10} and $PM_{2.5}$ emissions, respectively (ARB 2013c). This is the current emissions inventory available for Yolo County.



Source: ARB 2013c, data compiled by Ascent Environmental, Inc. in 2015. The 2012 emissions inventory is the most recent available as of July 2015.

Figure 4.3-4 **Yolo County 2012 Emissions Inventory**

Toxic Air Contaminants

Concentrations of toxic air contaminants (TACs) are also used to indicate the quality of ambient air. A TAC is defined as an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations.

According to the California Almanac of Emissions and Air Quality (ARB 2010),[1] the majority of the estimated health risks from TACs can be attributed to relatively few compounds, the most important being particulate matter from diesel exhaust (diesel PM). Diesel PM differs from other TACs in that it is not a single substance, but rather a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, lubricating oil, and whether an emissions control system is being used. Unlike the other TACs, no ambient monitoring data are available for diesel PM. However, ARB has made preliminary concentration estimates based on a PM exposure method. This method uses the ARB emissions inventory's PM_{10} database, ambient PM_{10} monitoring data, and the results from several studies to estimate concentrations of diesel PM. In addition to diesel PM, the TACs that pose the greatest existing ambient risk in California, for which data are available, are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride,

[1] Although a more recent version of the almanac was available in 2013, this 2009 version of the almanac is the latest version that contains TAC information.

hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene. Sources of these TACs vary considerably and include (but are not limited to) consumer products, gasoline dispensing stations, auto repair and auto body coating shops, dry cleaning establishments, chrome plating and anodizing shops, welding operations, and other stationary sources.

Diesel PM poses the greatest health risk among the 10 TACs mentioned. Based on receptor modeling techniques, ARB estimated its health risk to be 360 excess cancer cases per million people in the SVAB in the year 2000, which when coupled with the average health risk within the SVAB of 160 cancer cases per million people yields a total health risk of 520 cancer cases per million people. Since 1990, the health risk associated with diesel PM has been reduced by 52 percent. Overall, levels of most TACs, except para-dichlorobenzene and formaldehyde, have decreased since 1990 (ARB 2010:3-2).

According to the ARB Air Toxics “Hot Spots” Program (see Regulatory Setting below), stationary facilities that emit toxic substances above a specified level are required to prepare an inventory of toxic emissions, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures. There are approximately 40 existing facilities that meet the reporting criteria and are located in the same Davis zip code (95616) as the project (ARB 2013d). Minor stationary sources of TACs may also be located in the project vicinity and could include, but are not limited to: gasoline dispensing stations, auto body coating operations, and research and development facilities.

Major highways and roadways are also considered sources of TAC emissions, associated with the presence of diesel PM emissions from vehicle exhaust. I-80 passes along the southern end of the project site between Richards Boulevard and UC Davis exits. The annual average daily traffic volume on this segment of I-80 in the project vicinity is approximately 119,000 vehicles per day (California Department of Transportation 2014). The project site is also located adjacent to an active Union Pacific Rail Road line that carries both freight and passenger rail. Trains in Yolo County account for 10 percent of mobile diesel sources (ARB 2013c).

Ultrafine Particulate Matter

Ultrafine particulate matter (UFP) refers to a subfraction of currently regulated $PM_{2.5}$ and PM_{10} size particles. UFP is most often defined as particles with an aerodynamic diameter of 0.1 microns or smaller (Health Effects Institute 2013:1; ARB 2006:2; Kleeman et al. 2007:1).

Although ultrafine particles contribute only a small amount to total PM mass they have a large surface area and often very high number concentrations. Because of its small size, a given mass of UFP contains thousands to tens of thousands more particles, with a correspondingly larger surface area, than an equivalent mass of $PM_{2.5}$ or PM_{10}. This means that a given mass of UFP can impact a larger surface area of lung tissue than equal mass of $PM_{2.5}$ or PM_{10}, thus increasing exposure (Delfino et al. 2005:934). UFP behaves much like a gas and may be inhaled more deeply into the lung than larger particles (Oberdörster 2001:1).

Both laboratory and epidemiological studies indicate that exposure to UFP may lead to adverse health effects in animals and humans (Health Effects Institute 2013:2; Froines 2006) and toxicological studies have concluded that UFP is more toxic than larger sized particles (Zhu et al. 2002a:4324; Li et al. 2003:455). Experimental studies suggest that the adverse health effects of exposure to UFPs differ from those of larger particles. As a result of their physical characteristics, inhaled UFPs differ from larger particles in their deposition patterns in the lung, their clearance mechanisms, and in their potential for translocation from the lung to other tissues in the body (Health Effects Institute 2013:3). UFP passes rapidly into the human circulatory system, increasing the number of particles in the blood and thus increasing exposure to other organs (Nemmar et al. 2002:411). They have also been shown to contain many toxic components such as metals, carbon, and organic compounds which may initiate or play a role in many types of harmful tissue-level oxidant processes can that damage the heart, lung, and other organs (ARB 2006:3 to 4; Oberdörster 2001:1; Donaldson et al. 2001:526; Stölzel et al. 2007:458). UFP has also been found to be more potent than $PM_{2.5}$ and PM_{10} in inducing cellular damage (Li et al. 2003:455 to 456). Observed effects in selected studies include lung function changes, airway inflammation, enhanced allergic responses, vascular thrombogenic effects, altered endothelial function, altered heart rate and heart rate variability, accelerated atherosclerosis, and increased markers of brain inflammation (Health Effects Institute 2013:3, 36, 39, 45, 65).

The predominant source of UFP is combustion by on-road vehicles, off-road vehicles, and stationary sources (Health Effects Institute 2013:1; ARB 2006:3; Kleeman et al. 2007:1). Concentrations of UFP have been found to be substantially higher at locations proximate to and downwind of high-volume roadways, particularly roadways travelled by diesel-powered vehicles (Health Effects Institute 2013:3; Hagler et al. 2009:1229; Ham and Kleeman 2011:3988; Zhu et al. 2002a:4323). Studies have identified a strong correlation between ischemic heart disease and segments of Interstate 5 that regularly experience and stop-and-go traffic conditions with heavy vehicle braking (Cahill et al. 2011a:1129; Cahill et al. 2011b:1135). These studies found evidence that the UPF at these locations contain a substantial portion of transition metals, including nickel and copper, which result from brake and tire wear. The potential for health impacts of ultra-fine metals associated with cars braking and accelerating in inversion conditions is a serious health concern based on recent epidemiological studies (Cahill et al. 2011a:1135; Denier van der Gong et al. 2013:136). These transition metals have been identified as TACs by the Office of Environmental Health Hazard Assessment (OEHHA) (OEHHA 2014:4).

Concentrations of UFP often do not correlate well with concentrations of $PM_{2.5}$ and PM_{10} (ARB 2003a:4). Because of its smaller size UFP has different dispersion properties than $PM_{2.5}$ and PM_{10}. As aerosols, UFP does not undergo gravitational settling like $PM_{2.5}$ and PM_{10}. Because of coagulation processes wherein individual UFP particles collide with one another and adhere to form larger particles, there will be a continuous decrease in number concentration coupled with an increase in particle size. Thus, the combination of coagulation and dilution experienced by UFP results in a rapid decrease in concentration with downwind distance (Zhou and Levy 2007:93; Zhu et al. 2002a:4323). For these reasons, the concentration of UFP at a particular location is more a function of the proximity to a local source, and less a function of background levels, than is the case for $PM_{2.5}$ and PM_{10} (Zhou and Levy 2007:93). Ultrafine particle number concentration measured at 300 meters (984 feet) downwind from the freeway was indistinguishable from upwind background concentration (Zhu et al. 2002a:4323; Zhou and Levy 2007:96).

Relatively low temperature and high humidity are associated with higher rates of new particle formation and slower atmospheric dispersion, indicating that UFP concentrations will generally be higher in the winter than in the summer (Sioutas et al. 2005:951; Cahill et al. 2011a:173; Cahill et al. 2014:173).

Numerous field studies indicate that both diesel PM and UFP concentrations are substantially higher near heavily travelled roadways (Health Effects Institute 2013:3). Therefore, it is inferred that vehicles traveling on I-80 are the primary source of UFPs at and near the Nishi site. Some of the particular characteristics of the segment of I-80 that passes by the Nishi site suggest that the Nishi site may be exposed to higher UFP concentrations than is typical for areas adjacent to freeways. First, as shown in the wind rose presented in Figure 4.3-1, the predominant wind direction is from I-80 and toward the Nishi site. There are also periods when the wind direction is nearly parallel to I-80 such that the Nishi site is exposed to vehicle emissions from multiple segments of the freeway at the same time—a concept referred to as “linear enhancement.” Linear enhancement has been shown to occur on I-80 upwind of the Nishi site using the National Ocean and Atmospheric Administration’s Hybrid Single Particle Lagrangian Integrated Trajectory Model (Cahill, pers. comm., 2015:2). A portion of the adjacent I-80 segment is elevated and field studies found that freeway-generated pollutant concentrations can be the same level as far as 1,000 feet from the freeway as they are at the freeway edge (Feeney et al. 1975:1147; Cahill, pers. comm., 2014:3). Also, I-80 frequently experiences heavy congestion as traffic from nearby State Route 113 and east-bound I-80 merge and cause heavy braking by trucks and other vehicles. This type of congestion often occurs during the afternoon/evening commute period and, as shown in Figure 4.3-3, this is a time of day when winds are blowing from the freeway over the project site. As discussed above, multiple field studies have found that brake and tire wear emissions include transitional metals that are considered TACs. Moreover, the stop-and-go traffic conditions also result in more exhaust emissions than free flowing traffic.

Naturally Occurring Asbestos

Asbestos is the common name for a group of naturally occurring fibrous silicate minerals that can separate into thin but strong and durable fibers. Naturally occurring asbestos, which was identified as a TAC by ARB in 1986, is located in many parts of California and is commonly associated with serpentine soils and rocks. According to two reports by the California Department of Conservation, Division of Mines and Geology, the project area is not likely to contain naturally occurring asbestos (California Department of Conservation 2000).

