4.4 CULTURAL RESOURCES

4.4.1 Introduction

This section presents information on known and potentially existing cultural resources at the RBC site and analyzes the potential for development under the proposed 2014 LRDP to affect those resources. Information and analysis in this section is based on previous archaeological surveys (see Section 4.4.5) and those conducted for the current project: *Cultural Resources Inventory Report for the Richmond Bay Campus, Alameda County* (GANDA 2013) and *Historic Properties Survey Report for Richmond Bay Campus* (Tetra Tech 2013).

Cultural resources can be prehistoric, Native American, or historic. Prehistoric resources are artifacts from human activities that predate written records; these are generally identified in isolated finds or sites. Prehistoric resources are typically archaeological and can include village sites, temporary camps, lithic scatters, roasting pits/hearths, milling features, petroglyphs, rock features, and burial plots.

Historic resources are properties, structures, or built items from human activities that coincide with the epoch of written records. Historic resources can include archaeological remains and architectural structures. Historic archaeological sites include townsites, homesteads, agricultural or ranching features, mining-related features, refuse concentrations, and features or artifacts associated with early military and industrial land uses. Historic architectural resources can include houses, cabins, barns, lighthouses, other constructed buildings, and bridges. Generally, architectural resources that are over 50 years old are considered for evaluation for their historic significance.

Public and agency NOP comments related to cultural resources are summarized below:

- For construction activities proposed in a state right-of-way, Caltrans requires that project environmental documentation include results of a current Northwest Information Center archaeological records search.
- A private individual proposes that the Berkeley and Albany waterfront, grouped together, is eligible for inclusion in the National Register of Historic Places (NRHP) under 36 CFR 800.16 as a Cultural Landscape under the federal criteria for listing.

4.4.2 Environmental Setting

Archaeological

Prehistoric Context

Archaeological investigations in Central California and elsewhere seek to explain past human behavior, cultural continuity, and change. Archaeological interpretation of material remains can address many aspects of human behavior, including when and at what time of year people occupied an area; the technological and natural resources available; social organization; settlement patterns; trade, competition, and conflict relationships with neighboring groups; ceremonial systems; and external environmental issues affecting indigenous populations. Current archaeological research seeks to answer a wide array of questions regarding prehistoric human culture and adaptive responses.

Archaeological research throughout the Central Valley and Central California regions has resulted in the documentation of numerous prehistoric habitation sites. These early archaeological sites were typically near the shoreline of lakes, marshes, creeks, and rivers. Archaeologists now

recognize three general patterns of cultural adaptation throughout the Central Valley Region based on artifact assemblages and mortuary practices during the period between 5,000 Before Present (BP)[10] and 200 BP. The three primary time periods are the Early Period (5000–2500 BP), the Middle Period (2500–1300 BP), and the Late Period (1300–200 BP or contact). Fredrickson (1973, 1974, and 1994) delineated distinct time-period divisions based on general economic, technological, and mortuary traits. He introduced three cultural patterns, the Windmiller, Berkeley, and Augustine Patterns, and he correlated them respectively to the Early, Middle, and Late horizons of the California Central Taxonomic System (Rosenthal et al. in Jones and Klar 2007:154). A brief description of each:

The Early Period/Windmiller Pattern (5000–2500 BP) is divided into the Early, Middle, and Late Windmiller, named for the Windmiller Pattern first identified in the Sacramento–San Joaquin Delta as the oldest archaeological complex (Lillard et al. 1939). The Windmiller Pattern is thought to be composed of a mixed economy of game procurement and the use of wild plant foods. The archaeological assemblages of this period contain numerous projectile points, with large obsidian concave base and stemmed points; rectangular *Olivella* beads; and a wide range of faunal remains (Erlandson and Jones eds. 2002). The Windmiller Pattern reflects a seasonal adaptation in which valley sites were occupied during the winter months and foothill camps were inhabited in the summer (Rosenthal et. al. in Jones and Klar 2007:154; Moratto 1984:201-207).

The Middle Period/Berkeley Pattern (2500-1300 BP) shifted to a more specialized adaptation called the Berkeley Pattern that spanned approximately 1,200 years. Fredrickson (1974) defined the Berkeley Pattern based on the economic adaptive strategies developed around the area's extensive and rich resources. Deeply stratified midden deposits, developed over generations of occupation, are common to Berkeley Pattern sites exemplified by the Emeryville Shellmound (CA-ALA-309) southwest of the project area on the east shore of the San Francisco Bay. These middens contain numerous milling and grinding stones for food preparation. Early representations of the Berkeley Pattern resemble the Windmiller Pattern but shift to larger occupation sites near water sources with the presence of projectile points and atlatls (Rosenthal et. al. in Jones and Klar 2007:156; Hughes 1994; Moratto 1984:207-211).

The Late Period/Augustine Pattern (1300 BP–contact) followed the Berkeley Pattern. The Augustine Pattern exhibits elaborate ceremonial and social organization and the development of social stratification. Exchange became well developed. A more intensive emphasis was placed on acorn usage, as evidenced by the archaeological record of shaped mortars and pestles and numerous hopper mortars. Other Augustine Pattern traits include the introduction of pre-interment burning of offerings in a grave pit during mortuary rituals, increased village sedentism, population growth, and an incipient monetary economy in which beads were used as a standard of exchange (Rosenthal et. al. in Jones and Klar 2007:157; Moratto 1984:211-214).

Ethnographic Context

The project site is in the area ethnographically attributed to the Ohlone (also known as Costanoan). The term "Costanoan" derives from the Spanish word Costaños or "coast people." It refers to an ethno-linguistically distinct people who lived along the San Francisco peninsula before contact with European Americans. Ethnographic and ethnohistoric information about the Ohlone derives primarily from the accounts of early explorers and missionaries. The territory of

[10] "Before Present (BP)" is a dating metric often used in archaeology, geology, and other scientific disciplines. Past events are measured counting back a specified number of years from the originating date of January 1, 1950. So, for example, the Central Valley Region Early Period of 5,000—2500 BP correlates to 2,500—550 BC under the Gregorian or Western calendar system.

the Ohlone is purported to have extended from the Central Coast Ranges between San Pablo Bay in the north to Monterey in the south. The Ohlone tribal territory eastern boundary is not precisely known but is understood to extend to the Mount Diablo Range (Kroeber 1925:462; Moratto 1984:225).

The Ohlone language is one of the eight major linguistic subdivisions of Miwok-Costanoan, which belonged to the Utian family in the Penutian language family (Shipley 1978:82-84). Linguistic evidence suggests that the Ohlone entered the San Francisco and Monterey Bay areas about 1,500 BP (Levy 1978:486). The Ohlone were politically organized by tribelets, each having a designated territory. A tribelet consisted of one or more villages and camps in a physiographically defined territory. Tribelets generally had 200 to 250 members (Levy 1978:485; Margolin 1978:1). Each tribelet consisted of villages every three to five miles (as noted by early Spanish explorers) that contained an average of 60 to 90 persons (Milliken 1995:19). The project site is in the *Huchiun* triblet ethnographic territory, where *Chochenyo*/*East Bay Costanoan* was the common spoken language (Levy 1978:485; Margolin 1978:2).

The acorn was among the most important food resources for Ohlone, who preferred the area's abundant tanbark oak, valley oak, and California black oak. The large oak tree stands created a readily accessible staple. These could be stored in granaries and used through the winter months. Acorns were ground into meal and leached to remove tannins. Other important food resources were buckeye nuts, leached and made into a mush, and the seeds of dock, gray pine, and tarweed, all of which were roasted in baskets with hot coals before being eaten. The Ohlone gathered berries and fruits including gooseberries, blackberries, madrone, and wild grapes along with root resources such as wild onion, cattail, and wild carrot (Levy 1978:491).

Shellfish and marine mammals were important Ohlone dietary resources, particularly for coastal populations. Shellmound midden throughout the Bay Area attest to the importance of shellfish in the Ohlone diet. The Emeryville Shellmound (CA-ALA-309; documented by Nels Nelson in 1909), once a complex of mounds, is approximately 2.5 miles southwest of the project site on the San Francisco Bay eastern shoreline. Terrestrial mammals, including rabbits, black-tailed deer, Tule elk, and pronghorn sheep, were important to coastal and inland Ohlone populations. These were hunted and trapped using drive and snare methods. Hunting parties were communal, often bulk harvesting meat for immediate consumption or for winter storage for the various village groups (Lightfoot and Parrish 2009:212). Migratory waterfowl, particularly geese, ducks, and coots, the most important avian resources, were captured with nets; local quail were caught in traps. The Ohlone fished for salmon, sturgeon, and lampreys, and built Tule balsas (rafts) to move about the waterways. The Ohlone traded with surrounding tribes such as the Miwok (to the northeast), and the Northern Valley Yokuts (to the east). Mussels, abalone shells, dried abalone, and salt were exchanged for piñon nuts with the Yokuts. *Olivella* shells (the shell of a small predatory sea snail) were traded with the Sierra Miwok. Bows were traded with the Plains Miwok (Levy 1978:488).

Historic Period

In 1772, Europeans arrived in what would become Contra Costa County when a Spanish expedition led by Pedro Fages discovered the San Pablo Bay and the confluence of the Sacramento and San Joaquin rivers.[11] Though subsequent Spanish expeditions passed through the region, the Spanish did not appear to settle in the Richmond area during the Mission Period of 1769 through 1833. In the 1820s and 1830s, the Mexican government began granting large tracts

[11] Mildred B. Hoover, Hero E. Rensch, Ethel G. Rensch, Douglas E. Kyle, *Historic Spots in California, Fourth Edition*, Stanford University Press, Stanford, California: 1958, p. 129.

of land in the area to its citizens, including Ranchos San Pablo, San Ramon, and Pinole. The first permanent non-native settlers were Francisco Castro and his wife Maria Gabriela Berryessa. The Mexican government granted the 18,000 acre Rancho San Pablo to the Castros in 1823.[12] Americans began farming in Contra Costa County in the late 1830s, and by 1882, two-thirds of the cultivated land in the county was devoted to wheat production.[13]

In 1852 and 1853, Minna C. C. Quilfelt (or Quilfeldt) purchased 600 acres of Rancho San Pablo adjacent to the San Francisco Bay; this eventually became the southern portion of the City of Richmond.[14] In the 1860s, a wharf and produce warehouse were constructed to ship agricultural produce from Rancho San Pablo and Quilfelt Ranch to San Francisco markets. German native Richard Stege settled on Rancho San Pablo in the late 1860s after stints in the gold fields and the Siberian fur trade. A town named Stege formed on Richard Stege's holdings, and by the early twentieth century it boasted several industries, including the California Cap Works (located on the RBC site), the United States Briquette Company, the Stauffer Chemical Works, and the Stege Lumber Manufacturing Company.[15] Richmond incorporated in 1905, and by 1917 it was the largest city in Contra Costa County.[16]

California Cap Company

In 1877, William Letts Oliver, who was born in Chile to English parents, established the Tonite Powder Company adjacent to the Stege Ranch. Oliver was a mining engineer who developed an explosive called "*Tonite*" that could be used at high heat and was instrumental in construction of the Sutro Tunnel in the Comstock Lode.[17] This drainage tunnel allowed access to deeper mineral exploration. Mine flooding and inadequate pumps had inhibited some exploration activities up to that time.

To ensure a steady supply of blasting caps, otherwise imported from Europe, Oliver and partner Freeborn Fletter founded the California Cap Company.[18] The California Cap Company occupied a 160-acre parcel adjacent to the bay at the southern end of the Stege Ranch.

The California Cap Company, which operated on the site for nearly seven decades, was the first manufacturer of blasting caps in the United States. Richard Stege continued to reside on the ranch and contracted with Tonite Powder and California Cap to transport their products to the railroad.[19] The California Cap Company was on the parcel that is currently the RFS. The Tonite Powder Company appears to have been to the east of the RFS on the parcel that became the Stauffer Chemical Company and later the Zeneca site, although its exact location is unclear.[20]

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[12] Donald Bastin, *Images of America: Richmond*, Arcadia Publishing, Charleston SC: 2003, p. 9.

[13] J.P. Munro-Fraser, *History of Contra Costa County, California*, W.A. Slocum & Co., San Francisco: 1882, p. 55 – 57.

[14] Evan Griffins, "Early History of Richmond", December 1938, El Cerrito Historical Society, website: http://www.elcerritowire.com/history/pages/EarlyRichmond.htm, accessed January 2013.

[15] Frederick J. Hulaniski, *The History of Contra Costa County, California*. Elms Publishing Company, Berkeley, California: 1917, p. 354.

[16] Hulanski p. 288.

[17] Oliver, p. 1.

[18] Pacific Mining News, Supplement to Engineering & Mining Journal-Press, "Industrial Notes: Developing of the Blasting Cap Industry", Vol. 1, No. 7, November 1922, p. 222.

[19] Nilda Rego, "Enterprising Stege lost all and died without a penny," Time Out, March 27, 1994, p. 2, column 4.

[20] Nilda Rego, "Enterprising Stege lost all and died without a penny", Time Out, March 27, 1994, p. 2, column 4.

The Tonite and California Cap factories, the first of several gunpowder and chemical companies in the region, were separated by the Stege agricultural warehouse for safety. [21] Eventually the Tonite factory was incorporated into the California Cap Company. By 1916 there were at least a dozen buildings on the site. World War II brought thousands of defense industry jobs to Richmond. The California Cap Company was one of the most important local employers, but it did not survive the transition to a peacetime economy, and by 1949 the plant was shuttered and the Oliver family began looking for a buyer.

After World War II, UC Berkeley's Engineering Department needed an off-campus location to do experiments requiring more space than a laboratory. The University purchased the California Cap Company site from the Oliver family for the use by the Engineering Department in 1950 for $750,000.[22] The University named the acquired property the Richmond Field Station.

The RFS has been the location of a research overseen by numerous UC Berkeley departments over the years. The Sanitary Engineering Research Laboratory was the first department to do research at the site. This laboratory focused primarily on sewage treatment technology; it supported research on pollution control and disposal of solid and liquid waste.[23] At first the University used the buildings left behind by the California Cap Company. The Engineering Department established a machine shop, computer shop, receiving facility, mail service, and other facilities in the old blasting company buildings.[24] By the 1970s, the department had done many experiments at the RFS.

Records Searches and Cultural Resources Sites and Buildings

Archaeological and Landscape Resources

A records search at the Northwest Information Center of the California Historical Resources Information System at Sonoma State University, Rohnert Park was conducted on January 16, 2013 (File No. 12-0713). The records search compiled information regarding the locations of previously recorded cultural resources sites and previous studies within a 0.25-mile radius of the RBC site for the proposed 40-year LRDP undertaking. This defines the area in which eligible properties may be affected by the undertaking, including direct effects (such as destruction of the property) and indirect effects (such as visual, audible, and atmospheric changes that affect the character and setting of the property). This information was used to assess the archaeological sensitivity of the RBC site.

The records search found that 29 cultural resources investigations were completed within a 0.25-mile radius of the RBC site, with four of these on the RBC site. Seven cultural resources, including five prehistoric shell mounds and a historic-period pier and seawall, were recorded within this area. Two of the previously recorded cultural resources are on the RBC site. One of these cultural resources (CA-CCO-157, Loud's No. 299) is in a developed portion of the LRDP development area. The second cultural resource (CA-CCO-753H, Stege Marsh Seawall) is in the development area, but it has been partially dismantled.

In January 2013, a pedestrian survey of a portion of the development area was conducted. The survey found that approximately 70 percent of the 16 acres is developed with buildings, roads,

[21] Oliver, p. 1.
[22] P.H. McGauhey, "The Sanitary Engineering Research Laboratory: Administration, Research and Consultation, 1950-1975–An Interview Conducted by Malca Call", Regional Oral History Office, University of California, Berkeley, 1974, p. 70.
[23] University of California, Berkeley, 2008, p. 13.
[24] McGauhey, p. 71.

parking lots, and a large stock pile of soil. The remaining 30 percent consists of a large grassy field, lawns, landscaping, dirt driveways and parking lots, and wetlands. A small southern portion of the project site was inaccessible. The previously recorded historic period resource in the project site, CA-CCO-753H (Stege Marsh Seawall), could not be located during the survey. This area was inaccessible because it is in the fenced area marked as hazardous waste and habitat restoration. The survey identified two previously unrecorded historic period resources that were assigned temporary field numbers by the researchers. These include two stands of eucalyptus trees, GANDA-622-01, and one isolated bottle, GANDA-ISO-622-01(GANDA 2013).

The University of California, Berkeley Museum of Paleontology conducted a record search for paleontological resources in the area and determined that there have been no prior fossil finds in the RBC. Therefore paleontological resources are not further discussed in the analysis (Holroyd 2013).

The following discussion provides information regarding the known cultural resources in the LRDP development area. ***CA-CCO-157/P-07-000099 (Loud's No. 299).*** In 1915, L. L. Loud originally recorded this resource as an approximately 350-foot wide by 250-foot long shell mound on the end of a slough about 800 feet from the San Francisco Bay's historic shoreline. It is currently under a warehouse and paved parking lot at 3200 Regatta Boulevard in Richmond (Banks 1985a). This resource is in the LRDP development. This resource has not been evaluated for NRHP or California Register of Historical Resources (CRHR) eligibility because it is currently inaccessible.

CA-CCO-753H/P-07-002591 (Stege Marsh Seawall). Constructed in the late 19th or early 20th centuries, this segment of the Stege Marsh Seawall consists of an approximately 18-foot long wood beam mounted in place by two sets of round wood poles. Seventeen 1-foot by 3-inch wood planks form the back of the seawall and the other portion of the seawall has been dismantled. Subsurface portions of it may still be present and buried. This resource was evaluated and recommended as not eligible for listing in the NRHP or the CRHR (Hatoff et al. 2003).

GANDA-622-01 (Eucalyptus Stands 1 and 2). This landscape feature consists of two historic period Eucalyptus stands. Eucalyptus Stand 1 is on the east side of the development area, along the east side of S. 46th Street (Egret Way). Eucalyptus Stand 2 is on the northwest side of the development area, east of Avocet Way. According to the technical report for the Richmond Field Station Remediation Project (S-26851), Richard Stege purchased 600 acres of land and established an estate in 1876. Around the same time, chemical and explosive companies began buying land in the area and constructing manufacturing plants. In 1880, the California Cap Company was established at the Stege property, and trees were planted to serve as a buffer between the manufacturing facility and nearby residents (Hatoff et al. 2003). It is possible that the eucalyptus stands contain many of the same trees planted in the 1880s. The University purchased the property in 1950s and reused many of the existing buildings (Hatoff et al. 2003). It also may have retained the original eucalyptus stands. The eucalyptus stands have been evaluated and are recommended as not eligible for listing in the NRHP or CRHR.

GANDA ISO-622-01. This isolated resource is a late 19th to early 20th century complete aqua whiskey bottle identified on the south side of Building 110. As an isolated artifact that lacks association in the larger historic context of the LRDP, this resource is not eligible for listing in the NRHP or CRHR.

Historical Architectural Resources

There are 81 buildings in the RBC site. In January 2013, a historic properties survey was done for a portion of the RBC development area. Twenty-five buildings were inventoried and recorded.

Research was conducted at the Contra Costa Historical Society archives, the DOE Library, the Earth Sciences and Map Library at UC Berkeley, and through the Oakland Public Library's Oakland History Room. A records search at the Northwest Information Center (file No. 12-0776) did not yield any evaluated or eligible buildings or structures. The records search identified one previous historic structure survey by Holman (1989). This study identified the buildings that were over 50 years old and did not include all of the buildings in the current survey population. None of the buildings were considered to be individually significant, but they were not recorded individually or formally evaluated using NRHP or CRHR criteria.

Of the 25 buildings evaluated for listing in the NRHP and CRHR, Tetra Tech determined that two were eligible for listing—Buildings 150 and 175. These buildings were determined eligible under Criterion A/1 for their association with the California Cap Company and its innovation in explosives during the late 1800s through the middle of the 20th century. The other buildings in the surveyed area are not historically significant or do not retain sufficient integrity to be considered eligible for listing on the NRHP or the CRHR individually or as a contributing element to a historic district.

Native American Consultation

As part of the consultation process with Native American organizations and individuals, the Native American Heritage Commission was contacted on January 24, 2013, with a request for information about any sacred lands related to the project site and for a list of interested Native American groups and individuals in Contra Costa County. The Native American Heritage Commission has not responded to date.

4.4.3 Regulatory Considerations

Federal

Section 106 of the NHPA (16 USC 470 [f]), as amended (PL 89-515), and its implementing regulations (36 CFR Part 800.9 [a] and [b]) require federal agencies to consider the effects of their actions on properties listed or eligible for listing on the NRHP. The criteria for inclusion (36 CFR 60.4) are as follows:

A. Association with events that have made a significant contribution to the broad patterns of our history;

B. Association with the lives of persons significant to our past;

C. Resources that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Resources that have yielded or may be likely to yield information important in prehistory or history.

In addition to historic significance, a property must have integrity to be eligible for the NRHP. This is the property's ability to convey its demonstrated historical significance through location, design, setting, materials, workmanship, feeling, and association.

Section 106 describes the procedures for identifying and evaluating eligible properties, assessing the effects of federal actions on eligible properties, and consulting to avoid, reduce, or minimize adverse effects. Eligible properties need not be formally listed on the NRHP, but are afforded the

same protections as listed properties. Federal agencies are required to consult with the SHPO as part of the Section 106 process. Section 106 does not require the preservation of historic properties, but it ensures that the decisions of federal agencies concerning the treatment of these properties include meaningful considerations of cultural and historic values and of the options available to protect the properties.

State

California Environment Quality Act

The CEQA Statute and Guidelines include procedures for identifying, analyzing, and disclosing potential adverse impacts to historical resources, including all resources listed in or formally determined eligible for the NRHP, the CRHR, or local registers. CEQA Guidelines, Section 15064.5(a), defines the term "historical resources" to include:

1) A resource listed in, or determined to be eligible by, the State Historical Resources Commission, for listing in the CRHR (PRC Section 5024.1, Title 14 California Code of Regulations, Division 3, Chapter 11.5 Section 4850 et seq.).

2) A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k), or identified as significant in an historical resource survey meeting the requirements in PRC Section 5024.1(g), shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

3) Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record.

California Register of Historical Resources

Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the CRHR (PRC Section 5024.1, Title 14 CCR Division 3, chapter 11.5, Section 4852). The four eligibility criteria for CRHR listing closely parallel those of the NRHP. Each resource must be determined to be significant at the local, state, or national level under one of these four criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of California history and colonial heritage; or
2. Is associated with the lives of persons significant in our past; or
3. Embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4. Has yielded, or may be likely to yield, information important in prehistory or history. [25]

[25] California Public Resources Code, Sections 4850 through 4858; Office of Historic Preservation, Instructions for Nominating Historical Resources to the California Register of Historical Resources, August, 1997.

A resource may still be considered historical if it does not meet these standards. CEQA Statutes Section 21084.1, states that a resource need not be listed on any register to be historical. CEQA Guidelines Section 15064.5(a)(4) states that "until such time as a structure is evaluated for possible inclusion in the inventory pursuant to subdivisions (b) and (c) of PRC Section 5024.5 (historical significance criteria), state agencies shall assure that any structure which might qualify for listing is not inadvertently transferred or unnecessarily altered."

To be eligible for listing, a resource must also have sufficient integrity. The CRHR definition of integrity is slightly different from that used for the NRHP. Integrity is defined as the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance. The CRHR states that eligible resources must retain enough of their historic appearance or character to be recognizable as historic resources and to convey the reasons for their significance, and it lists the same seven aspects of integrity used for evaluating properties under the NRHP criteria.

Regulations Concerning Discovery of Human Remains

California Public Resources Code Section 5097.98 (Notification of Native American human remains, descendants; disposition of human remains and associated grave goods) mandates that the lead agency adhere to the following regulations when a project results in the identification or disturbance of Native American human remains:

a) Whenever the Native American Heritage Commission receives notification of a discovery of Native American human remains from a county coroner pursuant to subdivision (c) of Section 7050.5 of the Health and Safety Code, it shall immediately notify those persons it believes to be most likely descended from the deceased Native American. The descendants may, with the permission of the owner of the land or his or her authorized representative, inspect the site of the discovery of the Native American remains and may recommend to the owner or the person responsible for the excavation work means for treating or disposing of, with appropriate dignity, the human remains and any associated grave goods. The descendants shall complete their inspection and make their recommendation within 24 hours of their notification by the commission. The recommendation may include the scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

b) Whenever the Native American Heritage Commission is unable to identify a descendent, or the descendent identified fails to make a recommendation, or the landowner or his or her authorized representative rejects the recommendation of the descendent, and the mediation provided for in subdivision (k) of Section 5097.94 fails to provide measures acceptable to the landowner, the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property, in a location not subject to further subsurface disturbance.

c) Notwithstanding the provisions of Section 5097.94, the provisions of this section, including those actions taken by the landowner or his or her authorized representative to implement this section, and any action taken to implement an agreement developed pursuant to subdivision (l) of Section 5097.94, shall be exempt from the requirements of the California Environmental Quality Act [Division 13 (commencing with Section 21000)].

d) Notwithstanding the provisions of Section 30244, the provisions of this section, including those actions taken by the landowner or his or her authorized representative to implement this section, and any action taken to implement an agreement developed pursuant to

subdivision (1) of Section 5097.94, shall be exempt from the requirements of the California Coastal Act of 1976 [Division 20 (commencing with Section 30000)].

Local

City of Richmond Historic Structures Code

Historic preservation is implemented in the City of Richmond through the enforcement of its Historic Structures Code (Chapter 6.06 of the Richmond Municipal Code; City of Richmond 2013). The Historic Structures Code includes the following historic resource designation criteria:

On the recommendation of the Committee and approval of the Council a structure, site, or other improvement, not already designated as such, may be designated a historic resource in the City or may be designated an historic district if it meets any of the following criteria:

(1) It exemplifies or reflects valued elements of the City's cultural, social, economic, political, aesthetic, engineering, archaeological, or architectural history; or

(2) It is identified with persons or events important in local, state, or national history; or

(3) It reflects significant geographical patterns, including those associated with different eras of settlement and growth, particular transportation modes, or distinctive examples of park or community planning; or

(4) It embodies distinguishing characteristics of an architectural style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship; or

(5) It is representative of the notable work of a builder, designer, or architect whose style influenced the City's architectural development.

A structure, site, or other improvement which meets any of the above criteria at the highest level and whose loss would be a major loss to the City may be designated an outstanding historical resource.

City of Richmond General Plan

Historic Resources, Richmond General Plan 2030, is the Historic Resources Element that provides regulatory guidance for preserving and restoring the city’s historic assets. The element is designed to protect cultural assets and to ensure that policies that relate to historic resources will ensure their protection. Three goals, Historic Resource Preservation, Expanded Economic Opportunities Based on Historic Resources, and Increased Public Awareness of Richmond’s History, are included in the Historic Resources Element of the General Plan. Policies and implementing procedures associated with these goals are described in the plan.

The 2030 General Plan EIR determined that the effects on cultural resources from future development pursuant to the General Plan would be significant and unavoidable. Development could cause a substantial adverse change in the significance of historical resources because existing and proposed City policies do not explicitly prohibit demolition or inappropriate alteration of historic-period buildings or structures. Mitigation measures would be implemented to reduce potential impacts, but the impact would remain significant and unavoidable. Development could adversely impact archaeological or paleontological resources, but these impacts would be mitigated to less than significant. Cumulative impacts would be cumulatively considerable for historic structures and archaeological resources but less than significant for paleontological resources.

