4.2 AIR QUALITY

4.2.1 Introduction

This section discusses existing air quality conditions and analyzes the potential for development under the proposed 2014 LRDP to affect those conditions. Section information and analysis is based on data obtained from BAAQMD and an air quality analysis technical report prepared by Golder Associates, Inc. (Golder Associates, Inc. 2013).

Air quality impacts from the emissions of criteria air pollutants and toxic air contaminants (TAC) are considered in this section. The analysis addresses both temporary emissions from construction and demolition activities on the RBC site and long-term emissions from increased vehicle traffic projected to travel to and from the RBC site and new mechanical equipment that would be installed on the project site as the campus is developed. Greenhouse gas (GHG) emissions are addressed in Section 4.6.

Public and agency NOP comments related to air quality are summarized below:

- The project design should include ways to minimize air quality impacts from vehicle traffic emissions.
- The EIR should address the air quality impacts of hazardous materials remediation, including construction equipment emissions, in a manner consistent with the regulatory requirements.
- The EIR should address the impacts of potential radionuclide releases into air.

These issues are addressed in the sections that follow.

4.2.2 Environmental Setting

Air quality is a measure of the extent to which airborne chemicals are present in quantities sufficient to adversely affect human health and the environment. Common sources of air pollutants are motor vehicles, machinery and equipment, and commercial and industrial processes (such as smelting and dry cleaning). Natural processes such as volcanic eruptions and the decomposition of plant matter also contribute to air pollution. In addition to harming human health, air pollutants can cause effects such as reducing visibility (dust and smog) and contributing to climate change.

Because outdoor air continuously moves and mixes, outdoor air quality is generally assessed at a regional rather than local level. Pollutants released to outdoor air are more concentrated near an emissions source, but over time they disperse and have a regional impact. Pollutant movement in air is influenced by conditions such as wind, topography, and temperature.

The proposed RBC site is in the San Francisco Bay Area Air Basin (Air Basin). The primary factors that determine the Air Basin's air quality are air emissions' source locations, quantities, and types. Meteorological and topographical conditions also are important factors. Meteorological conditions, such as wind speed, wind direction, and variations in the air temperature at different heights above the ground, interact with the physical features of the landscape affecting the movement and dispersal of air pollutants.

Criteria Pollutants

Common air pollutants include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NOx), ozone, lead, and particulate matter (PM). The US Environmental Protection Agency (EPA) refers to these as criteria pollutants and uses them as indicators of air quality. Air quality in the basin is assessed by comparing concentrations of criteria pollutants to federal and state standards. The federal standards are known as the National Ambient Air Quality Standards (NAAQS). California has adopted similar and generally more stringent standards known as the California Ambient Air Quality Standards (CAAQS).

For each criteria pollutant an Air Basin is designated as attainment or unclassified if pollutant concentrations are below the standard for that pollutant, and as nonattainment if concentrations exceed the standard. The Air Basin is designated as nonattainment for the federal 8-hour ozone and 24-hour fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) standards. The Air Basin is designated as nonattainment for the state ozone, inhalable particulate matter less than 10 microns in diameter (PM_{10}), and $PM_{2.5}$ standards. The Air Basin is designated as attainment or unclassified for the other NAAQS and CAAQS (BAAQMD 2013a). The state and national standards and the Air Basin's attainment status are presented in Table 4.2-1.

BAAQMD monitors air quality in the Air Basin by collecting and analyzing air samples at monitoring stations throughout the region. Each station monitors selected pollutants based on local and regional conditions. Data from these stations provide an indication of air quality in the area. The data may or may not be indicative of air quality at the RBC site due to the distance from the site to the monitoring stations and differences in weather and topography between the two. The monitoring station nearest the RBC site is the Richmond station 2.8 miles northwest. The next nearest stations are San Pablo 3.3 miles northwest and Oakland West 7.3 miles southeast. Recent monitoring data from these stations are presented in Table 4.2-2.

Toxic Air Contaminants

A group of pollutants that are known or suspected to cause cancer or other serious adverse health effects are referred to as TACs. TACs are defined in the California Health and Safety Code Section 39655(a) as air pollutants "which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health." The Clean Air Act (CAA) refers to TACs as hazardous air pollutants. TACs are emitted by fuel combustion sources such as the exhaust from motor vehicle engines, by industrial processes such as manufacturing, and by commercial processes such as dry cleaners and gasoline stations. TACs are less pervasive in the atmosphere than criteria pollutants, and there are no ambient air quality standards for TACs.

BAAQMD inventories TAC emissions, conducts new source reviews, and determines TAC control and reduction strategies. BAAQMD's 2010 inventory of TAC emissions in Contra Costa County is provided in Table 4.2-3.

A TAC of particular concern in Richmond is diesel particulate matter (DPM). DPM is particulate matter emitted in the exhaust of diesel engines. DPM is known to cause cancer and respiratory illnesses and increase the risk of heart disease (California Air Resources Board [ARB] 2007). According to the City of Richmond General Plan, "DPM per square mile per year released in Richmond is six times higher than the [Contra Costa] County average and 40 times higher than the state average. More than 60 percent of the diesel pollution in Richmond comes from ships and commercial vessels, about 20 percent from diesel locomotives, and about 10 percent each from heavy duty trucks and construction equipment" (City of Richmond 2011).

Sensitive Receptors

Sensitive receptors are individuals or groups that are more susceptible to air pollution effects than the population at large. While the ambient air quality standards are designed to protect public health and are generally regarded as conservative for healthy adults, there is greater concern to

Table 4.2-1
State and National Ambient Air Quality Standards and Attainment Status

Pollutant	Averaging Time	California Concentration	California Attainment	National Concentration	National Attainment
Ozone	8 hours	0.070 ppm (137 µg/m^3)	Nonattainment	0.075 ppm	Nonattainment
	1 hour	0.09 ppm (180 µg/m^3)	Nonattainment	None	Not applicable
Carbon Monoxide	8 hours	9.0 ppm (10 mg/m^3)	Attainment	9 ppm (10 mg/m^3)	Attainment
	1 hour	20 ppm (23 mg/m^3)	Attainment	35 ppm (40 mg/m^3)	Attainment
Nitrogen Dioxide	1 hour	0.18 ppm (339 µg/m^3)	Attainment	0.100 ppm	Unclassified
	AAM	0.030 ppm (57 µg/m^3)	Unclassified	0.053 ppm (100 µg/m^3)	Attainment
Sulfur Dioxide	24 hours	0.04 ppm (105 µg/m^3)	Attainment	0.14 ppm (365 µg/m^3)	Attainment
	1 hour	0.25 ppm (655 µg/m^3)	Attainment	0.075 ppm (196 µg/m^3)	Attainment
	AAM	None	Not applicable	0.030 ppm (80 µg/m^3)	Attainment
Particulate Matter (PM_{10})	AAM	20 µg/m^3	Nonattainment	None	Not applicable
	24 hours	50 µg/m3	Nonattainment	150 µg/m^3	Unclassified
Fine Particulate Matter ($PM_{2.5}$)	AAM	12 µg/m3	Nonattainment	15 µg/m^3	Attainment
	24 hours	None	Not applicable	35 µg/m^3	Nonattainment
Sulfates	24 hours	25 µg/m^3	Attainment	None	Not applicable
Lead	Calendar quarter	None	Not applicable	1.5 µg/m^3	Attainment
	30 day average	1.5 µg/m^3	Attainment	None	Not applicable
	Rolling 3-month average	None	Not applicable	0.15 µg/m^3	Unclassified
Hydrogen sulfide	1 hour	0.03 ppm (42 µg/m^3)	Unclassified	None	Not applicable
Vinyl Chloride (chloroethene)	24 hours	0.010 ppm (26 µg/m^3)	Unclassified	None	Not applicable

AAM = annual arithmetic mean; ppm = parts per million; mg/m^3 = milligrams per cubic meter; µg/m^3 = micrograms per cubic meter

Source: BAAQMD 2013a

Table 4.2-2
Data from Nearby Air Quality Monitoring Stations

	2010 RH	2010 SP	2010 OW	2011 RH	2011 SP	2011 OW
Ozone						
Maximum 1-hour concentration (ppb)	--	97	--	--	78	57
Days exceeding the state 1-hour standard	--	1	--	--	0	0
Maximum 8-hour concentration (ppb)	--	81	--	--	58	48
Days exceeding the state 8-hour standard	--	1	--	--	0	0
Days exceeding the national 8-hour standard	--	1	--	--	0	0
Carbon monoxide						
Maximum 1-hour concentration (ppb)	--	--	2.7	--	1.9	3.5
Maximum 8-hour concentration (ppb)	--	--	1.7	--	1.0	2.7
Days exceeding the national or state standard	--	--	0	--	0	0
Nitrogen dioxide						
Maximum 1-hour concentration (ppb)	--	--	68.6	--	51	62
Maximum 24-hour concentration (ppb)	--	--	16	--	10	16
Days exceeding the national or state standard	--	--	0	--	0	0
Sulfur dioxide						
Maximum 1-hour concentration (ppb)	26.0	--	--	20.7	14.4	19.3
Maximum 24-hour concentration (ppb)	6.5	--	--	3.2	6.0	3.8
Days exceeding the national or state standard	0	--	--	0	0	0
PM_{10}						
Annual average (µg/m^3)	--	--	--	--	19.7	--
Maximum 24-hour concentration (µg/m^3)	--	--	--	--	73	--
Days exceeding the national standard	--	--	--	--	0	--
Days exceeding the state standard	--	--	--	--	1	--

RH = Richmond; SP = San Pablo; OW = Oakland West; ppb = parts per billion; µg/m^3 = micrograms per cubic meter; -- = no data

Raw data (i.e., data that have not yet been checked by BAAQMD for accuracy) for $PM_{2.5}$ are available for the Oakland West and San Pablo stations from January to early October 2013. As the data has not been verified, it is not reported in the table. The average $PM_{2.5}$ concentration at Oakland West during this time period was 12 µg/m^3, and the maximum concentration was 104 µg/m^3. At the San Pablo monitoring station, the average concentration was 11 µg/m^3, and the maximum was 68 µg/m^3.