Odors

Odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

With respect to odors, the human nose is the sole sensing device. The ability to detect odors varies considerably among the population and is subjective. Some individuals have the ability to smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person may be acceptable to another (e.g., fast food restaurant). It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word strong to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Land uses that are major sources of odor typically include wastewater treatment and pumping facilities, sanitary landfills, transfer stations, recycling and composting facilities, major livestock facilities, and various industrial uses such as chemical manufacturing and food processing. There are no major sources of odor located adjacent to or in the immediate vicinity of the project. The nearest major source of odor is the UC Davis Dairy Cattle Facility located approximately one mile west of the project site center and wind patterns in the area would carry odors from the dairy facility away from the project site.

Sensitive Land Uses

Sensitive land uses generally include uses where prolonged exposure to pollutants could result in health-related risks to individuals. Residential dwellings and places where people recreate or congregate for extended periods of time such as parks or schools are of primary concern because of the potential for increased and prolonged exposure of individuals to pollutants.

A number of existing sensitive land uses are located adjacent to or in close proximity to the project site, including multi-family residential dwellings and a university. The project will also result in new multi-family residential dwellings and parks located on the project site.

4.3.2 Regulatory Setting

Air quality in the vicinity of the project is regulated by the EPA, ARB, and Yolo-Solano Air Quality Management District (YSAQMD, or the District). Each of these agencies develops rules, regulations, policies, and/or goals to comply with applicable legislation. Although EPA regulations may not be superseded, both state and local regulations may be more stringent.

Concentrations of several air pollutants—ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead—indicate the quality of ambient air and are therefore the premise of air quality regulations. As previously mentioned, these are referred to as criteria air pollutants, or CAPs, because these pollutants are the most prevalent air pollutants known to be harmful to human health. Their effects on human health have been studied in depth and their criteria for affecting health have been documented. Acceptable levels of exposure to CAPs have been determined and ambient standards have been established for them (see Table 4.3-3).

Air quality regulations also focus on TACs (also known as hazardous air pollutants [HAPs] in federal regulations). In general, for those TACs that may cause cancer, all concentrations present some risk. In other words, there is no threshold level below which adverse health impacts may not be expected to occur. EPA and ARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the maximum, reasonably available, or best available control technology for toxics (BACT) to limit emissions. These statutes and regulations, in conjunction with additional rules set forth by YSAQMD, establish the regulatory framework for TACs.

Applicable regulations associated with CAPs, TACs, and odors are described below.

FEDERAL

Criteria Air Pollutants

At the federal level, EPA implements the national air quality programs. The EPA air quality mandates are drawn primarily from the federal Clean Air Act (CAA), enacted in 1970. The most recent major amendments were made by Congress in 1990.

The CAA requires EPA to establish National Ambient Air Quality Standards (NAAQS). As shown in Table 4.3-3, EPA has established NAAQS for the following CAPs: ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead (ARB 2013b). The primary standards protect public health and the secondary standards protect public welfare. The CAA also requires each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The federal Clean Air Act Amendments of 1990 (CAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA reviews all state SIPs to determine whether they conform to the mandates of the CAA and its amendments and whether implementing them will achieve air quality goals. If EPA determines a SIP to be inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the nonattainment area. If the state fails to submit an approvable SIP or to implement the plan within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basins.

Hazardous Air Pollutants

EPA has programs for identifying and regulating HAPs. Title III of the CAA directed EPA to promulgate national emissions standards for HAPs (NESHAP). The national emissions standards for HAPs may differ for major sources and for area sources of HAPs. Major sources are defined as stationary sources with potential to emit more than 10 tons per year (tpy) of any HAP or more than 25 tpy of any combination of HAPs; all other sources are considered area sources. The emissions standards are to be promulgated in two ways. First, EPA has technology-based emission standards designed to produce the maximum emission reduction achievable. These standards are generally referred to as requiring maximum available control technology for toxics. For area sources, the standards may be different, based on generally available control technology. Second, EPA also has health risk–based emissions standards, where deemed necessary, to address risks remaining after implementation of the technology-based NESHAP standards.

The CAA also required EPA to issue vehicle or fuel standards containing reasonable requirements that control toxic emissions of, at a minimum, benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, the CAA required the use of reformulated gasoline in selected areas with the most severe ozone nonattainment conditions to further reduce mobile-source emissions.

Ultrafine Particulates

No federal agencies, including EPA, have established any standards, policies, or guidance regarding UPF.

STATE

Criteria Air Pollutants

ARB coordinates and oversees the state and local programs for controlling air pollution in California and implements the California Clean Air Act (CCAA), adopted in 1988. The CCAA requires ARB to establish California Ambient Air Quality Standards (CAAQS), which are shown in Table 4.3-3. ARB has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the above-mentioned CAPs. In most cases the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that local air districts should focus particular attention on reducing the emissions from transportation and area-wide emission sources. The act provides districts with the authority to regulate indirect sources.

ARB also oversees local air district compliance with federal and state laws, approving local air quality plans, submitting SIPs to EPA, monitoring air quality, determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels.

Toxic Air Contaminants

TACs in California are regulated primarily through the Tanner Air Toxics Act (Assembly Bill [AB] 1807 [Statutes of 1983]) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588 [Statutes of 1987]). AB 1807 sets forth a formal procedure for ARB to designate substances as TACs. This process includes research, public participation, and scientific peer review before ARB can designate a substance as a TAC. ARB has identified more than 21 TACs to date and has adopted EPA's list of HAPs as TACs. Most recently, diesel PM was added to the ARB list of TACs.

Once a TAC is identified, ARB then adopts an airborne toxics control measure for sources that emit that particular TAC. If a safe threshold exists for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If no safe threshold exists, the measure must incorporate BACT to minimize emissions.

The Hot Spots Act requires that existing facilities that emit toxic substances above a specified level prepare an inventory of toxic emissions, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures.

ARB has adopted diesel exhaust control measures and more stringent emissions standards for various transportation-related mobile sources of emissions, including transit buses, and off-road diesel equipment (e.g., tractors, generators). Recent and upcoming milestones for transportation-related mobile sources include a low-sulfur diesel fuel requirement and tighter emissions standards for heavy-duty diesel trucks (2007) and off-road diesel equipment (2011) nationwide. Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially lower levels of TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1,3-butadiene, diesel PM) have been reduced significantly over the last decade and will be reduced further in California through a progression of regulatory measures (e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of ARB's Risk Reduction Plan, it is expected that diesel PM concentrations will be 75 percent less than the estimated year-2000 level in 2010 and 85 percent less in 2020. Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

ARB's *Air Quality and Land Use Handbook: A Community Health Perspective* (ARB 2005) provides guidance concerning land use compatibility with TAC sources. While not a law or adopted policy, the handbook offers advisory recommendations for the siting of sensitive receptors near uses associated with TACs, such as freeways and high-traffic roads, commercial distribution centers, rail yards, ports, refineries, dry cleaners, gasoline stations, and industrial facilities, to help keep children and other sensitive populations out of harm's way.

Ultrafine Particulate Matter

No state agencies, including EPA, have established any standards, policies, or guidance regarding UFP.

LOCAL

Yolo-Solano County Air Quality Management District

YSAQMD attains and maintains air quality conditions in Yolo and Solano Counties through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of YSAQMD includes the preparation of plans and programs for the attainment of ambient-air quality standards, adoption and enforcement of rules and regulations, and issuance of permits for stationary sources. YSAQMD also inspects stationary sources, responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements other programs and regulations required by the CAA, CAAA, and CCAA.

All projects are subject to adopted YSAQMD rules and regulations in effect at the time of construction. Specific rules applicable to the construction of the project may include but are not limited to the following:

- Rule 2.3—(Ringelmann Chart). This rule prohibits stationary diesel-powered equipment from generating visible emissions that would exceed the rule's visibility threshold.
- Rule 2.5—(Nuisance). This rule prohibits any source from generating air contaminants or other materials that would that would cause injury, detriment, nuisance, or annoyance to the public; endanger the comfort, repose, health, or safety of the public; or damage businesses or property.
- Rule 2.11—(Particulate Matter Concentration). This rule prohibits any source that would emit dust, fumes, or total suspended particulate matter from generated emissions that would exceed the rule's established emission concentration limit.
- Rule 2.14—(Architectural Coatings). This rule establishes volatile organic compound (VOC) content limits for all architectural coatings supplied, sold, offered for sale, applied, solicited for application, or manufactured within YSAQMD's jurisdiction.

- Rule 2.28—(Cutback and Emulsified Asphalts). This rule establishes organic compound limits for cutback and emulsified asphalts manufactured, sold, mixed, stored, used, and applied within YSAQMD's jurisdiction.
- Rule 2.40—(Wood Burning Appliances). This rule prohibits installation of open hearth wood burning fireplaces in any new development (residential or commercial, single or multi-family units). New developments may only use either a pellet-fueled heater, a U.S. EPA Phase II certified wood burning heater or a gas fireplace.
- Rule 2.37—(Natural Gas-Fired Water Heaters and Small Boilers). This rule establishes NO_X emission limits for natural gas-fired water heaters with a rated heat input capacity less than 1,000,000 British Thermal Units per hour—(Btu/hr) manufactured, offered for sale, sold, or installed within YSAQMD's jurisdiction.
- Rule 3.1—(General Permit Requirements). This rules establishes permitting processes (i.e., Authority to Construct and Permit to Operate) to review new and modified sources of air pollution.
- Rule 3.4—(New Source Review). This rule would require any new or modified stationary source that generates emissions that exceed established emissions limits for each pollutant (i.e., ROG, NO_X, sulfur oxides [SO_X], PM_{10}, CO, and lead) to comply with Best Available Control Technology and emissions offset requirements.
- Rule 3.13—(Toxics New Source Review). This rule requires the installation of best available control technology for toxics (T-BACT) at any constructed or reconstructed major source of TACs.

Criteria Air Pollutants

The CCAA requires districts to submit air quality plans for areas that do not meet state standards for ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide and particulate matter. The YSAQMD has attained all standards with the exception of ozone and PM. The District adopted its Air Quality Attainment Plan in February 1992 to identify emissions control measures that would aid the district in attaining the state standards for ozone. The CCAA does not currently require attainment plans for PM (YSAQMD 2015).