4.4.4 Impacts and Mitigation Measures

CEQA Guidelines Section 15064.5(b) states that "a project with an effect that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment."

Standards of Significance

Cultural resources impacts from the 2014 LRDP implementation 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:

- Cause a substantial adverse change in the significance of a historical resource as defined in 15064.5
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to 15064.5
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature
- Disturb any human remains, including those interred outside of formal cemeteries

Public Resources Code (PRC) Section 5020.1 and CEQA Guidelines Section 15064.5(b)(1) define a significant effect as one that would materially impair the significance of an historical resource. According to CEQA Guidelines Section 15064.5(b)(2), material impairment of a resource's historic significance could result if the project would:

- Demolish or materially alter in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its inclusion in, or eligibility for inclusion in, the CRHR as determined by the lead agency
- Demolish or materially alter in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to local ordinance or resolution (PRC Section 5020.1[k]), or its identification in an historical resources survey meeting the requirements of PRC Section 5024.1(g) unless a preponderance of evidence establishes that the resource is not historically or culturally significant
- Demolish or materially alter in an adverse manner those physical characteristics of a resource that convey its historical significance and that justify its eligibility for its inclusion on the CRHR

Although not a standard of significance, CEQA Guidelines Section 15064.5(b)(3) holds that, in general, a project impact on historic resources will be considered mitigated to a less than significant level if mitigation follows the Secretary of the Interior's guidelines.

Analytical Methods

Impacts must be considered when a proposed undertaking has the potential to affect cultural resources, such as those resources described above. CEQA associates a "substantial adverse change" in the significance of an historical resource with a significant impact on the environment. *PRC Section 5020.1* and *CEQA Guidelines Section 15064.5(b)(1)* define the term "substantial adverse change" as demolition, destruction, relocation, or alteration of a historical resource or its immediate surroundings such that a resource's value would be materially impaired. The analysis must determine whether there are historical resources that may be affected by the proposed project and whether the project would result in a substantial adverse change to the extent that the resource's historical value is materially impaired or lost.

The general method for determining whether a significant impact on historical resources could result requires determining a project's region of influence, identifying the presence or absence of cultural resources in that region, evaluating resource significance and/or whether it meets historical resource eligibility criteria, and determining the project's likelihood of causing a substantial adverse change.

In this analysis, there are near-term, reasonably foreseeable actions and longer-term planning actions associated with LRDP implementation. Impacts are determined by reviewing the proposed LRDP development program actions against the region's known or anticipated historical resources. The types, risks, context, and intensity of anticipated impacts are assessed qualitatively using the cultural resource professionals' best judgment.

Known historical resources under CEQA are present in the LRDP development areas. Other "unknown" historical resources may be present, but any such resources are currently unidentified, unevaluated, buried, and/or not yet of historic age. Implementation of the 2014 LRDP have the potential to result in a "substantial adverse change" and a "significant impact" on known and unknown historical resources.

Excavations, trenching, and grading for campus development could disturb or destroy significant archaeological resources in the developable areas identified in the LRDP. Much of the RBC site's ground surface is not visible and has not been examined for archaeological resources. The location of one recorded site is beneath an existing structure. Based on the environmental setting and recognized archaeological sites that were recorded and partially investigated nearly 100 years ago, the RBC site is considered highly sensitive for prehistoric archaeological resources. Likewise the historic industrial use of the LRDP developable area for over 100 years indicates that the RBC site is highly sensitive for historic-era archaeological deposits.

Two of the surveyed buildings have been determined to be eligible for the NRHP and are considered historical resources under CEQA. There are 81 RBC site buildings, only 25 have been formally evaluated. Of the 59 unevaluated buildings, some may currently be of historic age or will be during the life of the plan and may be historic resources under CEQA. Actions that could directly affect historic structures include demolition, seismic retrofitting, and accidents or vibration caused by nearby construction activities.

Given the prehistoric use of the LRDP development area, on-site resources may exist that are of interest to contemporary Native American populations. Ongoing efforts seek to determine whether there are such Native American resources present at the LRDP development sites.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to cultural resources include the following:

- LU2 – Land Use Policy on Character: Provide a setting capable of attracting new research programs and retaining world class researchers
    - Support excellence in building design that is harmonious with the waterfront location and creates visual variety in form and massing. Include iconic structures or buildings on the campus.

LRDP Impacts and Mitigation Measures

LRDP Impact CR-1: **Development under the 2014 LRDP could result in significant impacts on previously undiscovered, unevaluated, or unrecorded archaeological resources or human remains during construction and clearing. (*Potentially Significant; Less than Significant with Mitigation*)**

Although most, if not the entire RBC site, has been disturbed in conjunction with previous site uses, previously unknown archaeological resources or human remains may be encountered during ground-disturbing construction activities. Much of the ground surface is obscured by past development. Based on old maps, the location of site CA-CCO-157/P-07-000099 (Loud's No. 299) is believed to be collocated with an existing building and parking lot. Geo-archaeological and environmental setting analysis indicate a very high sensitivity for buried, surface, or near surface prehistoric resources throughout the RBC site. Subsurface historic period archaeological resources may also be present (GANDA 2013). The 2014 LRDP campus development may adversely affect previously unknown or unevaluated subsurface archaeological resources and possibly human remains by causing destruction, damage, loss of context, or complete or partial removal of site components. This would be a potentially significant impact. Implementing LRDP MM CR-1 would include site surveys and other measures to avoid impacting archaeological resources, reducing this impact to less than significant.

LRDP MM CR-1: Prior to any project-related excavation or construction, the University shall adequately survey all relevant disturbance areas for archaeological resources and assess the potential for buried resources based on past land use, site records, and proximity to known resources and landforms. Depending on the resulting level of suspected archaeological sensitivity, archaeological testing shall be done and/or qualified archaeological monitors will be present during ground disturbing activities.

Prior to any ground disturbing activities that could disturb potentially existing archaeological resources, the University would prepare a Construction Monitoring and Unanticipated Cultural Resources Discovery Plan to be implemented if an unanticipated discovery is made. At a minimum the plan would detail the following elements:

- Worker and supervisor training in the identification of cultural remains that could be found in the proposed project area
- Worker and supervisor response procedures to be followed if there is an unanticipated discovery, including appropriate points of contact for professionals qualified to make decisions about the potential significance of any find
- Identities of persons authorized to stop or redirect work that could affect the discovery, and their on-call contact information
- Procedures for monitoring construction activities in archaeologically sensitive areas

- A minimum radius (typically a minimum of 50 feet) around any discovery in which work would be halted until the significance of the resource has been evaluated and mitigation implemented as appropriate
- Procedures for identifying and evaluating the historical significance of a discovery
- Procedures for consulting Native Americans when identifying and evaluating the significance of discoveries involving Native American cultural materials
- Procedures to be followed for treatment of discovered human remains per current state law, including appropriate notification and consultation with Native American groups or individuals

If any suspected human bone is found during construction, all work should stop and the Contra Costa County coroner would be notified immediately per State law and the Discovery Plan. If the remains are determined to be Native American, the Native American Heritage Commission shall be notified for determination of the most likely descendent and tribal affiliation for disposition. No additional work shall take place near the find until the identified actions have been implemented.

LRDP Impact CR-2: **Development under the 2014 LRDP would result in significant impacts on historic Buildings 150 and 175 through demolition or visual intrusion from new building construction. (*Potentially Significant; Significant and Unavoidable*)**

Two buildings (Buildings 150 and 175) were determined eligible for listing on the NRHP and CRHR under Criterion A/1 for their association with the California Cap Company and its innovation in explosives during the late 1800s through the middle of the 20th century. Significant unavoidable impacts would result directly from demolition of these structures under the 2014 LRDP. Implementing LRDP MM CR-2 would reduce the impact; however because historic resources will be demolished, the proposed project will impact historic resources. Therefore, even with implementation of LRDP MM CR-2, the impact to historic resources is determined to be significant and unavoidable.

LRDP MM CR-2: Because demolition of Buildings 150 and 175 cannot be avoided, historic documentation would be completed by professionals meeting the Secretary of the Interior's Professional Qualification Standards for architectural history. Recording each structure to the standard established for the National Park Service's Historic American Building Survey or Historic American Engineering Record would include high resolution digital photographs taken of historic buildings in their current condition. Up to 20 archival black and white prints would be prepared as part of the recordation package. Construction or as-built drawings (if available) would be reproduced on archival paper.

LRDP Impact CR-3: **Development under the 2014 LRDP could result in significant impacts on historic structures that have not been identified or that would become of historic age over the life of the plan. (*Potentially Significant; Significant and Unavoidable*)**

The 2014 LRDP addresses a 40-year planning horizon. The RBC site is developed with approximately 81 one- and two-story buildings, roadways, parking lots, and landscaped areas. Twenty-five of the existing buildings in the development area have been evaluated for their historic significance. Some of the other buildings may be historic structures, and others that are not of historic age could become of age during the LRDP planning period. Significant unavoidable impacts could result directly from demolition or alteration of these structures under the LRDP or indirectly through the visual intrusion from the future construction anticipated under the plan. Implementing LRDP MM CR-3a would reduce the impact; however if avoidance of direct or indirect impacts is not possible, the proposed project may still impact historic resources. Therefore, even with implementation of LRDP MM CR-3a, conservatively, the impacts to historic resources are determined to be significant and unavoidable.

LRDP MM CR-3a: Prior to any project construction or demolition activities, the University shall ensure that all buildings and structures in the construction footprint have been adequately inventoried. If any of the inventoried structures are found to be historically significant and are to be retained, the University shall develop reuse or maintenance plans to identify the historic features of the building and prepare design guidelines based on the Secretary of Interior's Standards and Guidelines for the Treatment of Historic Properties and to ensure that the buildings retain their historic, character–defining features.

LRDP MM CR-3b: If avoidance of direct or indirect impacts on (as yet unidentified) historic buildings is not possible, the University shall determine site specific mitigation measures. Historic documentation would be completed by professionals meeting the Secretary of the Interior's Professional Qualification Standards for architectural history. Structures would be recorded to the standard established for the National Park Service's Historic American Building Survey or Historic American Engineering Record. This would include high resolution digital photography of historic buildings in their current condition. Up to 20 archival black and white prints would be prepared as part of the recordation package. Construction or as-built drawings (if available) would be reproduced on archival paper.

Cumulative Impacts and Mitigation Measures

LRDP Cumulative Impact CR-1: **Development under the 2014 LRDP together with regional cumulative development would result in a cumulatively minor cultural resources impact. (*Less than Significant*)**

This section evaluates whether implementation of the 2014 LRDP, in combination with other past, present, and reasonably foreseeable future LBNL, UC Berkeley, and non-UC projects, would result in significant cumulative cultural resources impacts in the project's region of influence. The region of influence, or cumulative setting, includes the Southern Shoreline Planning Area of the City of Richmond.

Past developments in the region have resulted in the loss or destruction of the spatial integrity of prehistoric and historic archaeological resources through ground-disturbing activities. Historic buildings and structures have been lost or impacted due to demolition, substantial alteration, neglect, or incompatible construction. Current and future projects and plans have the potential to cause substantial adverse changes to historical resources by altering, disturbing, or destroying archaeological resources during construction or by demolishing or altering buildings or structures or their setting. Construction of the Bio-Rad Laboratories Upgrade Project includes land where there are recorded archaeological sites. The extent to which historical resources are present in the region and would be impacted by cumulative projects and plans is unknown. The City of Richmond 2030 General Plan includes provisions for taking into account cultural resources and addressing adverse effects on historical resources, and future development in the region would be completed in the context of federal, state, and local laws and planning processes.

None of the known resources in the LRDP development area would be affected by other cumulative projects. Future actions in the LRDP development area would be subject to site-specific CEQA review, during which impacts on historical resources would be identified and mitigated. Therefore, cumulative impacts on cultural resources from the proposed LRDP and other projects and plans in the region of influence would be less than significant.

Mitigation Measure: No mitigation measure is required.

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4.5 GEOLOGY AND SOILS

4.5.1 Introduction

This section discusses existing RBC site geology and soils resources and analyzes the potential for development under the proposed 2014 LRDP to affect those resources. The section also describes RBC's regional geologic and seismic setting and analyzes potential geologic and seismic hazards that may affect the proposed project based on the site conditions and location. The analysis focuses on increased exposure of people and structures to hazards such as groundshaking, liquefaction, and erosion. Section information and analysis is based on existing project site documentation.

One NOP public comment related to geology and soils was received. This comment noted the liquefaction potential from a large earthquake along the Hayward or San Andreas Faults due to the presence of loose sandy fill at the RBC site.

4.5.2 Environmental Setting

Regional Geology

The San Francisco Bay Area geology is dominated by the San Andreas fault system that includes the San Andreas fault, the San Gregorio fault, the Hayward fault, the Calaveras fault, and other faults that have been active during approximately the last 30 million years. Bay Area geology is quite complex, owing to the relative movement of the North American continental and Pacific Ocean crustal plates. The terrain was created by tectonic forces that compressed ancient sedimentary deposits into a sub-parallel series of anticlines (concave downward) and synclines (concave upward). These folds were subsequently right-laterally faulted, uplifted, and eroded into their present configuration. The bedrock underlying the sediments in the San Francisco Bay basin, and exposed in some of the hills surrounding the Bay, consists of a complex of partially metamorphosed sedimentary and volcanic rocks belonging to the Franciscan Formation. The region was apparently well above sea level until about 1 million years ago when a combination of subsidence of the basin and rising sea levels from melting of continental ice caps led to deposition of sediments on the Franciscan bedrock surface.

Richmond is underlain by the Franciscan Formation. The Franciscan Formation consists of sedimentary and volcanic rocks that accumulated to a thickness of more than 50,000 feet, probably in a deep part of the oceanic basin beyond the continental slope, during Late Jurassic to Late Cretaceous time. Most of the Franciscan rock types are dense, hard, resistant, and form ground that will be generally stable during earthquake shaking. Where intensively sheared or weathered, these rocks disintegrate into much less stable ground, and the slopes underlain by these sheared materials are much less stable than areas of outcropping hard rock.

Above the Franciscan Formation lie tertiary marine and non-marine sedimentary and volcanic rocks. Outcrops of marine sedimentary rocks that formed when the sea invaded the area south of Santa Rosa in Miocene and Eocene time (24 million to 5 million years ago), are very limited in Richmond. Miocene and Eocene rocks comprise a sequence of hardened sandstone and shale. On the surface in shallow areas and under the bay waters is a combination of alluvium and bay mud.

Site Specific Geology

The Franciscan bedrock (primarily greywacke, black shale and slate, greenstone, and chert) underlies the site at depths between 80 to 160 feet or more. Depth to bedrock generally increases to the southwest. The groundwater table is about 10 feet below existing grade; tidal fluctuation will affect the groundwater elevation.

Historically, artificial fill was placed on the RBC site to reclaim the original low-lying lands and marshlands. In addition, pyrite cinders from the adjacent Stauffer Chemical facility were placed on the site. Much of the original pyrite has been removed and replaced with other imported fill soil, but some is still present. The native near surface geology consists of Holocene alluvial fan and alluvial fan levee deposits. The alluvial fan deposits consist of stiff to dense silty clay with interbedded sand and gravel lenses.

Faults and Seismic Hazards

The Hayward fault, approximately 2 miles northeast of the RBC site, is the closest active fault to the site (Figure 4-9). Based on the soil type, the relatively young age of the soil, and the shallow depth to groundwater, the sandy areas on the site could be susceptible to liquefaction during an earthquake. The areas dominated by clay would be less susceptible to liquefaction. Liquefaction hazard maps produced by ABAG indicate that the eastern portion of the project site is susceptible to liquefaction (ABAG 2011).

Repeated tectonic events in the San Francisco Bay Area resulted in a complex geologic structure with numerous folds, faults, and cross faults. Today, the most significant manifestations of these forces with respect to the project site are the San Andreas fault system and Hayward fault zone.

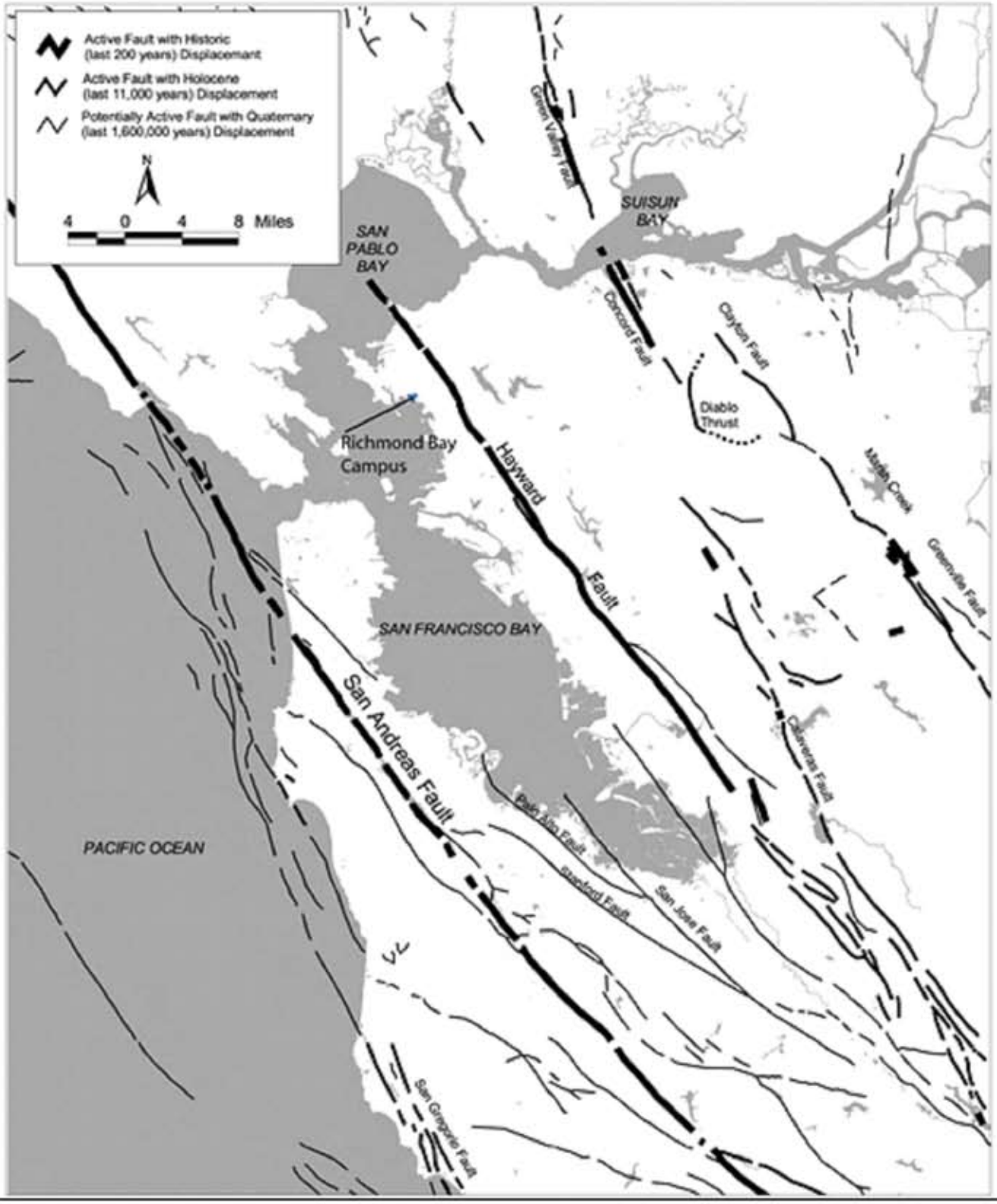
The Hayward fault is designated by the Alquist-Priolo Earthquake Fault Zoning Act as an active fault. A characteristic feature of the fault is its well-expressed and relatively consistent fault creep. Although large earthquakes on the Hayward fault have been rare since 1868, slow fault creep has continued to occur and has caused measurable offset. Fault creep on the East Bay fault segment is estimated at 0.35 inches per year. There have been two recorded incidents of major earthquakes along the Hayward fault. A magnitude 6.5 earthquake occurred on June 10, 1836, and a magnitude 6.9 occurred on October 21, 1868.

The San Andreas fault, 15 miles to the west, could produce significant groundshaking at the RBC site. The greatest Bay Area region earthquake in historic times occurred along the San Andreas fault on April 18, 1906, with a magnitude of 7.8.

The magnitude 6.9 Loma Prieta earthquake occurred in October 1989 with its epicenter about 70 miles south of Richmond. The damage in Richmond was relatively slight compared to that in San Francisco and Oakland. Older buildings were damaged, cracking appeared in residences and commercial buildings, and there was damage in the industrial areas near the Port. City staff relocated from City Hall, which was declared unsafe. There were no bridge or building collapses and no significant fire damage. The energy released during the Loma Prieta earthquake was just 3 percent of the amount of energy released during the 1906 earthquake.

Three moderate earthquakes occurred along the Calaveras fault, 20 miles to the southeast, in 1980. The Morgan Hill Earthquake of April 24, 1984, occurred on this fault. The effects of these earthquakes on Richmond were insignificant. The maximum credible earthquake on this fault is approximately magnitude 6.3.

During the recent historical period, six significant earthquakes have occurred in the San Francisco Bay Area, commencing with the 1868 earthquake. Other earthquakes between 1868 and 1906 were estimated as being in the range of magnitude 6.0 to 6.5.



Fault Zones

Richmond, California

TETRA TECH

Figure 4-9

After the 1989 Loma Prieta earthquake, the US Geological Survey and other scientists estimated that there is a 62 percent probability of at least one magnitude 6.7 or greater earthquake, capable of causing widespread damage, striking somewhere in the San Francisco Bay region before 2032 (USGS 2003). The region is defined as extending north-to-south from Healdsburg to Salinas. The probability of such earthquakes occurring on the Hayward and Rogers Creek faults is estimated at 27 percent. They projected that there was at least an 80 percent chance of one or more magnitude 6 to 6.6 earthquakes occurring in the Bay region before 2032.

Ground Shaking

Ground movement during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of affected geologic material. The composition of underlying soils, even those relatively distant from faults, can intensify ground shaking. For this reason, earthquake intensities are also measured in terms of their observed effects at a given locality. The Modified Mercalli intensity scale (Table 4.5-1) is commonly used to measure earthquake damage from ground shaking. The intensity values in that scale range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage. The intensities of an earthquake will vary over the region of a fault and generally decrease with distance from the epicenter of the earthquake.

Table 4.5-1
Modified Mercalli Scale of Earthquake Intensities

Earthquake Intensity	Effects Observed	Average Peak Acceleration
I	Earthquake shaking not felt. But people may observe marginal effects of large distance earthquakes without identifying these effects as earthquake-caused. Among them: trees, structures, liquids, bodies of water sway slowly, or doors swing slowly.	< 0.0015 g
II	*Effect on people:* Shaking felt by those at rest, especially if they are indoors, and by those on upper floors.	< 0.0015 g
III	*Effect on people:* Felt by most people indoors. Some people can estimate duration of shaking. But many may not recognize shaking of building as caused by an earthquake: the shaking is like that caused by the passing of light trucks.	< 0.0015 g
IV	*Other effects:* Hanging objectives swing. *Structural effects:* Windows or doors rattle. Wooden walls and frames creak.	0.015 g-0.02 g [a]
V	*Effect on people:* Felt by everyone indoors. Many estimate duration of shaking. But they still may not recognize it as caused by an earthquake. The shaking is like that caused by the passing of heavy trucks, though sometimes, instead, people may feel the sensation of a jolt, as if a heavy ball had struck the walls. *Other effects:* Hanging objects swing. Standing autos rock. Crockery clashes, dishes rattle or glasses clink. *Structural effects:* Doors close, open, or swing. Windows rattle.	0.03 g-0.04 g
VI	*Effect on people:* Felt by everyone indoors and by most people outdoors. Many now estimate not only the duration of shaking but also its direction and have no doubt as to its cause. Sleepers wakened. *Other effects:* Hanging objectives swing. Shutters or pictures move. Pendulum clocks stop, start or change rate. Standing autos rock. Crockery clashes, dishes rattle or glasses clink. Liquids disturbed, some spilled. Small unstable objectives displaced or upset. *Structural effects:* Weak plaster and Masonry D* crack. Windows break. Doors close, open, or swing.	0.06 g-0.07 g

Table 4.5-1
Modified Mercalli Scale of Earthquake Intensities

Earthquake Intensity	Effects Observed	Average Peak Acceleration
VII	*Effect on people:* Felt by everyone. Many are frightened and run outdoors. People walk unsteadily. *Other effects:* Small church or school bells ring. Pictures thrown off walls, knickknacks and books off shelves. Dishes or glasses broken. Furniture moved or overturned. Trees, bushes shaken visibly, or heard to rustle. *Structural effects:* Masonry D* damaged; some cracks in Masonry C*. Weak chimneys break at roof line. Plaster, loose bricks, stones, tiles, cornices, unbraced pampers and architectural ornaments fall. Concrete irrigation ditches damaged.	0.10 g-0.15 g
VIII	*Effect on people:* Difficult to stand. Shaking noticed by auto drivers. *Other effects:* Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Furniture broken. Hanging objects quiver. *Structural effects:* Masonry D* heavily damaged; Masonry C* damaged, partially collapses in some cases; some damage to Masonry B*; none to Masonry A*. Stucco and some masonry walls fall. Chimneys, factory stacks, monuments, towers, elevated tanks twist or fall. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off.	0.25 g-0.30 g
IX	*Effect on people:* General fright. People thrown to ground. *Other effects:* Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes. Steering of autos affected. Branches broken from trees. *Structural effects:* Masonry D* destroyed; Masonry C* heavily damaged, sometimes with complete collapse; Masonry B* is seriously damaged. General damage to foundations. Frame structures, if not bolted, shifted off foundations. Frames racked. Reservoirs seriously damaged. Underground pipes broken.	0.50 g-0.55 g
X	Effect on people: General Panic. *Other effects:* Conspicuous cracks in ground. In areas of soft ground, sand is ejected through holes and piles up into small craters, and, in muddy areas, water fountains are formed. *Structural effects:* Most masonry and frame structures destroyed along with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes and embankments. Railroads bent slightly.	> 0.60 g
XI	*Effect on people:* General panic. *Other effects:* Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. *Structural effects:* General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.	> 0.60 g
XII	*Effect on people:* General panic. *Other effects:* Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air. *Structural effects:* Damage nearly total, the ultimate catastrophe.	> 0.60 g

Notes:
a. g is gravity = 32 feet per second squared.
* Masonry A: Good workmanship and mortar, reinforced, designed to resist lateral forces;
* Masonry B: Good workmanship and mortar, reinforced;
* Masonry C: Good workmanship and mortar, unreinforced;
* Masonry D: Poor workmanship and mortar, weak materials like adobe.

Predicted ground shaking for a large event on the Hayward fault would be severe to violent along the length of the fault. Hayward fault rupture would generate structurally damaging ground motions in Richmond ranging from Modified Mercalli intensity VII to X.

Liquefaction

Liquefaction may occur when loose, unconsolidated, saturated fine- to medium-grained sandy soils are subjected to ground vibrations during a seismic event. This usually occurs in areas where the groundwater table is within 50 feet of the ground surface, and it is generally associated with uncompacted, saturated, or nearly saturated, non-cohesive sandy and silty soils. During liquefaction, loose soil sediments are shaken. This creates a sudden increase in pore water pressure and loss of shear strength and causes the soils to behave like a liquid. If the liquefying layer is near the ground surface, the effects may resemble those of quicksand. If the layer is deep below the ground surface, it may provide a sliding surface for the material above it or cause differential settlement of the ground surface that may damage building foundations by altering weight-bearing characteristics. Liquefaction can affect soils to 50 feet deep during prolonged periods of ground shaking.