Source: BAAQMD 2013b, 2013c

protect adults who are ill or have long-term respiratory problems, young children whose lungs are not fully developed, and older people. According to the ARB, sensitive receptors include children less than 14, persons over 65, and people with cardiovascular and chronic respiratory diseases.

BAAQMD identifies these land uses that may contain a high concentration of sensitive receptors: long-term health care facilities, rehabilitation centers, convalescent centers, retirement homes, residences, schools, playgrounds, child care centers, and athletic facilities. BAAQMD considers the relevant zone of influence for health risk assessment to be the area within 1,000 feet of the project boundary. The only sensitive receptors within 1,000 feet of the project boundary are the residences to the southwest of the RBC site in the Marina Bay neighborhood that are approximately 150 feet from the RBC development boundary.

Table 4.2-3
2010 Toxic Air Contaminant Emissions Inventory for Contra Costa County

Toxic Air Contaminant	Contra Costa County Emissions (pounds per year)	Toxic Air Contaminant	Contra Costa County Emissions (pounds per year)
Acetaldehyde	1,278.93	Hydrochloric acid mist	14,291.32
Acrolein	0.01	Hydrofluoric acid mist	4,616.70
Acrylamide	0.34	Hydrogen chloride	114,146.03
Acrylonitrile	20.17	Hydrogen fluoride	7208.63
Ammonia	1,134,465.74	Hydrogen sulfide	13,074.93
Arsenic	5.12	Isopropyl alcohol	17,742.69
Benzene	41,136.32	Lead	20.80
Benzyl chloride	0.07	Manganese	220.24
Beryllium	0.18	Mercury	248.33
Butadiene, 1,3-	139.01	Methyl alcohol	13,933.00
Cadmium	8.81	Methyl cellosolve	201.55
Carbon tetrachloride	2603.36	Methyl tertiary-butyl ether	26.09
Cellosolve acetate	40.07	Methylene chloride	18,507.77
Chlorine	1,983.64	Methylenedianiline	0.02
Chlorobenzene	317.55	Naphthalene	2,263.49
Chloroform	2,084.16	Nickel	270.36
Chromium (hexavalent)	7.15	Polycyclic aromatic hydrocarbons (benzo[a]pyrene equiv)	475.93
Cresol	4.96	Perchloroethylene	27,957.38
Dichlorobenzene	165.91	Phenol	1,078.36
Diesel engine exhaust particulate	6,192.09	Polychlorinated biphenyl	0.59
Diethanolamine	1,343.02	Propylene	1,815.72
Dioxane, 1,4-	19.47	Propylene glycol monomethyl ether	80.72
Ethyl chloride	116.06	Selenium	0.13
Ethylbenzene	3,601.61	Styrene	17,706.48
Ethylene dibromide	15.58	Sulfuric acid mist	10,279.75
Ethylene dichloride	94.84	Tetrachloroethane, 1,1,2,2-	0.12
Ethylene glycol	147.54	Toluene	53,250.81
Ethylene oxide	0.35	Trichloroethane, 1,1,1- (without dioxane)	541.04
Ethylidene chloride	20.34	Trichloroethane, 1,1,1- (with dioxane)	960.77
Formaldehyde	110,354.35	Trichloroethylene	968.99
Glutaraldehyde	84.16	Vinyl chloride	894.42
Hexachlorobenzene	0.02	Vinylidene chloride	28.37
Hexane	3,778.90	Xylene	43,743.70

Source: BAAQMD 2010

4.2.3 Regulatory Considerations

Federal

Criteria Pollutants

The federal CAA requires the EPA to establish and periodically review the NAAQS to protect public health and welfare. National standards have been established for seven air pollutants: ozone, CO, nitrogen dioxide (NO_2), SO_2, PM_{10}, $PM_{2.5}$, and lead.

The CAA requires each state to identify areas that have ambient air quality in violation of federal standards. States are required to develop, adopt, and implement a State Implementation Plan (SIP) to achieve, maintain, and enforce federal ambient air quality standards in these nonattainment areas. Deadlines for achieving the federal air quality standards vary according to air pollutant and the severity of air quality problems. The SIP must be submitted to and approved by the EPA. SIP elements are developed on a pollutant-by-pollutant basis whenever one or more air quality standard is being violated.

Hazardous Air Pollutants

Regulation of hazardous air pollutants (HAPs) under federal regulations is achieved through federal, state, and local controls on individual sources. Federal law defines HAPs as noncriteria air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. HAPs include both hazardous chemicals and radioactive materials. The 1990 federal CAA Amendments offer a comprehensive plan for achieving significant reductions in both mobile and stationary source emissions of HAPs. Under the 1990 CAA Amendments, a total of 189 chemicals or chemical families were designated HAPs because of their adverse human health effects. Title III of the 1990 federal CAA Amendments amended Section 112 of the CAA to enact an entirely new technology-based program. Under Title III, the EPA must establish maximum achievable control technology emission standards for all new and existing "major" stationary sources through promulgation of National Emission Standards for Hazardous Air Pollutants (NESHAP). Major stationary sources of HAPs are required to obtain an operating permit from BAAQMD pursuant to Title V of the 1990 CAA Amendments (a major source is defined as one that emits at least 10 tons per year of any one HAP or at least 25 tons per year of all HAPs combined).

NESHAP regulations promulgated by the EPA regulate both radioactive and non-radioactive emissions of HAPs. Subpart H of 40 CFR Part 61 established standards for emissions of radionuclides (other than radon) from facilities owned and operated by DOE. Some DOE facilities emit a wide variety of radionuclides in various physical and chemical states. The purpose of subpart H is to limit radionuclide emissions from DOE facilities so that no member of the public receives an effective dose equivalent to more than 10 millirem per year. Subpart H requires emissions sampling, monitoring, and dose calculations to determine compliance with the standard. Emissions measurement categories are determined by the greatest potential effective dose equivalent from airborne radionuclide emissions that could be received by a maximally exposed individual which is defined as a member of the public at an off-site point where there is a residence, school, business, or office. Standards for emissions of radionuclides from federal facilities not operated by DOE are covered in Subpart I of 40 CFR Part 61.

State

Criteria Pollutants

In California, air quality regulation is a joint responsibility between the ARB and local air quality management agencies. The ARB manages air quality, regulates mobile emissions sources, and oversees the activities of California counties and regional air districts. The ARB regulates local air quality indirectly by establishing CAAQS and vehicle emissions standards and by conducting research, planning, and coordination. California has adopted ambient standards that are more stringent than the federal standards for the seven criteria air pollutants. The CAAQS are established under the authority of the California Clean Air Act, which is patterned after the CAA.

The CAA and the California Clean Air Act require that SIPs be developed for areas designated as nonattainment (with the exception of areas designated as nonattainment for the state PM10 standard). On September 15, 2010, BAAQMD, in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments, adopted the 2010 Clean Air Plan. The 2010 Clean Air Plan updates the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement all feasible measures to reduce ozone; provide a control strategy to reduce ozone, particulate matter, TACs, and GHGs in a single, integrated plan; and establish emission control measures. The primary goals of the 2010 Clean Air Plan are to:

- Attain air quality standards,
- Reduce population exposure and protecting public health in the San Francisco Bay Area, and
- Reduce GHG emissions and protect the climate.

The 2010 Clean Air Plan represents the Bay Area's most recent triennial assessment of the region's strategy to attain the state one-hour ozone standard. The plan includes stationary-source control measures to be implemented through BAAQMD regulations; mobile-source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with the MTC, local governments, transit agencies, and others.

Toxic Air Contaminants

California's TAC program was implemented in 1983 with the passage of the Toxic Air Contaminant Identification and Control Act, also known as the Tanner Bill. It was amended in 1992 to include the federal NESHAP hazardous air pollutants as state TACs. Another component of California's TAC program is the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (Assembly Bill [AB] 2588) that regulates all of the TACs regulated by the Tanner Bill and additional TACs. AB 2588 includes requirements for certain facilities to quantify and report TAC emissions to the local air pollution control district that can require that the facility perform a human health risk assessment. BAAQMD regulates TACs through a permitting program and compliance with Air Toxic Control Measures (ATCM). ATCMs regulate a variety of sources of TACs including diesel engines and generators and operations that disturb naturally-occurring asbestos. The RBC site is not in an area where naturally-occurring asbestos is likely to be present (California Department of Conservation 2000).

Local

BAAQMD

BAAQMD is the agency with local air quality management authority in the nine-county San Francisco Bay Area Air Basin. BAAQMD has primary responsibility for most air quality regulatory programs, with the ARB exercising oversight responsibilities. The ARB directly implements statewide regulatory programs for motor vehicles, portable equipment, and hazardous air pollutants. BAAQMD is responsible for ensuring that federal and state air quality standards are met by monitoring ambient air pollutant levels throughout the air basin and implementing strategies to attain the standards.