In addition, as a part of the Sacramento federal ozone nonattainment area, YSAQMD works with the Sacramento Metropolitan Air Quality Management District (SMAQMD) to develop a regional air quality management plan under CAA requirements. The 2013 Ozone Attainment Plan was approved by ARB on November 21, 2013 and submitted to EPA as a revision to the SIP on December 31, 2013. EPA found the motor vehicle emissions budgets in the Plan for the 1997 8-hour ozone NAAQS to be adequate for attainment goals. The finding became effective on August 25, 2014. EPA proposed to approve and promulgate the Sacramento Region SIP for 1997 8-hour Ozone Standard. The comment period for the proposed rule ended November 14, 2014 (SMAQMD 2015a).

Toxic Air Contaminants

At the local level, air pollution control or management districts may adopt and enforce ARB's control measures. Under YSAQMD Rule R3-1 ("General Permit Requirements"), Rule R3-4 ("New Source Review"), and Rule R3-8 ("Federal Operating Permits"), all sources that possess the potential to emit TACs are required to obtain permits from the district. Permits may be granted to these operations if they are constructed and operated in accordance with applicable regulations, including new-source review standards (see Rule R3-4 above) and air-toxics control measures. YSAQMD limits emissions and public exposure to TACs through a number of programs. YSAQMD prioritizes the permitting of TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors.

Sources that require a permit are analyzed by YSAQMD (e.g., health risk assessment) based on their potential to emit toxics. If it is determined that the project will emit toxics in excess of YSAQMD's threshold of significance for TACs (identified below), sources have to implement BACT for TACs to reduce emissions. If a source cannot reduce the risk below the threshold of significance even after BACT has been implemented, YSAQMD will deny the permit required by the source. This helps to prevent new problems and reduces emissions from existing older sources by requiring them to apply new technology when retrofitting with respect to TACs. Although YSAQMD regulates sources that generate TACs, the District does not regulate land uses that may be sited in locations exposed to TACs. The decision on whether to approve projects in TAC-exposed locations is typically the responsibility of the lead agency charged with determining whether to approve a project.

Ultrafine Particulate Matter

YSAQMD has not established any rules, policies, or guidance regarding UFP.

City of Davis General Plan

The Air Quality Element of the City's General Plan (amended through January 2007) contains goals, policies, and actions that pertain to CAP emissions, TACs, and odors include (City of Davis 2007). Key policies that are applicable to the project include the following:

Goal AIR 1. Maintain and strive to improve air quality.

- **Policy AIR 1.1.** Take appropriate measures to meet the AQMD's goal for improved air quality.

Davis Municipal Code

40.24.040 Specified.

(c) Odors. No emission shall be permitted of odorous gases or other odorous matter in such quantities as to be readily detectable when diluted in the ratio of one volume of odorous air to four volumes of clean air at the points of measurement specified in section 40.24.030 or at the point of greatest concentration. Any process which may involve the creation or emission of any odors shall be provided with a secondary safeguard system, so that control will be maintained if the primary safeguard system should fail. There is hereby established as a guide in determining such quantities of offensive odors, Table iii, "odor thresholds," in Chapter 5, "Air Pollution Abatement Manual," Copyright 1951, by Manufacturing Chemists' Association, Inc., of Washington, D.C. and such manual or table as subsequently amended.

4.3.3 Impacts and Mitigation Measures

SIGNIFICANCE CRITERIA

Based on Appendix G of the State CEQA Guidelines, the project would result in a potentially significant impact on air quality if it would:

- 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 in a cumulatively considerable net increase of any criteria pollutant for which the project region is in 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; or
- conflict, or create an inconsistency, with any applicable plan, policy, or regulation adopted for the purpose of avoiding or mitigating environmental effects related to air quality.

Appendix G of the State CEQA Guidelines also recommends that, where available, the significance criteria established by the applicable air quality management district may be relied on to make the above determinations. Thus, according to guidance from the YSAQMD, the project would result in a potentially significant impact on air quality if it would result in the following during either short-term construction or long-term operation on a project-level basis:

- cause CAP or precursor emissions to exceed 10 tpy for ROG, 10 tpy for NO_X, 80 pounds per day (lbs/day) of PM_{10}, or substantially contribute to CO emissions concentrations that exceed the CAAQS; and/or
- cause odorous emissions in such quantities as to cause detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which may endanger the comfort, repose, health, or safety of any such person or the public, or which may cause, or have a natural tendency to cause, injury or damage to business or property. (YSAQMD 2007).

For the evaluation of TAC emissions, YSAQMD considers proposed development projects that have the potential to expose the public to TACs from stationary sources in excess of the following thresholds to have a significant impact. These thresholds are based on the District's Risk Management Policy (YSAQMD 2007:7).

- Probability of contracting cancer for the Maximally Exposed Individual (MEI) equals to 10 in one million or more.
- Ground-level concentrations of non-carcinogenic TACs would result in a Hazard Index equal to or greater than 1 for the MEI.

YSAQMD has not developed thresholds of significance for evaluating the exposure of sensitive receptors to mobile-source TACs (YSAQMD 2007:7), such as when development of residential dwelling units are proposed in close proximity to a high-volume roadway.

YSAQMD, like all other air districts in California, has not identified a threshold of significance for UFPs.

- On a cumulative basis, the District finds that any exceedance of project-level thresholds would also result in a significant cumulative impact. In addition, the District considers combined CO impacts from the project and other existing projects (i.e., background concentration) that exceed air quality standards as cumulatively significant. A screening criteria method may be used to determine if cumulative development could cause a violation of the CAAQS.

METHODS AND ASSUMPTIONS

Components of the Nishi Sustainability Implementation Plan that Could Affect Project Impacts

The following goals and objectives from the Nishi Sustainability Plans are applicable to the evaluation of air quality impacts:

Goal 1: Serve as a model for low-carbon, climate-resilient development that also enhances the fiscal and equitable sustainability of the broader community.

- **Objective 1.2**: Encourage innovative site and building design that encourages a healthy and interconnected natural and built environment, conserves natural resources, and promotes equitable and efficient communities.

Goal 2: Provide low-carbon transportation choices and enhance mobility and connectivity through the use of innovative designs, technologies, and programs.

- **Objective 2.1:** Reduce automobile dependency and reduce vehicle trips generated within the District by 10 percent compared to original project trip generation forecasts [3], working towards the communitywide goal of achieving 50 percent non-single-occupancy-vehicle (SOV) mode share for residential and commercial development by 2035.

- **Objective 2.2**: Achieve a 20 percent reduction in project-related vehicle miles traveled (VMT), compared to original project VMT forecasts.

- **Objective 2.4:** Incentivize the use of clean, energy-efficient, active (i.e., human powered), and economically sustainable means of travel.

Goal 5: Create synergy with other project design goals and existing community sustainability initiatives.

- **Objective 5.1:** Preserve and promote the health of future project residents and employees and the local ecosystem.

- **Objective 5.2:** Ensure appropriately sited and programmed open spaces and parks, in order to meet the recreational needs of new residents and workers while maximizing habitat connectivity, public health, active transportation connectivity, and stormwater management.

Impact Analysis Methodology

As noted in Chapter 3, "Project Description," this EIR evaluates development of the Nishi site at a project level and potential redevelopment that may occur within West Olive Drive as a result of rezoning/redesignation at a programmatic level. Where applicable, impacts were assessed in accordance with YSAQMD-recommended methodologies, which included recommendations for quantifying construction and operational emissions (Jones, pers. comm., 2015a).

Construction

Short-term construction-related emissions of CAPs and precursors were calculated using the California Emissions Estimator Model (CalEEMod) Version 2013.2 computer program (SCAQMD 2013) and SMAQMD's Road Construction Emissions Model (RCEM). CalEEMod was used to calculate construction of utilities, buildings, recreational and open space areas, and parking. RCEM was used to calculate construction of on-site roads, the bridge connect between Nishi and West Olive Drive, and the undercrossing between Nishi and UC Davis. Modeling was based on project-specific information (e.g., schedule, building types, amounts of demolition, area to be graded, area to be paved), where available, and default values in CalEEMod and RCEM that are based on the project's location, land use type, or type of construction.

The analysis assumes that construction of the Nishi development is divided into two phases. Phase 1 of construction would begin in 2017 and last through 2019. After Phase 1, Phase 2 would begin in 2019 and go through 2021. Phase 1 includes site preparation, site-wide grading, and construction of on-site roadways, utilities, 160,000 square feet of commercial space, 310 residential units, 1,383 parking spaces[2], and recreational and open space areas. Phase 2 includes frontage improvements and construction of the underpass between Nishi and UC Davis as well as construction of 165,000 square feet of commercial space, 331 residential units, and 748 parking spaces[3]. To accommodate the planned frontage improvements, the demolition of two structures immediately south of West Olive Drive would be necessary and would occur as part of Phase 1. No other demolition activities are planned because there are no other existing buildings on the Nishi site. Truck hauling was limited to a maximum of 50 trips per day (occurring mainly during demolition). A maximum of 120 worker trips per day (two trips per worker) was assumed. Other detailed assumptions used in modeling construction emissions can be found in Appendix C.

Per YSAQMD recommendations regarding construction emissions and as noted in Chapter 3, "Project Description," exposed areas would be watered twice per day (Jones, pers. comm., 2015a). According to CalEEMod defaults, this would reducing un-watered construction dust emissions by 55 percent for both PM_{10} and $PM_{2.5}$ fugitive emissions.

[2] Includes surface, podium, and structure parking.
[3] Includes surface and podium parking.

Operations

Phase 1 of the project is anticipated to operate starting in 2020 and the project is anticipated to be fully operational starting in 2022. As with construction emissions, long-term operational emissions of CAPs and precursors were also estimated using CalEEMod and off-model. CalEEMod was used to determine the CAP emissions from area sources, consumer products, and on-site natural gas combustion. With respect to area sources, the analysis assumed the project would not include fireplaces or wood-burning stoves, as prescribed by YSAQMD Rule 2.40. According to CalEEMod's user tips, the model applies the ROG emission factors associated with consumer products to the total building square footage, regardless of land use type. Thus, emissions from consumer products were calculated separately using the recommended emission factors from CalEEMod and applied them only to occupied residential and non-residential building areas only. All other area source emissions were determined by CalEEMod defaults for the project.