The State has not designated any liquefaction hazard areas in the City of Richmond under the Seismic Hazard Zones Mapping Program, although as noted above, liquefaction hazard maps have been produced by ABAG indicating that the eastern portion of the RBC site is susceptible to liquefaction.

Tsunami and Seiche

Tsunamis (seismic sea waves) are long period waves typically caused by underwater disturbances (landslides), volcanic eruptions, or seismic events. Areas highly susceptible to tsunami inundation tend to be in low-lying coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled but are still at or near sea level. There have been 19 recorded tsunamis in the Bay Area from 1868 to 1968. The maximum wave height associated with these tsunamis was just less than 15 feet at the Golden Gate Tide Gage in 1868. After natural attenuation across the Bay, estimates are that the wave height was approximately half that on the Richmond shoreline and negligible by the Carquinez Strait.

The West Coast and Alaska Tsunami Warning Center in Alaska and the Pacific Tsunami warning Center in Hawaii monitor potential tsunamis. The Centers currently issue “warnings” to particular locales when a 7.5 magnitude earthquake or greater occurs within 3 hours tsunami travel time to those locations, and issue “watches” when tsunami travel time is within 3 to 6 hours of particular locations. Information is transmitted to the Governor’s Office of Emergency Services Warning Control Center and local emergency managers.

There are no State or other officially designated tsunami evacuation zones in the City of Richmond.

A seiche is an earthquake-generated wave in enclosed or restricted bodies of water such as lakes and reservoirs caused when an earthquake ground wave matches the natural period of oscillation of the body of water. Seiche risk in the shoreline areas would be minimal because there are no large confined bodies of water with sufficient depth to resonate with earthquake generated shaking. Catastrophic earthquake damage also can result from dam failure or from large masses of earth breaking loose and sliding into a reservoir or the Bay.

Landslides

Landsliding is a form of ground failure where there is a relatively rapid downslope movement of a mass of soil, rock, and rock debris. The term is used here to include mudslides and earthflows. Landsliding is affected by the degree of water saturation, strength of rocks, slope angle, mass and

thickness of deposit, and type and extent of vegetative cover. Landslides occur from shearing between layers of soil below the ground surface. In clay, the ground slumps or drops in a mass, whereas in Bay Mud, the ground spreads laterally. Soil flows occur when the cohesion of the soil fails, generally after heavy rainfall. Rainfall saturates the soil, adding weight and decreasing friction. Most landslides occur on slopes greater than 15 percent. Slopes at the RBC site range from 0 to 5 percent. Soils at the RBC site consist of artificial fill, alluvial fan deposits, a mix of stiff to dense silty clay with interbedded sand and gravel lenses, bay sediments, and Yerba Buena Mud (Older Bay Mud). Bay sediments may exist in the site's upper 18 feet. The bay sediments consist of fine- to very fine-grained sediments, while the Yerba Buena mud is a fine-grained unit that behaves as a regionally extensive aquitard.

4.5.3 Regulatory Considerations

Federal

In October 1977, the US Congress passed the Earthquake Hazards Reduction Act to reduce earthquake risks to life and property in the United States. To accomplish this, the Act established the National Earthquake Hazards Reduction Program. This program was significantly amended in November 1990 by the National Earthquake Hazards Reduction Program Act by refining the description of agency responsibilities, program goals, and objectives. The mission of the program includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improved building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improved mitigation capacity; and accelerated application of research results. The Act designates the Federal Emergency Management Agency as the program lead agency and assigns several planning, coordinating, and reporting responsibilities. Other program agencies include the National Institute of Standards and Technology, National Science Foundation, and US Geological Survey.

State

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Sections 2621-2630) was passed in 1972 to mitigate surface faulting hazards to structures designed for human occupancy. The Act's main purpose is to prevent the construction of buildings for human occupancy on the surface trace of active faults. The law addresses only the hazard of surface fault rupture and not of other earthquake hazards. The Act requires the State Geologist to establish regulatory zones known as "Earthquake Fault Zones" around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their planning efforts. Before a project can be permitted in a designated Alquist-Priolo Earthquake Fault Zone, cities and counties must require a geologic investigation to demonstrate that proposed buildings would not be constructed across active faults.

The Seismic Hazards Mapping Act of 1990 (Public Resources Code Sections 2690–2699.6), addresses earthquake hazards from nonsurface fault rupture, including liquefaction and seismically induced landslides. The Act established a mapping program for areas that have the potential for liquefaction, landslide, strong ground shaking, or other earthquake and geologic hazards. The Act specifies that project lead agencies may withhold development permits until site specific geologic or soils investigations are conducted and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

The State of California provides building design standards through the California Building Code (CBC, California Code of Regulations, Title 24). Where no other building codes apply, Chapter 29 regulates excavation, foundations, and retaining walls. The CBC applies to building design and construction in the state and is based on the federal Uniform Building Code (UBC) used

widely throughout the country (generally adopted state-by-state or district-by-district). The CBC has been modified for California conditions with numerous more detailed or more stringent regulations. The state earthquake protection law (California Health and Safety Code Section 19100 et seq.) requires that structures be designed to resist stresses produced by lateral forces from wind and earthquakes. Specific minimum seismic safety and structural design requirements are in Chapter 16 of the CBC. The CBC identifies seismic factors that must be considered in structural design. CBC Chapter 18 regulates the excavation of foundations and retaining walls; Appendix Chapter A33 regulates grading activities, including drainage and erosion control, and construction on unstable soils, such as expansive soils and areas subject to liquefaction.

Local

The RBC would be a University of California property where work within the University's mission is performed. As a state entity, 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 to the extent feasible any physical consequences of potential land use conflicts. The RBC is in the City of Richmond. The following section summarizes the UC Seismic Safety Policy as it relates to geology and soils.

University of California Seismic Safety Policy

The University of California Seismic Safety Policy (UC 2011) requires "The design and construction of buildings on University premises shall comply, at a minimum, with the current seismic provisions of CBC for new or existing buildings as appropriate."

City of Richmond General Plan

The 2030 General Plan EIR determined that future General Plan development effects on geology, soils, and minerals would be less than significant. Future development would not expose people or structures to seismic hazards, soil spreading, land subsidence, soil erosion, or landslide hazards beyond an acceptable level of risk. Development would adhere to the California Building Code to minimize risk. No mitigation measures would be required. Cumulative impacts would be less than significant.

4.5.4 Impacts and Mitigation Measures

Standards of Significance

The 2014 LRDP implementation impacts on geology and soils would be considered significant if they would exceed the following Standards of Significance listed below, in accordance with Appendix G of the *State CEQA Guidelines* and the UC CEQA Handbook:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
    - Strong seismic groundshaking;
    - Seismic related ground failure, including liquefaction; and
    - Landslides.
- Result in substantial soil erosion or the loss of topsoil.
- Be on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

- Be on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994 or most current edition), creating substantial risks to life or property.
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

CEQA Checklist Items Adequately Addressed in the Initial Study

The Initial Study analysis circulated with the NOP concluded that further analysis of the following issues was not required in the EIR.

- Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
- Landslides.
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

A portion of the Hayward fault zone occurs in the City of Richmond, about 2 miles northeast of the site. No fault is present on the RBC site and there is no potential for fault rupture.

The RBC site is relatively flat, at the distal end of an alluvial plain, so there is no potential for landslide risk.

The Richmond properties are served by the City of Richmond wastewater treatment system, and RBC would not be served by septic systems or alternate wastewater disposal systems.

Analytical Methods

This section describes the potential geology and soils impacts resulting from development under the proposed 2014 LRDP and assesses them based on the Standards of Significance. Potential impacts were analyzed based on existing site data and the generalized scope of facility development analyzed in this EIR.

A project site's geotechnical characteristics determine its potential for structural and safety hazards that could occur during proposed project construction or operation. The conditions presented in the Richmond General Plan Update Final Environmental Impact Report, supplemented as necessary with widely available industry sources, were used to document regional and local geology in this EIR. Site assessment studies characterizing geotechnical conditions at each future proposed building site would be required prior to specific project approvals.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to geology and soils include the following:

- S3 – Sustainability Policy on Site Development: Embody environmental stewardship and respect the unique character of the RBC in site development.
    - Draw on the neighborhood context and prominently feature the natural assets including climate, wetlands, and proximity to the San Francisco Bay and the Bay Trail.
    - Actively promote sustainability as a core value at the campus and provide practical opportunities for innovation and education in sustainable design.

- Manage soil contamination as a component of each construction project.
- Control construction dust by implementing the best management practices (BMPs) defined in the BAAQMD CEQA Guidelines.

LRDP Impacts and Mitigation Measures

LRDP Impact GEO-1: Development under the 2014 LRDP would not expose people and structures to substantial adverse effects from seismic hazards such as ground shaking and earthquake-induced ground failure at the RBC site. (*Less than Significant*)

The RBC site is in an area potentially subject to strong seismic ground shaking from earthquakes along several active Bay Area faults. Due to its proximity to Hayward fault, the RBC site is subject to levels of ground shaking ranging up to very strong to violent (Modified Mercalli Intensity IX). Ground shaking intensities from a major Hayward Fault seismic event could approach or exceed a peak ground acceleration of 0.60 g. The RBC site area has not been officially assessed by the State of California for its liquefaction potential, but based on the soil type, the relatively young soil age, and the shallow groundwater depth, the sandy areas on the RBC site could be susceptible to liquefaction during an earthquake.

Seismic ground shaking could damage the proposed buildings, roadways, retaining walls, and other ancillary facilities and the development of the proposed campus would expose future campus population to risk from seismic ground shaking.

UC Seismic Safety Policy implementation would ensure that people or structures would not be exposed to a significant risk from ground shaking. The 1995 University policy on seismic safety, revised in 2011, requires that all new construction at the RBC site comply with the current seismic provisions of the California Code of Regulations, Title 24, California Buildings Standards or local seismic requirements, whichever is the most stringent. Adherence would include:

- Use of CBC seismic standards as the minimum seismic-resistant design for all proposed facilities;
- Seismic-resistant earthwork and construction design criteria based on the site-specific recommendations of a California-licensed professional civil engineer in cooperation with the project's California-licensed professional geotechnical and structural engineers (section 1802 ff and 1802A ff);
- An engineering analyses that demonstrates satisfactory performance of alluvium or fill where either forms part or all of the support, especially where the possible occurrence of liquefiable soils exists; and
- An analysis of soil expansion potential and appropriate remediation (compaction, removal/replacement) prior to using any expansive soils for foundation support.

With adherence to the University Seismic Safety Policy, all campus development would be designed and constructed to current seismic standards. Although conformance to the highest seismic standards does not guarantee avoidance of structural damage in the event of a maximum credible earthquake, it is reasonable to expect that structures built in compliance with the seismic requirements would not collapse or cause loss of life in a major earthquake. There are seismic shaking hazards beyond that associated with building collapse, including falling debris, fire, gas leaks, and others that are difficult to quantify given the potential magnitude and unpredictable nature of seismic events. The UC Seismic Safety Policy dictates stringent standards intended to

limit the impacts of such hazards. For all of these reasons, the impact related to seismic ground shaking would be less than significant.

Mitigation Measure: No mitigation measure is required.

LRDP Impact GEO-2: **Development under the 2014 LRDP would result in construction on soils that could be subject to erosion and instability. (*Potentially Significant; Less than Significant with Mitigation*)**

RBC site soils consist of artificial fill; alluvial fan deposits, a mix of stiff to dense silty clay with interbedded sand and gravel lenses; bay sediments; and Yerba Buena Mud (Older Bay Mud). Bay sediments may exist in the upper 18 feet. The bay sediments consist of fine- to very fine-grained sediments, while the Yerba Buena Mud is a fine-grained unit that behaves as a regionally extensive aquitard. Because of this soil lithology, there is potential for expansive soils and settlement at the RBC site. Expansion occurs in clay soils and results in soil swelling and shrinking with change in moisture conditions. Such shrinking and swelling can cause problems with building foundations, slab on-grade, and pavement unless adequately addressed during design and construction. Settlement is the gradual downward movement of an engineered structure (e.g., a building) from the compaction of the unconsolidated material below the foundation. Structures built on Bay Mud are prone to settlement that can damage the building's foundation and structural integrity unless identified and addressed during design and construction. Erosion potential at the RBC site is relatively low because the area is flat with slopes between 0 and 5 percent and clay-bearing soils encountered are likely to be cohesive.

LRDP MM GEO-2

GEO-2a: A site-specific, design-level geotechnical investigation shall be completed during the design phase of each new building project and prior to construction approval on the RBC site. This investigation shall be conducted by a licensed geotechnical engineer and shall include an evaluation of potential soils hazards and appropriate measures to minimize these hazards. Geotechnical recommendations shall subsequently be incorporated into building design.

GEO-2b: Construction under the LRDP shall comply with ABAG's Manual of Standards for Erosion and Sediment Control Measures, and the California Stormwater Quality Association's Stormwater Best Management Practice Handbook for Construction (CASQA 2003) (or subsequent editions thereof). Construction under the LRDP shall use construction BMPs and standards to control and reduce erosion. These measures could include, but are not limited to, restricting grading to the dry season, protecting all finished graded slopes from erosion using such techniques as erosion control matting and hydroseeding, or other suitable measures.

GEO-2c: All LRDP construction projects shall include, as appropriate, revegetation of disturbed areas (including slope stabilization projects) using native shrubs, trees, or grasses.

Cumulative Impacts and Mitigation Measures

LRDP Cumulative Impact GEO-1: Development under the 2014 LRDP together with cumulative development in the region would not result in significant cumulative impacts related to geology and soils. (*Less than Significant*)

Development under the proposed 2014 LRDP would attract an increased number of people to an area exposed to potential seismic effects such as ground shaking or liquefaction. Development under the 2014 LRDP would allow an increase in the size and number of structures subject to the effects of expansive soils or other soil constraints that could affect structural integrity, roadways, or underground utilities. Site preparation and development would create temporary or permanent ground surface changes that could alter erosion rates. Other reasonably foreseeable future development in Richmond would also be exposed to similar seismic hazards or be affected by expansive soils and erosion. Potentially adverse environmental effects associated with seismic hazards, expansive soils, topographic alteration, and erosion are site-specific and generally do not aggregate. Implementation of the UC Seismic Safety Policy, the National Pollutant Discharge Elimination System permit requirements, and the UC safety policies would help ensure that potential site-specific geotechnical and soil conditions would be adequately addressed and that potential impacts to future City development would be maintained at less-than-significant levels. Therefore, the proposed 2014 LRDP would result in less than significant cumulative geologic, seismic, and soil impacts.

4.5.5 References

A3GEO. 2012. Preliminary Foundation Consultation. September 10, 2012.

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4.6 GREENHOUSE GAS EMISSIONS

4.6.1 Introduction

This section discusses existing global, national, and statewide GHG and climate change conditions, and it evaluates the potential global climate impacts from development under the proposed 2014 LRDP. The section identifies the applicable federal, state, regional, and local agencies that regulate, monitor, and control GHG emissions. The proposed project GHG emissions calculations, estimates, and supporting technical data are in Appendix B.

Public and agency NOP comments related to greenhouse gas emissions are summarized below:

- The RBC development should reduce its vehicle miles traveled per capita as much as possible. Bicycling should be emphasized as an important transit option. A plan and strategies to reduce greenhouse gas emissions from transportation to and from the new campus should be prepared.
- The host city's climate action plan (CAP) should be analyzed and respected in the RBC design.
- The RBC development should minimize total vehicle miles traveled (VMT) generated by inter-campus travel, especially by private automobile.
- The RBC development should minimize total VMT generated by workers commuting by private vehicles, especially from solo driving along freeway corridors.
- The RBC development should provide significant access to both regional and local transit and contribute to general improvements in local and regional transit infrastructure to offset any increase in project-related VMT.
- The RBC development should recommend affirmative ideas and effective programs to encourage dense worker housing near new RBC jobs; the proposed project should also ensure that the host city or cities have an adequately supportive certified Housing Element in their general plans.
- The RBC development should support meaningful "traffic demand management" programs such as car share and vanpooling.
- The RBC development should reduce the predominance of free employee parking by under-sizing parking facilities compared with traditional office-park standards.
- The RBC development should avoid the collateral construction of "attractor" shopping malls or similar developments that encourage more regional VMT.
- The University should comply with the CAPs that all of the potential host cities have separately been implementing. The proposed project should also incorporate the California state goals and policies intended to reduce greenhouse gases and encourage "complete communities," consistent with Senate Bill (SB) 275 and Assembly Bill (AB) 32.
- The RBC development should mesh its bicycle/pedestrian network seamlessly with the Bay Trail and other surrounding access points.
- The RBC development should provide secure, indoor bicycle storage for employees who commute by bicycle and bike-sharing facilities at convenient locations so that visitors and employees may borrow RBC bicycles for running errands, visiting nearby retail stores and restaurants, or recreating during work breaks.

4.6.2 Environmental Setting

Background

Global climate change refers to any significant change in climate measurements, such as temperature, precipitation, or wind, lasting for an extended period (i.e., decades or longer) (EPA 2008a). Climate change may result from:

- Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- Natural processes in the climate system (e.g., changes in ocean circulation, reduction in sunlight from the addition of atmospheric gases and particles from volcanic eruptions, forest fires, etc.); and
- Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, and desertification).

The primary effect of global climate change has been a rise in the average global tropospheric[26] temperature of 0.2 degree Celsius (°C) per decade, determined from meteorological measurements worldwide between 1990 and 2005. Climate change modeling using 2000 emission rates shows that further warming is likely to occur, which would induce further changes in the global climate system during the current century (IPCC 2007). Changes to the global climate system and ecosystems, and specifically the changes in California, could include:

- Declining sea ice and mountain snowpack levels, thereby increasing sea levels and sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures (IPCC 2007);
- Rising average global sea levels primarily due to thermal expansion and the melting of glaciers, ice caps, and the Greenland and Antarctic ice sheets (model-based projections of global average sea level rise at the end of the 21st century (2090–2099) range from 0.18 meter to 0.59 meter or 0.59 foot to 1.94 feet) (IPCC 2007);
- Changing weather patterns, including changes to precipitation, ocean salinity, and wind patterns, and more energetic aspects of extreme weather including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones (IPCC 2007);
- Declining Sierra snowpack levels, which account for approximately half of the surface water storage in California, by 70 percent to as much as 90 percent over the next 100 years (Cal/EPA 2006);
- Increasing the number of days conducive to tropospheric ozone formation by 25 to 85 percent (depending on the future temperature scenario) in high ozone areas in southern California and the San Joaquin Valley by the end of the 21st century (Cal/EPA 2006);
- Increasing the potential for California's coastline erosion and sea water intrusion into the Sacramento and San Joaquin Delta and associated levee systems from the rise in sea level (Cal/EPA 2006);

[26] The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth's surface from 6 to 7 miles).

- Increasing pest infestation, making California more susceptible to forest fires (Cal/EPA 2006);
- Increasing electricity demand by 1 to 3 percent by 2020 due to rising temperatures; this would result in hundreds of millions of dollars in extra expenditures (Cal/EPA 2006); and
- Summer warming projections in the first 30 years of the 21st century ranging from about 0.5 to 2 °C (0.9 to 3.6 °F) and by the last 30 years of the 21st century, from about 1.5 to 5.8 °C (2.7 to 10.5 °F) (Cal/EPA 2006).

The natural process through which heat is retained in the troposphere is called the "greenhouse effect." The greenhouse effect traps heat in the troposphere through a threefold process: (1) short-wave radiation in the form of visible light emitted by the sun is absorbed by the earth as heat; (2) long-wave radiation is re-emitted by the earth; and (3) greenhouse gases in the upper atmosphere absorb or trap the long-wave radiation and re-emit it back toward the earth and into space. This third process is the focus of current climate change actions.

Gases that absorb or trap long-wave radiation are called "greenhouse gases" because of their role in producing the greenhouse effect. While water vapor and carbon dioxide (CO_2) are the most abundant GHGs, other trace GHGs have a greater ability to absorb and re-radiate long-wave radiation. To gauge the potency of GHGs in intercepting long-wave radiation, scientists have established a Global Warming Potential (GWP) for each GHG based on its ability to absorb and re-emit long-wave radiation over a specific time period. The GWP of a gas is determined using carbon dioxide as the reference gas, with a GWP of 1 over 100 years (IPCC 1996).[27] For example, a gas with a GWP of 10 is 10 times more potent than carbon dioxide over 100 years. The use of GWP allows GHG emissions to be reported using carbon dioxide as a baseline. The sum of each GHG multiplied by its associated GWP is referred to as "carbon dioxide equivalent" (CO_2e). This essentially means that 1 metric ton of a GHG with a GWP of 10 has the same climate change impacts as 10 metric tons of carbon dioxide.

Greenhouse Gases

State law defines GHGs to include:

- Carbon Dioxide (CO_2). Anthropogenic, or human-caused carbon dioxide primarily is generated by fossil fuel combustion from stationary and mobile sources. Due to the emergence of industrial facilities and mobile sources over the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent (US EPA 2008b). Carbon dioxide is the most widely emitted GHG and is the reference gas (GWP of 1) for determining the GWP of other GHGs. In 2004, 82.8 percent of California's GHG emissions were carbon dioxide (CEC 2007).
- Methane (CH_4). Methane is emitted from biogenic sources (i.e., resulting from the activity of living organisms), incomplete combustion in forest fires, landfills, manure management, and leaks in natural gas pipelines. In the United States, the top three sources of methane are landfills, natural gas systems, and enteric fermentation (EPA n.d.[a]). Methane is the primary component of natural gas used for space and water heating, steam production, and power generation. The GWP of methane is 21.
- Nitrous Oxide (N_2O). Nitrous oxide is produced by natural and human-related sources. Primary human-related sources include agricultural soil management, animal manure

[27] All Global Warming Potentials are given as 100-year values.

management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of nitrous oxide is 310.

- Hydrofluorocarbons (HFCs). HFCs typically are used as refrigerants in both stationary refrigeration and mobile air conditioning. HFC use for cooling and foam blowing is growing, particularly as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) use is phasing out. The GWP of HFCs ranges from 140 for HFC-152a to 6,300 for HFC-236fa.
- Perfluorocarbons (PFCs). Perfluorocarbons are compounds consisting of carbon and fluorine. They are primarily an aluminum production and semiconductor manufacturing byproduct. PFCs are potent GHGs with a GWP several thousand times that of carbon dioxide, depending on the specific PFC. Another area of concern regarding PFCs is their long atmospheric lifetime (up to 50,000 years) (Energy Information Administration 2007). The GWPs of PFCs range from 5,700 to 11,900.
- Sulfur Hexafluoride (SF_6). Sulfur hexafluoride is a colorless, odorless, nontoxic, nonflammable gas. It is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity. Sulfur hexafluoride is the most potent GHG that has been evaluated by the United Nations Intergovernmental Panel on Climate Change (IPCC) with a GWP of 23,900. However, its global warming contribution is not as high as the GWP would indicate due to its low mixing ratio, as compared to carbon dioxide (4 parts per trillion in 1990 versus 365 ppm of CO_2) (EPA n.d.[b]).

Contributions to Greenhouse Gas Emissions

Global

Worldwide anthropogenic (man-made) GHG emissions are tracked for industrialized nations (referred to as Annex I) and developing nations (referred to as Non-Annex I). Man-made GHG emissions for Annex I nations are available through 2007. Man-made GHG emissions for Non-Annex I nations are available through 2005. The sum of these emissions totaled approximately 42,133 million metric tons of CO_2e ($MMTCO_2e$).[28] Global emissions inventory data are not all from the same year and may vary depending on the source of the emissions inventory data.[29] The top five countries and the European Union accounted for approximately 55 percent of the total global GHG emissions according to the most recently available data.

United States

The United States was the number two producer of global GHG emissions as of 2007, the most current year of IPCC Assessment reporting. The primary GHG emitted by human activities in the United States was CO_2, representing approximately 84 percent of total GHG emissions (EPA 2008a). Carbon dioxide from fossil fuel combustion, the largest source of GHG emissions, accounted for approximately 80 percent of US GHG emissions (EPA 2008a).

[28] The CO_2 equivalent emissions commonly are expressed as "million metric tons of carbon dioxide equivalent ($MMTCO_2e$)." The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP, such that $MMTCO_2e$ = [million metric tons of a GHG] x [GWP of the GHG]. For example, the GWP for methane is 21. This means that the emission of one million metric tons of methane is equivalent to the emission of 21 million metric tons of CO_2.

[29] The global emissions are the sum of Annex I and non-Annex I countries, without counting land use, land-use change and forestry (LULUCF). For countries without 2005 data, the UNFCCC data for the most recent year were used. United Nations Framework Convention on Climate Change, "Annex I Parties – GHG total without LULUCF," http://unfccc.int/ghg_emissions_data/ghg_data_from_unfccc/time_series_annex_i/ items/3841.php and "Flexible GHG Data Queries" with selections for total GHG emissions excluding LULUCF/LUCF, all years, and non-Annex I countries, http://unfccc.int/di/FlexibleQueries/Event.do?event= showProjection. n.d.

State of California

ARB compiles GHG inventories for the State of California. Based on the 2008 GHG inventory data (i.e., the latest year for which data are available), California emitted 474 $MMTCO_2e$ including emissions from imported electrical power in 2008 (ARB 2010). Based on the ARB inventory data and GHG inventories compiled by the World Resources Institute, California's total statewide GHG emissions rank second in the United States (Texas is number one) with emissions of 417 $MMTCO_2e$ excluding emissions related to imported power (ARB 2010). The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and other sources, including commercial and residential activities.

Between 1990 and 2008, the population of California grew by approximately 7.3 million (from 29.8 to 37.9 million) (US Census 2009). This represents an increase of approximately 27.2 percent from 1990 population levels. In addition, the California economy, measured as gross state product, grew from $788 billion in 1990 to $1.8 trillion in 2008 representing an increase of approximately 128 percent (more than twice the 1990 gross state product) (California Department of Finance 2009). Despite the population and economic growth, California's net GHG emissions grew only by approximately 11 percent. The California Energy Commission (CEC) attributes the slow rate of growth to the success of California's renewable energy programs and its commitment to clean air and clean energy (CEC 2006a).

4.6.3 Regulatory Considerations

Federal

In *Massachusetts vs. EPA*, the Supreme Court held that the EPA has the statutory authority under Section 202 of the CAA to regulate GHGs from new motor vehicles. The court did not hold that the EPA was required to regulate GHG emissions; however, it indicated that the agency must decide whether GHGs from motor vehicles cause or contribute to air pollution that is reasonably anticipated to endanger public health or welfare. Upon the final decision, the President signed Executive Order 13432 on May 14, 2007, directing the EPA, along with the Departments of Transportation, Energy, and Agriculture, to initiate a regulatory process that responds to the Supreme Court's decision.

In December 2007, the President signed the Energy Independence and Security Act of 2007, which sets a mandatory Renewable Fuel Standard requiring fuel producers to use at least 36 billion gallons of biofuel in 2022. The Act also sets a national fuel economy standard of 35 miles per gallon by 2020. The Act contains provisions for energy efficiency in lighting and appliances and for green building technology implementation in federal buildings. On July 11, 2008, the EPA issued an Advanced Notice of Proposed Rulemaking on regulating GHGs under the CAA. The Advanced Notice of Proposed Rulemaking reviews the various CAA provisions that may be applicable to the regulation of GHGs and presents potential regulatory approaches and technologies for reducing GHG emissions. On April 10, 2009, the EPA published the Proposed Mandatory Greenhouse Gas Reporting Rule in the *Federal Register* (EPA 2009). The rule was adopted on September 22, 2009 and covers the approximately 10,000 facilities nationwide that account for 85 percent of US GHG emissions.