BAAQMD CEQA Guidelines. BAAQMD has published CEQA Air Quality Guidelines that include thresholds of significance to assist lead agencies in evaluating the air quality impacts of projects and plans proposed in the San Francisco Bay Area Air Basin. BAAQMD's original CEQA Air Quality Guidelines were published in 1999. Revised thresholds of significance were adopted in June 2010 and a revised version of the guidelines was adopted in May 2011. The California Building Industry Association (CBIA) filed a lawsuit alleging that BAAQMD had violated CEQA by failing to review the potential environmental impacts of the revised thresholds before adopting them. On March 5, 2012, the Alameda County Superior Court issued a judgment finding that BAAQMD had failed to comply with CEQA when it adopted the June 2010 thresholds of significance. However, that decision was appealed by BAAQMD, and on July 13, 2013, the court of appeal ruled that adoption of the thresholds was not subject to CEQA.

BAAQMD Rules and Regulations. Specific rules and regulations have been adopted by BAAQMD that limit emissions that can be generated by various uses or activities. These rules regulate not only the emissions of the state and federal criteria pollutants, but also the emissions of TACs. The rules are also subject to ongoing refinement by BAAQMD. A few of the primary BAAQMD rules applicable to the project include the following:

- Regulation 2, Rule 1 (General Requirements): This rule requires new and modified sources of air pollution to acquire permits (e.g., Authority to Construct, Permit to Operate) in order to monitor stationary source emissions within BAAQMD's jurisdiction. The rule also includes a list of equipment and processes that would be exempt from permitting requirements. Among others, these include cooling towers and boilers with a heat input rating less than 10 million BTU/h fired exclusively with natural gas, liquefied petroleum gas, or a combination, and laboratories located in a building where the total number of fume hoods within the building is fewer than 50 or the total laboratory space is less than 25,000 square feet, provided that responsible laboratory management practices are used.
- Regulation 8, Rule 3 (Architectural Coatings): This rule sets limits on the reactive organic gas (ROG) content in architectural coatings sold, supplied, offered for sale, or manufactured within BAAQMD's jurisdiction. The rule also includes time schedules that specify when more stringent ROG standards are to be enforced. The rule applies during the construction phase of a project. In addition, any periodic architectural coating maintenance operations are required to comply with this rule.
- Regulation 8, Rule 15 (Emulsified and Liquid Asphalts): This rule sets limits on the ROG content in emulsified and liquid asphalt used for maintenance and paving operations. The rule includes specific ROG content requirements for various types of asphalt (e.g., emulsified asphalt, rapid-cure liquid asphalt, slow-cure liquid asphalt). This rule applies during the construction phase of a project. In addition, any future asphalt maintenance of a project's roads would be required to comply with the ROG standards set in Rule 15.

- Regulation 9, Rule 6 (Nitrogen Oxide Emission from Natural Gas-Fired Water Heaters): This rule sets a limit on the NOx emissions from natural gas-fired water heaters. The rule applies to natural gas-fired water heaters manufactured after July 1, 1992, with a heat input rating of less than 75,000 BTU/h. Water heaters subject to the rule must not emit more than 40 nanograms of NOx per joule of heat output.

City of Richmond

The proposed RBC site is a University of California property where work would be conducted within the University's mission on land that is owned or controlled by The Regents. As a state entity created by Article IX, Section 9 of the California State Constitution, the University is exempt under the state constitution from compliance with local land use regulations, including general plans and zoning. The University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The RBC site is in the city of Richmond. The following sections summarize objectives and policies from the City of Richmond General Plan 2030 and local ordinances as they relate to air quality.

The City of Richmond 2030 General Plan Energy and Climate Change Element (City of Richmond 2012) contains the following policy related to air quality:

- **Policy EC5.3—Air Quality:** Support regional policies and efforts that improve air quality to protect human and environmental health and minimize disproportionate impacts on sensitive population groups. Work with businesses and industry, residents and regulatory agencies to reduce the impact of direct, indirect and cumulative impacts of stationary and non-stationary sources of pollution such as industry, the port, railroads, diesel trucks and busy roadways. Ensure that sensitive uses such as schools, childcare centers, parks and playgrounds, housing and community gathering places are protected from adverse impacts of emissions.

  Continue to work with stakeholders to reduce impacts associated with air quality on disadvantaged neighborhoods and continue to participate in regional planning efforts with nearby jurisdictions and BAAQMD to meet or exceed air quality standards. Support regional, state and federal efforts to enforce existing pollution control laws and strengthen regulations.

The following action is related to this policy:

- **Action EC5.C—Air Quality Monitoring and Reporting Program:** Work with BAAQMD and other government agencies to establish and identify funding for a citywide air quality monitoring and reporting program. The air quality monitoring and reporting program would assess the cumulative impact of air pollution and toxins on human and environmental health and monitor exposure of sensitive uses such as schools, childcare centers, parks and playgrounds, housing and community gathering places.

  Collaborate with the County Health Services Department, BAAQMD, and state agencies to establish baseline exposures and to the extent feasible, document health effects associated with monitored baseline exposures and develop provisions to hold businesses and operations financially accountable for their impacts on the environment or community due to air pollution exceeding legal thresholds.

The 2030 General Plan EIR determined that the effects on air quality from future development pursuant to the General Plan would be significant and unavoidable. Future development could introduce new sources of air emissions that would contribute substantially to an existing or projected air quality violation or conflict with implementation of the Clean Air Plan. Mitigation measures would be implemented to minimize potential impacts, but the impact would remain significant and unavoidable. Other impacts would be less than significant with mitigation. For example, development under the General Plan would not expose sensitive receptors to concentrations of carbon monoxide or toxic air contaminants in excess of the established thresholds. It would not expose a large number of people to odors. Cumulative impacts would be cumulatively considerable for potential air quality violations and conflicts with the Clean Air Plan but less than significant for exposure to carbon monoxide, toxic air contaminants, and odors.

4.2.4 Impacts and Mitigation Measures

Standards of Significance

Air quality impacts from campus development under the 2014 LRDP would be considered significant if they would exceed the following Standards of Significance, in accordance with Appendix G of the *State CEQA Guidelines* and the UC CEQA Handbook:

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation
- Conflict with or obstruct implementation of the applicable air quality plan
- Expose sensitive receptors to substantial pollution concentrations
- Expose people to substantial levels of TACs, such that the exposure could cause an incremental human cancer risk greater than 10 in one million or exceed a hazard index of one for the maximally exposed individual
- Create objectionable odors affecting a substantial number of people
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)

The UC CEQA Handbook states that where available, the significance criteria established by the applicable air district may be used to make significance determinations.

As noted above, the significance thresholds under BAAQMD's CEQA Air Quality Guidelines were challenged by the CBIA. However, in July 2013, the court of appeal ruled that adoption of the thresholds was not subject to CEQA. Although this decision may be appealed by the CBIA, the University has determined that in this circumstance it will use the methodological approach and emissions thresholds in the BAAQMD guidelines to evaluate the impacts of the proposed project. The thresholds for the evaluation of air quality impacts from the BAAQMD CEQA Air Quality Guidelines are presented in the sections that follow.

Criteria Pollutant Emissions

Impacts from construction or direct or indirect operational emissions associated with the proposed project would be considered significant if they exceeded the following thresholds:

- 54 pounds per day of ROGs or volatile organic compounds (VOCs), NOx, or $PM_{2.5}$ (vehicle exhaust); or
- 82 pounds per day of PM_{10} (vehicle exhaust).

These BAAQMD CEQA thresholds are the same for construction and operational emissions. BAAQMD has not established a quantitative threshold for $PM_{2.5}$ and PM_{10} from fugitive dust emissions from construction activities, but rather states that BMPs should be employed to control such emissions.

Local Community Risk and Toxic Air Contaminant Emissions

Local community risk and hazard impacts are associated with TACs and $PM_{2.5}$ because emissions of these pollutants can have significant health impacts at the local level. The proposed project would result in a significant impact if its emissions of TACs or $PM_{2.5}$ resulted in either:

- Non-compliance with a qualified risk reduction plan; or
- An incremental increase in cancer risk of more than 10 in 1 million, an increase in non-cancer risk (i.e., chronic or acute) as measured by a hazard index greater than 1.0, or an increase in $PM_{2.5}$ emissions greater than 0.3 micrograms/cubic meter ($\mu g/m^3$) annual average.

Odors

For impacts associated with odors, BAAQMD considers project operations that result in five confirmed complaints per year averaged over three years to have a significant impact.

Local Carbon Monoxide Concentrations

When sources of CO emissions are concentrated in an area, such as a large volume of vehicles at a congested intersection, a CO "hotspot" can result, meaning that CO concentrations in a localized area could exceed state or federal standards. The impact from CO emissions is considered significant if the emissions would contribute to a violation of the state standards for CO (9.0 part per million [ppm] averaged over 8 hours and 20 ppm over 1 hour).

Federal regulations and the BAAQMD CEQA Air Quality Guidelines contain a list of conditions under which a CO hotspot might be created and require a CO hotspot analysis when these conditions are met.

BAAQMD recommends CO modeling for a plan or a project in which: (1) project vehicle emissions of CO would exceed 550 pounds per day; (2) project traffic would affect intersections or roadway segments operating at level of service (LOS) E or F, or would cause a decline to LOS E or F;[9] or (3) project traffic would increase traffic volumes on nearby roadways by 10 percent or more (unless the increase in traffic volume is less than 100 vehicles per hour). Intersections are determined to operate at an LOS between A and F (LOS A being the best and LOS F being the worst) according to congestion or delay time, demand/capacity ratio, and relative flow of traffic at the intersection. Intersections that are determined to operate at LOS F or E have the potential to cause a CO hotspot (i.e., exceedance of the CAAQS). Indirect CO emissions are considered significant if they contribute to a violation of the state standards for CO (9.0 ppm averaged over 8 hours and 20 ppm over 1 hour).