With respect to building energy use, only natural gas use would result in direct on-site CAP and precursor emissions. Total natural gas use during project operation was estimated by Davis Energy Group and assumed both residential and non-residential buildings as well as possible spas would use natural (Davis Energy Group 2015). CalEEMod was used to calculate emissions from the anticipated natural gas use based on the Davis Energy Group study.

With respect to mobile sources, ARB's emission factor model, EMFAC2014, was used to estimate annual and daily CAP emissions from VMT generated by the project, which was available from Fehr and Peers (Grandy, pers. comm., 2015). See Chapter 4.14, "Transportation," for additional analysis of VMT associated with the project. The California's Emission Factor Model (EMFAC) (ARB 2014) is ARB's latest update to the EMFAC model series and takes into account effects of future policies and economic forecasts. The modeled emission factors reflect the county average vehicle mix and usage rates forecast for 2022 for Yolo County.

With respect to impacts from CO emissions, roadway and intersection traffic volumes from the traffic analysis presented in Section 4.14, "Transportation and Circulation," were used to determine significance related to localized CO impacts, particularly from vehicular emissions, explained further in Impact 4.3-3.

Exposure to Toxic Air Contaminants

Health risk from construction-related emissions of TACs was assessed qualitatively. This assessment was based on the proximity of TAC-generating construction activity to off-site sensitive receptors, the number and types of diesel-powered construction equipment being used, and the duration of potential TAC exposure.

The level of health risk exposure from stationary TAC sources on the UC Davis campus is evaluated based on results of the most recent health risk assessment for all stationary sources on campus (ERM 2010).

The contribution to diesel PM exposure from train activity on the nearby segment of Union Pacific Rail Road is assessed qualitatively based on the number and types of trains that pass along this segment and general guidance from ARB about the level of health risk activity associated with rail operations (ARB 2005).

Levels of health risk associated with exposure to diesel PM emitted on I-80 were estimated using measurements of elemental sulfur collected near the project site in February 2015 (Barnes 2015). This approach assumes that all of the sulfur measured on the Nishi site is emitted in the engine exhaust of motor vehicles traveling on the freeway. This assumption is reasonable because there are not any known sources of elemental sulfur in the area. ARB's emission factor model, EMFAC2014, was used to calculate the ratio of diesel PM to sulfur emitted by vehicles in Yolo County traveling at typical freeway travel speeds, and this ratio was used to estimate average diesel PM concentrations on the project site. Cancer risk levels were estimated using a cancer potency factor for diesel PM recommended by the San Joaquin Valley Air Pollution Control District; this methodology was recommended by YSAQMD (Reed, pers. comm., 2014).

The SMAQMD *Recommended Protocol for Evaluating the Location of Sensitive Land Uses Adjacent to Major Roadways*, Version 2.4 (*Roadway Protocol*) (SMAQMD 2011) was used to supplement the estimated level of cancer risk. SMAQMD's *Roadway Protocol* includes lookup tables to estimate the level of cancer risk at locations in Sacramento County near freeways. The look-up tables in the *Roadway Protocol* account for the volume of traffic on the roadway being examined, the roadway orientation (e.g., east-west or north-south), the distance between the receptors and roadway, and the orientation of the receptor relative to the roadway (e.g., a receptor located 400 feet north of a roadway segment that runs east-west). For residential land uses, the calculation of cancer risk associated with exposure to diesel PM is typically calculated based on a 70-year period of exposure (SMAQMD 2011:15). While the project site is not located in Sacramento County, application of SMAQMD's *Roadway Protocol* is considered appropriate because the Davis area has similar topography and land use coverage attributes (i.e., surface roughness characteristics) as Sacramento County and the vehicle fleet on the segment of I-80 that passes through Davis has similar characteristics (i.e., fleet mix) as the vehicle fleet on highways in Sacramento County.

In the absence of a quantitative threshold of significance established by YSAQMD (YSAQMD 2007:7) this analysis provides a qualitative discussion to determine whether the estimated level of cancer risk on the project site is considered to be substantial.

Exposure to Ultrafine Particulate Matter

The concentrations of UFP on the project site are evaluated qualitatively based on the UFP concentrations measured on the site (Barnes 2015) and a review of the literature about the associated health effects of UFP exposure. Attributes unique to the site and the nearby segment of I-80 are also considered, including the constituents of the UFPs measured on the site; the relative orientation of the site, the freeway, and the predominant wind direction; and typical traffic conditions.

ISSUES NOT EVALUATED FURTHER

All potential air quality issues identified in the significance criteria are evaluated below.

PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

Impact 4.3-1: Short-term construction-generated emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$.

Nishi Site

Short-term construction-generated emissions would not exceed YSAQMD's significance thresholds during construction. This is a **less-than-significant** impact.

Construction-related activities would result in project-generated emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ from site preparation (e.g., grading, and clearing), off-road equipment, material delivery, and worker commute exhaust emissions, vehicle travel, and other miscellaneous activities (e.g., building construction, asphalt paving, application of architectural coatings). Fugitive dust emissions are associated primarily with site preparation and vary as a function of soil silt content, soil moisture, wind speed, and area of disturbance. Other particulate matter emissions can result from combustion of fuels and from tire and brake wear. Ozone precursor emissions of ROG and NO_X are associated primarily with exhaust from construction equipment, haul truck trips, and worker trips. ROG emissions are also generated during asphalt paving and the application of architectural coatings.

Maximum daily construction emissions by construction year are summarized in Table 4.3-4 for ROG, NO_X, PM_{10}, and $PM_{2.5}$ for each construction year and takes into account any overlapping of construction schedules. For informational purposes, fugitive dust and exhaust emissions are presented for both PM_{10} and $PM_{2.5}$.

Refer to Appendix C for a detailed summary of the modeling assumptions, applied construction schedule, inputs, and outputs.

Table 4.3-4 Summary of Annual and Maximum Daily Emissions of Criteria Air Pollutants Associated with Project Construction Activities by Construction Year

Year	For comparison with YSAQMD Thresholds			For TAC analysis and informational purposes only				
	ROG (tpy)	NO_X (tpy)	PM_{10} – Total (lbs/day)	PM_{10} – Exhaust (lbs/day)	PM_{10} – Fugitive Dust (lbs/day)	$PM_{2.5}$ -Exhaust (lbs/day)	$PM_{2.5}$ – Fugitive Dust (lbs/day)	$PM_{2.5}$ – Total (lbs/day)
2017	0.9	7.7	55.5	6.0	49.4	3.9	7.4	11.2
2018	0.8	5.7	55.2	5.7	49.4	5.3	7.4	12.6
2019	4.0	5.1	30.8	2.5	29.4	2.3	3.7	6.0
2020	0.6	4.9	49.3	7.3	41.9	6.7	5.6	12.3
2021	4.0	2.6	43.3	1.1	42.1	1.1	4.6	5.6
YSAMQD Threshold of Significance	10	10	80	Not Applicable				
Exceeds Thresholds?	No	No	No	Not Applicable				

Notes: YSAQMD Thresholds of Significance is 10 tons per year for both ROG and NO_X and 80 pounds per day for PM_{10} from exhaust. Numbers in bold indicate exceedances of the YSAQMD thresholds.

ROG = reactive organic gases
NO_X = oxides of nitrogen
PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$ = respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less
tpy = tons per year
lbs/day = pounds per day
YSAQMD = Yolo County Air Quality Management District

Source: data compiled by Ascent Environmental in 2015

*As shown in Table 4.3-4, construction of the project would result in maximum unmitigated annual emissions of approximately 4.0 tpy of ROG AND 7.7 tpy of NO_X and maximum daily emissions of 55.5 lbs/day of PM_{10}, which would be less than the allowable emissions limits established by YSAQMD. Because estimated construction emissions are not expected to exceed YSAQMD thresholds, this impact is **less than significant.***

Mitigation Measures

No mitigation measures are required.

West Olive Drive

Construction-related activities associated with the redevelopment of parcels along West Olive Drive would result in temporary, short-term project-generated emissions of ROG, NO_X, and particulate matter. However, specific construction details related to the site are not yet available and would be market dependent. Given that the project would be at least half the size of the Nishi site and would not require new infrastructure development because of existing utilities serving the site, short-term construction related emissions would not be anticipated to exceed YSAQMD thresholds. Therefore, this impact is **less than significant.**

Construction-related activities associated with the redevelopment of parcels along West Olive Drive would result in temporary, short-term project-generated emissions of ROG, NO_X, and particulate matter. Although specific construction details related to the site are not yet available, it is known that the project site is approximately 10.8 acres, which is slightly less than a quarter of the Nishi site. In addition, the rate of development on the site would be market dependent and would likely have occur at a slower pace than the construction period planned for the Nishi development. To that end, resulting construction emissions from the West Olive Drive redevelopment would likely have less annual and daily construction emissions than Nishi and would not exceed thresholds.

*Because construction emissions associated with redevelopment of West Olive Drive are not anticipated to exceed YSAQMD thresholds, this impact is **less than significant**.*

Mitigation Measures

No mitigation measures are required.

Impact 4.3-2: Long-term operational emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$.

Nishi Site

Operational activities associated with the Nishi-Gateway development would result in long-term project-generated emissions of CAPs, particularly ROG. Long-term, operational emissions could exceed YSAQMD significance thresholds for ROG, but would not exceed YSAQMD thresholds for NO_X and PM_{10}. Thus, long-term operational emissions of NO_X could conflict with the air quality planning efforts and contribute substantially to the nonattainment status of Yolo County with respect to the NAAQS and CAAQS for ozone. This would be a **significant** impact.

Regional area- and mobile-source emissions of non-attainment pollutants and precursors (i.e., ROG, NO_X, and PM_{10}) generated by operation of the project were also modeled using CalEEMod and off-model methods, described earlier under "Impact Analysis Methodology." Additional model results and detailed assumptions used in the model and off-model calculations available in Appendix C.

Table 4.3-5 summarize the modeled operation-related emissions of CAPs and ozone precursors under build-out conditions in 2019 and in 2022 after the construction of Phase 1 and Phase 2 have been completed, respectively. Operational Emissions in 2022 reflect the full-build out scenario.