On September 15, 2009, the EPA and the Department of Transportation's (DOT) National Highway Traffic Safety Administration jointly established a national program that set new standards to reduce GHG emissions and improve fuel economy; these standards apply to model year 2012 through 2016 light-duty vehicles. The proposed standards would be phased in and would require passenger cars and light-duty trucks to comply with a declining emissions standard. In 2012, passenger cars and light-duty trucks had to meet an average standard of 295 grams of

CO_2 per mile and 30.1 miles per gallon. By 2016, the vehicles would have to meet an average standard of 250 grams of CO_2 per mile and 35.5 miles per gallon.[30] These standards were formally adopted by the EPA and DOT on April 1, 2010.

On October 5, 2009, the President signed Executive Order 13514 that provides a strategy for sustainability and greenhouse gas reductions for federal agencies. The Executive Order has a number of requirements for agencies to achieve, including:

- Setting a GHG emissions reduction target to be achieved by 2020,
- 50 percent recycling and waste diversion by 2015,
- Drafting a sustainability plan,
- Reporting GHG emissions, and
- 30 percent reduction in petroleum consumption in agency fleets by 2020.

On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHGs under section 202(a) of the CAA:

- **Endangerment Finding:** The Administrator finds that the current and projected concentrations of the six key well-mixed GHGs (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The Administrator finds that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

While these findings do not impose additional requirements on industry or other entities, this action was a prerequisite to finalizing the EPA and DOT jointly proposed GHG emissions standards for light-duty vehicles. On April 1, 2010, the EPA and National Highway Traffic Safety Administration issued final rules requiring that by the 2016 model-year, manufacturers must achieve a combined average vehicle emission level of 250 grams of CO_2 per mile, which is equivalent to 35.5 miles per gallon as measured by EPA standards. These agencies are currently in the process of developing similar regulations for the 2017-2025 model years.

State

Title 24 Building Standards Code

The California Energy Commission first adopted Energy Efficiency Standards for Residential and Nonresidential Buildings (California Code of Regulations, Title 24, Part 6) in 1978 in response to a legislative mandate to reduce statewide energy consumption. Although not originally intended to reduce GHG emissions, increased energy efficiency and reduced electricity, natural gas, and other fuels consumption would result in fewer GHG emissions from buildings subject to the standards. The standards are updated periodically to allow for the consideration and inclusion of new energy efficiency technologies and methods. The latest revisions were adopted in 2008 and became effective on January 1, 2010.

[30] The CO_2 emission standards and fuel economy standards stated are based on EPA formulas.

Part 11 of the Title 24 Building Standards Code is referred to as the California Green Building Standards Code (CALGreen Code). The purpose of the CALGreen Code is to "improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of building concepts having a positive environmental impact and encouraging sustainable construction practices in these categories: (1) planning and design, (2) energy efficiency, (3) water efficiency and conservation, (4) material conservation and resource efficiency, and (5) environmental air quality (California Building Standards Commission 2009). The CALGreen Code is not intended to substitute for or be identified as meeting the certification requirements of any green building program that is not established and adopted by the California Building Standards Commission (CBSC). The CBSC released a *2010 Draft California Green Building Standards Code* on its website (California Building Standards Commission 2010). The update to Part 11 of the Title 24 Building Standards Code became effective on January 1, 2011. Unless otherwise noted in the regulation, all newly constructed buildings in California are subject to the requirements of the CALGreen Code.

Assembly Bill 1493

In response to the transportation sector's contribution of more than half of California's CO_2 emissions, AB 1493 was enacted on July 22, 2002. AB 1493 requires ARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles whose primary use is noncommercial personal transportation. ARB adopted the standards in September 2004. The new standards will be phased in during the 2009–2016 model years. When fully phased in, the near term (2009–2012) standards will result in a reduction of about 22 percent in GHG emissions compared to the emissions from the 2002 fleet, while the midterm (2013–2016) standards will result in a reduction of about 30 percent.

Before these regulations may go into effect, the EPA must grant California a waiver under the federal CAA that ordinarily preempts state regulation of motor vehicle emission standards. On June 30, 2009, the EPA formally approved California's waiver request. In light of the September 15, 2009 announcement by the EPA and National Highway Traffic Safety Administration regarding the national program to reduce vehicle GHG emissions, California—and states adopting California emissions standards—have agreed to defer to the proposed national standard through model year 2016 if granted a waiver by the EPA. The 2016 endpoint of the two standards is similar, although the national standard ramps up slightly more slowly than required under the California standards. The Pavley standards require additional reductions in CO_2 emissions beyond 2016 (referred to as Phase II standards). While the Phase II standards have yet to be fully developed, ARB has made it clear that the state intends to pursue additional reductions from motor vehicles in the 2017 through 2020 timeframe under the California Global Warming Solutions Act of 2006 or AB 32, discussed in detail below.

Executive Order S-3-05 and the Climate Action Team

In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established these targets: GHG emissions should be reduced to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The Secretary of the California Environmental Protection Agency (Cal/EPA) is required to coordinate efforts of various agencies to collectively and efficiently reduce GHGs. Some of the agency representatives involved in the GHG reduction plan include the Secretary of the Business, Transportation and Housing Agency; the Secretary of the Department of Food and Agriculture; the Secretary of the Resources Agency; the Chairperson of ARB; the Chairperson of the CEC; and the President of the Public Utilities Commission.

Representatives from each of the aforementioned agencies comprise the Climate Action Team. The Cal/EPA secretary is required to submit a biannual progress report from the Climate Action

Team to the governor and state legislature disclosing the progress made toward GHG emission reduction targets. Another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, coastline, and forests, and reporting possible mitigation and adaptation plans to combat these impacts. Some strategies currently being implemented by state agencies include ARB's vehicle climate change standards and diesel anti-idling measures, the CEC's building and appliance efficiency standards, and Cal/EPA's green building initiative. The Climate Action Team also recommends future emission reduction strategies, such as using only low-GWP refrigerants in new vehicles, developing ethanol as an alternative fuel, reforestation, solar power initiatives for homes and businesses, and investor-owned utility energy efficiency programs. According to the report, implementation of current and future emission reduction strategies has the potential to achieve the goals in Executive Order S-3-05.

Assembly Bill 32

In furtherance of the goals established in Executive Order S-3-05, the legislature enacted AB 32, the California Global Warming Solutions Act of 2006 that Governor Schwarzenegger signed on September 27, 2006. AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries with penalties for noncompliance. AB 32 requires the state to undertake several actions; the major requirements are discussed below.

ARB Early Action Measures. ARB is responsible for carrying out and developing the programs and requirements necessary to achieve the goal of AB 32—the reduction of California's GHG emissions to 1990 levels by 2020. The first action under AB 32 resulted in ARB's adoption of a report listing three specific early-action greenhouse gas emission reduction measures on June 21, 2007. On October 25, 2007, ARB approved six additional early-action GHG reduction measures under AB 32. ARB has adopted regulations for all early action measures. The early-action measures are divided into three categories:

- Group 1 – GHG rules for immediate adoption and implementation
- Group 2 – Several additional GHG measures under development
- Group 3 – Air pollution controls with potential climate co-benefits

The original three adopted early-action regulations meeting the narrow legal definition of "discrete early-action GHG reduction measures" include:

- A low-carbon fuel standard to reduce the "carbon intensity" of California fuels;
- Reduction of refrigerant losses from motor vehicle air conditioning system maintenance to restrict the sale of "do-it-yourself" automotive refrigerants; and
- Increased methane capture from landfills to require broader use of state-of-the-art methane capture technologies.

The six additional early-action regulations adopted on October 25, 2007, also meeting the narrow legal definition of "discrete early-action GHG reduction measures," are:

- Reduction of aerodynamic drag, and thereby fuel consumption, from existing trucks and trailers through retrofit technology;
- Reduction of auxiliary engine emissions of docked ships by requiring port electrification;
- Reduction of perfluorocarbons from the semiconductor industry;

- Reduction of propellants in consumer products (e.g., aerosols, tire inflators, and dust removal products);
- The requirement that all tune-up, smog check, and oil change mechanics ensure proper tire inflation as part of overall service to maintain fuel efficiency; and
- Restriction on the use of sulfur hexafluoride from non-electricity sectors if viable alternatives are available.

State of California Greenhouse Gas Inventory and 2020 Limit. As required under AB 32, on December 6, 2007, ARB approved the 1990 greenhouse gas emissions inventory, thereby establishing the emissions limit for 2020. The 2020 emissions limit was set at 427 $MMTCO_2e$. ARB also projected the state's 2020 GHG emissions under "business as usual" conditions—that is, emissions that would occur without any plans, policies, or regulations to reduce GHG emissions. ARB used an average of the state's GHG emissions from 2002 through 2004 and projected the 2020 levels based on population and economic forecasts. The projected net emissions totaled approximately 596 $MMTCO_2e$. Therefore, the state must reduce its 2020 "business as usual" emissions by approximately 29 percent to meet the 1990 target.

The inventory revealed that in 1990, transportation, with 35 percent of the state's total emissions, was the largest single sector, followed by industrial emissions, 24 percent; imported electricity, 14 percent; in-state electricity generation, 11 percent; residential uses, 7 percent; agriculture, 5 percent; and commercial uses, 3 percent. AB 32 does not require individual sectors to meet their individual 1990 GHG emissions levels; the total statewide emissions are required to meet the 1990 threshold by 2020.

AB 32 Climate Change Scoping Plan. AB 32 requires ARB to adopt a scoping plan indicating how reductions in significant GHG sources will be achieved through regulations, market mechanisms, and other actions. After receiving public input on their draft scoping plan, the ARB Governing Board approved the Climate Change Scoping Plan on December 11, 2008. Key elements of the Scoping Plan include these recommendations:

- Expanding and strengthening existing energy efficiency programs and building and appliance standards;
- Achieving a statewide renewable energy mix of 33 percent;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state's long-term commitment to AB 32 implementation.

Under the Scoping Plan, approximately 85 percent of the state's emissions are subject to a cap-and-trade program where covered sectors are placed under a declining emissions cap. The emissions cap incorporates a margin of safety whereas the 2020 emissions limit will still be achieved even if uncapped sectors do not fully meet their anticipated emission reductions.

Emissions reductions will be achieved through regulatory requirements and the option to reduce emissions further or purchase allowances to cover compliance obligations. It is expected that emission reduction from this cap-and-trade program will account for a large portion of the reductions required by AB 32.

Senate Bill 97 (CEQA Guidelines)

In August 2007, the legislature enacted SB 97 (Dutton) that directed the Governor's Office of Planning and Research (OPR) to develop guidelines under CEQA for the mitigation of greenhouse gas emissions. A number of actions have taken place under SB 97; they are discussed below.

OPR Climate Change Technical Advisory. On June 19, 2008, OPR issued a technical advisory as interim guidance regarding the analysis of GHG emissions in CEQA documents (OPR 2008). The advisory indicated that a project's GHG emissions, including those associated with vehicular traffic and construction activities, should be identified and estimated, and recommended that the lead agency determine significance of the impacts and impose all mitigation measures that are necessary to reduce GHG emissions to a less than significant level. The advisory did not recommend a specific significance threshold. Instead, OPR requested that ARB recommend a method for setting thresholds that lead agencies may adopt (OPR 2009).

CEQA Guideline Amendments. In its work to formulate CEQA Guideline Amendments for GHG emissions, OPR submitted the Proposed Draft CEQA Guideline Amendments for Greenhouse Gas Emissions to the Secretary for Natural Resources on April 13, 2009. The Natural Resources Agency conducted formal rulemaking procedures in 2009 and adopted the CEQA Guideline Amendments on December 30, 2009. They became effective in March 2010.

Local

Bay Area Air Quality Management District

On June 2, 2010, BAAQMD adopted updated CEQA Air Quality Guidelines. These guidelines contain GHG operational emissions significance thresholds and recommended methodologies and models for use in assessing the impacts of a project's GHG emissions on global climate change (BAAQMD 2010a). The updated CEQA Air Quality Guidelines recommend that significance thresholds for GHG emissions should be related to AB 32's GHG reduction goals or the state's strategy to achieve the 2020 GHG emissions limit, and also provide recommended mitigation measures for reducing GHG emissions from land use development projects and stationary sources.

The CBIA filed a lawsuit alleging that the District 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 on July 13, 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 GHG impacts from the BAAQMD CEQA Air Quality Guidelines are presented below in Section 4.6.4.

Local Plans and Policies

The proposed RBC site is a University property that conducts work 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 local plans and policies. However, the University seeks to cooperate with local jurisdictions. The RBC site is in the City of Richmond. The City of Richmond has adopted a resolution committing to the emissions targets in AB 32, and has adopted an Energy and Climate Change element as part of its General Plan 2030.

The applicable local plan or policy would be a greenhouse gas reduction plan or a CAP adopted or proposed by the University for the RBC. While the University plans to adopt a CAP, it has not been developed for the RBC. BAAQMD's Clean Air Plan is a multi-pollutant plan that includes GHGs but specifically states that it is not to be considered a GHG reduction plan. Therefore, consistent with BAAQMD's CEQA guidance on GHG emissions, which is designed to meet AB 32 requirements in the region, AB 32 is the applicable plan. AB 32 establishes GHG reduction goals for the state through 2020. Because the time horizon for campus development under the proposed 2014 LRDP is 2050, in addition to AB 32, other state requirements also provide the planning framework. This is discussed further in the sections below.

4.6.4 Impacts and Mitigation Measures

Standards of Significance

The impacts related to 2014 LRDP implementation GHG emissions would be considered significant if they would exceed the following significance criteria, in accordance with Appendix G of the *2013 State CEQA Guidelines*:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

Section 15064.4 of the amended *2013 State CEQA Guidelines* states that, when making a GHG emissions significance determination, a lead agency shall have discretion to determine whether to: (1) Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use; or (2) Rely on a qualitative analysis or performance based standards.

Section 15064.4 also states that a lead agency should consider these factors when assessing the significance of GHG emissions on the environment: (1) the extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting; (2) whether the project emissions exceed a significance threshold that the lead agency determines applies to the project; and (3) the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

The first Appendix G criterion may be evaluated by directly calculating the proposed project GHG emissions and comparing the emissions with the available significance thresholds. BAAQMD has operational GHG emissions significance thresholds in its CEQA Air Quality Guidelines. There are no significance thresholds for construction emissions of GHGs, although BAAQMD recommends that emissions be quantified, reported, and evaluated. BAAQMD's significance thresholds for operational-related GHG emissions are:

- Compliance with a Qualified GHG Reduction Strategy,
- Annual emissions less than 1,100 $MTCO_2e$, or

- Annual emissions of 4.6 $MTCO_2e$/service person/year (where service persons are residents plus employees).

BAAQMD has a stationary sources emissions threshold of 10,000 $MMTCO_2e$ per year. Stationary source emissions are to be assessed separately from area and mobile sources associated with a project's operation.

The BAAQMD emissions thresholds are specifically designed to bring the region into compliance with AB 32 requirements.

The 2014 LRDP has a projected full implementation date of 2050, which is beyond the final AB 32 target date. Therefore, the BAAQMD threshold of 4.6 $MTCO_2e$/service person could not be used to evaluate the emissions from full LRDP development. AB 32 mandates reduction of GHG emissions to 1990 levels by 2020, with no targets beyond that date. Executive Order S-3-05 includes the same 2020 target, and includes a 2050 target of an 80 percent reduction from 1990 levels. BAAQMD was consulted to develop a significance threshold with which the University could evaluate the GHG emissions effect of full RBC development. The BAAQMD recommended that the LRDP should show progress toward the Executive Order S-3-05 target, and that interpolation between the 2020 and 2050 targets would be an acceptable manner to develop a significance threshold to evaluate the emissions associated with the full 2014 LRDP implementation.

Using California Department of Finance projections of state population in 2050 and by reducing 1990 emissions of GHG by 80 percent, the 2050 target was estimated to be 0.81 $MTCO_2e$/service person/year. This threshold is used in this EIR to evaluate the operational GHG emissions from the full 2014 LRDP implementation. The stationary emissions threshold for 2050 would remain at 10,000 $MTCO_2e$/year per BAAQMD guidance.

The second Appendix G criterion may be evaluated by demonstrating compliance with plans, policies, or regulations adopted by local governments to control GHG emissions. According to the Natural Resources Agency:

> Provided that such plans contain specific requirements with respect to resources that are within the agency‘s jurisdiction to avoid or substantially lessen the agency‘s contributions to GHG emissions, both from its own projects and from private projects it has approved or will approve, such plans may be appropriately relied on in a cumulative impacts analysis (Natural Resources Agency 2009).

Under CEQA, "the determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data" (CEQA Section 15064). CEQA grants agencies the general authority to adopt criteria for determining whether a given impact is "significant" (California Public Resources Code Section 21082). When there is no CEQA guidance, the agency may look to and assess general compliance with comparable regulatory schemes. The BAAQMD's Clean Air Plan represents a comparable regulatory scheme, but specifically states that it is not to be considered a GHG reduction plan. As AB 32 is the basis for the BAAQMD's regulations to control GHG emissions, it is a relevant policy for this analysis. Because the LRDP full development is projected to occur well past the final target date for AB 32, Executive Order S-3-05 becomes relevant.

Based on the above, the proposed project's GHG emissions significance and its global climate impacts are assessed based on the BAAQMD's GHG significance thresholds and the interpolated

thresholds based on Executive Order S-3-05 targets. Full 2014 LRDP implementation is assessed relative to Executive Order S-3-05 and with the interpolated thresholds.

Analytical Methods

OPR in its technical advisory has recommended that GHG emissions from project-related traffic, energy consumption, water usage, and construction activities be identified and estimated, to the extent that data are available to calculate them. ARB staff has considered extensively the value of indirect emissions in a mandatory reporting program. ARB believes that indirect energy usage provides a more complete picture of a facility's emissions footprint. According to ARB, "As facilities consider changes that would affect their emissions – addition of a cogeneration unit to boost overall efficiency even as it increases direct emissions, for example – the relative impact on total (direct plus indirect) emissions by the facility should be monitored. Annually reported indirect energy usage also aids the conservation awareness of the facility …" For these reasons, ARB has proposed requiring the calculation of direct and indirect GHG emissions as part of the AB 32 reporting requirements, and the analysis in this EIR address both types of emissions (ARB 2007).

The California Air Pollution Control Officers Association (CAPCOA) stated that the information needed to characterize GHG emissions from manufacture, transport, and end-of-life of construction materials (often referred to as lifecycle emissions) would be speculative at the CEQA analysis level (CAPCOA 2008). Since accurate and reliable data do not exist for estimating project lifecycle emissions, the analysis does not assess them.

The data sources and tools used to evaluate the proposed project's operational GHG impacts include the CalEEMod and calculation algorithms supported by the sources listed above. The CalEEMod model uses the EMFAC2007 emissions factor model for on-road motor vehicle sources and the OFFROAD2007 emissions factor model for off-road equipment. Site-specific or project-specific data were used in the CalEEMod model where available. Where information was not available for the project, model default values were selected. CalEEMod calculates GHG emissions from a project based on Bay Area-specific data and assumptions, and includes corrections for future applicable regulatory requirements, such as the Low Carbon Fuel Standard, the Renewable Fuels Portfolio standards, and others.

Additional sources consulted for this analysis include data and guidance from the EPA, the US Energy Information Administration, ARB, the CEC, the California Climate Action Registry's General Reporting Protocol, and other GHG and global climate change data as referenced. Emission calculations for the proposed project are in Appendix B.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to GHG emissions include the following:

- S1 – Sustainability Policy on Decision Making: Sustainability choices will be given equal weight with other planning, programming, cost, and design factors for facilitating scientific research and facility operations.
    - Include deliberate steps during early planning, design, and construction to encourage communication and integrated design across all disciplines to identify coordinated, low-cost means to fully satisfy occupant needs with minimized resource use.
- S2 – Sustainability Policy on Living Laboratory: The RBC will be cultivated as a living laboratory, in which planning, operating practices and infrastructure, facilities performance monitoring data, and sustainability goals are leveraged to engage, apply, and strengthen research.

  - Install energy, water and other performance monitoring systems to facilitate efficient use of those resources.
  - Develop infrastructure and resources for the campus based on state-of-the-practice research in sustainability fields. Make and prioritize decisions based on scientific research and outcomes and lifecycle costing whenever possible.
- S3 – Sustainability Policy on Site Development: Embody environmental stewardship and respect the unique character of the RBC in site development.
  - Draw on the neighborhood context and prominently feature the natural assets including climate, wetlands, and proximity to the San Francisco Bay and the Bay Trail.
  - Actively promote sustainability as a core value at the campus and provide practical opportunities for innovation and education in sustainable design.
  - Manage soil contamination as a component of each construction project.
  - Control construction dust by implementing the BMPs defined in the BAQMD CEQA Guidelines.
- S4 – Sustainability Policy on Energy and Climate: Pursue energy efficiency targets and renewable energy use consistent with leading-edge best practices in mitigating climate change.
  - Develop, track, and pursue energy efficiency goals that include annual consumption and peak demand targets for all buildings and infrastructure.
  - Use building orientation and passive design strategies to minimize energy use.
  - Maximize on-site generation of renewable energy.
  - Purchase grid power from 100 percent renewable sources where available at reasonable cost.
  - Directly address the challenge of high energy use in laboratory research facilities by exploring innovative design and making use of the mild climate at the RBC site to minimize energy use.
  - Develop projections for infrastructure and resources to serve the campus that are measured relative to benchmarks from best practice scenarios.
  - Prepare a CAP to guide RBC development and operations and publically report greenhouse gas emissions using standard protocols.
- S5 – Sustainability Policy on Transparency: Operate transparently in sustainability efforts by setting targets, measuring performance, and regularly reporting results.
  - Establish a multi-stakeholder committee that periodically evaluates sustainability goals and progress made towards those goals in a transparent process.
  - Make the cost for future flexibility, redundancy, and spare capacity explicit and subject to budgeting processes.
- S6 – Sustainability Policy on Green Building: New construction projects exceeding $5 million will target certification through the US Green Building Council of LEED Gold® at a minimum.
  - In addition to the LEED Gold requirement, laboratory and data center spaces and buildings will be designed to an equivalent "Gold" level using the LBNL Environmental Performance Criteria (EPC) or equivalent rating system for each building type.

  - Buildings will be designed to comply with the UC Sustainable Practices Policy, the UC Berkeley Campus Sustainability Plan, the LBNL Policy on Sustainability Standards for New Construction, and any future sustainability policies, as applicable.
- S7 – Sustainability Policy on Reduced Total Costs: Plan and manage use of all resources to minimize lifecycle costs.
  - Implement integrated design approaches that manage first costs and minimize life cycle costs for all facility and infrastructure investments.
- S8 – Sustainability Policy on Waste Minimization: Waste minimization and diversion planning for the RBC will target 100 percent diversion of municipal solid waste to composting and recycling by 2020, while simultaneously minimizing all waste streams.
  - Take advantage of opportunities to minimize the overall amount of material handled either as compost, recycle, or landfill waste identified through ongoing evaluation of activities.
  - Apply acquisition policies to minimize waste and environmental impacts.
- S9 – Sustainability Policy on Health and Wellness: RBC development will promote health and wellness of the community, including employees, visitors, and ecosystems associated with the site.
  - The on-campus transportation system will encourage walking and bicycling between buildings on the campus, minimizing the levels of greenhouse gases produced for local travel.
  - Provide an outdoor recreation area suitable for physical exercise.
  - Provide walkways with signs interpreting the ecological value of the grassland and marsh areas.
  - Provide health-conscious food choices at on-site eating amenities.
- S10 – Sustainability Policy on Local Connections: The RBC procurement policies will embody the University's commitment to sustainability and improving the quality of life of citizens in the local communities.
  - Food and other goods and services will be sourced from local growers and vendors to the degree practicable.
  - Recognize that potable water is a shared resource that must be conserved though building design, utility and landscape approaches.

LRDP Impacts and Mitigation Measures

LRDP Impact GHG-1: Development under the 2014 LRDP would generate GHG emissions that would result in a significant impact on the environment. (*Potentially Significant; Significant and Unavoidable*)

Construction GHG Emissions

During construction, the proposed project would generate GHGs from the exhaust of construction equipment and construction workers' vehicles. The manufacture of construction materials used by the project would indirectly generate GHG emissions (upstream emission source). Upstream emissions are generated during the manufacture of construction materials (e.g., cement, steel, and materials transport). This project's upstream GHG emissions, which may include perfluorocarbons and sulfur hexafluoride, are not estimated in this impact analysis because they

are not under the University's control and the lack of data precludes their quantification without speculation.

The BAAQMD does not provide any guidance on project-level analysis of construction GHG emissions impacts. It recommends that construction GHG emissions be estimated, reported, and evaluated. While the exact construction schedule is not currently known, it is possible to estimate the maximum amount of construction that would occur during any one year and estimate emissions based on that maximum activity level. This was done using CalEEMod to estimate GHG emissions during a theoretical 12-month maximum construction activity period. Carbon dioxide emissions associated with these maximum construction activities are approximately 450 metric tons. Emissions in other LRDP development years would be less than or equal to this maximum annual total. This annual amount is too small to have a measureable effect on global climate and is well below the threshold of 1,100 $MTCO_2e$ developed by the BAAQMD for evaluating the significance of the impact from a project's operational GHG emissions. The impact from LRDP-level construction emissions would be less than significant.

Operational GHG Emissions

Campus development under the proposed LRDP would generate direct operational GHG emissions. Most of these emissions—primarily carbon dioxide, methane, and nitrous oxide—would be from fuel combustion from building heating systems and motor vehicles. Building and motor vehicle air conditioning systems may use HFCs (and HCFCs and CFCs to the extent that they have not been completely phased out at later dates); these emissions are not quantified because they would only occur through accidental leaks. It is not possible to estimate the frequency of accidental leaks without speculation. ARB drafted a proposed Regulation for Management of High Global Warming Potential Refrigerants that would reduce stationary refrigeration and air conditioning systems emissions by requiring persons subject to the rule to reclaim, recover, or recycle refrigerant and to properly repair or replace faulty refrigeration and air conditioning equipment (ARB 2009).

Non-Stationary Source Emissions. Non-stationary sources include mobile sources and area sources. Mobile sources include motor vehicles, as well as gas-powered yard tools, construction equipment, and trains. Mobile source emissions were calculated using CalEEMod, which uses emission and Bay Area-specific consumption factors to calculate GHG emissions from projects within BAAQMD's jurisdiction. For estimating GHG emissions, the proposed project was assumed to fall under the CalEEMod land use category of Research and Development. Mobile emissions were calculated using trip rates from the transportation study (Fehr & Peers 2013).

Area sources include emissions from activities such as landscaping, natural gas and electricity consumption for heating and lighting, water use and wastewater generation, and solid waste disposal. Rates of electricity and natural gas consumption, water and wastewater generation, and solid waste production were based on information provided by the University. Emissions were calculated using emission factors from CalEEMod, with the exception of electricity that was calculated using emission factors reported by PG&E,[31] the local utility.

Stationary Source Emissions. Stationary sources associated with the proposed project include boilers and emergency generators. Boilers emissions were calculated using estimated fuel consumption rates provided by the University in combination with emission factors found in the

[31] It is possible that the University would obtain electricity from other energy providers that may include a higher proportion of renewable energy in their power mix than PG&E. Therefore the use of PG&E emission factors provides a conservative estimate of emissions.