If necessary, a simplified CO modeling analysis, described in the BAAQMD CEQA Air Quality Guidelines, may be used to determine localized CO concentrations. If modeling demonstrates that the source would not cause a violation of the state standard at existing or reasonably foreseeable receptors, the motor vehicle trips generated by the project would not have a significant impact on local air quality. The traffic study prepared for the proposed project indicates that six intersections would operate at an LOS of E or F, so a CO analysis is required for project

[9] Levels of service (LOS) range from A (least congested) with a condition of free flow with low volumes and high speeds to F (most congested) with stop and go, low-speed conditions with little or poor maneuverability.

operation. Under 40 CFR 93.123(c)(5) and the BAAQMD CEQA Air Quality Guidelines, a CO hotspot analysis is not required for temporary construction emissions and therefore was not conducted for project construction.

Cumulative

The project would have a cumulatively considerable impact if:

- The project's criteria pollutant emissions exceed the BAAQMD CEQA thresholds.
- The project's TAC emissions, when combined with the cancer and human health risk from existing sources, result in an increased excess cancer risk of more than 100 in 1 million, an increase in non-cancer risk (i.e., chronic or acute) as measured by a hazard index greater than 10, or an increase in $PM_{2.5}$ emissions greater than 0.8 $\mu g/m^3$ annual average.

CEQA Checklist Items Adequately Addressed in the Initial Study

The NOP Initial Study deferred analysis of the project's air quality impacts to the LRDP EIR. All of the standards of significance listed above are addressed in the following analysis.

Analytical Methods

Construction and demolition activities would generate air pollutant emissions including airborne dust known as fugitive dust, emissions from the operation of on- and off-road construction equipment and vehicles, worker trips, architectural coatings such as paint, and paving off-gasses.

Operational activities would include instituting or operating several new emissions sources, including natural gas-fired boilers, cooling towers, emergency generators, laboratory chemicals use, and vehicle trips. Natural gas-fired boilers would heat buildings and cooling towers would be used to cool them. Emergency generators would serve as a back-up electricity source if there was a power failure. Laboratory chemicals would be used to support a variety of research purposes resulting in the potential for chemical emissions to be released to the atmosphere through lab hood vents on building roofs. Operational emissions would also come from delivery trucks transporting supplies to the RBC site and removing waste, additional employee vehicles, and shuttle buses traveling to and from the RBC site.

These air emission sources were estimated and analyzed in an air quality analysis technical report that was prepared for the project (Golder Associates, Inc. 2013). Air quality impacts from criteria pollutant emissions and TACs were quantitatively assessed for construction, operation, and cumulative conditions of the 2014 LRDP development. Model inputs were based on project description information. A detailed description of the analytical methods, models, and assumptions used to develop the quantitative analysis are in the report, included as Appendix B.

The estimated emissions and calculated risk values were compared to the BAAQMD CEQA thresholds listed above. Impacts are considered significant if they exceed the BAAQMD CEQA thresholds. Potential odor impacts were assessed qualitatively.

RBC 2014 LRDP Policies

The following policy from the 2014 LRDP applies to air quality.

- S3 – Sustainability Policy on Site Development: Embody environmental stewardship and respect the unique character of the Richmond Bay Campus in site development.
  - Control construction dust by implementing the BMPs defined in the BAAQMD CEQA Air Quality Guidelines.

LRDP Impacts and Mitigation Measures

Criteria Pollutants

LRDP Impact AIR-1: Criteria pollutant emissions associated with the construction and demolition activities under the 2014 LRDP would not violate an air quality standard or contribute substantially to an existing or projected air quality violation. (*Less than Significant*)

Construction and demolition associated with RBC development under the 2014 LRDP would generate air pollutant emissions including airborne dust known as fugitive dust and emissions from the operation of on- and off-road construction equipment and vehicles, worker trips, architectural coatings such as paint, and paving off-gasses. As discussed in further detail below, large construction projects would generally not occur simultaneously, although such projects may have some degree of schedule overlap.

Construction would typically begin with any necessary demolition, followed by site clearing and excavation. Soil-disturbing activities such as site excavation, elevation, and grading and placement of infrastructure and structural foundations would generate fugitive dust emissions that would contribute particulate matter to the local atmosphere.

Preliminary construction would include determining any special site or building conditions due to historic site contamination. If excavation is involved, soil that is certified clean may be shipped off site unless the project is a balanced cut-fill excavation that would reuse the soil on site. Contaminated soil would be excavated and removed by truck. Foundation work, building frame erection, and building finishing are the three major phases to follow.

Construction equipment would typically include large vehicles, stationary equipment, and hand-held equipment used on the building site and at nearby staging areas. They would be powered by diesel or gasoline engines or electricity. Such equipment would include cranes, scrapers, dozers, spreaders, compactors, loaders, drill rigs, haul trucks, cement trucks, bore drillers, rough terrain forklifts, pavers, rollers, and other rigs.

The air quality analysis considered emissions from construction equipment during each phase of construction based on the number of pieces of equipment and the duration of their use. It also considered the number of truck trips to deliver supplies and equipment, to transport soil for site grading, and to remove contaminated soil. Vehicle trips by construction workers were also considered. Construction and demolition emissions are estimated using the California Emissions Estimator Model (CalEEMod), version CalEEMod.2011.1.1. Details concerning the construction emissions estimates are in the air quality analysis technical report (Appendix B). The estimated construction emissions are presented in Table 4.2-4.

The LRDP construction emissions in Table 4.2-4 represent a typical annual level of construction and demolition that is expected to occur on the project site based on the total amount of building space that would be constructed under the 2014 LRDP.

Fugitive dust would be generated by construction activities such as excavation, site elevation, and grading. While BAAQMD has quantitative thresholds for $PM_{2.5}$ and PM_{10} from vehicle exhaust, it has not established a threshold for fugitive dust emissions from construction activities, but rather states that BMPs should be employed to control such fugitive dust emissions. Since there is no quantitative threshold for construction fugitive dust, these emissions were calculated (see Appendix B), but are not presented in this section.

Table 4.2-4
LRDP Construction Emissions (pounds per day)

	On-site Stationary (Exhaust)	On-site Mobile (Exhaust)	Off-site Mobile (Exhaust)	Total Construction Emissions	BAAQMD CEQA Threshold
ROG/VOC	--	0.48	1.12	1.59	54
NOx	--	3.42	9.18	12.6	54
CO	--	2.56	8.14	10.7	NE
PM_{10}	--	0.16	0.29	0.45	82
$PM_{2.5}$	--	0.16	0.27	0.42	54

Note: all table units are pounds per day, rounded to two decimal places. Minor discrepancies between the totals reported in column 4 and the sum of individual values in columns 1 through 3 are a result of rounding.

-- = not evaluated; BAAQMD = Bay Area Air Quality Management District; CEQA = California Environmental Quality Act; CO = carbon monoxide; NA = not applicable; NE = not established; NOx = nitrogen oxides; $PM_{2.5}$ = fine particulate matter; PM_{10} = inhalable particulate matter; ROG = reactive organic gases; VOC = volatile organic compounds

Source: Golder Associates, Inc. 2013

As stated in the LRDP Policy S3, fugitive dust from construction activities would be controlled by implementing the construction BMPs recommended in the BAAQMD CEQA Air Quality Guidelines. The BMPs relevant to controlling fugitive dust include:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph).
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

All excavated soils would be managed to prevent dust, spills to the ground or water, disposal into drains, and exposure risk to people or the environment. Excavation, transportation, and handling of all soil would be required to result in no visible dust at the fence line of the excavation. Any soil material proposed to be placed as fill, whether from an off-site source or on-site source, would be kept covered or moist to facilitate eventual compaction and to control dust during earthwork operations. A water truck, water tank, or hydrant would be available to supply water in sufficient quantity on the job site while earthwork operations are underway. Sufficient water would be applied to suppress dust while exercising care to avoid generating runoff to any area outside the project boundary. Dust control measures would be implemented, as appropriate and necessary, beginning with site mobilization and continuing during all phases of the construction activities. Water would not be applied if there was a possibility of spreading contaminated soil or leaching contaminants from the soil, or if it resulted in hazardous working conditions.

Construction emissions associated with RBC development under the 2014 LRDP would not exceed the BAAQMD CEQA thresholds (Table 4.2-4), and BMPs would be implemented to control fugitive dust, resulting in a less than significant impact.

Mitigation Measure: No mitigation measure is required.

LRDP Impact AIR-2: **Operational activities associated with development under the 2014 LRDP would result in criteria pollutant emissions that would exceed BAAQMD CEQA thresholds and therefore potentially violate an air quality standard or contribute substantially to an existing or projected air quality violation. (*Potentially Significant; Significant and Unavoidable*)**

Operational activities associated with RBC development under the 2014 LRDP would include instituting or operating several new sources of criteria pollutant emissions, including natural gas-fired boilers, cooling towers, emergency generators, and vehicle trips. Emissions from each of these sources were calculated and included in the air quality analysis, as presented below:

- Natural gas-fired boilers would heat buildings and cooling towers would be used to cool them. Natural gas boilers would primarily produce NOx and TAC emissions. Cooling towers would produce emissions of particulate matter and sodium bromine (if used as a biocide), a TAC. (The human health impacts from the operational emissions of TACs from boilers and cooling towers are analyzed in LRDP Impact AIR-4 below.)
- Emergency generators would serve as a back-up electricity source if there was a power failure. Routine emissions of criteria pollutants would be associated with the maintenance testing of the emergency generators. Emergency generators would primarily produce SO_2 and DPM emissions. Emergency generators were assumed to meet EPA Tier 4 emission standards or better. This is a reasonable assumption for new generators because Tier 4 standards will be in full effect by 2015. (DPM emissions are TACs. The human health impacts from the operational emissions of DPM from emergency generators are analyzed in LRDP Impact AIR-4 below.)
- Chemicals used in the RBC laboratories would produce ROG/VOC and TAC emissions. (The human health effects from ROG/VOC and TAC emissions from laboratories are analyzed in LRDP Impact AIR-4 below.)
- Vehicle trips were also considered in the analysis. Delivery trucks would transport supplies to the RBC site and remove waste. Employees would travel by motor vehicles to and from the RBC site. Vehicle trips would result in emissions on and off site from fuel combustion and fugitive dust from tire friction that causes particles of dust on roads to become airborne. Although the RBC would provide facilities for alternative fuel vehicles such as electric and compressed natural gas vehicles, the air quality analysis assumes a typical mix of vehicle types (i.e., does not assume a higher percentage of alternative fuel cars than would normally be assumed) in order to provide a conservative analysis. Shuttle buses that would provide service to and from the RBC site would also generate emissions. (The human health effects from ROG/VOC and TAC emissions from motor vehicles are analyzed in LRDP Impact AIR-4 below.)