Table 4.3-5 Summary of Annual and Maximum Daily Emissions of Criteria Air Pollutants Associated with Nishi Gateway Long-Term Operation starting in 2019

Emissions Source	Operation of Phase 1 of Nishi-Gateway Development Starting in 2019			Operation of Nishi-Gateway Development at Full Build-out in 2022		
	ROG (tpy)	NO_X (tpy)	PM_{10} (lbs/day)	ROG (tpy)	NO_X (tpy)	PM_{10} (lbs/day)
Area Sources[1]	3.3	0.0	0.1	6.0	0.1	0.3
Natural Gas	0.0	0.4	0.2	0.1	0.9	0.4
Mobile	2.1	1.8	4.9	4.4	3.7	10.2
Total	5.5	2.3	5.2	10.5	4.7	10.9
YSAQMD Thresholds of Significance	10	10	80	10	10	80
Exceed Significance Criteria?	No	No	No	Yes	No	No

Note: Summation may not equal totals because of rounding.

[1] Includes architectural coating, consumer products, and landscaping emissions.

ROG = reactive organic gases
NO_X = oxides of nitrogen
PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$ = respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less
tpy = tons per year
lbs/day = pounds per day
YSAQMD = Yolo County Air Quality Management District

Source: Data provided by Ascent Environmental in 2015 based on modeling using CalEEMod v. 2013.2.2

As shown in Table 4.3-5, at full build-out, the Nishi-Gateway development would exceed YSAQMD's ROG thresholds starting in 2022. Annual ROG emissions are approximately split evenly between area and mobile sources generated by the project, with a negligible percent attributable to on-site natural gas combustion. Further analysis shows that approximately 70 percent of annual ROG emissions from area sources are because of use of consumer products.

*Estimated operational emissions associated with proposed uses at the Nishi site would exceed YSAQMD thresholds. Thus, this impact would be **significant.***

Mitigation Measures

Implement Mitigation Measure 4.14-5 (Transportation Demand Management program).

Significance after Mitigation

Emissions reductions from Mitigation Measure 4.14-5 were calculated by taking the difference in ROG emissions resulting from unmitigated and mitigated VMT levels. Emissions from both VMT levels were calculated using the same method described above. The potential reductions of these mitigation measures on total annual ROG emissions are presented below in Table 4.3-6.

Table 4.3-6 Mitigated Annual ROG Emissions Associated with Nishi-Gateway Operation at Full Build-out in 2022

Emissions Source	Emissions reductions due to TDM mitigation ROG (tpy)	Mitigated Annual Emissions ROG (tpy)
Area Sources	0.0	6.0
Natural Gas	0.0	0.1
Mobile[1]	-0.9	3.6
Total	-0.9	9.7
YSAQMD Thresholds of Significance		10
Exceed Significance Criteria?		No

[1] Reductions due to Mitigation Measure 4.14-5 (Transportation Demand Management program) only affect mobile source emissions of ROG.

ROG = reactive organic gases
TDM = Transportation Demand Management
tpy = Tons per day
YSAQMD = Yolo County Air Quality Management District

Source: Data provided by Ascent Environmental in 2015 based on modeling using CalEEMod v. 2013.2.2

As shown in Table 4.3-6 above, mitigation of this impact would reduce annual ROG emissions to 9.7 tpy. Thus, the application of Mitigation Measure 4.14-5 would reduce annual ROG emissions to below YSAQMD thresholds and would result in a less-than-significant impact with mitigation.

A Special Note on Simultaneous Construction and Operational Emissions

For a brief period between 2019 and 2021, construction of Phase 2 will occur during the operation of Phase 1. During this time, mitigated emissions are not anticipated to exceed YSAQMD thresholds, as shown in Table 4.3-7 below. The values in Table 4.3-7 take into account the effect of Mitigation Measure 4.14-5.

Table 4.3-7 Summary of Annual and Maximum Daily Emissions of Criteria Air Pollutants Associated with Nishi-Gateway Simultaneous Long-Term Operation and Construction between 2019 and 2021 (Mitigated)

Emissions Source/Year	ROG (tons/year)	NO_X (tons/year)	PM_{10} (lbs/day)
Operation of Phase 1	5.5	2.1	5.2
Construction of Phase 2 (2019)	4.0	5.1	30.8
Construction of Phase 2 (2020)	0.6	4.9	49.3
Construction of Phase 2 (2021)	4.0	2.6	43.3
Simultaneous Emissions			
2019	9.5	7.4	36.0
2020	6.2	7.1	54.5
2021	9.6	4.9	48.5
YSAQMD Thresholds of Significance	10	10	80
Exceed Significance Criteria?	No	No	No

ROG = reactive organic gases
NO_X = oxides of nitrogen
PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$ = respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less
lb/day = pounds per day
YSAQMD = Yolo County Air Quality Management District

Source: Data provided by Ascent Environmental, Inc. in 2015 based on modeling using CalEEMod v. 2013.2.2

West Olive Drive

Operational activities associated with the redevelopment of parcels along West Olive Drive would result in long-term project-generated emissions of CAPs that may be greater than current operational emissions. It is anticipated that the net increase in emissions would not exceed YSAQMD thresholds. Therefore, this impact is **less than significant.**

Operational activities associated with the redevelopment of parcels along West Olive Drive would result in long-term project-generated emissions of CAPs. However, with respect to existing land uses on-site, the redevelopment of the area currently does not anticipated residential land uses, and the type and intensity of land uses on-site is not anticipated to change significantly. Although the site may be used more intensively than existing conditions in the future, the net increase in long-term operational emissions is expected to be minimal and would not exceed YSAQMD thresholds. For example, Table 2 on page 10 of the YSAQMD CEQA Handbook establishes screening thresholds based on project size (YSAQMD 2007). Based on the anticipated use type (commercial) that may increase with the redesignation/rezoning of West Olive Drive, none of the square-footage-based screening thresholds would be exceeded, so emissions resulting from potential redevelopment would not exceed YSAQMD thresholds. This is further confirmed by the long-term emissions estimated for the Nishi development, which is a completely new source of emissions and would only slightly exceed YSAMQD emissions thresholds for NO_X under an unmitigated scenario.

*Operational CAP emissions associated with potential redevelopment within West Olive Drive are not anticipated to exceed YSAQMD thresholds. Therefore, this impact is **less than significant**.*

Mitigation Measures

No mitigation measures are required.

Impact 4.3-3: Generation of local mobile-source CO emissions.

Nishi Site

Long-term operation-related local mobile-source emissions of CO generated by the development on the Nishi site would not violate a standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations. As a result, this impact would be **less than significant.**

Local mobile-source CO emissions near roadway intersections are a direct function of traffic volume, speed, and delay. Transport of CO is extremely limited because it disperses rapidly with distance from the source under normal meteorological conditions. However, under certain specific meteorological conditions, CO concentrations near roadways and/or intersections may reach unhealthy levels at nearby sensitive land uses, such as residential units, hospitals, schools, and childcare facilities. Thus, high local CO concentrations are considered to have a direct influence on the receptors they affect.

CO concentration is a direct function of vehicle idling time and, thus, traffic flow conditions. Under specific meteorological conditions, CO concentrations near congested roadways and/or intersections may reach unhealthy levels with respect to local sensitive land-uses such as residential areas, schools, and hospitals. As a result, it is recommended that CO not be analyzed at the regional level, but at the local level.

According to YSAQMD, a project would not violate the CO standard and result in a significant CO impact if the following criterion is met (YSAQMD 2007):

- A traffic study for the project indicates that the peak-hour Level of Service (LOS) on one or more streets or at one or more intersections in the project vicinity will be reduced to an unacceptable LOS (typically LOS E or F); or

- A traffic study indicates that the project will substantially worsen an already existing peak-hour LOS F on one or more streets or at one or more intersections in the project vicinity. “Substantially worsen” includes situations where delay would increase by 10 seconds or more when project-generated traffic is included.

According to the traffic study conducted by Fehr & Peers for this project (refer to Section 4.14, “Transportation and Circulation”), the operation of the Nishi site (both Access Scenarios 1 and 2) would not result in the worsening of any of the 69 intersections analyzed in the project vicinity to LOS of E or F during the peak-hour when compared to the existing condition. This analysis evaluated both Access Scenarios identified in Chapter 3, “Project Description.” However, when compared to the Cumulative No Project 2035 condition, the Cumulative with Project condition, under Access Scenario 1, results in the worsening of two intersections to LOS E or F (“WB 80 Causeway E of Co Rd 32A” and “2nd St E of Pena Dr”). Under Access Scenario 2, the Cumulative with Project condition results in the worsening of only one intersection (“Old Davis Rd N of I-80”). Although this change in LOS would, in and of itself, exceed YSAQMD screening criteria identified above, intersection peak-hour volumes are relatively low (below 10,000 vehicles per hour) when compared to CO screening thresholds from other nearby air districts, including SMAQMD and the Bay Area Air Quality Management District (BAAQMD).

- In recent discussions with YSAQMD staff, the District concurs with the SMAQMD screening criteria as they relate to the magnitude of intersection volumes affected by the project and finds that the proposed Nishi development would meet such criteria (Jones, pers. comm., 2015b). Screening criteria for SMAQMD were developed based on a conservative analysis of local intersections and are considered appropriate for a preliminary screening analysis. As with the YSAQMD criteria, if the criteria are exceeded for the project, a detailed dispersion modeling analysis would need to be performed based on local data. These screening criteria have been developed in a manner such that, if they are met, development-generated, long-term operation-related local mobile-source emissions of CO would not violate a standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations.

- According to SMAQMD, a project would result in a less-than-significant CO impact if the following criterion is met (SMAQMD 2015b):
  - The project would not result in an affected intersection experiencing more than 31,600 vehicles per hour.

Whereas the SMAQMD screening criteria reference intersection vehicle volumes of 31,600 vehicles per hour or more, the intersection volumes in the project vicinity do not exceed 10,000 vehicles per hour even under Cumulative with Project conditions.

*As a result, development-generated, long-term operation-related local mobile-source emissions of CO would not violate a standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations of carbon monoxide. Thus, this impact would be **less than significant**.*

Mitigation Measures

No mitigation measures are required.