Code of Federal Regulations (40 CFR Part 98 Subparts A and C). Emergency generators emissions were calculated using fuel consumption rates found in AP-42 (the EPA's compilation of air pollution emission factors), an assumed carbon content for diesel fuel of 87 percent, and the assumption that 100 percent of the carbon content becomes carbon dioxide during combustion.

Summary of Emissions. Table 4.6-1 summarizes total net estimated GHG emissions per year at full 2014 LRDP implementation and compares the resulting emission rate to the significance threshold based on Executive Order S-3-05. The service person figure for this analysis was assumed to be 10,000 persons.

Table 4.6-1
Estimated Operational GHG Emissions – LRDP

GHG Emissions Source	Emissions (metric tons CO_2e/year)
Total Non-Stationary Source Emissions	**44,723**
Total Operational GHG Emissions per Service Person	**4.5**
Threshold based on EO S-3-05	**0.8**
Exceeds Threshold?	Yes
Total Stationary Source Emissions	**31,880**
BAAQMD Threshold	**10,000**
Exceeds Threshold?	Yes

Source: Golder Associates 2013. Emissions calculations are provided in Appendix B.

As shown in Table 4.6-1, the proposed project's operational emissions would exceed the stationary and non-stationary source thresholds. The impact of GHG emissions from stationary and non-stationary sources would be significant. For stationary sources, the primary source of emissions is the boilers that are used for heating. For non-stationary sources, the emissions are relatively evenly split between electricity use and vehicle travel.

UC Berkeley has adopted the 2009 CAP plan to reduce GHG emissions and the 2009 Sustainability Plan to reduce overall resource use on the UC Berkeley campus. LBNL has also developed a Sustainability Plan to minimize its impact on the environment. CAPs provide a framework for reducing site-wide facility or campus emissions. That is, while each individual project on a campus may not meet AB 32 or Executive Order S-3-05 targets, the CAP's facility-wide programs help the facility meet its aggregate emissions targets. The 2014 LRDP includes policies to develop a CAP for the RBC, minimize energy and water use, and minimize waste. The CAP has not been developed yet, and its effectiveness to reduce the impact of the proposed LRDP cannot be evaluated.

Implementing LRDP MM GHG-1 would reduce this impact. However, it is uncertain if the Executive Order S-3-05 targets would be achieved. Therefore conservatively, the impact is determined to be significant and avoidable.

LRDP MM GHG-1: One or more CAPs would be developed and implemented for the RBC. The CAP would include target emission rates per service person that are consistent with AB 32 and Executive Order S-3-05 emissions targets. The CAP would also implement specific control measures and programs to achieve these targets. These control

measures and programs would be developed specifically for each project based on its siting and design needs, but they would at minimum address these general topics:

- Energy Efficiency: minimize energy consumption to the extent possible through measures such as design guidelines for new buildings that require specific levels of energy efficiency, incentive programs for employees or departments to reduce energy use, programs to track energy use and discover opportunities to reduce waste, and landscaping or other features that provide shade or otherwise help reduce energy use.
- Renewable Energy Generation: investigate and develop opportunities for renewable energy generation on campus, whether solar, wind, or other sources.
- Vehicle Trip Minimization: encourage the use of carpools, shuttles, bicycles, or public transportation that provide resources for employees to access and use alternative transportation, and provide infrastructure that allows employees to interact or conduct meetings and business without traveling.
- Renewable Fuel Vehicles: encourage or require the use of renewable fuel vehicles such as by providing electric vehicle charging and compressed natural gas fueling stations, purchasing renewable fuel vehicles for the campus fleet, and providing preferential parking or other incentives for drivers using renewable fuel or hybrid vehicles.
- Waste Reduction: implement waste reduction, aggressive recycling goals with incentives, composting systems for general buildings and dining areas, guidelines for low waste construction and purchasing, and educational programs.

LRDP Impact GHG-2: Development under the 2014 LRDP would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. (*Potentially Significant; Significant and Unavoidable*)

AB 32 and Executive Order S-3-05 are the basis for GHG emissions reductions in California. Local agencies such as BAAQMD base their planning and regulations on the AB 32 requirements, including a reduction of GHG emissions to 1990 rates by 2020. BAAQMD adopted its GHG significance thresholds specifically to meet AB 32 requirements in its jurisdiction, and so projects meeting those thresholds can be assumed to meet the requirements of AB 32. Projects that exceed the timeline in AB 32 that ends in 2020 will be expected to comply with Executive Order S-3-05, which requires an 80 percent reduction from 1990 emission rates by 2050. Because the estimated rate of emissions associated with the proposed project exceeds the threshold based on Executive Order S-3-05, the proposed project would conflict with the applicable regulation and the impact is considered significant.

If emissions were reduced to levels meeting the Executive Order S-3-05 goal, an 80 percent reduction from 1990 levels by 2050, the proposed project would be in compliance with the

relevant regulation. Because there is uncertainty whether GHG reduction achieved pursuant to LRDP MM GHG-2 would be sufficient to meet the Executive Order S-3-05 goal, this impact is considered significant and unavoidable.

LRDP MM GHG-2: Implement LRDP MM GHG-1.

4.6.5 References

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4.7 HAZARDS AND HAZARDOUS MATERIALS

4.7.1 Introduction

This section discusses existing hazards and hazardous materials at the project site. It analyzes the potential for development under the proposed 2014 LRDP development to increase the use, generation, and disposal of, or exposure to hazards and hazardous materials, focusing on existing site conditions and anticipated future demolition, construction, and laboratory activities.

Public and agency NOP comments related to hazards and hazardous materials are summarized below:

- The EIR should include a comprehensive, independent, and transparent safety and risk analysis of the proposed actions, including for any novel aspects of new science.
- The EIR should identify and propose remedies related to known contamination.
- The EIR should discuss prevention of, and planned response to, any possible release of pollutants and biohazards into the environment if there is an accident, including earthquake, fire, and flood.

4.7.2 Environmental Setting

Historical chemical manufacturing operations at the California Cap Company and industrial operations at neighboring properties released or deposited chemicals onto the uplands, marsh, and transition areas of the RFS and the property adjacent to Regatta Boulevard. More recently, research studies at the RFS have been primarily in the field of engineering; thus, hazardous materials[32] use at the RFS has been relatively minor. As described in historical records, chemicals used at the RFS include bench-scale laboratory chemicals and radioisotopes, mercury manometers, radioisotopes for tracer studies, wood treatment chemicals, gasoline, diesel fuel, hydraulic oil, herbicides for grounds maintenance, PCBs in electrical equipment, building paint and caulking, and other miscellaneous products for housekeeping and other facilities maintenance activities (UC Berkeley 2008).

Because the RFS is an academic teaching and research facility, generally only small laboratory-scale (1 gallon or less) amounts of chemicals are used and stored at the site. Available records indicate that larger quantities were used in a few exceptional instances, but currently the only laboratory research chemicals in reportable quantities are gases, hydraulic oil, and petroleum products (UC Berkeley 2008).

Current site operations include the use of solvents, adhesives, cements, paints, cleaning agents, degreasers, and vehicle fuels. The 2013 Hazardous Materials Business Plan for the RFS lists the following chemicals in reportable quantities: acetylene, argon, asphalt, asphalt cold patch, carbon dioxide, cleaners, orange oil degreaser, gasoline, helium, hydraulic oil, hydrogen, nitrogen, oil, oxygen, paint, propane, roof sheeting, safety kleen, transmission fluid, and waste oil. The 2013 Hazardous Materials Business Plan for the RBC site property west of Regatta Boulevard lists diesel fuel being present in a 400-gallon container at this property. The May 2013 Chemical Inventory for the RFS reports less than 1,000 gallons of liquids and less than 500 pounds of solids of laboratory chemicals on hand. Wet chemistry laboratories remain in operation at Buildings

[32] Section 22501(o) of the California Health and Safety Code defines "hazardous material" as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment. Hazardous materials are commonly used in research laboratories and commercial, agricultural, and industrial applications, and in residential areas to a limited extent.

112, 478, and 484, and a number of small mechanical engineering shops with some shop chemicals are present in other buildings. Hazardous wastes are packaged, labeled, and categorized for transport to appropriately licensed off-site treatment and disposal facilities.

Existing Structures

As with the UC Berkeley main campus, many current and historical RFS research facilities used or stored hazardous chemicals. These include the earthquake engineering facilities at Buildings 420 and 421 and Buildings 102, 110, 111, 112, 113, 114, 117, 118, 121, 125, 138, 151, 158, 177, 197, 278, 280A, 280B, 450, 460, 470, 474, 478, 480, and 482 (UC Berkeley 2008). Although there are no indications that spills have occurred, few, if any, samples have been collected in these areas. While few soil samples have been collected adjacent to these buildings, a site-wide groundwater monitoring well network has been installed that did not detect any evidence of widespread contamination of the RFS.

Building 120 was used as a solvent storage shed at the time of the 1989 inspection, and approximately 20 55-gallon drums of thinner, kerosene, and various petroleum hydrocarbon products were observed in the building (UC Berkeley 2008). Spills were observed on the floor and in drip pans and these were cleaned up at the time. Empty and full unlabeled drums were observed. This building is currently used to store chemical wastes prior to off-site disposal. Approximately 20 unlabeled 55-gallon drums were stacked three-high against a wall outside the building, and most of the drums appeared to be empty (UC Berkeley 2008). Another six 55-gallon drums were found just outside Building 120 near a small area of stained soil. Several of the six drums were empty, while others contained a mixture of water and unknown product (UC Berkeley 2008).

There are potentially asbestos-containing materials in existing facilities in the form of transite walls and wall partitions, floor tiles and mastic; and in pipe and heating, ventilation, and air conditioning insulation materials. A number of surveys for asbestos-containing material have been done at the RFS. The campus maintains an active Asbestos Operations & Maintenance Program to assess suspect asbestos-containing materials that might be impacted by upcoming construction and maintenance projects, including hiring licensed third party industrial hygiene firms to conduct comprehensive surveys for planned building renovation and demolition. When some of the existing facilities were built, lead-based paint was in common use.

Aboveground Storage Tanks

Currently there are eight aboveground storage tanks (ASTs) at the RFS storing fuels for facility operations and one AST at the RBC site property, west of Regatta Boulevard storing fuel for an emergency generator.

At the RFS, three ASTs hold fluids for teaching and research laboratories. Tank A-18-1, installed in 1996 on the west side of Building 280A, is an empty 1,500-gallon double-walled SuperVault™ tank that used to contain diesel fuel. Tank A-18-3, installed in 1969 at Building 421, is a 2,000-gallon single-walled steel tank that contains hydraulic fluid for equipment in the Earthquake Engineering Research Center. Tank A-18-4, installed in 1965 at Building 484, consists of two linked tanks containing a maximum of 1,000 gallons of hydraulic fluid for equipment in the Structural Test Laboratory.

Five ASTs are used to store fuels for RFS facilities' operations. Tank A-18-2, installed in 1997 in the Corporation Yard, is a 1,500-gallon double-walled SuperVault™ tank that stores gasoline for fueling RFS maintenance vehicles. The four remaining tanks contain diesel fuel for emergency generators and a fire suppression water pump. Tank A-18-5, installed in 1982, is a 120-gallon single-walled steel tank at Building 400 that supplies fuel to the fire suppression system pressure

booster engine. Tank A-18-6, installed in 2004 in Building 400, is a 110-gallon double-walled steel belly tank attached to a diesel-powered emergency electrical generator. Tank A-18-7, installed in 2005, is a 110-gallon double-walled steel belly tank attached to a diesel-powered emergency electrical generator for Building 194. Tank A-18-8 is a 365-gallon double walled generator belly tank installed in 2012 and attached to a diesel-powered emergency electrical generator for Buildings 112 and 113.

The ASTs are all in good condition and there have been no reports of releases except for a valve seep onto soil from the hydraulic fluid piping between Buildings 421 and 484 (planned for excavation in summer 2013). During a site walk with DTSC staff on May 12, 2011, it was confirmed that there is no staining or evidence of a spill at the other AST locations.

Fifty-five-gallon drums and two potable fuel tanks (70 and 100 gallons) store petroleum products (for research and vehicle fueling and maintenance) and waste petroleum products, such as waste oil. Drums are kept in Buildings 120, 197, 280A, and 421.

The AST at the RBC site property west of Regatta Boulevard is a 400-gallon double-walled steel belly tank attached to a diesel-powered emergency electrical generator that provides emergency power to the cooling system of the Film Archive.

Underground Storage Tanks

Currently, no known underground storage tanks (USTs) are at the RFS. Five USTs were removed between 1986 and 1997. No known leaks or releases were associated with these tanks (UC Berkeley 2008).

Polychlorinated Biphenyls Transformers

Current RFS electrical power distribution equipment contains only non-PCB dielectric fluids. Historically, most transformers were originally mounted to utility poles and they were later replaced with ground-level transformers on pads. Records showed that all PCB-containing electrical distribution system transformers were either removed for off-site disposal or retrofilled on-site with non-PCB oils in the late 1980s and early 1990s (UC Berkeley 2008). During this period, approximately 40 pieces of electrical equipment (mostly capacitors and some transformers) were temporarily placed on a concrete pad in the northern portion of Building 280B, as part of a campus-wide cleanout of PCB items. There are no records indicating that spills of PCB oils ever occurred, and former employees did not recall any leaks or spills associated with the transformers at the RBC (UC Berkeley 2008). PCBs have been detected in the soil at a number of locations that require cleanup, as discussed in Section 3.10 (Tetra Tech 2013).

Radiological Materials

Radiological materials have been used in certain types of research at the RFS since the 1950s. Meter readings were taken and building interior surfaces were wipe-surveyed as part of the routine radiation safety inspections conducted for decades, with no evidence of radiological contamination identified (UC Berkeley 2008).

Records also show two locations where radionuclides were used in tracer experiments in the outdoor environment. In one study, short-lived radionuclides were used in areas secured with four-foot-high “antipersonnel” fences to research nutrient uptake in isopods. In another location, UC Berkeley developed a research project in the early 1950s for deep-well injection and contaminant transport as part of a State of California-funded program. Following completion of studies in 1953, some or all of these wells were used in studies in the 1950s and 1960s to evaluate groundwater transport. These studies used primarily short-lived radionuclide tracers, such as cesium (Cs-134), iodine (I-131), and strontium (Sr-89); however, small amounts of

several long-lived radionuclides (strontium (Sr-90), cesium (Cs-137), tritium (H3), and carbon (C-14)) were also used.

No radiological spills outside of buildings have been reported. Records indicate that well purge water with residual radioactive tracer compounds from the Research Well Field was discharged to San Francisco Bay through the storm drain system of ditches and pipes. Also, a former UC employee reported in 2005 that he witnessed drums of rocks he was told were radioactive buried in trenches in the bulb portion of the transition area (in the Natural Open Space). Meter surveys and soil sample analyses have not detected radiological content above background, but in 2006, a magnetometer survey by DTSC found an anomaly in one area indicating ferrous metal beneath the surface.

Currently, there are two Radiation Use Authorizations for UC Berkeley activities-- one for radiation-producing machines and one for radioactive sources; the number of Radiation Use Authorizations can change regularly depending on current research needs.

Soil and Groundwater Contamination

Soil and Groundwater Investigations

Investigations between 1981 and 2008 involved collection of soil and groundwater samples in a variety of locations in the RFS. Soil samples were generally analyzed for metals, PCBs, polycyclic aromatic hydrocarbon (PAH), semivolatile organic compounds, or pesticides. The investigations prior to 2010 focused on potential source areas and identified areas requiring further investigation. The data collected during these investigations is summarized in the Current Conditions Report (Tetra Tech 2008) and Site Characterization Report (Tetra Tech 2013).

Significant soil and groundwater sampling has been done through the oversight of DTSC through the Field Sampling Workplan (FSW) that was prepared by UC Berkeley and approved by DTSC in 2008. This section summarizes FSW Phases I, II, and III investigation activities and sampling results from 2010 through 2012.

The FSW addresses data gaps identified in the Current Conditions Report that warranted additional characterization or evaluation at the RFS. The purpose of the FSW investigation was to close previously identified data gaps and to identify any immediate or potential risks to public health and the environment. The results are briefly summarized below and are described in detail in the Site Characterization Report (Tetra Tech 2013), which was recently submitted to and approved by the DTSC in connection with a proposed RAW for developable portions of the RBC within the RFS.

Chemicals of Concern

The results of the historical and FSW investigations indicate that there are elevated concentrations of certain metals, PAHs, and PCBs. Other potential contaminants more limited in soils include dioxins, total petroleum hydrocarbon (TPH), and VOCs. For this discussion, “elevated” concentrations in soil refers to soil concentrations above the screening criteria used in the Site Characterization Report. Two VOCs in groundwater (TCE and carbon tetrachloride) have been detected above the calculated human health vapor intrusion criteria for future commercial workers.

Metals. Arsenic concentrations above background levels in soil are the result of historical placement of pyrite cinders as fill material. Arsenic is commonly associated with iron sulfides, such as those used in production of sulfuric acid at the former Stauffer production areas. In addition, it is found in related sulfide minerals, including arsenopyrite and chalcopyrite.

Potential sources of lead include (1) emissions from automobiles and fuels such as those associated with the adjacent I-580 freeway, (2) as a component of metals used in manufacturing ammunition shells and blasting caps, (3) pyrite cinder used as fill, and (4) lead-based paint from former or existing buildings. Some elevated concentrations of lead are found in isolated areas of RFS soils, perhaps attributable to the "nugget effect" that can occur when lead-based paint chips enter the soil.

Mercury is present at elevated concentrations in RFS soils primarily due to historical activities associated with manufacturing explosives. The former California Cap Company historically used elemental or liquid mercury in the Mercury Fulminate Area (MFA). This form of mercury can volatilize into the atmosphere from soil, sediment, or water. Drawings of the mercury fulminate production plant show an open structure (presumably for ventilation) and air stack that could have contributed to aerial deposition of mercury in the areas surrounding the mercury fulminate plant in the central meadow. Drawings also identify storage tank rinsate areas in the MFA. Additionally, movement of the blasting caps around the facility via the tram system could have tracked mercury away from the mercury fulminate plant.

PAHs. PAHs at the RFS are likely a result of burning carbon-containing compounds (including at the former waste incinerator near Building 120 and the former Field Laboratory), aerial emissions from surrounding industrial facilities, and gasoline and diesel exhaust from regional roadways and railyards. An assessment of the soil data, mostly in the Corporation Yard, indicates that concentrations of PAHs decrease with depth; where PAHs are present, concentrations of PAHs are elevated above screening criteria in surface soils (0 to 0.5 foot below ground surface (bgs)), but are typically less than screening criteria at deeper depths (2 to 2.5 feet bgs), and are not detectable below 2 to 2.5 feet bgs.

PCBs. Aroclors-1248, -1254, and -1260 are commonly found at the RFS and are likely associated with hydraulic fluids and di-electrical fluids in capacitors and transformers, or with one of the many uses of PCBs allowed until 1977, including heat transfer fluids for gas turbines, hydraulic fluids for vacuum pumps, fire retardants, and plasticizers in adhesives, textiles, surface coatings, sealants, printing, and carbonless copy paper (Lloyd and others 1975). Typically, a release of PCBs to surface soils from a spill would have migrated little from its original release point, as PCBs adsorb strongly to soil. This model is supported by the sampling data obtained during the FSW Phase II investigation, which sampled near former PCB-containing transformers. Where PCB contamination was detected, elevated concentrations of PCBs were limited to a small area, both horizontally and vertically, confirmed through step-out sampling.

PCBs have also been detected at low concentrations (below screening criteria) in surficial soils in the RFS, most of which may not be attributed to a spill but possibly to aerial deposition from surrounding industrial facilities, including the PG&E facility northwest of the property.

Dioxins. Dioxins in the environment are the result of burning chlorine-based chemical compounds with hydrocarbons, such as stack emissions from the incineration of municipal refuse and certain chemical wastes or exhaust from automobiles powered by leaded gasoline. The former waste incinerator at Building 120 may be a potential historical source of dioxins; soil samples collected for dioxin analysis near the former incinerator location indicate that dioxin concentrations in that area exceed commercial screening values in surficial soil, but concentrations decrease as sample depth increases.

VOCs. Although RFS soils have not been found to contain concentrations of VOCs exceeding screening criteria, groundwater results indicate that TCE, TCE-related chlorinated hydrocarbons, and carbon tetrachloride exceed groundwater screening criteria.

Groundwater impacted with elevated levels of TCE and TCE-related chlorinated hydrocarbons exceeding California and federal maximum contaminant levels has migrated onto the RFS from the adjacent former Zeneca site. UC concluded that the source of TCE and related chlorinated hydrocarbons in groundwater at the RFS is legacy industrial activities at the former Zeneca site, based on (1) the measured groundwater gradient from the former Zeneca site to the RFS, (2) known historical TCE sources and groundwater contamination at the upgradient former Zeneca site, and (3) lack of measured or identified TCE sources within the RFS property. The remedy for contaminants in groundwater originating from the former Zeneca Site, including TCE and its breakdown components, is subject to the former Zeneca Site Investigation and Remediation Order (IS/E-RAO 06/07-005) issued by DTSC.

Carbon tetrachloride was detected at one location in the coastal-terrace prairie at concentrations exceeding the commercial vapor intrusion screening criteria and California maximum contaminant levels during the FSW Phase I investigation. Carbon tetrachloride has also been detected at some locations downgradient of this location at concentrations exceeding the California maximum contaminant level. No source of carbon tetrachloride has been identified in the immediate area or upgradient of the locations where it was detected.

TPH. Low concentrations of TPH compounds in soil may originate from small diesel spills from equipment, from ASTs or former USTs, from incomplete combustion of petroleum from nearby automobiles and industrial uses, or as a carrier in herbicides. No evidence of spills was observed at any of the ASTs still in place, and all USTs have been removed and administratively closed. Soil sample results indicate that the Earthquake Engineering hydraulic lines at Building 484 have leaked, and soil excavation in this area is proposed to be completed as a maintenance activity. TPH contamination may be present near and around the Earthquake Engineering hydraulic lines.

Explosives. Between the late 1800s and 1948, the California Cap Company and other smaller companies manufactured blasting caps, ammunition shells, and explosives on the RFS property. The chief constituent of the explosive used by the California Cap Company was a nitrocellulose (guncotton) base called “tonite,” the manufacturing of which included the production of mercury fulminate. Documentation indicates that nitrocellulose and mercury fulminate were the primary explosives used in these manufacturing operations; however, other explosives such as octogen (HMX), cyclotrimethylenetrinitramine (RDX), or 2,4,6-trinitrotoluene (TNT) may have been employed. Historical documents indicate that explosives were tested and stored in the north-central portion of the RFS property. Soil data indicates that HMX may have been used, as it was detected at a low level in one soil sample collected near the former explosives storage area at a concentration of 0.37 milligrams per kilogram, five orders of magnitude below the commercial screening criteria.

4.7.3 Regulatory Considerations

The RBC site is subject to environmental, health, and safety regulations applicable to proposed site activities, including the transportation, use, management, and disposal of hazardous materials and wastes. This section provides an overview of the regulatory setting.

State and Federal

Among primary federal agencies with regulatory responsibility for environment, health, and safety management are EPA, US Department of Labor, Occupational Safety and Health Administration (OSHA), DOT, and DOE. Federal laws, regulations, and responsible agencies relevant to the proposed RBC are discussed in detail in this section. In many cases, California state law mirrors or is more restrictive than federal law, and enforcement of these laws has been delegated to the state or a local agency. All demolition activities involving possible radiological contamination would be coordinated with the California Department of Public Health in order to

assure proper management of any possible radiological contamination. In January 1996, the California Environmental Protection Agency adopted regulations implementing a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The program has six elements: hazardous waste generators and hazardous waste on-site treatment, underground storage tanks, aboveground storage tanks, hazardous materials release response plans and inventories, risk management and prevention programs, and Unified Fire Code hazardous materials management plans and inventories. The local agency responsible for implementing the Unified Program is called the Certified Unified Program Agency. Because the RBC site is in the city limits of the City of Richmond, the City of Richmond is the designated Certified Unified Program Agency.

Hazardous Materials Management

Federal and state laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and if they are accidentally released, to prevent or to mitigate injury to public health or the environment. These laws require hazardous materials users to prepare written plans detailing the types and quantities of hazardous materials used on site and addressing emergency response and training procedures. The City of Richmond, through its Certified Unified Program Agency program, requires any business that handles hazardous materials above certain thresholds to prepare a Hazardous Materials Business Plan. At the proposed RBC site, UC Berkeley voluntarily complies with these state requirements as implemented by the City of Richmond. LBNL also maintains a Hazardous Materials Business Plan for LBNL facilities and operations.

Hazardous Waste Handling

Under the federal Resource Conservation and Recovery Act of 1976 (RCRA), the EPA regulates the generation, treatment, and disposal of hazardous waste, and the investigation and remediation of hazardous waste sites. Individual states may apply to the EPA to be authorized to implement their own hazardous waste programs in lieu of RCRA, if the state program is at least as stringent as federal RCRA requirements. The EPA authorized California to implement its own hazardous waste program, with certain exceptions. In California, DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste and the investigation and remediation of hazardous waste sites. The DTSC program incorporates the provisions of federal and state hazardous waste laws (LBNL 2007). In California, oversight of waste management practices at hazardous waste generator sites is generally provided by Certified Unified Program Agencies.

Hazardous Materials Transportation

The DOT regulates the transportation of hazardous materials between states. The State of California has adopted DOT regulations for the intrastate movement of hazardous materials and regulates the transportation of hazardous waste originating in the state and passing out of the state. The two state agencies that have primary responsibility for enforcing federal and state regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol and the California Department of Transportation (Caltrans). The California Highway Patrol enforces hazardous material and hazardous waste labeling and packing regulations to prevent leakage and spills in transit and to provide detailed information to cleanup crews if there is an accident. The California Highway Patrol regularly inspects licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill identification teams at as many as 72 locations throughout the state that can respond quickly if there is a spill (LBNL 2007).

At the proposed RBC site, DOE Order 460.1B ("Packaging and Transportation Safety") would also apply to LBNL activities, as this Order establishes the safety requirements for the proper

packaging and transportation of DOE offsite shipments and onsite transfers of hazardous materials.

Department of Toxic Substances Control

Pursuant to Section 102 of CERCLA, 42 U.S.C, Section 9602, and California Health and Safety Code (HSC) Section 25316, DTSC provides the oversight of "hazardous substances" as listed in 40 CFR Section 302.4. DTSC has issued a Site Investigation and Remedial Action Order (Order) as a result of hazardous substances identified at the RFS property.

The HSC provides jurisdiction to DTSC regarding the oversight and enforcement of the DTSC Order for the RFS. The Order is issued pursuant to its authority under HSC Sections 25358.3(a), 25355.5(a)(1)(B), 58009, and 58010.

- HSC Section 25358.3(a) authorizes DTSC to take various actions, including issuance of the Order, upon DTSC's making certain determination of a release or a threatened release of a hazardous substance.
- HSC Section 25355.5(a)(1)(B) authorizes DTSC to issue an order establishing a schedule for removing or remedying a release of a hazardous substance at a site, or for correcting the conditions that threaten the release of a hazardous substance. The order may include but is not limited to requiring specific dates by which the nature and extent of a release shall be determined and the site adequately characterized, a remedial or removal action plan prepared and submitted to DTSC for approval, and a removal or remedial action completed.
- HSC Section 58009 authorizes DTSC to commence and maintain all proper and necessary actions and proceedings to enforce its rules and regulations; to enjoin and abate nuisances related to matters within its jurisdiction that are dangerous to health; to compel the performance of any act specifically enjoined upon any person, officer, or board, by any law of California relating to the matters within its jurisdiction; or on matters within its jurisdiction, to protect and preserve the public health.
- HSC Section 58010 authorizes DTSC to abate public nuisances related to matters within its jurisdiction.