To the extent feasible, the estimates of operational emissions of criteria pollutants were developed taking into account proximity of retail uses to the RBC site and emissions-reducing project features included in the LRDP. These features include:

- Providing shuttle service to and from the site;
- Implementing low emission generators and compressors or equip them with supplementary exhaust pollution control systems where practical and feasible;
- Providing complete streets and bicycle facilities on the RBC site; and

- Orienting buildings to take advantage of solar heating and natural cooling and use passive solar designs.

The estimated LRDP emissions are based on the anticipated average annual activity levels assuming full development of the RBC under the 2014 LRDP. Details concerning the operational emissions estimates are in the air quality analysis technical report (Appendix B). The estimated operational emissions are presented in Table 4.2-5.

Table 4.2-5
LRDP Operational Emissions (pounds per day)

	On-site Stationary (Exhaust)	On-site Mobile (Exhaust)	On-site Fugitive Dust	Off-site Mobile (Exhaust)	Off-site Fugitive Dust	Total Operational Emissions	BAAQMD CEQA Threshold
ROG/VOC	90.10	9.38	--	36.14	--	***135.62***	54
NOx	47.20	10.50	--	52.90	--	***110.60***	54
CO	213.20	110.60	--	483.70	--	807.50	NE
PM_{10}	71.21	0.90	26.102	43.24	101.10	***242.56***	82
$PM_{2.5}$	50.20	0.83	6.400	18.21	24.82	***100.46***	54

Bold italics = exceeds Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (CEQA) threshold

Note: all table units are pounds per day rounded to two decimal places. Minor discrepancies between the totals reported in column 6 and the sum of individual values in columns 1 through 5 are a result of rounding.

-- = not evaluated; CO = carbon monoxide; NA = not applicable; NE = not established; NOx = nitrogen oxides; $PM_{2.5}$ = fine particulate matter; PM_{10} = inhalable particulate matter; ROG = reactive organic gases; VOC = volatile organic compounds

Source: Golder Associates, Inc. 2013

As shown in Table 4.2-5, operational emissions of four criteria pollutants would exceed the BAAQMD CEQA thresholds, resulting in a significant impact. The greatest contributors of criteria pollutant emissions causing these projected exceedances are:

- ROG/VOC: exhaust emissions from employee vehicle trips and emissions from laboratories;
- NOx: exhaust emissions from employee vehicle trips and natural gas boilers; and
- PM_{10} and PM $_{2.5}$: particulate matter emissions from cooling towers and road dust from employee vehicle trips on on-site roadways, city roadways, and the freeway.

The estimated emissions that exceed the BAAQMD thresholds would result when all of the building space (up to 5.4 million square feet) is developed at RBC and the campus has a daily population of 10,000 persons. As the relationship between building space and population and the mass emission rate of criteria pollutant emissions is essentially linear, in the early stages of campus development, emissions would be substantially lower. In fact, based on an evaluation of the total projected criteria pollutant emissions, the development of up to 1,500,000 square feet of building space and associated increase in population at RBC would not result in emissions of criteria pollutants that would exceed BAAQMD CEQA thresholds.

Nonetheless, at full development of the campus, the total emissions of four criteria pollutants would exceed the applicable thresholds. As noted earlier, the 2014 LRDP includes policies requiring the University to provide shuttle service to and from the RBC site, implementation of low emissions generators and compressors (or fitting them with supplemental pollution control systems where practical and feasible), and orientation of new buildings to maximize solar heating and natural cooling and reduce energy use associated with heating and cooling. The plan also provides for complete streets/sidewalks and commits to secure bike parking and shower changing facilities. LRDP MM AIR-2 would be implemented to minimize the impact from operational emissions. Additional reductions in operational emissions would be achieved with the implementation of LRDP MM GHG-1 (see Section 4.6), LRDP MM TRA-1 (see Section 4.11), and compliance with the new LBNL policy on sustainable building construction. However, because the benefits from each element of LRDP MM AIR-2 are difficult to quantify, and there is uncertainty whether these measures would reduce emissions of NOx, PM_{10} and $PM_{2.5}$ below the BAAQMD CEQA thresholds, it is conservatively concluded that even with mitigation, the impact would remain significant and unavoidable.

LRDP MM AIR-2: When the University has developed 1,000,000 square feet of building space on the RBC site, before approving the construction of another building, the University shall prepare and implement an operational emissions minimization program that will be composed of campus-wide programs to minimize emissions from mobile and area sources, and project-specific emissions control measures, based on project-specific analysis, to minimize emissions from area and stationary sources.

Campus-wide Control Measures

Campus-wide programs would include, but not be limited to, the following:

- Implement an enhanced TDM program to minimize vehicular traffic. The TDM program shall include the continued implementation of existing TDM measures such as provision of preferential carpool/vanpool parking; secure bike parking; showers and changing facilities; transit subsidies; Guaranteed Ride Home Program; and information to employees and students regarding alternative transportation modes. The TDM program will be expanded, following an evaluation of campus population and trip generation, to incorporate additional measures such as car share services; free transit passes; parking cash-out; daily parking charge; employee telecommuting program; compressed work schedules; infrastructure that allows employees to interact or conduct meetings and business without traveling; and a dedicated transportation coordinator.
- Convert campus fleet to low-emission, alternative fuel, and electric vehicles over time.
- Use electric equipment for landscape maintenance.
- Implement an educational program for faculty and staff and distribute information to students and visitors about air pollution problems and solutions.
- Develop centralized utilities such as a central plant (in place of individual boilers in buildings).

Stationary and Area Source Control Measures

When the University has developed 1,000,000 square feet of building space on the RBC site, if and when a specific building project is proposed that would add new stationary or area sources of emissions to the RBC site, the University will conduct a project-specific air quality impact assessment. If significant impacts are identified, project-specific mitigation measures will be implemented, which would include, but not be limited to, the following:

- Select solar or low-emission boilers.
- Select low-emission cooling towers.
- Other control measures determined appropriate for the specific project based on project-specific analysis.

Toxic Air Contaminants

LRDP Impact AIR-3: Construction and demolition associated with development under the 2014 LRDP would not expose people to substantial levels of TACs or expose sensitive receptors to substantial pollutant concentrations in excess of the relevant BAAQMD CEQA thresholds. (*Less than Significant*)

Human health effects from TAC emissions that would occur in association with construction and demolition activities under the 2014 LRDP were analyzed in a human health risk assessment. The assessment calculated the estimated cancer risk, chronic and acute health hazards, and $PM_{2.5}$ concentrations that would be experienced at the maximally exposed individual on the project site as well as off-site in the nearby residential and non-residential areas. Table 4.2-6 presents the results of this analysis compared to the BAAQMD CEQA thresholds.

As shown in Table 4.2-6, construction and demolition TAC emissions under the 2014 LRDP would not result in human health risks or $PM_{2.5}$ concentrations for the maximally exposed individual that would exceed the BAAQMD CEQA thresholds, and therefore the impact would be less than significant.

As Table 4.2-6 indicates, potential cancer risk, and chronic and acute hazard indices were not calculated for the on-site worker. The human health effects from TACs emitted by future construction activities under the LRDP on on-site workers at the RBC cannot be reasonably analyzed at this time for a number of reasons. Human health impacts are dependent on the relationship between the TAC source and the receptors. The sequence in which future buildings would be constructed on the site is not known at this time. Although Figure 3-4, LRDP Conceptual Layout, provides a general representation of the likely arrangement of future buildings on the RBC site, it is not known at this time which buildings will be constructed and occupied first and which ones will be constructed subsequently, and therefore under what circumstance there could be a receptor near a construction site and downwind of the construction activities. Furthermore, the scale of the construction project that could be located close to an occupied building, and therefore the magnitude of TAC emissions, cannot be predicted at this time. The relative location of the receptor and the scale and size of the construction project are essential data without which the human health effects cannot be evaluated without undue

Table 4.2-6
Health Risk Assessment for LRDP Construction

Assessment	Maximally Exposed Individual	BAAQMD CEQA Threshold
Cancer Risk		
Off-site Resident	3.3 in a million	10 in a million
Off-site Worker	2.6 in a million	10 in a million
On-site Worker	--	10 in a million
Chronic Hazard		
Off-site Resident	0.003	Hazard Index less than 1.0
Off-site Worker	0.06	Hazard Index less than 1.0
On-site Worker	--	Hazard Index less than 1.0
Acute Hazard		
On-site	--	Hazard Index less than 1.0
Off-site	--	Hazard Index less than 1.0
$PM_{2.5}$ Annual	0.018 µg/m^3	0.3 µg/m^3

-- = not evaluated; $PM_{2.5}$ = fine particulate matter; µg/m^3 = micrograms per cubic meter; Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (CEQA)

Source: Golder Associates, Inc. 2013

speculation. Consistent with CEQA requirements, when future construction projects are proposed at the RBC, they will be evaluated for their potential to result in significant health effects on nearby receptors, including on-site workers.