West Olive Drive

Long-term operation-related local mobile-source emissions of CO generated associated with the redevelopment of parcels along West Olive Drive would not violate a standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations. As a result, this impact would be **less than significant.**

As discussed above, CO concentration is a direct function of meteorological conditions and motor vehicle activity. Future potential land uses along West Olive Drive would be constrained by the existing boundaries and would remain dominated by commercial land uses. Increased intensity of commercial uses in this area would mostly likely generate slightly higher traffic volumes at the adjacent intersection of Richards Blvd and West Olive Drive. Traffic study conducted by Fehr & Peers for this project (refer to Section 4.14, "Transportation and Circulation") forecasts a maximum peak-hour volume of 3,550 vehicles per hour at this intersection (Cumulative with Nishi Access Scenario 1 scenario).

*It is unlikely that the redevelopment of the West Olive Drive site would increase traffic volumes at this intersection by over 200 percent to exceed 10,000 vehicles per hour. Therefore, this impacts is **less than significant**.*

Mitigation Measures

No mitigation measures are required.

Impact 4.3-4: Short-term construction emissions of toxic air contaminants.

Nishi Site

Construction-related activities would result in temporary, short-term project-generated emissions of TACs, particularly diesel PM. However, because of the relatively low mass of diesel PM generated during project construction, the relatively short duration in which construction would occur, the fact that the TAC-emitting construction activity would not be centralized around any single location on the Nishi project site throughout the construction period, and the highly dispersive properties of diesel PM before it reaches nearby sensitive receptors, construction-related TAC emissions would not expose sensitive receptors to an incremental increase in cancer risk that exceeds 10 in one million or a hazard index greater than 1.0. This impact would be **less than significant.**

Construction-related activities would result in temporary, short-term project-generated emissions of diesel PM from the exhaust of off-road, heavy-duty diesel equipment used during site preparation (e.g., demolition, clearing, grading); paving; application of architectural coatings; as well as on-road truck travel and other miscellaneous activities. For construction activity, diesel PM is the primary TAC of concern. On-road diesel-powered haul trucks traveling to and from the construction area to deliver materials and equipment are less of a concern because they would not stay on the site for long durations.

Particulate exhaust emissions from diesel-fueled engines (i.e., diesel PM) were identified as a TAC by the ARB in 1998. The potential cancer risk from the inhalation of diesel PM, as discussed below, outweighs the potential for all other health impacts (i.e., non-cancer chronic risk, short-term acute risk) and health impacts from other TACs (ARB 2003b; OEHHA 2009:A-3), so diesel PM is the focus of this discussion. Based on the emission modeling conducted and presented in Table 4.3-4 above, maximum daily exhaust emissions of PM_{10}, considered a surrogate for diesel PM, would not exceed 7 lbs/day during the most intense season of construction activity. Furthermore, diesel PM would be generated from different portions of the project area rather than a single location, and different types of construction activities (e.g., site preparation, paving, building construction) would not occur at the same place at the same time.

The dose to which receptors are exposed is the primary factor used to determine health risk (i.e., potential exposure to TAC emission levels that exceed applicable standards). Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for any exposed receptor. Thus the risks estimated for an exposed individual are higher if a fixed exposure occurs over a longer period of time. According to OEHHA, HRAs, which determine the exposure of sensitive receptors to TAC emissions, should be based on a 70- or 30-year exposure period; however, such assessments should be limited to the period/duration of activities that generate TAC emissions (OEHHA 2012:11-3). Consequently, it is important to consider that the use of off-road heavy-duty diesel equipment would be limited to the periods of construction and only during the buildout period when new facilities are constructed.

Also important to consider is the proximity of nearby sensitive receptors. Studies show that diesel PM is highly dispersive (e.g., diesel PM concentrations decrease by 70 percent at 500 feet from the source) (Zhu et al. 2002b:1032), and receptors must be in close proximity to emission sources to result in the possibility of exposure to concentrations of concern. The closest sensitive receptors, some of the multi-family dwelling units of Solano Park, are located more than 150 feet from the Nishi project site. Other nearby land uses include commercial uses, and transient lodging where occupants generally do not reside longer than a typical weekend or week-long vacation stay. Given the locations of potential receptors relative to potential diesel PM emission sources and the temporary nature of construction activities within specific locations on the Nishi project site, the concentrations and durations of any diesel PM exposure that might occur would be limited.

Moreover, implementation of Mitigation Measure 4.11-1, provided in Section 4.11 “Noise and Vibration,” which requires construction staging areas to be located as far as possible from sensitive receptors, would have the added benefit of further limiting the amount of time diesel construction equipment operates near sensitive receptors.

*Considering the relatively low mass of diesel PM emissions that would be generated during project construction, the relatively short duration of construction activities within specific portions of the Nishi project site, the distance to the nearest off-site sensitive receptors, and the highly dispersive properties of diesel PM, construction-related TAC emissions would not expose sensitive receptors to an incremental increase in cancer risk that exceeds 10 in one million or a hazard index greater than 1.0. This would be a **less-than-significant** impact.*

Mitigation Measures

No mitigation measures are required.

West Olive Drive

Construction-related activities associated with the redevelopment of parcels along West Olive Drive would result in temporary, short-term project-generated emissions of TACs, particularly diesel PM. However, because of the relatively low mass of diesel PM generated during project construction, the relatively short duration in which construction would occur, and the highly dispersive properties of diesel PM before it reaches nearby sensitive receptors, construction-related TAC emissions would not expose sensitive receptors to an incremental increase in cancer risk that exceeds 10 in one million or a hazard index greater than 1.0. This impact would be **less than significant**.

Rezoning to allow for redevelopment of parcels within West Olive Drive may result in similar TAC-emitting construction activities that would occur on the Nishi site and, therefore, the potential level of health risk exposure would be similar to that identified for the Nishi site above. The nearest sensitive receptors to this area are the townhomes along Cottage Circle and west of the Davis Commons shopping center, which are more than 300 feet away. Therefore, considering the relatively low mass of diesel PM emissions that would be likely be generated during project construction, the relatively short duration of construction activities within specific portions of the Nishi project site, the distance to the nearest off-site sensitive receptors, and the highly dispersive properties of diesel PM, construction-related TAC emissions would not expose sensitive receptors to an incremental increase in cancer risk that exceeds 10 in one million or a hazard index greater than 1.0.

*Because of the low risk of exposure, construction-related TAC emissions would not expose sensitive receptors to an incremental increase in cancer risk that exceeds 10 in one million or a hazard index greater than 1.0. This would be a **less-than-significant** impact.*

Mitigation Measures

No mitigation measures are required.

Impact 4.3-5: Land use compatibility with off-site sources of TACs and UFPs.

Nishi Site

The project would introduce receptors in close proximity to multiple existing sources of TACs and UFPs. The level of health risk associated with exposure to TACs from local stationary sources and train engines passing on the nearby rail line would not be substantial. However, residential receptors located on the Nishi site could be exposed to relatively high concentrations of diesel PM and UFPs generated by vehicles traveling on I-80 resulting in substantial levels of health risk. This would be a **significant** impact.

Residential dwelling units, which are considered sensitive receptors, would be developed on the Nishi site and could potentially be exposed to TACs generated by nearby sources, including stationary sources on the UC Davis campus, diesel PM generated by trains using the Union Pacific Railroad (UPRR), diesel PM generated be vehicle traffic on I-80, and emissions of UFPs generated by vehicle traffic on I-80. The level of health risk exposure to the project site is discussed for each of these TAC sources separately below.

One common metric of health risk is the number of additional cancer cases that may occur in the population exposed to a particular TAC, or located in an area exposed to TACs in general. This is typically reported as additional cancer risk per million people. For perspective, according to the *America Cancer Society*, the lifetime probability of contracting/dying from cancer in the United States is 43.3%/22.8% among males and 37.8%/19.3% among females (American Cancer Society 2015). In other words there is a lifetime probability that over 430,000 per 1 million males and over 370,000 per 1 million females will develop cancer over their lifetime. This data is intended to provide perspective in evaluation of the incremental risk of an individual project. This is also generalized information that may not be reflective of baseline conditions in Davis, Yolo County, or California in general.

Stationary Sources

Pursuant to the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) an HRA was prepared for all stationary sources of TACs emitted from the UC Davis campus (ERM 2010). The HRA was approved by YSAQMD in 2010 and there have been no substantial changes to the number or types of TACs sources operating on the campus since that time based on a review of the types and level of development approved on the UC Davis campus since 2010. The HRA accounted for 71 different chemicals emitted by an array of stationary sources including diesel generators, boilers, laboratory fume hoods, the incinerator at the veterinary medical school, small heaters and furnaces, kilns, a walnut dryer, landfill flare and fugitive emissions, chloroform remediation, fuel dispensers, bulk solvent storage and solvent dispensing operations, and the wastewater treatment plant. Most of these sources are also subject to permitting requirements, including YSAQMD Rule 3.13, Toxics New Source Review, which ensure that the level of health risk resulting from their operation would not be substantial. Dispersion modeling was performed using local meteorological data and site characteristics (ERM 2010:2, 4 through 7). Risk exposure levels were estimated for off-campus sensitive receptors and on-campus sensitive receptors (i.e., student housing) in accordance with OEHHA's *Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA 2003). The HRA estimated a maximum cancer risk at the point of maximum impact to be 2.2 in one million at a downwind location north of campus (ERM 2010:2 and 17). The highest chronic non-cancer hazard index estimated by the HRA was 0.01, also at a location north of campus, and the highest acute non-cancer hazard index was 0.2, at an on-campus worker location (ERM 2010:2). Because these risk levels are less than the cancer risk threshold of 10 in one million and the hazard index of 1.0, and the Nishi project site is located upwind of the campus it is not anticipated that residential and worker receptors developed on the Nishi site would be exposed to levels of health risk from TAC-generating activities on campus that exceed the applicable thresholds.

Union Pacific Railroad

The UPRR line that passes along the northern boundary of the project site carries both freight trains and passenger trains that are powered by diesel engines. Approximately 35 freight trains and 31 passenger trains pass along this segment on an average day (Yolo County 2009:HS-40; Amtrak 2015). Approximately four additional freight trains will travel along these tracks per day if the Valero Crude by Rail Project is approved by the City of Benicia (City of Benicia 2014:4.2-32).