All response actions taken pursuant to the Order must be consistent with the requirements of HSC Chapter 6.8 and any other applicable state or federal statutes and regulations, including Title 29 CFR 1910.120 and Title 8 CCR Section 5192 health and safety regulations.

Occupational Safety

Occupational safety standards are in federal and state laws to minimize worker safety risks from physical and chemical hazards in the workplace. The federal OSHA is generally responsible for assuring worker safety in the workplace. In California, the Department of Industrial Safety (Cal/OSHA) operates an occupational worker safety and health program under an agreement with OSHA. Under that agreement, Cal/OSHA has jurisdiction in California over most public and private sector workplaces, with certain exceptions. At the proposed RBC, while Cal/OSHA would have jurisdiction over UC Berkeley non-radiological occupational safety and health, future LBNL operations would be subject to LBNL policy and DOE's jurisdiction and worker safety regulation, which includes requirements to comply with various OSHA standards.[33] LBNL also

[33] DOE's "Worker Safety and Health Program" (10 CFR 851) establishes DOE's nonradiological occupational safety and health regulation for DOE workplaces, just as OSHA and Cal/OSHA regulations do for non-DOE workplaces. This program ensures

adheres to Cal/OSHA Construction Safety Orders for subcontracted work when a Cal/OSHA standard is more stringent than federal standards. OSHA and Cal/OSHA regulations contain requirements, concerning the use of hazardous materials in the workplace and during construction, that mandate employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, emergency action and fire prevention plan preparation, and a hazard communication program. The hazard communication program regulations contain training and information requirements and require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, alarm systems, and training in emergency evacuation).

Biosafety Standards

Federal and state laws and funding agencies establish standards for working with biohazardous materials and biological materials in research. Materials are defined as being biohazardous based on the applicable biosafety standard. Biohazardous materials are generally materials, agents, or organisms that potentially present a risk to humans, animals, plants, or the environment (e.g., infectious agents, and research recombinant organisms) The U.S. Public Health Service, including the National Institutes of Health and the Centers for Disease Control and Prevention, establish standards for working with biohazardous materials. These federal guidelines address biological safety in research, including containment levels (e.g., biosafety level 1 to 4) and controls for different types of recombinant experiments and research operations such as laboratories, animals, or greenhouses. Operations at RBC will operate at the lower and more common biosafety levels (e.g., biosafety level 1 or 2). OSHA also establishes worker safety requirements for research with materials such as human blood or tissue. In addition, U.S. Department of Agriculture and California agencies set requirements to control acquisition of and prevent release of materials (e.g., soil), agents (e.g., pathogens), or organisms (e.g., transgenic plants) that may harm plants or animals such as crops or livestock. UC Berkeley and LBNL research involving biohazardous materials is conducted in compliance with these federal and state laws and guidelines and in compliance with California Department of Public Health medical waste regulations.

Radiation Safety—Ionizing Radiation and Non-Ionizing Radiation

Ionizing Radiation. Ionizing radiation is high energy particle and non-particle radiation (such as x-rays and gamma rays) emitted from radioactive sources and radiation-producing machines which is capable of imparting ionizing energy in a biological medium such as the human body. Sources of ionizing radiation are present at UC Berkeley and LBNL in research applications. UC Berkeley laboratories using radioactive materials must comply with regulations of several federal agencies, including the Nuclear Regulatory Commission. Radionuclides released to the atmosphere from LBNL research activities must adhere to EPA National Emission Standards for Hazardous Air Pollutants regulations and DOE Order 458.1, “Radiation Protection of the Public and the Environment.” EPA administers the National Emission Standards for Hazardous Air Pollutants regulations (under 40 CFR Part 61), which limit the dose to the public from airborne radionuclide emissions to 10 millirem per year. DOE has established a set of limits for radiation workers in 10 CFR Part 835. To minimize radiological impacts to the environment and the public, UC and LBNL manages its programs so that radioactive emissions and exposures are as low as reasonably achievable.

that DOE contractor workers have safe and healthful workplaces where hazards are abated, controlled, or otherwise mitigated in a manner that provides reasonable assurance that workers are protected from the hazards associated with their jobs. It establishes management responsibilities, workers’ rights, required safety and health standards, and worker training on the hazards of their jobs, and hazard controls.

Non-ionizing Radiation. Non-ionizing radiation is energy that is not created by radioactive materials and does not impart ionizing energy in a biological medium such as the body. Many sources of non-ionizing radiation are present at UC Berkeley and LBNL in research applications or in ancillary equipment. These sources include lasers, large magnets, microwave generators, and radio-frequency radiation. In general, non-ionizing radiation tends to be less hazardous to humans than ionizing radiation. However, depending on the wavelength/frequency and the irradiance (or power density) value, non-ionizing radiation sources may present a human health hazard. Most typically, the hazard, if any, is to those in the lab and not members of the public.

OSHA standards apply to non-ionizing radiation by requiring a safe and healthful workplace free of recognized serious hazards. Additionally, DOE's "Worker Safety and Health Program" (10 CFR 851) ensures that DOE contractor workers have safe and healthful workplaces where hazards are abated, controlled, or otherwise mitigated in a manner that provides reasonable assurance that workers are protected from the hazards associated with their jobs. Both UC Berkeley and LBNL have laser safety programs that include control measures, medical surveillance, and safety training. These laser safety programs are based on ANSI Z136.1 Standard for the Safe Use of Lasers.

Local

The proposed RBC would include portions of the RFS and other properties in Richmond owned or controlled and operated by the University of California. As a state entity, the University is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible.

The City of Richmond General Plan 2030 includes the following policies pertaining to hazardous materials:

- Continue to work with the appropriate local, state, and federal agencies to promote the clean-up and reuse of contaminated sites to protect human and environmental health. Work with property owners and regional agencies to prevent, reduce or eliminate soil and water contamination from industrial operations, the Port and other activities that use, produce or dispose of hazardous or toxic substances. Implement appropriate mitigation measures and clean-up of sites that are known to contain toxic materials as a condition of reuse. Support the remediation and reuse of large, disturbed sites, such as the Winehaven complex at Point Molate and the Terminal 4 site at Point San Pablo, into mixed-use centers that provide the maximum benefit to the community without compromising the integrity of the surrounding natural areas.
- Implement standards dealing with the safe management of hazardous substances in close coordination with the City Fire Department and the DTSC. The standards should require soil testing at development sites where contamination is suspected, address safe household hazardous and universal waste disposal and ensure compliance with hazardous substance regulations and safe transport of hazardous materials. Use of the latest technologies available should be considered when conducting remediation to expedite the cleansing process and do the least harm to the environment (City of Richmond 2012).

The 2030 General Plan EIR determined that the effects on hazards and hazardous materials from future development pursuant to the General Plan would be less than significant. Future development would not create a significant hazard from the routine use, storage, transportation, and disposal of hazardous materials or from the demolition or renovation of existing structures that could contain hazardous materials. Existing regulations would minimize the potential for

people to be exposed to hazardous materials at contaminated sites. No mitigation measures would be required. Cumulative impacts would also be less than significant.

Emergency response plans are maintained at the federal, state and local level for all types of disasters, including human-made and natural. UC Berkeley EH&S maintains a Dedicated Spill Response Team that consists of health and safety professionals, hazardous materials technicians, and appropriately licensed hazardous materials drivers. The team is trained to respond to most incidents and arranges for appropriate outside assistance when necessary. LBNL developed a Master Emergency Program Plan (MEPP) that establishes policies, procedures, and an organizational structure for responding to and recovering from a major disaster. The MEPP uses the Standardized Emergency Management System for managing response to multi-agency and multi-jurisdiction emergencies in California and the National Incident Management System, which is a nationwide standardized approach to incident management prescribed by Homeland Security Presidential Directive 5. The plan includes four phases of emergency management: mitigation, preparedness, response, and recovery. UC Berkeley and LBNL would coordinate with state and local authorities to develop a site-specific emergency response plan for the new facilities proposed for the RBC.

4.7.4 Impacts and Mitigation Measures

Standards of Significance

The impacts related to hazards and hazardous materials from 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:

- Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?
- Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?
- Would the project result in development that would emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?
- Would the project be on a site that is on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?
- Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

CEQA Checklist Items Adequately Addressed in the Initial Study

The analysis in the Initial Study prepared for the project and circulated with the NOP concluded that further analysis of the following issues was not required in the EIR:

- For a project within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?
- For a project near a private airstrip, would the project result in a safety hazard for people residing or working in the project area.

- Would the project expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands

The proposed RBC is not in an airport land use plan or within 2 miles of a public airport, so further analysis is not required. The proposed RBC is not near a currently operating or planned private airstrip, so further analysis is not required. The proposed RBC is not near wildlands and the risk of wildland fires is low. There are numerous open space and wetland areas, but these are not considered moderate or high-risk for wildland fires due to their limited and non-contiguous setting away from large open or natural areas that are susceptible to wildland fires. Further analysis is not required.

Analytical Methods

By convention, most hazardous materials are thought to be hazardous chemicals, but certain radioactive materials and biohazardous materials, as defined here, are also hazardous. This EIR considers hazardous materials to include hazardous chemicals, radioactive materials, and biohazardous materials that would be used at the RBC.

This analysis was prepared using information gathered from available documentation and information in the 2014 LRDP. Data regarding hazardous materials, materials of concern, and wastes that would be used and generated at the RBC were gathered by compiling available documentation such as program descriptions, monitoring reports, and the LRDP project description. Potential 2014 LRDP impacts concerning hazardous materials and materials of concern were then evaluated in light of existing programs and proposed LRDP policies intended to protect the environment from unintended consequences.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to hazards and hazardous materials include the following:

- SP1 – Safety and Preparedness Policy on Model Programs: Develop model health and safety programs for the RBC.
    - Develop comprehensive and effective physical safety, life safety, and emergency service plans to protect the environment, the public, employees, and guests at all times.
    - Ensure clear and responsible management of environment, health, and safety programs and services.
    - Implement land use controls to prohibit unsafe exposure of workers, visitors, and the surrounding community to environmental contaminants.
    - Use transparent environment, health, and safety reporting practices.

- SP2 – Safety and Preparedness Policy on Inclusion: Ensure that the RBC contributes to and serves as a resource for the Richmond community.
    - Encourage inclusion through an open, un-gated campus to advance the ideals of institutional transparency and mutual trust, with security at the building level rather than the campus level.
    - Enable community access to RBC amenities such as outdoor spaces and meeting facilities to promote a better understanding of the University's mission.

- Expand partnerships with local agencies, including fire and police departments, and local neighborhoods to promote understanding and address safety and security concerns of neighbors and the campus population (University of California 2013).

LRDP Impacts and Mitigation Measures

This section describes the potential hazardous materials impacts from development under the 2014 LRDP based on the Standards of Significance, whether they are significant or less than significant, and whether any significant impacts can be mitigated to less than significant levels.

LRDP Impact HAZ-1: **Development under the 2014 LRDP would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials. (*Less than Significant)***

Development under the 2014 LRDP would increase the amount of space at the site from 1,050,000 gsf to approximately 5,400,000 gsf. Construction would typically begin with demolition of existing facilities, followed by site clearing, soil contamination investigation and management, and excavation work. As described in Section 4.7.2, asbestos and lead-based paint are likely present in facilities that would be demolished. Before demolition, areas with contamination would have to be abated or cleaned as described below.

During demolition, any hazardous materials would be managed in accordance with UC and LBNL procedures. The University would remove, and contain, any asbestos- and lead-containing materials, a process to be overseen by asbestos-certified staff.

In general, asbestos-containing materials would be removed before the start of demolition by a licensed asbestos abatement professional (40 CFR Part 61, Subpart M).[34] BAAQMD regulates the demolition and renovation of buildings and structures that may contain asbestos, and the BAAQMD must be notified at least 10 working days before any demolition. Regulated asbestos-containing materials removed before demolition or encountered in the demolition debris would have to be segregated and packaged in sealed, leak-tight containers and properly labeled for transport and disposal in a disposal facility authorized to accept asbestos. Asbestos-containing materials can be disposed of at a solid waste management facility, such as a demolition landfill. Standard asbestos abatement and removal safety protocols include:

- Seal the area undergoing removal to prevent release of asbestos fibers to noncontaminated areas; use polyethylene film, duct tape, and negative air pressure machines with high-efficiency particulate air (HEPA) filters;
- Wear proper safety equipment, including approved respirators and disposable protective clothing;
- Use a decontamination unit before leaving the sealed area;
- Keep all asbestos-containing materials wet from removal until disposal;
- Leave large pieces of asbestos-containing material intact to avoid the creation of dust;

[34] Per 40 CFR Part 61, Subpart M, Section 61.145, asbestos-containing materials do not have to be removed from the building if: (1) it is Category I nonfriable material that is not in poor condition, is on a facility component that is encased in concrete or other similarly hard material, and is adequately wet when exposed during demolition; or (2) it is Category II nonfriable material, and the probability is low that it will become crumbled, pulverized, or reduced to powder during demolition.

- Put all friable asbestos in airtight, leak-proof containers with warning labels for transport to approved asbestos disposal facilities;
- Use only a HEPA-filtered vacuum cleaner designed for asbestos containment when cleaning during and after asbestos removal.

Demolition waste would be likely to include paint residue (chips and scrapings); demolition debris (masonry, metal, and boards painted with lead-based or other heavy metal-based paint); scrap metal (metal objects that contain lead or other heavy metals) that could be classified as hazardous waste, which would have to be managed, transported, and disposed of at an appropriately permitted and licensed off-site facility. All hazardous wastes would be disposed of in accordance with applicable UC Berkeley and LBNL procedures at properly licensed and permitted facilities.

As discussed in Section 4.7.2, the RFS portion of the proposed RBC site includes some areas of contaminated soil and groundwater. The University has done substantial work in characterizing site contamination. Arsenic, copper, lead, mercury and PCBs have been detected in the soil at levels exceeding commercial use standards. Any remediation would be done in accordance with a DTSC Order (see Section 3.9) or other DTSC authority. More specifically, soil would be excavated or evaluated for contamination prior to on-site reuse or off-site disposal, pursuant to a RAW, including Soil Management Plan requirements, if approved by DTSC under Chapter 6.8 of the California Health and Safety Code, which includes requirements to ensure protection of public health and safety and the environment, or under currently specified requirements of the existing DTSC Order under Health and Safety Code Section 6.8. Hazardous soil would be categorized for transport to appropriately permitted and licensed off-site facilities. Contaminated groundwater would be treated to remove contamination as required under DTSC Order or authority. The impacts of such activities would not be expected to create a significant hazard to workers or the public.

During demolition activities, the intrusion of subsurface vapors into buildings is one of the exposure pathways to be considered in assessing the risk posed by releases of hazardous chemicals into the environment. DTSC has provided guidance regarding an approach for evaluating vapor intrusion into buildings and its subsequent impact on indoor air quality (DTSC 2011). Demolition activities would be conducted in accordance with the DTSC guidance, which would include compliance with an 11-step process to identify, evaluate, and potentially mitigate human exposure from vapor intrusion. Compliance with the DTSC guidance should minimize the potential for any significant impacts.

Once operational, there would be an increase in the use of hazardous materials and chemicals, radioactive materials, and production of wastes at the site. The chemicals used in new laboratories and support space developed under the 2014 LRDP would be similar to those currently used at other UC sites such as UC Berkeley and LBNL. The level and the nature of the hazards posed by these chemicals and wastes vary widely and are unique to the individual materials, although they often can be grouped by chemical types. Substances can possess one or more common hazard characteristics such as corrosivity (acids and bases), flammability (solvents such as acetone), toxicity (cyanides, mercuric chloride) and reactivity. Some nonradioactive chemicals have the potential for causing cancer or acute and chronic illnesses, while some substances may present little hazard.

Because most handling of hazardous materials would take place indoors, potential pathways for exposure to non-radioactive hazardous materials under routine conditions include direct contact or injection during research or through accidental spills, or inhalation. To address this potential impact, laboratories and other facilities constructed under the 2014 LRDP would continue to comply with all applicable hazardous materials standards. For UC Berkeley activities, fume

hoods and other engineering controls would be required to meet Cal/OSHA requirements, and fume hood ventilation rates would continue to be checked annually. For LBNL activities, fume hoods and other engineering controls would be required to meet DOE and LBNL requirements, and fume hood ventilation rates would continue to be checked at their established frequencies. Proper use of the fume hoods and other engineering controls would keep indoor laboratory air toxics concentrations below the Cal/OSHA Permissible Exposure Limits for UC Berkeley activities and below the American Conference of Governmental Industrial Hygienists Threshold Limit Values and the OSHA Permissible Exposure Limits for LBNL activities. Continued implementation of UC Berkeley and LBNL policies and procedures, and continued compliance with existing laws and regulations would minimize the risk to workers and students from exposure to non-radioactive hazardous chemicals and the impact would be less than significant.

During operations, the intrusion of subsurface vapors into buildings is one of the exposure pathways to be considered in assessing the risk posed by releases of hazardous chemicals into the environment. As with demolition, operations would be conducted in accordance with the DTSC guidance, which should minimize the potential for any significant impacts from vapor intrusion.

Hazardous materials use and storage areas would be periodically inspected by local regulatory agencies. The following inspections currently occur:

- The Contra Costa County Hazardous Materials Program Division inspects the site approximately annually for hazardous waste storage.
- The Richmond Fire Department inspects the site approximately annually for hazardous materials storage and fire safety.
- The Richmond Public Works Industrial Pretreatment Program inspects the site approximately every two years for hazardous waste storage, hazardous waste manifest recordkeeping, and spill prevention control and countermeasure requirements.
- The City of Richmond collects wastewater samples a number of times per year for compliance with the Industrial Discharge Permit issued to the site.

The above inspections occur in addition to inspections by campus EH&S and the fire marshal.

The potential for exposure to the public, including nearby homes and schools, from hazardous materials used at the RBC under routine conditions would be limited, because most hazardous materials use and storage on the campus would take place indoors. The most probable potential pathway for public exposure would be air emissions from accidental releases either on campus or during transportation and routine operations. Exposure to routine air emissions are analyzed in Section 4.2 (Air Quality) and were determined to be less than significant. The potential for public exposure under upset or accident conditions, both from handling of hazardous materials on campus and during transportation, is discussed under LRDP Impact HAZ-2, below.

Development under the 2014 LRDP could introduce the use of biohazardous materials at the RBC, such as microorganisms, plants, and animals that have been genetically engineered or modified using recombinant DNA techniques. All research involving biohazardous materials at the RBC would be required to comply with UC Berkeley policies and procedures (for UC Berkeley facilities) and with LBNL policies and procedures (for LBNL facilities). The potential for exposure of RBC workers or the public to biohazardous materials would be minimized by compliance with Centers for Disease Control and National Institutes of Health guidelines for research involving biohazardous materials. These guidelines specify containment practices for plants, microorganisms, and animals, depending on the potential hazard posed by the organism.

Hazardous waste, mixed waste, combined waste, and radioactive waste would be packaged, labeled, and categorized for transport to appropriate permitted and licensed off-site treatment, storage, and disposal facilities. Biohazardous waste and universal waste would also be generated and managed at the RBC. On-site waste collection areas equipped with all required safety features would be designated to accommodate hazardous waste and radioactive waste (including mixed waste and combined waste) collection and management (e.g., consolidation). Hazardous waste storage areas would be physically separate from the radioactive waste storage area. The RBC would have designated storage areas for management of biohazardous waste (including medical waste) and universal waste.

Compliance with hazardous waste storage and transportation regulations, and continuation of current UC Berkeley and LBNL programs and controls to reduce and manage hazardous wastes and to prevent inadvertent releases of hazardous materials to the sanitary sewer would minimize the hazards to workers, the public, and the environment. Treatment, storage, and disposal facilities are currently available with adequate capacity to accept and safely manage any wastes produced. The increase in hazardous waste generation would be insignificant in relation to the vendor's disposal capacity.

Development under the 2014 LRDP could result in an increase in radioactive material use. Safety controls, plans, and procedures would be implemented to limit exposure to radiation from radioisotopes, radiation-producing machines, and radioactive wastes. The potential for the proposed project to expose workers, non-involved site workers or visitors, or the public to significant health or safety risks is low. With respect to radioactive waste, no radioactive waste would be disposed of at RBC, LBNL, or any offsite LBNL facilities. Implementation of the 2014 LRDP would continue the practice of using out-of-state disposal facilities. The quantities of radioactive wastes would be insignificant relative to the available disposal capacity.

UC Berkeley holds a Broad Scope Radioactive Materials License issued by the State of California Department of Public Health, Radiological Health Branch. Approval and oversight for campus use of radioactive materials and radiation producing machines is provided by the Radiation Safety Committee and the EH&S Radiation Safety Officer (RSO). Any use of radioactive materials and radiation producing machines at UC Berkeley must be preauthorized in writing. The written authorization is referred to as an Radiation Use Authorization and is fundamental to the UC Berkeley campus radiation safety program. The RSO conducts an evaluation of the radiation safety aspects of the proposed use and at the RSO's discretion, complex uses may need review by the Radiation Safety Committee. All aspects of radioactive material or radiation producing machine use on the campus is governed by the Radiation Safety Team that provides oversight and services to support the safe use of these materials and machines.

All work with ionizing radiation at LBNL is subject to a DOE-approved Radiation Protection Program (RPP). This RPP contains plans for implementing measures to ensure worker and public safety from hazards arising from LBNL work with ionizing radiation. All work is conducted according to the As Low As Reasonably Achievable principle.

Implementation of safety plans, programs, practices, and procedures, as defined in this section, would ensure that impacts to the public or the environment through the routine transport, use, or disposal of hazardous and radioactive materials and wastes would be less than significant.
With respect to potential impacts from non-ionizing radiation, compliance with applicable federal and state regulations, UC Berkeley and LBNL requirements, and DOE Orders, would provide reasonable assurance that workers are protected from non-ionizing hazards.

LRDP ENVIRONMENTAL PROTECTION PRACTICE HAZ-1:

In implementing the 2014 LRDP, UC Berkeley and LBNL shall continue the same (or equivalent) health and safety plans, programs, practices and procedures related to the use, storage, disposal, and transportation of hazardous materials and wastes (including chemical, radioactive, and bio-hazardous materials and waste) as are currently practiced at the UC Berkeley main campus and at the LBNL hill site. These include, but are not limited to, UC Berkeley and LBNL requirements for safe transportation of hazardous materials; EH&S training programs; the requirement that laboratories have chemical hygiene plans; a chemical inventory; a toxic use reduction program; a spill prevention, control, and countermeasure plan; monitoring of USTs; a waste minimization program; a biosafety program; a waste management program (including medical and biohazardous waste); a radiation safety and/or protection program; compliance with radioactive air emission regulations (40 CFR 61) and compliance with DOE Orders for LBNL activities; compliance with the National Institutes of Health Guidelines for Research Involving Recombinant DNA Molecules; and compliance with US Department of Agriculture requirements for open-field-based research involving transgenic plants.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HAZ-2: **Development under the 2014 LRDP would not create a significant public or environmental hazard through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. (*Less than Significant)***

Federal, state, and local emergency response plans would be implemented to respond to most RBC emergency incidents. UC Berkeley EH&S maintains a Dedicated Spill Response Team that consists of health and safety professionals, hazardous materials technicians, and appropriately licensed hazardous materials drivers. The team is trained to respond to most incidents and arranges for appropriate outside assistance when necessary. LBNL developed a MEPP that establishes policies, procedures, and an organizational structure for responding to and recovering from a major disaster. The MEPP uses the Standardized Emergency Management System for managing response to multi-agency and multi-jurisdiction emergencies in California and the National Incident Management System, which is a nationwide standardized approach to incident management prescribed by Homeland Security Presidential Directive 5. The plan includes four phases of emergency management: mitigation, preparedness, response, and recovery. UC Berkeley and LBNL would coordinate with state and local authorities to develop a site-specific emergency response plan for the new facilities proposed for the RBC.

One state law governing the storage of hazardous materials is the California Accidental Release Program (CalARP). This law addresses facilities that contain specified hazardous materials or “regulated substances” that, if released, could result in adverse off-site consequences. Chemical inventories that would be maintained by UC in the Materials Business Plan and Chemical Inventory would be reviewed at least annually to determine whether the use or storage of regulated substances at any RBC facility would be large enough to trigger CalARP requirements. A risk management plan under CalARP would be required for any chemicals with maximum storage quantities greater than levels that would potentially cause an off-site consequence. RBC best practices would inventory campus hazardous materials in future locations and quantities would be kept to a minimum. Given past experience at other UC facilities, quantities above CalARP thresholds are not anticipated. Should that occur, UC would comply with all applicable CalARP reporting requirements. LBNL activities would also comply with all applicable DOE orders. Compliance with all applicable federal, state, and local laws and regulations related to the

transportation, storage, and use of hazardous and radioactive materials would minimize the potential for a release and provide for prompt and effective cleanup if an accidental release occurred. Therefore, the impacts related to accidental release due to the increased transportation, storage, or use of hazardous and radioactive materials under the 2014 LRDP would be less than significant. Safety plans, programs, practices, and procedures implementation, as defined in the LRDP Impact HAZ-1 discussion, would ensure these impacts remain less than significant.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HAZ-3: **Development under the 2014 LRDP would not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. (*Less than Significant)***

The RBC site is not within one-quarter mile of an existing or proposed school per CEQA Guideline 15186. While the RBC would handle certain hazardous materials, these materials and their handling protocols are subject to extensive regulations, procedures, and oversight, as discussed in LRDP Impact HAZ-1. The potential impacts associated with site contamination are also addressed under LRDP Impact HAZ-1. As described in that section, operations would not result in hazardous emissions or hazardous materials handling that could expose off-site receptors to a significant human health or safety risk. The impact would be less than significant.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HAZ-4: **The RBC would be on a site included on a list of hazardous materials sites compiled pursuant to the California Government Code Section 65962.5, but this would not create a significant hazard to the public or the environment. (*Less than Significant)***

The RFS portion of the proposed RBC site is listed on the current California EPA Hazardous Waste and Substances Sites List, also known as the “Cortese list” (California Government Code Section 65962.5). This listing is due to prior site activities that resulted in soil contamination at specific site locations. The DTSC has been directing efforts to address the effects of this past contamination on the RFS portion of the RBC site (see Section 3.9). The potential impacts associated with site contamination are also addressed under LRDP Impact HAZ-1. Because on-site contamination would be addressed in accordance with a RAW if approved by DTSC under California Health and Safety Code Section 6.8, which requires DTSC to ensure protection of public health and safety and the environment from the harmful effects of releases or threatened releases of hazardous substances, or under the current provisions in the existing DTSC order for the RFS under Health and Safety Code Chapter 6.8, the impacts would be less than significant.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HAZ-5: **Development under the 2014 LRDP would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (*Less than Significant)***

As discussed in Section 4.7.3, emergency response plans are maintained at the Federal, State, and local level for all types of disasters, including human-made and natural. UC Berkeley and LBNL would coordinate with state and local authorities to develop a site-specific emergency response plan for the proposed new RBC facilities. The UC Berkeley EH&S Emergency Response Team and LBNL responders would be capable of responding to most RBC incidents and, if necessary, may arrange for appropriate assistance from the City of Richmond Fire Department, the LBNL Fire Department, and outside emergency response contractors. New 2014 LRDP development would be in areas adjacent to other developed sites. Because on-site activities that could trigger emergency response would generally be similar in nature to current types of LBNL and UC Berkeley activities, and because existing emergency control and avoidance programs would continue, implementation of the 2014 LRDP would not exceed emergency response capabilities and impacts would be less than significant.