However, it is unlikely that TACs emitted during construction of future buildings on the RBC site would result in significant human health impacts on on-site workers. Previously, a Phase 1 development program was proposed on the RBC site involving the grading of about 16 acres in the southern portion of the RBC site and the construction of approximately 600,000 square feet of building space. That project would have been immediately adjacent to and upwind of existing on-site worker receptors at the RBC site. The analysis of the human health effects of the construction TACs associated with the Phase 1 development program was completed before the project was discontinued. That analysis showed that human health impacts from Phase 1 construction activities on the nearby existing worker receptors immediately north and northeast of the Phase 1 site would have been less than significant.

Mitigation Measure: No mitigation measure is required.

LRDP Impact AIR-4: **Operational activities associated with development under the 2014 LRDP would expose people to substantial levels of TACs or expose sensitive receptors to substantial pollution concentrations in excess of the relevant BAAQMD CEQA thresholds. (*Potentially Significant; Significant and Unavoidable*)**

Non-radioactive Toxic Air Contaminants

Potential impacts to human health from exposure to the operational TAC emissions associated with RBC development under the 2014 LRDP were analyzed in a human health risk assessment.

The risk assessment included TAC emissions from a variety of sources that are anticipated to be developed on the RBC site under the 2014 LRDP. TAC sources and types of TACs that would be emitted by operational activities include the following:

- Boilers: benzene, toluene, propylene, formaldehyde, toluene, xylenes, lead, and mercury;
- Cooling towers: bromine;
- Generators: DPM;
- Laboratories: 44 laboratory chemicals (see air quality analysis technical report in Appendix B for a listing of chemicals);
- Vehicles: acrolein, benzene, toluene, ethylbenzene, xylenes, methanol, naphthalene, n-hexane, lead, and propylene.

TAC emissions from natural gas-fired boilers, cooling towers, emergency generators, and vehicles were quantified using methods described above under LRDP Impact AIR-2. TAC emissions from chemical use in laboratories were also quantified. Laboratory chemicals would be used for a variety of research purposes resulting in the potential for the TAC emissions to reach the atmosphere through lab stacks on building roofs. To estimate wet lab emissions, as a first step, LBNL and UC Berkeley reviewed chemical use in existing labs at the LBNL campus and the UC Berkeley main campus and prepared lists of chemicals that are anticipated to be used in the future wet labs at RBC. For the identified lab chemicals, emissions were estimated using methodologies followed by LBNL and UC Berkeley in previous health risk assessments prepared for their respective main sites. These methodologies are based on either annual chemical use data or emission factors for laboratory chemicals related to square footage of laboratory space. A full list of the TACs and operational emissions estimates, including a discussion of the methodologies, are found in the air quality analysis technical report in Appendix B.

The estimated emissions were then modeled using a dispersion model to estimate TAC concentrations and the estimated concentrations were used in conjunction with appropriate toxicity factors (including age sensitivity factors) and length of exposure assumptions to estimate potential cancer and non-cancer health effects on on-site worker receptors and off-site residential and worker receptors. The assessment calculated the estimated cancer risk, chronic and acute health hazards, and $PM_{2.5}$ concentrations that would be experienced at the maximally exposed individual on the RBC site (on-site worker) as well as the maximally exposed individual (both off-site resident and off-site worker) off-site in the nearby residential and non-residential areas. Table 4.2-7 presents the results of this analysis compared to the BAAQMD CEQA thresholds.

As shown in Table 4.2-7, the lifetime excess cancer risk, chronic health hazard, and the off-site acute health hazard associated with RBC development under the 2014 LRDP would be below the applicable BAAQMD CEQA thresholds. However, two values in Table 4.2-7 exceed the thresholds. The estimated acute hazard index for on-site worker (1.06) exceeds the applicable threshold, and the annual $PM_{2.5}$ concentration of 0.89 $\mu g/m^3$ (which would occur off-site) also exceeds the applicable threshold. Therefore, TAC emissions from operational activities associated with RBC development under the 2014 LRDP would result in a significant impact. The greatest contributors to the exceedance of the acute hazard index on site are formaldehyde and chloroform emissions from laboratories, and formaldehyde and nitrogen dioxide emissions from boilers and motor vehicle exhaust. The greatest contributors to the $PM_{2.5}$ exceedance off-site are emissions from employee vehicle trips and natural gas boilers.

The estimated TAC emissions that result in the exceedance of the BAAQMD thresholds would result when all of the building space (up to 5.4 million square feet) is developed at RBC and the campus has a daily population of 10,000 persons. As the relationship between building space and

Table 4.2-7
Health Risk Assessment for LRDP Operations

Assessment	Maximally Exposed Individual	BAAQMD CEQA Threshold
Cancer Risk		
Off-site Resident	8.9 in a million	10 in a million
Off-site Worker	3.1 in a million	10 in a million
On-site Worker	4.9 in a million	10 in a million
Chronic Hazard		
Off-site Resident	0.07	Hazard Index less than 1.0
Off-site Worker	0.27	Hazard Index less than 1.0
On-site Worker	0.36	Hazard Index less than 1.0
Acute Hazard		
On-site	***1.06***	Hazard Index less than 1.0
Off-site	0.89	Hazard Index less than 1.0
$PM_{2.5}$ Annual	***0.89 µg/m³***	0.3 µg/m³

Bold italics = exceeds BAAQMD CEQA threshold

$PM_{2.5}$ = fine particulate matter; $\mu g/m^3$ = micrograms per cubic meter

Source: Golder Associates, Inc. 2013

population and the mass emission rate of TAC emissions is essentially linear, in the early stages of campus development, TAC emissions would be substantially lower and the impacts identified in Table 4.2-7 would not occur.

Nonetheless, at full development of the campus, the total TAC emissions would have the potential to result in an acute hazard index that exceeds 1.0, and $PM_{2.5}$ concentrations that exceed the applicable thresholds. LRDP MM AIR-2 (described above) would be implemented to minimize the impact from $PM_{2.5}$ emissions. Because the benefits from each element of LRDP MM AIR-2 are difficult to quantify, there is uncertainty whether the mitigation measure would adequately reduce $PM_{2.5}$ emissions below the BAAQMD CEQA threshold. Therefore, it is assumed that the impact would remain significant and unavoidable.

LRDP MM AIR-2 would also minimize emissions from on-site boilers and reduce the significant impact to on-site workers. In addition, LRDP MM AIR-4a and LRDP MM AIR-4b are proposed to minimize TAC emissions from RBC laboratories, which would reduce the impact to the on-site workers to a less than significant level.

Radioactive Materials

The future wet labs at the RBC are expected to involve the use of some radioactive materials. As with other hazardous materials, the most probable potential pathway for public or environmental exposure to radioactive material would be air emissions from routine use of these materials inside the labs. Based on historical data from LBNL laboratory operations at a number of other locations, exposure to airborne radionuclides at the RBC would be less than 0.1 percent of EPA and DOE regulatory limits and less than 0.001 percent of the threshold below which risks of health effects are considered either too small to be observed or are nonexistent (Health Physics

Society 2010). Furthermore, all labs owned and operated by the DOE at the RBC will be subject to standards in Subpart H of the NESHAP regulations. Subpart H limits radionuclide emissions from DOE facilities so that no member of the public receives an effective dose equivalent of more than 10 millirem per year. Subpart H also requires emissions sampling, monitoring, and dose calculations to determine compliance with the standard. Based on the most recent evaluation of emissions from the UC Berkeley Central Campus (UC Berkeley 2012 Annual Radiation Safety Report), the radiation dose to the maximally exposed member of the public resulting from the use of licensed radioactive materials in the UC Berkeley RBC laboratories would be expected to be much less than the Central Campus, which had a calculated maximum dose of less than 5 percent of the 10 millirem/year dose limit imposed by the EPA. For these reasons, the emissions from the use of radioactive materials in RBC laboratories developed pursuant to the proposed 2014 LRDP would have a less than significant impact.

LRDP MM AIR-4a. Implement LRDP MM AIR-2 to minimize the operational emissions of $PM_{2.5}$ from mobile and stationary sources and TAC emissions from on-site stationary sources.

LRDP MM AIR-4b: To reduce the effects from RBC laboratory emissions of formaldehyde and chloroform, the University shall implement one of the following measures in conjunction with every laboratory project that involves the use of these chemicals:

- Implement one or more emission control technologies on laboratory fume hoods or stacks. Controls will be limited to portions of the laboratory that involves the use of formaldehyde and chloroform. Controls will be selected specific to the chemical emissions to be controlled (formaldehyde or chloroform or both chemicals), and in the case of laboratory stacks, may include, as appropriate, activated carbon filters, scrubbers, biofilters, flares, catalytic converters, cryogenic condensers, vapor recovery systems, and thermal oxidizers.
- Demonstrate that the project's use of formaldehyde and chloroform will be at least 10 percent below that assumed for the LRDP human health risk assessment.

In the event that neither measure can be implemented, the laboratory project shall demonstrate by preparing a new human health risk assessment that the maximum acute hazard from project emissions, in conjunction with existing site emissions and future emissions under the 2014 LRDP, will not exceed a hazard index of 1.0.