ARB's *Land Use Handbook* provided in depth discussion of elevated health risk levels near rail yards but areas with rail lines are not among the many TAC-generating land uses discussed in the handbook (ARB 2005:4). The rail line along the project site does not experience the types of high diesel PM-generating that typically occurs at a rail yard. Trains that pass along the rail line near the project site generally do not travel at low speeds or stop and idle. Unlike a rail yard, it does not attract heavy truck traffic for intermodal transfer, no engine maintenance activities take place, multiple train engines do not operate along the segment at the same time, there is not switching engine activity, and no engine idling. Also, as shown by the wind rose in Figure 4.3-1, the predominant wind direction is such that any diesel PM emissions generated along the rail line are blown away from the project site. Moreover, other community-wide health risk assessments have shown that the level of health risk from trains passing on rail lines is nominal compared the levels of health risk from freeway traffic (City of Hayward 2014). Thus, it is not anticipated that residential and worker receptors on the Nishi site would be exposed to levels of health risk from TACs generated by the active railway that exceed the applicable thresholds.

Diesel Particulate Matter

People living and working on the project site would be exposed to emissions of diesel PM generated by vehicles traveling on I-80. The segment of I-80 that passes by the project site currently carries an average daily volume of approximately 119,000 vehicles (California Department of Transportation 2014) and a peak hour traffic volume of 9,190 vehicles (Grandy, pers. comm., 2015). YSAQMD does not recommend a quantitative threshold of significance for evaluating the level of health risk exposure from the siting of new sensitive receptors near a freeway. It its *Air Quality and Land Use Handbook* ARB recommends avoiding siting of new sensitive land uses, including residents, within 500 feet of a freeway or urban road with an average roadway volume of 100,000 vehicles per day (or 50,000 vehicles per day for rural roads) (ARB 2005:4).

Applying the method discussed under the above heading, Impact Analysis Methodology, the concentration of diesel PM on the Nishi site approximately 300 feet from the edge of I-80 was estimated to be approximately 0.57 micrograms per cubic meter (μg/m^3). This estimate is based on the particulate measurements conducted near the Nish site in February 2015 (Barnes 2015). Long-term exposure to this concentration of diesel PM corresponds to an incremental cancer risk level of 235 in one million above the background level of cancer risk from TACs in the region for residential receptors. Detailed calculations are included in Appendix C. Risk levels associated with freeway emissions would be higher on portions of the project site closer to I-80 and lower at more distant locations. It's important to note that the data collected during the measurement period are not necessarily representative of annual average pollutant concentration levels or the levels of long-term, multi-year exposure that would be experienced by residents on the project site but are considered to represent higher concentration levels that may be experienced during a year. The estimated level of increased cancer risk based on SMAQMD's *Roadway Protocol* (SMAQMD 2011) is approximately 197 in one million. Differences in these two estimates may be because of a number of factors including the meteorology that existed during the 10-day measurement, the potential for "linear enhancement" because the wind direction is often aligned with the orientation of this segment of I-80, the fact that a nearby portion of I-80 is elevated which can result in the highest diesel PM concentrations being further from the freeway than for at-grade segments, and that vehicles often experience congestion along this segment of I-80 thereby generating more emissions than free-flowing traffic.

As stated above, YSAQMD does not specify a cancer risk threshold for sensitive receptors exposed to freeway-generated TACs. In the absence of a locally adopted threshold, a recommendation from BAAQMD is considered. BAAQMD specifies a cumulative threshold of an excess cancer risk of 100 in a million for new sensitive receptors that would be sited in proximity to multiple TAC sources (BAAQMD 2010:2-5). Thus, both estimates of the incremental increase in cancer risk for residential receptors located on the project site are considered to be substantial.

<u>Ultrafine Particulates</u>

During a 10-day measurement period an average UFP concentration of 14.6 μg/m^3 was measured on the project site (Barnes 2015). The elemental makeup of UFPs measured near the site indicate that they contain transitional metals that are adverse to human health, including higher rates of ischemic heart disease, particularly in comparison to other freeway segments of concern in the Sacramento region (Barnes 2015:8-10).

This measurement was collected approximately 300 feet from the northern edge of I-80. Given the dispersive properties of UFP it's likely that average concentrations are higher closer to the freeway and lower at more distant locations. While these measurements do not represent an annual average concentration or the levels of long-term, multi-year exposure, a variety of meteorological conditions did occur during the 10-day measurement period (i.e., inversions and non-inversions, varying wind speeds and directions) (Barnes 2015:10) and; therefore, the 10-day average is not representative of one meteorological regime.

Because the measured concentrations of UFP exceed 12 μg/m^3, which is the annual CAAQS and NAAQS for $PM_{2.5}$, and because both laboratory and epidemiological studies indicate that long-term exposure to UFP near roadways results in greater probability of adverse health effects than larger sized particles, the level of health risk from long-term exposure to UFP concentrations on the project site is considered to be substantial.

The level of health risk exposure from TACs generated by nearby stationary sources and diesel PM generated by trains passing on the Union Pacific Rail Road line would not be substantial. However, the level of health risk exposure from pollutants generated on I-80 would be substantial. Based on measurements collected near the project site it is estimated that the level of cancer risk on the project site is approximately 235 in a million, which exceeds the 100-in-a-million cancer risk level specified by BAAQMD. Substantially high UFP concentrations were also measured near the project site and subsequent elemental analysis *indicates that the UFPs contain transitional metals associated with severe adverse health effects. For these reasons, exposure to diesel PM and UFPs on the project site is considered to be a **significant** impact.*

Mitigation Measure

Mitigation Measure 4.3-5a: All residential buildings shall be located as far as feasible from I-80, and no residential buildings shall be located on the southwest portion of the project site along the elevated segment of I-80. Residential buildings shall be sited more distant from I-80 than non-residential buildings, including parking garages, such that the non-residential structures serve as a barrier between I-80 and the residential buildings. In addition, housing where individuals typically reside for a longer period of time, such as for-sale residential units, shall be located more distant from I-80 than other residential units.

Mitigation Measure 4.3-5b: A comprehensive tree planting and maintenance plan shall be developed and implemented to minimize TAC concentrations levels in outdoor areas of the project site. Development and initial planting required by the plan shall be fully funded by the applicant. The plan shall be performed by a qualified arborist approved by the City. The tree siting and maintenance plan shall be completed and approved by the City before construction. The plan shall include ongoing maintenance requirements and clearly identify the funding mechanism for this maintenance during the life of project. Funding for ongoing maintenance may be sourced from the formation of a homeowners association with required dues, establishment of a community facilities district, or some other mechanism approved by the City. The plan shall consist of a vegetative filtration along I-80 and tree canopy across the project site. These two elements are described in greater detail below:

- *Vegetative filtration along Interstate 80.* The plan shall locate trees along the ground level portions of the I-80 right of way to provide vegetative filtration between freeway traffic and the project site. Tree species and spacing shall be selected such that the stand of vegetation should have a minimum year-round width of 5 meters (Islam et al. 2012:2) and be at least 3 meters tall within 15 years of when the first residential dwelling unit on the site is inhabited. A wider barrier results in more deposition (Zhang 2015:14). The stand of vegetation may consist of multiple, staggered rows of trees to eliminate gaps such that a vegetative barrier is achieved. The height of the vegetative stand should be balanced with other site planning considerations, including protection of existing views of the UC Davis campus from I-80, to the extent feasible. If a sound wall is located along I-80 to reduce freeway noise exposure to the project site, the vegetated barrier shall be located on the project side of the sound wall and be as close to the sound wall as feasible such that air passing over the sound wall will immediately come into contact with the trees. If a sound barrier is not constructed then shrubs or other non-tree vegetation can be used to fill gaps between individual trees; however, installation of species that have invasive qualities or would serve as “ladder fuels” in a fire should be avoided.

- *Tree Canopy across the Project Site.* Trees shall also be planted throughout the project site to form a canopy that filters emissions flowing from I-80. As part of detailed site design, an arborist shall work with designers to identify all locations where trees should be located, taking into account areas where shade is desired such as along pedestrian and bicycle routes, the locations of solar photovoltaic panels, and other infrastructure. The tree canopy should be designed such that it shades 50 percent of all paved areas, outdoor activity areas, and pedestrian and bicycle routes, within 15 years of when the first residential dwelling unit on the site is inhabited.

  For both the vegetative filtration along I-80 and the tree canopy throughout the project site, tree selection criteria shall include their ability to filter UFP, $PM_{2.5}$, and PM_{10} during all seasons based on peer-reviewed research in academic journals and reports by EPA and ARB. Tree selection should also consider irrigation needs; maintenance needs (e.g., pruning, leaf litter, replacement planting); hardiness; growth rate; canopy cover; surface drainage characteristics and related grading needs; allergen production; production of biogenic volatile organic compounds; storm water detention needs of the project site; drying effects from traffic-generated turbulence; fire safety needs; vulnerability to physical damage from nearby mowing, chemical applications, or animals; disease and pest resistance; root depths; mulching requirements; staking and eventual stake removal; and water conservation goals. All trees shall be planted in accordance with the planting standards established by the Western Chapter of the International Society of Arboriculture's, *Guideline Specifications for Selecting, Planting, and Early Care of Young Trees* (Kempf and Gilman 2011), including but not limited to standards for root ball management, root pruning, staking, mulching, and irrigation. Tree selection can be performed using the SelecTree tool developed by the Urban Forest Ecosystems Institute at Cal Poly San Luis Obispo (http://selectree.calpoly.edu/). The plan shall also identify the availability of selected tree species from nurseries.

In its contracting language the property owner/applicant shall require its contractor (or planting/ landscaping contractor) to place orders from supply nurseries in advance to ensure that the quantity of selected nursery trees is available to fulfill the requirements of this mitigation measure.

Mitigation Measure 4.3-5c: The air filtration systems on all residential buildings and buildings in which people work shall achieve a minimal removal efficiency of 95 percent for UFP (particulate matter with an aerodynamic diameter of 0.1 microns and smaller). Achieving a minimal removal efficiency of 95 percent may include, but not be limited to, the following:

- strategically located air intakes pursuant to requirements and recommendations of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers;
- positively pressurizing buildings;
- double-door entrances at the main entrances to buildings; and/or
- high-volume, low-pressure drop air exchange systems that cause UFP to pass through multiple filters at a slow enough speed such that they attach to the surface of standard electrostatic filters.