Mitigation Measure: No mitigation measure is required.

Cumulative Impacts and Mitigation Measures

LRDP Cumulative Impact HAZ-1: **Development under the 2014 LRDP in conjunction with other reasonably foreseeable future development in the project vicinity would not create a significant public or environmental hazard through the routine transport, use, or disposal of hazardous materials. (*Less than Significant*)**

The potential for public exposure, including at nearby homes and schools, to RBC hazardous materials under routine conditions would be limited, because most RBC hazardous materials use and storage would take place indoors and under controlled conditions. The most probable potential pathway for public exposure would be air emissions from on-site accidental releases or during transportation and routine operations. Air would be sampled for dust and particulates during removal of soil contaminated with mercury fulminate and during construction. Cumulative exposure to routine air emissions is analyzed in Section 4.2 (Air Quality) and determined to be less than significant. Compliance with all applicable Federal and State laws related to the transportation of hazardous materials would reduce the likelihood and severity of accidents during transit, thereby ensuring that a less than significant cumulative impact would occur in this regard.

LRDP Cumulative Impact HAZ-2: **Development under the 2014 LRDP in conjunction with other reasonably foreseeable future development in the project vicinity would not create a significant public or environmental hazard through reasonably foreseeable upset and accidental conditions involving the release of hazardous materials into the environment. (*Less than Significant*)**

Cumulative development in the project area would include some industrial and commercial entities that could use various hazardous products in greater quantities than under current conditions. The use, storage, disposal, and transport of hazardous materials could result in an increased risk for

spills and accidents. Although the specific risks of such spills and accidents are not quantifiable, all construction and demolition activities, and all new development, would be subject to compliance with hazardous materials regulations. Future developments would be required to evaluate their respective hazards and hazardous materials impacts on a project-by-project basis. Compliance with all applicable federal, State, and local regulations during the construction and operation of new developments would ensure that there are no significant cumulative hazards to the public or the environment associated with the routine transportation, use, disposal, or release of hazardous materials.

4.7.5 References

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4.8 HYDROLOGY AND WATER QUALITY

4.8.1 Introduction

This section presents existing RBC site hydrologic and water quality conditions and analyzes the potential for development under the proposed 2014 LRDP to affect those resources. This analysis is based on information summarized in the Current Conditions Report (Tetra Tech 2008), more recent Tetra Tech reports including the 2012 Groundwater Results Technical Memorandum, and various publicly available technical studies.

The hydrology and water quality discussion includes a description of the regulatory environment; stormwater drainage features; flooding potential; groundwater hydrology, including groundwater depth and flow; surface water and groundwater interaction; and current water quality. Existing RBC site conditions are described in terms of historical and current site uses.

Public and agency NOP comments related to hydrology and water quality concerned restoration of the Meeker Ditch to a natural state, existing site contamination, completion of site remediation, increasing runoff to Western Stege Marsh, and assessing and planning for sea-level rise and storm surges.

4.8.2 Environmental Setting

The RBC site is approximately 134 acres and consists of upland areas developed with buildings that are used for academic teaching and research activities and spaces leased by private entities, areas of coastal grasslands, a tidal salt marsh (known as the Western Stege Marsh), and a transition zone between the upland areas and the marsh. Grasslands occur in a number of meadows on the RBC site. The parcel west of Regatta Boulevard is fully developed.

Surface Water

Runoff on the RFS portion of the RBC site currently flows from north to south by way of sheet flow, open swales, culverts, and storm drains. The existing storm drain system consists of two main 24-inch storm drain lines -- the Eastern Storm Drain and the Western Storm Drain – spanning the respective eastern and western edges of existing improvements. It is believed that the Western Storm Drain was originally a sewer line draining to the San Francisco Bay mudflats that was placed along Syndicate Avenue prior to the establishment of the Richmond Publically Owned Treatment Works and construction of the existing City of Richmond sewer mains traversing the north and south portion of the RFS (Hyde et al. 1941). After construction of the Richmond Publically Owned Treatment Works, the Western Storm Drain remained connected as an overflow port to the City of Richmond sanitary sewer main traversing the northern portion of the RFS before the overflow was closed by UC Berkeley in 2004 with permission from the City of Richmond. The Western Storm Drain now conveys only runoff from the central and northeastern portions of the RFS, the NRLF (Building 400), eastern portions of the coastal-terrace prairie, and the asphalt pads to the east of Building 128.

The Western Storm Drain discharges to Meeker Slough downstream of the confluence of Meeker Tidal Creek and Meeker Ditch. The Eastern Storm Drain collects runoff from the southeast portion of the RFS (Building 180 and south) and discharges in the northeastern corner of Western Stege Marsh, which drains to the west into Meeker Slough upstream of the Bay Trail bridge. The most western portion of the RFS, including most of the coastal-terrace prairie and Building 280, drains through an open swale west of the EPA Laboratory, then overland into Meeker Slough downstream of the Meeker Ditch/Meeker Tidal Creek confluence.

The Regatta portion of the RBC drains to City storm drains that discharge to Meeker Tidal Creek and Meeker Ditch.

A tidally influenced trapezoidal concrete-lined storm drain channel, Meeker Ditch, runs north-south along the eastern edge of Regatta Boulevard and South 32nd Street. Meeker Ditch is the continuation of a mostly culverted former creek channel draining a watershed extending to McBryde Avenue near Alvardo Park that is almost completely urbanized and consists of housing, light industry, commercial and institutional facilities, and some small parks. Meeker Ditch discharges at the southwest corner of the RBC upland area into Meeker Slough at the confluence with Meeker Tidal Creek. The creek is a tidally influenced storm drain channel at the northern boundary of the Marina Bay housing complex that collects runoff from the watershed between Richmond Inner Harbor and I-580, which is also almost completely urbanized and consists of housing, institutional buildings, warehouses, and rail yards.

The former Zeneca site is east of 46th Street. In the past, runoff from a portion of the former Zeneca Site drained into the RFS Eastern Storm Drain via an interconnecting storm drain originating on South 46th Street near RFS Building 185. Following 2002 and 2003 Zeneca site remediation activities, only a small amount of Zeneca site surface runoff now flows into the interconnecting and Eastern Storm Drain (Tetra Tech 2008).

Flooding

A flood hazard zone exists along the RFS southern margin as offshore winds can combine with high tides to increase shoreline water elevations. The project site's southern portion is within the 100-year flood hazard zone and is potentially subject to water inundation due to projected storm surge, a tsunami, or a seiche.

Sea levels are expected to rise in coming years due to global climate change. Estimates forecast by experts differ and are expressed in ranges; by year 2100, for example, the International Panel on Climate Change estimates a sea level rise range of 19 to 58 cm (7 to 23 inches) (IPCC 2007) while others cited in this EIR forecast a 50 to 140 cm (19 to 55 inches) range (Rahmstorf 2007). San Francisco Bay is the base level elevation for Meeker Ditch stormwater discharge west of the project site. At high tidal stands, a higher base level has the potential to reduce the Meeker Ditch stormwater discharge rate to the Bay and to increase the water table elevation, including in the project area. As a result, flooding frequency within the lower Meeker Tidal Creek reaches could increase when high tides, westerly wind-driven waves, and high storm discharges occur. However, these effects would not result from alteration of drainage patterns.

As discussed in the 2014 LRDP, the areas that are now Western Stege Marsh and the transition area just north of the marsh were historically intertidal mudflats. Offshore breakwaters constructed in the 1930s and the rerouting of Meeker Creek from further west to its current location resulted in soil deposition and transition of the mudflats to the tidal marshland which exists today. The 1959 construction of the embankment which now supports the Bay Trail includes a bridge over Meeker Slough where tidal and storm drain waters connect the marsh and the bay. Assuming natural adaptation with sea level rise, the marsh will likely transgress up the slopes that border the marsh which include areas reserved under the RBC LRDP as Natural Open Space, with or without the project. Within its existing boundary, the marsh will need to aggrade upward to continue supporting vegetation in adaptation to sea level rise. Adequate wave sheltering and sediment deposition are necessary to promote upward aggradation of the marsh.If the existing offshore structures (e.g. breakwaters and Bay Trail embankment) degrade and are not replaced by a beach dune or other shoreform, the Bay waves may limit sediment deposition. If the sea level rises at a faster rate than natural soil deposition, marsh vegetation continuity may depend on soil augmentation by the University. Aggradation at a pace slower than sea level rise would result in a lower elevation relative to the sea level which may cause the marsh to revert back to an intertidal mudflat.

Groundwater Occurrence

RBC site contamination investigations have revealed three water-bearing zones within 100 feet below the ground surface (Tetra Tech 2008). These are:

- Shallow zone, 10 to 20 feet below the surface;
- Intermediate zone, 30 to 74 feet below the surface; and
- Deeper zone, 90 to 100 feet below the surface.

The shallow water-bearing zone spans the depth in which artificial fill, Quaternary alluvium, and young Bay sediments are found. Although the sediments are generally coarser in the upper 20 feet, clay content and sufficiently discontinuous permeable lenses slow groundwater flow such that the yield from shallow wells is low (Tetra Tech 2012). Intermediate zone groundwater appears to flow through a relatively continuous, five-foot-thick sand stratum at a depth of about 30 to 35 feet. Groundwater may be under semi-confined conditions within this zone. The older Bay Mud acts as a confining layer or aquitard. The deeper groundwater zone is below or within the older Bay Mud.

The ground surface elevation slopes from about 30 in the north and 25 feet National Geodetic Vertical Datum in the RBC site northeast corner and slopes down to the south and west. To the south, it slopes to about 15 to 20 feet in the site's central portion, down to about 2 feet along the edge of Meeker Slough. To the west, it slopes to about 10 feet at the far western boundary of the Regatta property.

Groundwater gradients vary somewhat seasonally and locally across the RBC site, probably due to differences in the amount of recharge and local differences in vertical permeability. The general direction of flow is toward the southwest, in the direction of Meeker Slough. In the late fall, groundwater elevations in the shallow zone are about 10 to 11 feet National Geodetic Vertical Datum (15 feet bgs) in the RBC site northeast corner, falling to about 6 feet National Geodetic Vertical Datum (10 feet bgs) in the RBC site central area, and dropping to about just below the ground surface along Meeker Slough. During groundwater monitoring rounds between November 2010 and April 2011, groundwater elevations in the site's northeast corner increased about one foot in April relative to November, probably as a result of greater springtime recharge.

During the 2010/2011 monitoring period, a groundwater mound observed near Building 150 was reportedly caused by a leaking underground water line. The break was identified and repaired in fall 2010 but by April 2011, the mound had not diminished significantly. This suggests that vertical permeability is very low in the shallow zone and that the mounded groundwater may have been perched on low permeability sediments.

Groundwater elevation measurements in grouped wells spanning different aquifer zones reveal slight vertical gradients, probably due to the low permeability within the shallow sediments and poor hydraulic connection across zones. However, the vertical gradient direction appears to be influenced by seasonal recharge and local conditions. For example, during the spring, regional recharge would be expected to increase hydrostatic pressure in deeper aquifer units, creating an upward gradient. However, the effect might be reversed in unpaved areas that receive more local recharge and where the shallower, perched zone is replenished.

Groundwater Quality

Total dissolved solids at the RFS average 1,420 milligrams per liter with a maximum of 27,500 milligrams per liter at the northwestern edge of the Western Stege Marsh adjacent to the Meeker Slough. The high total dissolved solids levels are due to the proximity to the Bay (Tetra Tech

2013). Groundwater at the RBC site has not been significantly impacted by contaminated soils. However, as described in the 2013 Site Conditions Report, Proposed Richmond Bay Campus (Tetra Tech 2013), results of four semi-annual rounds of groundwater sampling from piezometers installed site-wide in 2010 show that volatile organic compounds (tetrachloroethylene (PCE), TCE, and others) are present along the eastern property boundary of the RFS and adjacent areas of the former Zeneca site where historic industrial activities resulted in groundwater contamination. In addition, an area of carbon tetrachloride groundwater contamination is present in the northwest portion of the RFS from an unknown source that may be on-site or off-site.

Of the 25 monitoring wells analyzed in April 2011 (Tetra Tech 2012), only three produced metal concentrations exceeding drinking water standards. Above-standards arsenic was found in a well at the edge of Western Stege Marsh; nickel was detected in a well near Building 163 at the site's southeast corner and in a well east of Building 472 at the eastern site boundary.

A passive groundwater treatment system known as a "biologically active permeable barrier" is installed across the shallow aquifer zone just south of the RBC site uplands area to treat dissolved metals from upgradient sources. The biologically active permeable barrier traps dissolved metals as the groundwater passes through the barrier toward Western Stege Marsh. In addition, a subsurface slurry wall has been installed along the RBC southeastern boundary (south from Building 178). This slurry wall prevents shallow groundwater from migrating across the RBC boundary and it channels upgradient groundwater into the biologically active permeable barrier. The primary purpose of this system is to protect water quality in Western Stege Marsh.

A Final Site Characterization Report (SCR) (Tetra Tech 2013) has been prepared to help determine remedies and prescriptive requirements for certain 2014 LRDP-defined developable areas of the RFS site. The SCR found that carbon tetrachloride concentrations (primarily) in the RFS northeast area exceeded commercial vapor intrusion risk-based concentration and maximum contaminant levels. The carbon tetrachloride source is unknown but is suspected to be historical activities near Building 280B. TCE exceeded the commercial vapor intrusion risk-based concentration and maximum contaminant levels primarily along the eastern boundary of the RFS.

Additional information on groundwater contamination is presented in Section 4.7.2.

4.8.3 Regulatory Considerations

Federal

Clean Water Act

The Clean Water Act (CWA) (33 U.S.C. 1251 et seq.) of 1972 is the principal federal law protecting the quality and integrity of the nation's surface waters. The CWA offers a range of mechanisms to reduce pollutant input to waterways, manage polluted runoff, and finance municipal wastewater treatment facilities. Permit review serves as the CWA's principal regulatory tool; CWA regulation operates on the premise that discharges to jurisdictional waters are unlawful unless authorized by a permit. The following CWA sections are particularly relevant to the proposed project:

- Section 303 – water quality standards and implementation plans
- Section 401 – State Water Quality Certification or waiver
- Section 402 – National Pollutant Discharge Elimination System (NPDES)
- Section 404 – Discharge of dredged or fill materials into waters of the US

Section 303 of the CWA requires states to identify waters that do not meet applicable water quality standards, establish priority rankings for listed waters, and develop action plans, called Total Maximum Daily Loads, to improve water quality.

Section 401 of the Clean Water Act, in order to ensure water quality standards compliance, requires State Water Quality Certification for all federal permit or license applications for any activity that may result in a discharge to a water body. Most Certifications are issued in connection with Section 404 permits for dredge and fill discharges.

Section 402 of the Clean Water Act established a permit system, the NPDES, to regulate point sources of discharges in navigable waters of the United States. The EPA implements the NPDES, although the Act also allows states with sufficient authority to implement the NPDES program in lieu of the EPA. UC Berkeley operates under its own NPDES permit. The RBC may operate under this permit or its own individual permit.

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the US, which include wetlands and vernal pools. Discharge activities regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and mining projects (www.epa.gov/owow/wetlands/pdf/reg_authority_pr.pdf).

The Water Quality Control Plan for the San Francisco Bay Basin is the San Francisco Bay RWQCB's planning document.

The State Water Resources Control Board and the nine RWQCBs share authority for implementation of the federal Clean Water Act and the state Porter-Cologne Act.

Energy Independence and Security Act

Section 438 of the Energy Independence and Security Act (42 USC 17094) requires federal agencies, or projects using federal funds, to reduce stormwater runoff from federal development and redevelopment projects to protect water resources. Stormwater management strategies should be implemented to plan, design, construct, and conduct operations in a manner to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow or retain all stormwater on site. The State Water Resources Control Board's LID goal parallels the EISA strategies. LID practices include bioretention, rain gardens, rooftop gardens, sidewalk storage, vegetated swales, buffers and strips, tree preservation, roof leader disconnection, rain barrels and cisterns, permeable pavers, soil amendments, impervious surface reduction and disconnection, pollution prevention, and good housekeeping (SWRCB 2010).

State

The State Water Resources Control Board and the San Francisco Bay RWQCB implement the Non-Point Source regulations under the Clean Water Act. The State has developed a General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit Order 2009-0009-DWQ) for developments that would disturb an acre or more of land. The General Permit requires developers to prepare a Storm Water Pollution Prevention Plan (SWPPP) that identifies BMPs to be implemented. These plans must be prepared by a Qualified Construction Storm Water Developer and must be implemented under supervision of a Qualified Construction Storm Water Practitioner with appropriate levels of training.

Local

Because the RBC would be operated by the University on UC land for UC purposes, it is exempt from many local regulations. However, LBNL and UC Berkeley seek to coordinate with local jurisdictions to reduce any potential conflicts with the local regulations.

Contra Costa County Watershed Program

The Contra Costa County Watershed Program is responsible for ensuring that the County complies with its municipal stormwater NPDES permits. The City of Richmond and 15 other cities and towns, Contra Costa County, and the Contra Costa County Clean Water Program are co-permittees under this program. The watershed program's current NPDES permits are the Municipal Regional Permit for discharges to the San Francisco Bay (Region 2) and the East Contra Costa County Permit for discharges to the Delta (Region 5). The Municipal Regional Permit was adopted on October 14, 2009; it applies to 76 Bay Area municipalities in order to standardize requirements, pool resources, and achieve results on a large scale.

Under Phase 1 Non-Point Source requirements, municipalities are responsible for ensuring that stormwater discharges from municipal storm sewers meet the receiving water standards. Municipalities must develop local ordinances or programs to ensure compliance. The Contra Costa County Watershed Program defines standards for new developments. LID is one of the requirements of the Clean Water Program.

City of Richmond General Plan

The RBC site is a University property where work within the University's mission is performed. As a state entity, the University is exempt under the state constitution from compliance with local land use regulations, including general plans and zoning. However, 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 located within the City of Richmond and is within the Southern Shoreline Planning Area of the City of Richmond General Plan. The following sections summarize goals and policies from the City of Richmond General Plan and local ordinances as they relate to hydrology and water quality.

The Conservation, Natural Resources and Open Space Element (Element 7) of the City of Richmond General Plan addresses hydrology and water quality issues both directly and indirectly. For example, Element 7 calls for habitat conservation and restoration, open space conservation, establishment of creek corridor performance standards, and urban creek restoration actions. Although these are not specifically intended to address hydrology and water quality, they are likely to result – indirectly – in water quality improvements and may improve drainage and hydrology. Conversely, General Plan policies that would directly address hydrology and water quality include:

Policy CN1.3 Urban Creek Restoration. Encourage the restoration of urban creeks and coordinate efforts with property owners and local interest groups. Creek "daylighting" of culverts or hardened channels shall be pursued where feasible in new and redevelopment projects. Actions identified in the General Plan to implement this policy include establishing Creek Corridor Performance Standards and restoring Urban Creeks. Among the specific Creek Corridor Performance Standards identified in the General Plan are:

- Offer sufficient width in or adjacent to preserves to allow for existing and created wildlife habitat, species sensitive to human disturbance, vegetative filtration for water quality, corridors for wildlife habitat linkage, protection from runoff, and other impacts of adjacent urban uses;

- Allow for sufficient width adjacent to natural resource preserves to allow for trails and greenbelts; and
- Discourage the use of herbicides and provide sufficient width for a mowed firebreak (where necessary), adjacent passive recreation uses, and access for channel maintenance and flood control.
- In areas of creek restoration, implement design specifications and modeled flow conditions to ensure that creek channel configuration and vegetation would withstand storm flows, that conveyance capacity is not impeded, and that the system is stabilized following construction. Design shall be conducted by a certified professional in stream restoration and fluvial geomorphology processes.
- Implement construction BMPs to reduce erosion potential including, but not limited to, construction scheduled for dry season work; high flow bypass until the system is stabilized; temporary and permanent erosion and sediment controls; prevention of run-off during construction.
- Implement monitoring, inspection, and maintenance programs and plans to ensure long-term continued function.

To restore urban creeks the General Plan calls for:

- Restoring creeks currently diverted in culverts or hardened channels to their natural state, where feasible;
- Adopting regional guidelines for channel creation or modification to ensure that channels meander, have a naturalized side slope and a varied channel bottom elevation; and
- Including improvement standards for soft bottom channels.

Policy CN3.1 Stormwater Management. Develop strategies to promote stormwater management techniques that minimize surface water runoff in public and private developments. Use low-impact development techniques to best manage stormwater through conservation, on-site filtration and water recycling.

In order to continue to comply with the City of Richmond's NPDES Permit, the General Plan calls for following actions to be implemented:

- Require development to comply with the Contra Costa Clean Water Program Stormwater Guidebook;
- Work with developers to ensure compliance with the City’s minimum standards and NPDES requirements;
- Encourage all projects to use pervious pavements, cluster structures, disconnect downspouts, minimize land disturbance and use micro- detention such as LID;
- Require adequate source control measures to limit pollution generation in businesses including draining non-stormwater discharges such as swimming pools, trash and food compactor racks, vehicle outdoor storage, fire sprinkler test water and equipment washing; and
- Require businesses that may be susceptible to polluting stormwater to implement BMPs including covering drains and storage precautions for outdoor material storage, loading docks, repair and maintenance bays and fueling areas.

Policy CN3.2 Water Quality. Work with public and private property owners to reduce stormwater runoff in urban areas to protect water quality in creeks, marshlands and water bodies and the bays. Promote the use of sustainable and green infrastructure design, construction and maintenance techniques on public and private lands to protect natural resources. Incorporate integrated watershed management techniques and to improve surface water and groundwater quality, protect habitat and improve public health by coordinating infrastructure and neighborhood planning and establishing best practices for reducing non-point runoff. To this end, the General Plan calls for:

- Support efforts by the regional water provider to increase water recycling by residents, businesses and developers;
- Installing water recycling and rainwater catchments in new developments as appropriate to recycle water; and
- Evaluation of the use of recycled water in new and existing buildings and landscapes.

Policy CN3.3 Flood Management. Minimize the flood hazard risks to people, property and the environment. Address potential damage from a 100-year flood, tsunami, sea level rise and seiche, and implement and maintain flood management measures in all creeks and in all watersheds. The General Plan requires new developments to:

- Install and maintain flood control measures on all creeks and watersheds in coordination with the Contra Costa County Flood Control and Water Conservation District;
- Include flood prevention mitigation measures within the 100-year floodplain;
- Install flood control measures to address sea level rise as appropriate; and
- Improve groundwater recharge and minimize stormwater runoff to better accommodate floodwaters.

Policy CN3.4 Water Conservation. Promote water conservation. Encourage residents, public facilities, businesses and industry to conserve water especially during drought years. Work with East Bay Municipal Utility District to advance water recycling programs including using treated wastewater to irrigate parks, golf courses and roadway landscaping and by encouraging rainwater catchment and graywater usage techniques in buildings. The General Plan calls for:

- Low-flow appliances and fixtures to be required in all new development in accordance with EBMUD Water Service Regulations (Section 31);
- Working with water providers and water conservation agencies to create an incentives program that encourages retrofitting existing development with low-flow water fixtures;
- New developments and landscaped public areas to use state-of-the-art irrigation systems that reduce water consumption including graywater systems and rainwater catchment;
- Encouraging use of drought-tolerant and native vegetation;
- New plantings to be grouped by hydrozones of water needs listed in the Water Use Classification of Landscape Species III developed by the Department of Water Resources and the UC Cooperative Extension (or successor document); and
- Development project approvals to include a finding that all feasible and cost-effective options for conservation and water reuse are incorporated into project design including graywater systems.

The 2030 General Plan EIR determined that the effects from future development pursuant to the General Plan on hydrology and water quality would be less than significant. Future development would not violate stormwater management requirements. It would not substantially alter groundwater, drainage patterns, runoff, or flooding potential, including flooding potential associated with dam failure or sea level rise. No mitigation measures would be required. Cumulative impacts would be less than significant.

City of Richmond Landscape Design and Development Guidelines

The Department of Public Works implements the City of Richmond's Landscape Design and Development Guidelines. The Department encourages new developments to design and manage landscaping that is appropriate to local environmental conditions and effective in water conservation, during both drought and normal conditions. The Guidelines apply to all new residential developments of 4 or more dwelling units or with a minimum of 10,000 square feet of landscaping and all new or rehabilitated commercial, industrial, and institutional developments. The City reviews all development plans submitted via the Site Development Review process administered by the Planning Department.

4.8.4 Impacts and Mitigation Measures

Standards of Significance

Potential impacts of the 2014 LRDP on hydrology and water quality 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 water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff
- Otherwise substantially degrade water quality
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam
- Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow.

CEQA Checklist Items Adequately Addressed in the Initial Study

The NOP Initial Study concluded that further analysis of the following issue was not required in the EIR:

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

As stated in the Initial Study, while the RBC could include temporary lodging, it would not include temporary or permanent housing within the 100-year flood hazard area; therefore, this topic is not discussed further in the EIR.

Analytical Methods

CEQA and University of California guidelines identify standard information sources and methods for evaluating potential hydrology and water quality impacts. The following methods have been used in this analysis:

- Information on drainage patterns, water volumes and quality, floodplains, and locations of groundwater recharge areas were obtained from available sources, including: the US Geological Survey, California Geological Survey, California Department of Water Resources, the State Water Resources Control Board, the San Francisco Bay RWQCB, the Federal Emergency Management Agency (which prepares flood insurance rate maps); and recent environmental reports for the project vicinity.
- Project-related changes (increases) in stormwater runoff were estimated in preliminary drainage studies prepared to determine whether mitigation is needed.
- The effects of stormwater runoff on the quality of the receiving water were qualitatively evaluated based on data from previous investigations at the site.
- Applicable regulatory standards were identified, including federal NPDES permits administered by the State Water Resources Control Board and the San Francisco Bay RWQCB, construction nonpoint source discharge requirements, and Phase 1 program requirements.
- Potential cumulative impacts were evaluated, with particular focus on downstream effects of increased stormwater runoff and reduction in floodplain storage area.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to hydrology and water quality include the following:

- UI2 – Utilities and Infrastructure Policy on Sustainability: Design infrastructure improvements to embody sustainable practices.
    - Maintain or restore, to the maximum extent technically and practically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of stormwater flow.
    - Incorporate low impact development strategies in site planning to manage stormwater.
    - Protect the campus development from 55” of sea level rise through the year 2100 using natural shore forms where practicable; and coordinate closely with the East Bay Regional Park District on maintaining the Bay Trail embankment.

LRDP Impacts and Mitigation Measures

LRDP Impact HYD-1: Stormwater runoff and dewatering associated with 2014 LRDP-related construction activities could result in a violation of water quality standards. *(Less than Significant)*

During construction, there is potential for rainwater to come into contact with disturbed soils containing elevated metals concentrations, remnant cinders, or other contaminants. During construction, some construction areas may need to be dewatered due to a high groundwater table or the accumulation of rainwater. Discharge of these fluids could violate water quality requirements if the fluids contain sediment or chemical contaminants.