Other Air Quality Impacts

LRDP Impact AIR-5: **Development under the 2014 LRDP would conflict with or obstruct implementation of the applicable air quality plan. (*Potentially Significant; Significant and Unavoidable*)**

The 2010 Clean Air Plan is the plan that would be applicable to the proposed project. The BAAQMD suggests that in order to evaluate whether a project or a plan is consistent with the 2010 Clean Air Plan, the lead agency can evaluate three questions: 1) Does the project support the primary goals of the 2010 Clean Air Plan, which includes the attainment of air quality standards? 2) Does the project include applicable control measures from the 2010 Clean Air Plan? And 3) Does the project disrupt or hinder implementation of any 2010 Clean Air Plan control measures? RBC development pursuant to the 2014 LRDP is evaluated relative to these three questions below.

Support Primary Goals of the 2010 Clean Air Plan

As discussed under LRDP Impact AIR-1, construction associated with RBC development under the 2014 LRDP would result in emissions that do not exceed BAAQMD CEQA thresholds. Therefore the emissions would not hinder the attainment of air quality standards. However, as discussed under LRDP Impact AIR-2 above, emissions from RBC operational activities would exceed the BAAQMD CEQA thresholds. Therefore, 2014 LRDP implementation would conflict with the 2010 Clean Air Plan, and the impact would be significant.

LRDP MM AIR-2 would be implemented to minimize this impact. Because the benefits from the elements of LRDP MM AIR-2 are difficult to quantify and there is uncertainty whether the emissions would be reduced below the BAAQMD CEQA threshold, it is assumed that the impact would remain significant and unavoidable.

Include Applicable 2010 Clean Air Plan Control Measures

The 2010 Clean Air Plan contains 55 control measures aimed at reducing air pollution in the Bay Area. The 2014 LRDP includes policies to guide RBC development to be sustainable. These policies are consistent with the applicable Clean Air Plan Land Use and Local Impact measures, Energy and Climate measures, Mobile Source measures, and Transportation control measures included in the 2010 Clean Air Plan. In addition, LRDP MM AIR-2 and LRDP MM GHG-1 include a range of measures that are consistent with the Clean Air Plan control measures. Therefore, the proposed project would not conflict with the 2010 Clean Air Plan under this criterion.

Hinder Implementation of 2010 Clean Air Plan Control Measures

The proposed project does not include any element that would hinder the implementation of any of the Clean Air Plan control measures. Therefore, the proposed project would not conflict with the 2010 Clean Air Plan under this criterion.

In summary, although RBC development under the proposed LRDP would not conflict with the 2010 Clean Air Plan under three criteria provided by the BAAQMD, it would nonetheless result in emissions of criteria pollutants that would exceed BAAQMD CEQA thresholds even after mitigation and would therefore interfere with the attainment of air quality standards. The impact would be significant and unavoidable for reasons presented above.

Mitigation Measure: Implement LRDP MM AIR-2.

LRDP Impact AIR-6: **Development under the 2014 LRDP would not create objectionable odors affecting a substantial number of people. (*Less than Significant*)**

Construction Emissions

Construction activities at the RBC could generate temporary odors from fuel combustion, paving, and architectural coatings. These odors would be temporary and limited to the immediate project area and would be unlikely to affect a substantial number of people in the surrounding area. Therefore, the impact on air quality from construction-phase odors would be less than significant.

Operational Emissions

Land uses primarily associated with odorous emissions include waste transfer and recycling stations, wastewater treatment plants, landfills, composting operations, petroleum operations, food and byproduct processes, factories, and agricultural activities, such as livestock operations. The proposed project does not include any of these types of land uses. In addition, the proposed project would not be sited near any of these recognized sources of odors. Operational activities at RBC that could generate odors would be the use of laboratory chemicals and preparation of food in the food service areas. These odors would be controlled by ventilation systems and fume hoods and limited to the immediate area around the source. Therefore, the impact on air quality from odors generated by operational activities would be less than significant

Mitigation Measure: No mitigation measure is required.

LRDP Impact AIR-7: **Development under the 2014 LRDP would not create a carbon monoxide hotspot, an area where the carbon monoxide concentration would exceed the state ambient air quality standards. (*Less than Significant*)**

Construction Emissions

Under 40 CFR 93.123(c)(5) and the BAAQMD CEQA Air Quality Guidelines, a CO hotspot analysis is not required for construction emissions as construction activities are short term and are considered unlikely to result in a CO hotspot. Therefore such an analysis was not conducted.

Operational Emissions

Operational activities at the RBC would generate increased vehicle traffic on area roads. The traffic study prepared for the proposed project indicates that under 2035 conditions with full development of the RBC under the 2014 LRDP, six intersections would operate at an LOS of E or F. A CO analysis was performed for these intersections to determine if CO emissions generated by project-related traffic would contribute to a violation of the state standards for CO (9.0 ppm averaged over 8 hours and 20 ppm over 1 hour). The analysis was performed using a simplified spreadsheet version of the CALINE4 model with EMFAC2007 CO vehicle emissions factors and background CO concentrations from the San Pablo monitoring station (the nearest monitoring station where CO data are collected). The maximum CO concentrations at the study intersections would be 2.4 ppm averaged over 1 hour and 1.3 ppm averaged over 8 hours. Because these concentrations are well below the state 1-hour and 8-hour standards (see Table 4.2-1), carbon monoxide impacts on air quality from operational activities would be less than significant.

Mitigation Measure: No mitigation measure is required.

Cumulative Impacts and Mitigation Measures

LRDP Cumulative Impact AIR-1: **Development under the 2014 LRDP would result in a cumulatively considerable increase in criteria pollutant emissions for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors). (*Potentially Significant; Significant and Unavoidable*)**

BAAQMD's CEQA Air Quality Guidelines state that if a project's criteria pollutant emissions exceed the CEQA thresholds, then that project's impacts would also be cumulatively considerable. As shown in Table 4.2-4, the project's criteria pollutant emissions during RBC construction would be less than the BAAQMD CEQA thresholds. However, as shown in Table 4.2-5, operational emissions would exceed the applicable thresholds. Because the project's operational criteria pollutant emissions would exceed BAAQMD CEQA thresholds, the RBC at full development under the 2014 LRDP would make a cumulatively considerable contribution to the significant cumulative impact on regional air quality, and the impact would be significant.

LRDP MM AIR-2 would be implemented to minimize this impact. Because the benefits from each element of LRDP MM AIR-2 are difficult to quantify and there is uncertainty whether this would reduce emissions below the BAAQMD CEQA thresholds, it is assumed that the impact would remain significant and unavoidable.

Cumulative MM AIR-1: Implement LRDP MM AIR-2.

LRDP Cumulative Impact AIR-2: Development under the 2014 LRDP would not result in an increase in non-cancer risk (i.e., chronic or acute) as measured by a hazard index greater than 10, but would result in a cumulatively considerable increase in cancer risk of more than 100 in 1 million and an increase in $PM_{2.5}$ concentration greater than 0.8 µg/m^3 annual average. (*Potentially Significant; Significant and Unavoidable*)

BAAQMD's CEQA Air Quality Guidelines include standards and methods for determining the significance of cumulative health risk impacts. A cumulative health risk determination first considers the health risks from existing permitted sources and major roadways near a project (i.e., within a 1,000-foot radius of the source, also considered the zone of influence for health risks). That health risk is then added to the health risk estimated for the proposed project to determine whether the cumulative health risk thresholds would be exceeded.

Table 4.2-8 presents existing sources of TACs within 1,000 feet of the RBC site boundary to establish the cumulative setting for analysis of human health impacts. All of the sources listed in the table are within 1,000 feet of the RBC site boundary. The data reported in the table are from the BAAQMD database.

Construction TAC Emissions

Table 4.2-9 presents the results of the cumulative health risk assessment and the annual increase in $PM_{2.5}$ concentrations from anticipated annual construction activities at the RBC under the 2014 LRDP.

As shown in Table 4.2-9, if estimated human health risk from LRDP construction TAC emissions is added to the risk from existing sources in the area, the cumulative cancer risk and chronic health risk would be below the BAAQMD CEQA thresholds. However, the annual increase in $PM_{2.5}$ concentrations from the cumulative projects, including the proposed project, would exceed the BAAQMD CEQA thresholds for construction under cumulative conditions. As the table shows, the total $PM_{2.5}$ concentration from existing sources (1.47µg/m^3) already exceeds the BAAQMD CEQA threshold. The project's construction activities would make a very small incremental contribution to the existing significant cumulative impact. The primary RBC sources of $PM_{2.5}$ are exhaust emissions from on- and off-road construction vehicle travel and construction equipment use.

Table 4.2-8
Existing Sources Within 1,000 Feet of the RBC Site Boundary

ID	Name	Address	Cancer Risk (in a million)	Chronic Hazard Quotient	$PM_{2.5}$ ($\mu g/m^3$)
5462	Bio-Rad Laboratories	3110 Regatta Boulevard	36.1	0.374	0.028
G9842	RFS	1301 South 46th Street	0[a]	0[a]	NA[a]
15755	Grace Baking	3200G Regatta Boulevard	0.0576	0.00002	0.53
G7543	Pacific Gas and Electric Company	1100 South 27th Street	1.1	0.0016	NA
17029	Verizon Wireless, Richmond	South 27th Street and Pierson Avenue	8.5[b]	0.003 [b]	0.002 [b]
93	Safeway Stores, Inc. Bakery Plant	905 South 34th Street	0.03	0.00001	0.617
G7555	Stop and Shop	800 Carlson Boulevard	2.37	0.0034	NA
15508	Wareham Property Group EPA Laboratory	1337 South 46th Street, Building 201	19[b]	0.0067[b]	0.34[b]
851	I-580 (East/North of Freeway)	300 feet from maximally exposed individual	50.4	0.041	0.279
		Total	91.1[c]	0.42	1.47

ID = identification number; NA = not applicable; $PM_{2.5}$ = fine particulate matter; RFS = Richmond Field Station; $\mu g/m^3$ = micrograms per cubic meter

[a] The BAAQMD database reports zero values for the RFS under existing conditions. However, the RFS currently contains a few boilers, emergency generators, laboratories, and a gasoline filling station. While most of these existing sources at RFS will be removed in conjunction with new development under the 2014 LRDP, some of these existing sources are expected to remain on the RBC site in the foreseeable future. Human health effects from the sources expected to remain are reported in Tables 4.2-9 and 4.2-10.