The air filtration and mechanical airflow systems shall be properly maintained and, on an annual basis, tested documented by a qualified professional to ensure that the UFP filtration system is operating at a minimum 95 percent effectiveness.

Low cost air filtration systems capable of 95 percent efficiency include those developed by the UC Davis DELTA Group, which has designed a high-volume, low-pressure drop system that causes UFP to pass through multiple filters at a slow enough speed such that they attach to the surface of standard electrostatic filters (Cahill et al. 2014:6).

Significance after Mitigation

Locating residential buildings further from I-80 than non-residential buildings, as required by Mitigation Measure 4.3-4a, would reduce health risk exposure to residential areas where people typically spend more time than non-residential uses. It should be noted that the current land plan meets the requirements of this measure. Locating for-sale residential units more distant from I-80 than rental units, also required by Mitigation Measure 4.3-5a, is expected to provide more protection at for-sale units where individuals typically reside for a longer period of time.

Field research studies, wind tunnel studies, and dispersion modeling exercises indicate that roadside concentrations of diesel PM and UFP would be reduced because of the implementation of a vegetative barrier (Baldauf et al. 2013:15; Breathe California 2008:7; Steffens et al. 2012:120; Steffens et al. 2013:85; Hagler et al. 2012:7; Islam et al. 2012:1; Bowker et al. 2007:8128), as required by Mitigation Measure 4.3-4b. Wind tunnel studies of redwood, deodar, and Live Oak tree species indicate that vegetation can reduce concentrations of very fine particles (i.e., 0.25 microns or smaller, a size range representative of most of diesel PM) by 30 to 80 percent at wind velocities of 1.0 meter per second (2.2 miles per hour) and generally more removal occurs at lower wind speeds, particularly for UFPs (Breathe California 2008:5). Other field studies found the presence of tree canopy throughout a roadside area to be effective in reducing concentrations of diesel PM and UFP emitted on a nearby freeway (Dadvand et al. 2015:59). However, this same body of literature also indicates that the extent of the reduction from vegetation varies according to multiple factors, including species selection (including the drag coefficient of the selected species, leaf area density and porosity), barrier width and height, barrier layout, meteorological conditions, highway geometry, road properties, and vehicle fleet characteristics.

In addition to requiring UFP filtration systems with a minimal removal rate of 95 percent to reduce indoor concentrations of UFP, Mitigation Measure 4.3-5c would also result in a substantial reduction to indoor concentrations of diesel PM.

While Mitigation Measures 4.3-5a, 4.3-5b, and 4.3-5c are expected to result in substantial reductions to exposure levels of UFPs and diesel PM, the level of effectiveness cannot be quantified. For this reason, and because "safe" levels of UFP exposure and diesel PM exposure have not been identified by any applicable agency, or by a consensus of scientific literature, this analysis assumes that resultant levels UFP exposure and diesel PM on the project site could potentially be associated with a substantial increase in health risks. Therefore, this impact would be **significant and unavoidable**.

West Olive Drive

Redevelopment of West Olive Drive is not anticipated to involve new residential receptors. Therefore, no sensitive receptors within West Olive Drive would be exposed to substantial concentrations of diesel PM and UFPs from vehicle activity on I-80. **No impact** would occur.

Redevelopment as a result of redesignation/rezoning of West Olive Drive is not currently anticipated to include additional residential receptors. Therefore, the project would not result in potential exposure of residential receptors to diesel PM and UFPs that could represent substantial health risks. Should residential uses be proposed within West Olive Drive at a later date, such a proposal would be subject to subsequent evaluation under CEQA, including the evaluation of potential exposure of on-site residents to diesel PM and UFPs.

*Because no residential receptors are currently anticipated as part of the potential redevelopment of these parcels, on-site sensitive receptors would not be exposed to substantial concentrations of diesel PM and UFPs from vehicle activity on I-80, **no impact** would occur.*

Mitigation Measures

No mitigation measures are required.

Impact 4.3-6: Exposure of sensitive receptors to odors.

Nishi Site

The project would introduce new odor sources into the area (e.g., diesel exhaust emissions from delivery trucks). However, these types of odor sources already operate in and near the project area and do not result in odor complaints. Also, the project would not locate land uses in close proximity to any existing odor sources. This impact would be **less than significant.**

The occurrence and severity of odor impacts depends on numerous factors, including: the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of the receptors. While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and regulatory agencies. Projects with the potential to frequently expose a substantial number of members of the public to objectionable odors would be deemed to have a significant impact.

In discussions with the City staff, UC Davis, and YSAQMD, the area surrounding the Nishi project site, including the West Olive area, has not reported frequent odor complaints from any particular source (Jones, pers. comm., 2015c). However, the following occasional odor complaints have occurred in the project vicinity.

- decay odors from Putah Creek and the Arboretum waterway during algal blooms or low water levels (Pfohl, pers. comm., 2015);
- wood-burning from residences (Hess, pers. comm., 2015); and
- dumpsters (Hess, pers. comm., 2015).

New residences on the Nishi site could have similar odor complaints, however, all of the listed complaints above were infrequent and on-site land uses would not allow wood-burning.

Minor odors from the use of heavy duty diesel equipment and the laying of asphalt during project-related construction activities would be intermittent and temporary, and would dissipate rapidly from the source with an increase with distance. Although, the project site is located approximately 170 feet from the nearest sensitive receptors, located at the Solano Park Apartments, odors from construction activities would be temporary.

Operation of the proposed land uses would include diesel-fueled delivery trucks hauling materials to and from the research and development and office land uses, residences, and retail; however, these types of sources are not different from those that currently deliver materials to existing land uses in the vicinity of the project area. Operations under the project may also include restaurant kitchens but any odors potentially generated by the kitchens are not typically considered to be objectionable and are also not different from the restaurant kitchens currently in the project vicinity. Also, facilities developed under the project would be subject to Davis Municipal Code Section 40.24.040 (c) regarding the control of odors.

Project implementation would not result in any major sources of odor as it is not proposed to include any features or facilities known to produce objectionable odors (e.g., landfill, wastewater treatment plant, compost facility). Diesel exhaust from the use of on-site construction equipment would be intermittent and temporary, and would dissipate rapidly from the source with an increase in distance. Thus, neither construction nor operation of the project would create objectionable odors affecting a substantial number of people. Also, the project would not locate land uses in close proximity to any major existing odor sources. This impact would be ***less than significant****.*

Mitigation Measures

No mitigation measures are required.

West Olive Drive

Potential redevelopment of West Olive Drive may result in additional commercial space. Similar to development associated with the Nishi site, potential odors associated would be localized and limited largely to specific equipment (e.g., delivery trucks), which are not anticipated to generate substantial odors or result in complaints regarding odor. Therefore, this impact is **less than significant.**

Future potential land uses within West Olive Drive as a result of the project would remain largely commercial in nature. Existing land uses include restaurants and auto-body shops that may generate intermittent odors because of cooking and usage of chemicals on-site. Future land uses may include businesses or services that could generate similar odors; however, specific future uses are currently unknown. Typical major generators of odors would include:

- wastewater treatment facilities,
- composting facilities,
- waste management or landfill facilities, and
- major food or agricultural processors or distributors.

These odorous uses are of such a scale that they would be very unlikely to occur on West Olive Drive. The anticipated uses identified in Chapter 3, "Project Description," are not considered major odor-generating facilities that could result in substantial odors or odor complaints. Also, as mentioned previously, the City, UC Davis, and YSAQMD have not received odor complaints from any particular sources in the area surrounding West Olive Drive. The closest sensitive receptors are residences the Aggie Village Cottages located approximately 350 feet downwind of the site boundary. Potential odors generated by on-site dumpsters or diesel trucks generated by the West Olive site would likely be imperceptible at nearby residences.

Potential redevelopment associated with the redesignation/rezoning of West Olive Drive would not result in substantial odors or odor-generating uses such that they would be noticeable by nearby residents or result in odor complaints. Therefore, this impact is ***less than significant****.*

Mitigation Measures

No mitigation measures are required.

Impact 4.3-7: Conflict, or create an inconsistency, with any applicable plan, policy, or regulation adopted for the purpose of avoiding or mitigating environmental effects related to air quality.

Nishi Site

Implementation of the project within the Nishi site would be consistent with the policies of the City of Davis General Plan related to air quality. This would be a **less-than-significant** impact.

The City of Davis General Plan includes policies to protect environmental resources, including air quality. The features of the proposed development of the Nishi site and mitigation measures discussed in this document are consistent with the policies of the City of Davis General Plan as shown in Table 4.3-8.

Development of the Nishi site as part of the project would not conflict with any local policies or ordinances protecting air quality. Impacts would be ***less than significant****.*

Mitigation Measures

No mitigation measures are required.

West Olive Drive

Redevelopment that could occur as a result of the redesignation/rezoning of parcels located in West Olive Drive would be consistent with the policies of the City of Davis General Plan related to air quality. This would be a **less-than-significant** impact.

Similar to what was discussed above, potential redevelopment of West Olive Drive would not create conflicts or result in inconsistencies with the policies of the City General Plan related to air quality.

Potential redevelopment associated with the proposed General Plan Amendment and zoning change of West Olive Drive would not conflict with any regulations established for the protection of air quality. Impacts would be ***less than significant****.*

Mitigation Measures

No mitigation measures are required.

Table 4.3-8 City of Davis General Plan Policy Consistency

Policy	Project Consistency
Policy AIR 1.1. Take appropriate measures to meet the AQMD's goal for improved air quality.	The project includes numerous measures to reduce air quality impacts during construction and operation. Although unmitigated construction emissions do not exceed YSAQMD thresholds, planned construction already includes on-site watering to reduce dust impact on nearby residences. During operation, as discussed in Impact 4.3-2, the project would include measures to reduce vehicle miles traveled, which correlates with a reduction in air quality impacts. On-site sources of air pollution are expected to be minimal. The project is consistent with this policy.