[b] The data reported for sources 17029 and 15508 are for emergency generators at a distance of more than 280 meters from the maximally exposed individual. BAAQMD guidance allows these results to be multiplied by 0.04 (diesel generator attenuation factor), greatly reducing their contribution to the total.

[c] The total includes the risk from sources 17029 and 15508 after attenuation.

Source: Golder Associates, Inc. 2013

The numbers reported in Table 4.2-9 were calculated using the methodology provided in the BAAQMD CEQA Air Quality Guidelines which is a simplified method of estimating cumulative health effects without conducting detailed modeling of the emissions from existing sources in the area. In the event that results obtained from the simplified method exceed thresholds, a lead agency can conduct detailed modeling of the emissions from the existing sources and the proposed project together to estimate the cumulative impact. The University conducted such an analysis for LRDP construction $PM_{2.5}$ emissions using $PM_{2.5}$ emissions data for existing sources and default release parameters provided by the BAAQMD. The analysis revealed that the cumulative annual increase in $PM_{2.5}$ concentrations from existing sources plus the LRDP construction activities would be 0.30 µg/m3, instead of 1.49 $\mu g/m^3$ as reported in Table 4.2-9 above. Therefore, based on detailed modeling, the cumulative impact from LRDP construction $PM_{2.5}$ emissions would be less than significant.

Table 4.2-9
LRDP Cumulative Construction Health Risk Assessment

Source	Construction		
	Cancer Risk (in a million)	**Chronic Hazard Quotient**	**$PM_{2.5}$ ($\mu g/m^3$)**
Existing Sources within 1,000 feet of RBC Site Boundary (Table 4.2-8)	91.1	0.42	1.47
Existing Sources on the RBC Site	0.3	0.001	0,00
LRDP Emissions	3.3	0.003	0.02
Cumulative Emissions	94.7[a]	0.42	***1.49***
BAAQMD CEQA Threshold	100	10	0.8

Bold italics = exceeds BAAQMD CEQA threshold

$PM_{2.5}$ = fine particulate matter; RBC = Richmond Bay Campus; $\mu g/m^3$ = micrograms per cubic meter

[a] The TAC sources at Verizon Wireless (ID 17029 in Table 4.2-8 above) and at the EPA Lab (ID 15508) are emergency generators. The BAAQMD human health risk assessment guidelines note that cancer risk from emergency generators attenuates with distance and the guidelines provide a generator distance multiplier of 0.04 to be applied to the maximum impact value for emergency generators. That multiplier was applied to these two sources in estimating the total cancer risk under cumulative conditions.

Source: Golder Associates, Inc. 2013

Although the refined analysis above demonstrates that the cumulative $PM_{2.5}$ impacts would be less than significant, and pursuant to LRDP Policy S3, the University has committed to implementing the construction mitigation measures recommended by the BAAQMD to minimize all construction emissions, which will ensure that the LRDP construction emissions of $PM_{2.5}$ will not make a cumulatively considerable contribution to a significant $PM_{2.5}$ impact, the University nonetheless conservatively concludes that the cumulative impact related to $PM_{2.5}$ emissions from LRDP construction would be significant and unavoidable.

Operational TAC Emissions

Table 4.2-10 presents the results of the cumulative health risk assessment and the annual increase in $PM_{2.5}$ concentrations from anticipated annual operational activities at the RBC under the 2014 LRDP.

As shown in Table 4.2-10, if human health risk from LRDP operational TAC sources is combined with the risk from existing TAC sources in the area, the cumulative chronic health risk would be below the BAAQMD CEQA threshold. However, the cumulative cancer risk and the annual increase in $PM_{2.5}$ concentrations from the cumulative projects, including the proposed project, would exceed the BAAQMD CEQA thresholds, resulting in a significant impact. The primary RBC contributors to the cancer risk are natural gas boilers and diesel generators, while the primary RBC contributors to the $PM_{2.5}$ exceedance are road dust from employee vehicle trips and natural gas boilers.

The analysis above is considered highly conservative because the cumulative results are obtained by simply adding the maximum impacts from all existing sources and are not obtained by modeling the TAC emissions from existing sources (i.e., the maximum impact at any location). The results conservatively add the maximum value for each source together and do not provide for any attenuation of risk that occurs with distance from the source to the maximally exposed individual receptor for the project. As noted in Table 4.2-10 above, a distance multiplier was applied only to generators and to none of the other sources. If a similar distance multiplier is applied to all existing sources (most of which are greater than 500 meters from the maximally

Table 4.2-10
LRDP Cumulative Health Risk Assessment

Source	Operation		
	Cancer Risk (in a million)	**Chronic Hazard Quotient**	**$PM_{2.5}$ (μg/m^3)**
Existing Sources within 1,000 feet of RBC Site Boundary (Table 4.2-8)	91.1	0.42	1.47
Existing Sources on the RBC Site	2.4	0.00	0.0
LRDP Emissions	8.9	0.07	0.89
Cumulative Emissions	***102.4***[a]	0.49	***2.36***
BAAQMD CEQA Threshold	100	10	0.8

Bold italics = exceeds BAAQMD CEQA threshold

$PM_{2.5}$ = fine particulate matter; RBC = Richmond Bay Campus; μg/m^3 = micrograms per cubic meter

[a] The TAC sources at Verizon Wireless (ID 17029 in Table 4.2-8 above) and at the EPA Lab (ID 15508) are emergency generators. The BAAQMD human health risk assessment guidelines note that cancer risk from emergency generators attenuates with distance and the guidelines provide a generator distance multiplier of 0.04 to be applied to the maximum impact value for emergency generators. That multiplier was applied to these two sources in estimating the total cancer risk under cumulative conditions.

Source: Golder Associates, Inc. 2013

exposed individual receptor) and the incremental cancer risk from the project site is added in, the maximum cancer risk at the maximally exposed individual receptor would be 64.4 in a million, well below the BAAQMD CEQA threshold for cancer risk.

Furthermore, studies conducted by the ARB showed that due to programs and controls that were put in place and increasing regulation especially of diesel emissions, statewide human health risks from existing sources decreased by 45 percent between 1990 and 2000 (ARB undated). Additional reductions are projected in the future to result from the ARB's Diesel Risk Reduction Plan, ARB's implementation of ACTMs, the BAAQMD's Air Toxics Program, and its implementation of NESHAPs.

The information above notwithstanding, the University is committed to minimizing its impact on the local community and the environment. Therefore, it will implement LRDP MM AIR-2 to minimize $PM_{2.5}$ and vehicle TAC emissions, and Cumulative MM AIR-2b to ensure that as new TAC sources are added to the RBC site, the site's impact on the community is evaluated and appropriate TAC controls are added to the projects or existing sources retrofitted so that the RBC site does not contribute substantially to a significant human health effect on or in the vicinity of the RBC site. Compliance with the performance standard included in Cumulative MM AIR-2b will ensure that the project will not result in a significant impact related to cancer risk. However, there remains uncertainty whether the University will be able to control its $PM_{2.5}$ emissions adequately to render its contribution to the cumulative $PM_{2.5}$ impact cumulatively not considerable (i.e., less than significant). Therefore the University concludes that the impact related to $PM_{2.5}$ concentrations would be significant and unavoidable.

Cumulative MM AIR-2a: Implement LRDP MM AIR-2 to minimize $PM_{2.5}$ and vehicle TAC emissions.

Cumulative MM AIR-2b: When the University has developed 500,000 square feet of R&D building space on the RBC site, before approving the construction of another R&D building, LBNL and UC Berkeley will prepare an updated human health risk assessment (HHRA) that will estimate and report the human health effects of RBC operations on on-site and off-site receptors. If the HHRA indicates that there would be no significant health effects from RBC operations (project level or cumulative, based on significance thresholds applicable at that time), no further action is required.

In the event that significant human health effects are indicated, LBNL and UC Berkeley will implement control measures to minimize TAC emissions from laboratories, parking garages, other stationary sources, or other measures to reduce the human health effects from RBC TAC emissions to levels below applicable significance thresholds.

Control measures for new or existing laboratories could include, but would not be limited to, the measures listed in LRDP MM AIR-4a and LRDP MM AIR-4b.

Control measures for parking structures could include, but would not be limited to, the following:

- Locate parking structures to be as distant as possible from receptors to the north of the campus;
- Control parking structure emissions through a collection and bag house system.

LRDP Cumulative Impact AIR-3: **Under cumulative conditions, development under the 2014 LRDP would not create a carbon monoxide hotspot, an area where carbon monoxide would exceed the state ambient air quality standards. (*Less than Significant*)**

Construction Emissions

Under 40 CFR 93.123(c)(5) and the BAAQMD CEQA Air Quality Guidelines, a CO hotspot analysis is not required for temporary construction emissions and therefore was not conducted.

Operational Emissions

The maximum CO concentrations at the six intersections that would operate at LOS E or F would be 2.4 ppm averaged over 1 hour and 1.3 ppm averaged over 8 hours. Because these concentrations are below the state 1-hour and 8-hour standards, cumulative air quality impacts from the proposed project's operational emissions of CO would be less than significant.

Mitigation Measure: No mitigation measure is required.

4.2.5 References

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