For construction projects subject to the statewide stormwater general permit, the University would obtain coverage under the Storm Water General Permit and would prepare a SWPPP.

If dewatering is needed, discharge of the accumulated groundwater or rainwater to either the storm system or sanitary sewer system would require a permit from the appropriate regulatory agency. The University would apply for and obtain such a permit, which would contain requirements for discharges, including testing, treatment, monitoring, and reporting to ensure that impacts to surface and groundwater quality would be minimal.

With implementation of standard construction BMPs and the measures described above, the proposed project would not result in contaminants reaching adjacent receiving waters; any potential effect would be less than significant.

LRDP Impact HYD-2: Development under the 2014 LRDP would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. (*Less than Significant*)

As described in Chapter 3, Project Description, campus development in accordance with the 2014 LRDP would tend to be concentrated in already developed parts of the RBC site. As a result, RBC site impervious surfaces would increase by only about 3 acres. Impermeable surface increases typically decrease infiltration in those areas. The introduction of LID measures, such as installing pervious pavements and directing surface runoff to pervious areas, would further offset the effects of increased impervious surface. Since potable water is supplied by EBMUD and not from groundwater wells, and because the elevation of the water table is controlled by regional hydrologic conditions, and given the above stormwater management planning, no overall decline in groundwater levels is expected. The impact on groundwater would be less than significant.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HYD-3: Development under the 2014 LRDP would not substantially alter the existing drainage pattern of the RBC site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. (*Less than Significant*)

There are no streams present on the project site. Meeker Ditch, Meeker Tidal Creek, and Meeker Slough are located along the western boundary of the RBC site; Meeker Ditch is within the 2014 LRDP Natural Open Space designated area. RBC development would not alter the course of

Meeker Tidal Creek or place new structures in the creek's vicinity. Furthermore, the existing RBC site drainage patterns would be maintained. The proposed project would not result in increased erosion from runoff on or off the site. 2014 LRDP development impacts would be less than significant. While scoping comments raised Meeker Ditch changes as an issue, the proposed project does not include Meeker Ditch alterations or plans to return it to a natural state.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HYD-4: Development under the 2014 LRDP would not substantially alter drainage patterns in a manner which would result in flooding on- or off-site. (*Less than Significant*)

As discussed above, the existing RBC site drainage patterns would be maintained and impervious surfaces would increase by no more than approximately 3 acres under 2014 LRDP development. In addition, LID measures, such as installing pervious pavements and directing surface runoff to pervious areas, would further offset the effects impervious surface creation. Therefore campus development would not increase the risk of on or off-site flooding. The impact would be less than significant.

Sea levels are expected to rise in coming years due to global climate change. The San Francisco Bay is the base elevation for Meeker Ditch stormwater discharge. At high tidal stands, a higher base level would likely reduce the rate of Meeker Ditch stormwater discharge to the Bay while increasing the water table elevation. As a result, flooding frequency would potentially increase within the lower reaches of the creek when high tides, westerly wind-driven waves, and high storm discharges occur. However, these effects are expected to occur with or without the project and would not result or be intensified from project-related alteration of site drainage patterns.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HYD-5: Development under the 2014 LRDP would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff. (*Less than Significant*)

The RBC site is about 54 acres or 41 percent impervious area. With full 2014 LRDP development, the RBC is anticipated to comprise approximately 43 percent impervious surface area, (an increase of about 3 acres of impervious surfaces). At full 2014 LRDP development, RBC building space would be approximately 5.4 million gsf, or about 100,000 gsf per acre of impervious surfaces. This would exceed a 3-fold increase in land use efficiency compared to the current ratio, with little reduction in pervious land area. RBC stormwater runoff would be moderated by LID design techniques that are consistent with NPDES requirements, the UC Sustainable Practices Policy, and LRDP sustainability goals. As a result, runoff rates from the RBC site are not expected to increase over existing conditions, but would likely decrease.

For construction projects subject to the Stormwater General Permit for Construction, the University would obtain coverage under the Storm Water General Permit and would prepare a SWPPP. The new construction would incorporate State Water Resources Control Board standards for stormwater runoff. Stormwater quality discharge permit requirements are anticipated to include, where practical: infiltration; evapotranspiration through landscape-based stormwater facilities; and capture, treatment, and re-use systems (tanks and ponds supported by treatment and irrigation systems or recycled water systems). Wherever possible, RBC drainage would be designed to use

low-impact surface conveyance solutions to minimize need for underground drainage line construction. The RBC would also incorporate new open swales, runoff treatment features, and BMPs commensurate with San Francisco Bay RWQCB requirements to treat stormwater before it is discharged into Western Stege Marsh. Buildings that are constructed using federal funds would also be required to comply with EISA Section 438 requirements.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HYD-6: Development under the 2014 LRDP would not place structures within a 100-year flood hazard area which would impede or redirect flood flows or expose people or structures to a significant risk of loss, injury, or death involving flooding. (*Less than Significant*)

Only the southernmost portion of the RBC site lies within the current 100-year flood hazard zone (southern portion of Illustrative Development Scenario Neighborhood 1). A flood hazard zone exists along the RBC site shoreline due to the potential for offshore winds in combination with high tides to increase shoreline water elevations. There would be no impact related to flood hazard or redirection of flood flows within a 100-year flood hazard area associated with development of other parts of the RBC site.

Future facilities to be constructed in the southern portion of this neighborhood would need to be protected from water inundation related to sea level rise combined with storm or seiche/tsunami events. As reflected in LRDP Policy UI2, campus facilities would be protected from the amount of sea level rise anticipated through 2100. Potential protective steps include increasing the base elevation of this area from an average of approximately 13 feet NGVD to a minimum of 15 feet NGVD. This would address potential flood hazards associated with predicted future sea level rise and reduce or avoid potential flood risks to site, people, and structures. That impact would be less than significant.

Future development at what would be the former Regatta property under the RBC LRDP would also potentially be subject to water inundation by year 2100 due to a 100-year flood, taking future sea level rise into account. As noted, LRDP Policy UI2 requires protection of development under the LRDP from sea level rise. Specific protections for development at the former Regatta property in accordance with that policy would be defined, using updated projections, at the time of a proposal to construct one or more facilities at that portion of the RBC.

Mitigation Measure: No mitigation measure is required.

LRDP Impact HYD-7: Development under the 2014 LRDP would not expose people or structures to inundation by seiches, tsunamis, or mudflows. *(Less than Significant)*

The project site is located along the eastern shore of San Francisco Bay. Tsunami waves generated by seismic events outside the Bay tend to be greatly attenuated by passage through the Golden Gate's narrow channel and by the Bay's generally shallow bathymetry. Only 5 of 51 historic tsunamis are believed to have produced runups of more than 0.5 meters (1.6 feet) within San Francisco Bay (Borrero et al. 2006). The maximum probable runup in the Richmond Inner Harbor from any tsunami event is estimated to be about 1.6 meters (4.5 feet); however, the probability of such an event is very low (Borrero et al. 2006). The recurrence time for a 10 foot high tsunami wave outside the Golden Gate is estimated at about 100 years; such waves are

expected to be reduced about 50 percent upon passing through the Central Bay (Ritter and Dupre, 1972).

Potential protective steps that may be taken to implement LRDP Policy UI2, discussed under LRDP Impact HYD-6 above, would keep the entire RBC development area above the maximum predicted tsunami level.

Seiches are similar to tsunamis but are generated by local seismic or other abrupt displacement events in a closed water bodies. The probable seiche height in San Francisco Bay is predicted to be approximately one foot above the water level at the time of occurrence (Ritter and Dupre 1972). The greatest impacts from a seiche would logically be when the water level was at a peak high level; however, the probability of a seiche occurring during a tidal extreme is negligible. The maximum wave height at Richmond Inner Harbor from a large, local earthquake is estimated to be 0.44 meters (1.4 feet) (Borrero et al. 2006).

Potential protection measures discussed under LRDP Impact HYD-6 above would keep the entire RBC development area above the maximum predicted seiche level.

Mitigation Measure: No mitigation measure is required.

Cumulative Impacts and Mitigation Measures

Development under the 2014 LRDP would include impacts on hydrology and water quality that would be localized and less than significant or less than significant with mitigation. Proposed project elements with a potential for off-site cumulative impacts include stormwater discharge runoff and floodplain alterations. There are no current development plans in the vicinity sufficiently defined to indicate that they would raise the level of local topography therefore there would be no cumulative effect.

LRDP Cumulative Impact HYD-1: **Development under the 2014 LRDP, in conjunction with other foreseeable development, would increase the amount of impermeable surfaces in the area which could increase stormwater discharge to Meeker Slough and Western Stege Marsh. (*Less than Significant*)**

Foreseeable development, including the proposed project, in the greater watershed area would contribute to cumulative increases in impermeable surfaces that could affect stormwater runoff. However, new development would occur within a largely built-out urban area where stormwater drainage systems generally already exist; stormwater drainage would be addressed on a site-by-site basis prior to new development approvals. The expected incremental increase in impermeable surfaces would not exceed stormwater drainage system capacity. Stormwater management associated with the proposed project would be expected to reduce the amount of stormwater discharged from the RBC site as retention and infiltration techniques are implemented in compliance with NPDES requirements and as well as EISA Section 438 requirements. The cumulative impact would be less than significant.

4.8.5 References

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4.9 LAND USE AND PLANNING

4.9.1 Introduction

This section evaluates the potential land use and planning impacts of development under the 2014 LRDP. The planned 2014 LRDP land uses are described and assessed for potential conflicts with existing RBC site and surrounding land uses and land use plans.

Public and agency NOP comments related to land use and planning are summarized below:

- The EIR should consider proposed new building heights and massing in terms of compatibility with surrounding uses.
- The EIR should consider 2014 LRDP compatibility with the Eastshore State Park General Plan goals and policies.
- The 2014 LRDP should conform to local zoning and approved local land use policies to the maximum extent feasible.

These comments are considered in the analysis below.

4.9.2 Environmental Setting

Project Site

The approximately 134-acre RBC site is in the City of Richmond, approximately 5 miles northwest of the UC Berkeley campus and the LBNL site in Berkeley (see Figure 3-1). The City of Richmond is in Contra Costa County. The RBC site is bounded on the west by a PG&E service station, on the northwest by Regatta Boulevard, on the northeast by Meade Street, on the east by South 46th Street, and on the south by the San Francisco Bay. I-580 runs parallel to Meade Street along the northeastern boundary of the RBC site.

Existing On-Site Land Uses

The RBC site has been the location of a variety of industrial enterprises dating back to the mid-19th century. At the time of acquisition by the University in 1950, a portion of the RBC site (109.8 acres) was developed with a number of buildings associated with previous uses. After UC acquisition, certain University programs were moved into existing and new buildings at this property, known as the RFS. The RFS continues to operate as a field station for mostly UC Berkeley research programs and is currently developed with roadways, parking lots, landscaped areas, and approximately 80 one- and two-story buildings. Figure 3-2 shows current land uses at the overall RBC site, which is currently developed with 1,050,000 gross square feet of facilities, including more than 500,000 assignable square feet of research space.

Programs at the RFS include the NRLF, an archive for 7.7 million volumes of lesser-used books for the four northern UC campuses. The NRLF is at the northern boundary of the RBC site on Regatta Boulevard. Other research space includes one of the world's largest earthquake shaking tables and test facilities for advanced transportation research. The southwestern corner of the RBC developed area is occupied by the EPA regional laboratory. The Regatta parcel, which comprises the western portion of the RBC site, is developed with a warehouse building and surface parking. The warehouse building currently houses University archives and other uses. The existing facilities are concentrated in the RBC site's eastern and western portions; and a large portion of the central area is open space.

Existing Surrounding Land Uses

Land uses surrounding the RBC site include industrial and office uses and a major interstate freeway. Regatta Boulevard, along the RBC site northwestern boundary, is adjacent to a railroad spur and a business complex developed with one- to two-story buildings. Bio-Rad Laboratories, a private research equipment manufacturing company, is immediately west of the RBC site. The adjacent property to the east is the location of former chemical production operations and is currently vacant.

Across Meeker Slough adjacent to the southwestern boundary of the RBC site is a mix of single- and multi-family residences known as the Marina Bay neighborhood; to the north and across I-580 are low- and medium-density residential neighborhoods adjacent to the northeastern boundary of the RBC site.

The Eastshore State Park is located along the shoreline adjacent to the RBC site. The park extends approximately 8.5 miles along the San Francisco Bay eastern shoreline from the Oakland Bay Bridge northward to the Marina Bay neighborhood. The park includes approximately 2,262 acres of waterfront uplands and tidelands along the cities of Oakland, Emeryville, Berkeley, Albany, and Richmond. The portion of the state park nearest the project is called the South Richmond Shoreline, a southwest-facing stretch of gravel beaches in its southern reaches and tidal marsh to the north behind the seawall. The arc of upland area extending from Point Isabel to Marina Bay is the dike the railroad used to run on (California Department of Parks and Recreation 2002). A segment of the Bay Trail is built on this dike. The East Bay Regional Park District manages the state park.

Planned Land Use Changes in the Project Vicinity

The City of Richmond General Plan 2030 outlines a long-term vision for land uses and development in the area surrounding the RBC site. It designates the RBC site and its immediate surroundings southwest of I-580 as Business/Light Industrial and Open Space. The Marina Bay neighborhood is designated for low- and medium-density residential uses, which is the current use. The project vicinity is already mostly developed, and the General Plan proposes no substantive land use changes; however, the City of Richmond has identified its southern shoreline area for revitalization and redevelopment.

4.9.3 Regulatory Considerations

Local

City of Richmond General Plan 2030

The RBC site is a University property where work within the University's mission is performed on land owned 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 has a tradition of working cooperatively with local communities, and it is University practice to seek consistency with local plans and policies where feasible. The local municipal jurisdiction for the RBC site is the City of Richmond. The City of Richmond General Plan 2030, Economic Development Element and Land Use and Urban Design Element contain the following goals, policies, and actions related to land use and planning.

Goal ED8: A Thriving Mixed-Use Neighborhood along the Southern Shoreline. Transform the Southern Shoreline into a model mixed-use neighborhood characterized by green development, a fully developed university research and development campus, new employment centers, attractive residential communities, a connection to regional ferry services, an

accessible shoreline and a modern port. Incorporate a range of commercial uses including industrial activities, high-technology and professional firms and a local-serving retail, and medium to higher-density housing outside of the Harbour Way-Marina Way South Industrial Buffer Zone and other designated buffers. Expand public improvements along the Southern Shoreline to offer access to the Richmond waterfront for recreational activities which take advantage of impressive Bay views.

The following policies are outlined in relation to Goal ED8:

- **Policy ED8.1 - A Balanced Mix of Land Uses:** Promote a balanced mix of office, retail, and light industrial uses in the Southern Gateway Change Area. Partner with the UC Berkeley Field Station to attract and expand new technology firms in the area.
- **Policy ED8.2 - Land Use Compatibility:** Minimize conflicts between land uses to protect human and environmental health and safety, preserve community character and retain job generating activities that have long-term viability. Types, intensities and ranges of use and development should be compatible with existing uses and should minimize or eliminate conflicts that adversely impact public safety, human or environmental health or generate nuisances.

  Encourage existing larger industries that have surplus land to develop modern industrial parks that could attract new and existing industries and facilitate a reduction of existing and future land use conflicts.

  New development should complement the character and scale of existing neighborhoods, cultural resources, historic structures and landscapes.
- **Action ED8.A - Southern Shoreline Specific Plan:** Develop a specific plan to guide improvements in the Southern Shoreline area. Work with the University of California and other stakeholders to articulate a vision. Maintain and improve public access to the shoreline including a mix of uses along the shoreline to activate the area throughout the day.

Goal LU4: Enhanced Environmental Quality. Protect and preserve natural resources to nurture environmental and human health. Work with local and regional regulating bodies to protect water quality in creeks and bays, and to reduce or mitigate air, water and soil pollution and contamination. Encourage the sensitive integration of built and natural environments to develop a high-quality urban experience.

- **Policy LU4.1 - Richmond Shoreline:** Conserve, protect and enhance natural and cultural resources along the Richmond shoreline. Promote a balance of uses along the shoreline that supports multiple community needs.

  Protect and restore wetlands, native habitats and open space; develop shoreline parks and trails; and enhance and showcase historic and cultural resources. Prepare, adopt, and implement plans that will to protect natural and built environments from adverse potential impacts of sea level rise due to climate change.
- **Policy LU4.2 - Open Space and Conservation Areas:** Preserve open space areas along the shoreline, creeks, and in the hills to protect natural habitat. Maintain the integrity of hillsides, creeks and wetlands. Protect existing open space, agricultural lands and parks.
- **Policy LU4.3 - Habitat and Biological Resources Protection and Restoration:** Protect natural habitat and work with the CDFW, the San Francisco Bay RWQCB, the East Bay Regional Park District and other regional agencies to identify areas for special protection and establish appropriate protection measures for these areas.

Protect wetlands from direct and indirect impacts of new and existing development and infrastructure.

Protect marshlands and baylands to ensure they are not polluted or damaged from bay filling and dredging.

Protect and restore creek corridors and riparian areas to ensure they function as healthy wildlife habitat and biological areas.

Identify mitigations of impacts to sensitive species in coordination with the USFWS, the CDFW, and other regulatory agencies.

- **Policy LU4.4 - Toxic and Contaminated Sites:** Continue to work with the appropriate local, state, and federal agencies to promote the clean-up and reuse of contaminated sites to protect human and environmental health. Work with property owners and regional agencies to prevent, reduce or eliminate soil and water contamination from industrial operations, the Port and other activities that use, produce or dispose of hazardous or toxic substances. Implement appropriate mitigation measures and clean-up of sites that are known to contain toxic materials as a condition of reuse. Support the remediation and reuse of large, disturbed sites, such as the Winehaven complex at Point Molate and the Terminal 4 site at Point San Pablo, into mixed-use centers that provide the maximum benefit to the community without compromising the integrity of the surrounding natural areas (City of Richmond 2012).

The General Plan 2030 EIR evaluates General Plan consistency with existing land use plans and policies as well as land use compatibility. Future development would not physically divide an established community; conflict with existing land use plans, policies, or regulations; or result in substantial land use incompatibilities. The potential physical environmental effects resulting from future development and land use changes are analyzed in the appropriate General Plan 2030 EIR sections.

Eastshore State Park General Plan

The Eastshore State Park General Plan guides efforts to balance recreation and conservation, protect and enhance the natural resource base, and expand opportunities for public enjoyment of the park's shoreline setting.

Policies that apply to the South Richmond shoreline portion of the state park are:

PI/SR-7 Removal of invasive exotic plant species and re-vegetation with native plant species in Hoffman Marsh and along South Richmond shoreline.

PI/SR-8 Coordinate with the owners of the adjacent tidal marsh, mudflat, subtidal, and upland habitat areas to ensure adequate protection of this valuable natural area.

PI/SR-9 Explore the possibility of adding one or two new vista points seating areas along the Bay Trail north of Point Isabel.

PI/SR-10 Incorporate interpretive panels into the vista points and other key points along the Bay Trail that explore the natural, cultural and social history of this portion of the park project.

PI/SR-11 Provide fencing along the Bay Trail where necessary to protect tidal marshes, tidal mudflats, and water birds from disturbance.

4.9.4 Impacts and Mitigation Measures

Standard of Significance

The impacts from development under the proposed 2014 LRDP related to land use and planning would be considered significant if they would exceed these Standards of Significance, in accordance with Appendix G of the *State CEQA Guidelines* and the UC CEQA Handbook:

- Physically divide an established community;
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal plan, or zoning ordinance) adopted for avoiding or mitigating an environmental effect; or
- Conflict with any applicable habitat conservation program or natural community conservation plan.

CEQA Checklist Items Adequately Addressed in the Initial Study

The analysis in the NOP Initial Study concluded that no further analysis of the following issue is required in the EIR:

- Conflict with any applicable habitat conservation program or natural community conservation plan.

The RBC site is not in an area for which a federal, state, or local habitat conservation plan or natural community conservation plan has been adopted or proposed.

Analytical Methods

This section focuses on compatibility of the proposed 2014 LRDP development with other relevant land use plans and zoning provisions for the area surrounding and including the RBC site. Compatibility is evaluated by comparing the proposed RBC land uses and campus development patterns with the City of Richmond land use designations for the area surrounding and including the RBC site.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to land use and planning include the following:

- LU1 – Land Use Policy on Development Capacity: Provide for development of up to 5,400,000 square feet of facilities.
  - Maximize density to reduce overall building footprints, conserve open space, and share attractive views.
  - Vary building heights for visual interest on site and views into the campus, with lower buildings at the waterfront edge and taller buildings in the northern and western areas of the site.
  - Convey the values of the campus in each phase of development.
- LU2 – Land Use Policy on Character: Provide a setting capable of attracting new research programs and retaining world class researchers.
  - Support excellence in building design that is harmonious with the waterfront location and creates visual variety in form and massing. Include iconic structures or buildings on the campus.

- Locate and design buildings, rooftops, open space, and circulation routes to allow for a variety of view corridors within and beyond the campus.
- Create a distinct identity and sense of place by preserving and enhancing the site's assets including the grasslands, marsh, and bayfront areas.

- LU3 – Land Use Policy on Inspiration: Facilitate the casual interactions and new awareness of synergistic research which leads to inspiration and innovation through the layout of the campus, provision of amenities, and design of buildings and spaces.
  - Plan the initial development to create a critical mass of core facilities and research programs selected to attract future synergistic enterprise.
  - Design buildings to include uses such as informal meeting zones, open stairways, light-filled lobbies, and transparent walls which promote the exchange of new ideas.
  - Provide amenities such as cafes, sculpture gardens, public art, recreation fields, and outdoor gathering places at multiple scales with weather protection where feasible for casual interaction, contemplation, and community-building activities.
  - Develop the campus to become the centerpiece of a vibrant and revitalized South Shoreline Area, serving as a catalyst for additional development on nearby properties.
- LU4 – Land Use Policy on Growth: Ensure that the RBC grows in a logical and cost-effective manner.
  - Retain existing uses on campus for as long as possible and evaluate opportunities to retain or relocate uses on site for the long term.
  - Concentrate development to preserve future capacity while maintaining natural areas.
  - Create complete collections of buildings and open spaces as development progresses.
  - Phase growth to create the critical mass of activities and population needed to support amenities.
  - Plan and develop infrastructure to allow logical and cost effective extensions to support future development.
  - Implement LRDP provisions for development undertaken by the private sector for synergistic uses by public or private entities.
- LU5 – Land Use Policy on Community: The RBC will be an asset to residents of local East Bay communities.
  - Provide programs and facilities on site that can be used for education and outreach to the local community including an arts program that helps to establish the campus as a visitor destination.
  - Support integration of the campus into the Richmond South Shoreline Area; remove peripheral fencing as adequate population is achieved; and consider adjacent uses in decisions on building siting and design.
  - Allow convenient multi-mode access to the campus and promote public transit, bicycle, and pedestrian transportation modes.
  - Identify Lark Drive and Regatta Boulevard as where the public realm will be designed to integrate with the neighboring community fabric.

LRDP Impacts and Mitigation Measures

LRDP Impact LU-1: Development under the 2014 LRDP would not physically divide an established community. *(No Impact)*

The RBC would be on University-owned land parcels; both parcels are currently developed with institutional and light industrial uses. The RBC site is separated from the Richmond community by I-580 and the railroad lines north and east of the site and by Meeker Slough southwest of the site. The University would work with the City of Richmond to acquire the road right-of-way parcel for Regatta Boulevard and realign the right-of-way on the western boundary of the proposed campus. The realignment would not divide the nearby neighborhood. 2014 LRDP implementation would not expand the campus site into the surrounding community and would not physically divide any established communities. No impact would occur.

Mitigation Measure: No mitigation measure is required.

LRDP Impact LU-2: Development under the 2014 LRDP would not result in development that would conflict with land use plans applicable to the project site or with land use plans for properties adjacent to the project site. (*Less than Significant*)

Since its acquisition in 1950, the RFS has been used as a field station by UC Berkeley to house certain research programs. The Regatta parcel, at the western edge of the RBC site and acquired in 2007, has been used to house archives for UC Berkeley and other private leased uses. No applicable land use plan has been adopted for these portions of the proposed RBC site. The proposed 2014 LRDP is a land use plan that, once adopted, would be the RBC site's governing plan. As there is no existing applicable land use plan, campus development under the proposed 2014 LRDP would not conflict with an applicable land use plan.

City of Richmond General Plan

The land use plan for areas surrounding the RBC site is the City of Richmond General Plan 2030. All of the lands immediately west and south of the Regatta parcel, north of the Regatta and RFS parcels, and east of the RFS parcel are designated Light Industrial/Business uses in the General Plan; that is also the General Plan land use designation for the RBC site. Light industrial uses are developed on some adjacent parcels and some other parcels are vacant. There are no proposals to develop or redevelop land near the RBC site. If any of these properties were to be developed in the future, the uses would be industrial or business.

The proposed 2014 LRDP would not conflict with the City's General Plan vision for the RBC site and the Richmond's shoreline area. The proposed RBC facilities would include research laboratories, which would not conflict with the business/light industrial use designation. The 2014 LRDP identifies two land use designations to inform the pattern of RBC development: (1) Research, Education, and Support, and (2) Natural Open Space; the LRDP Land Use Plan is shown as Figure 3-3. Using the land use plan and the LRDP development goals and objectives, a conceptual portrayal of potential RBC development has been devised, as shown on Figure 3-4 (that conceptual layout is part of an Illustrative Development Scenario, which is discussed in detail in Section 3.7). As shown in both the LRDP Land Use Plan and the LRDP Conceptual Layout, the RBC site central and southern portions would remain undeveloped and protected as open space; most of the remainder of the site would be developed. This manner of development would place developed campus uses in areas that adjoin industrial and business uses and would provide a buffer between RBC facilities and nearby sensitive land uses such as residential and natural areas. The Marina Bay residential neighborhood to the southwest would continue to be

separated from development on the RBC site by an approximately 250-foot open space buffer. The residential neighborhood to the northeast would be more than 500 feet from any RBC development and further shielded from the RBC by the intervening I-580. These neighborhoods are designated in the 2030 General Plan for low- and medium-density residential uses.

RBC building heights are expected to vary, with lower buildings at the Bay front edge and taller buildings farther inland. Four- and five-story buildings are expected to be a common building module, with heights of 100 feet for five-story buildings featuring floor-to-floor heights typical of laboratory buildings. These tall stories allow for extra capacity and access to utility systems that often need to be altered as laboratory uses and needs change over time. Neighborhoods within the campus may also feature iconic buildings that help establish a sense of place. An example would be Sather Tower (the Campanile) at UC Berkeley, which measures 303 feet to the top. As shown on Figure 3-4, the building heights proposed in the RBC site eastern and northeastern portions would not conflict with the industrial land uses or I-580 to the east and northeast. The proposed buildings and expansion of the Northern Regional Library Facility in the RBC site northern portion would be consistent with the existing industrial land uses north of Regatta Boulevard. The building heights in the RBC site Regatta area would not conflict with the light industrial and business land uses to the north, west, and southeast of the property. There would be an open space buffer between the Marina Bay neighborhood and the existing EPA building and proposed buildings in the RBC site's southwestern portion. This buffer and the plan to construct only lower buildings along the Bay front edge would minimize building height impacts on nearby residents and park recreational users.

As noted in the 2014 LRDP planning principles, the RBC would respect and promote its connection to the City of Richmond through its site planning and programs. Opportunities to do so include coordinating planning with the City of Richmond for the South Shoreline Area, developing an open campus, creating science education outreach programs, providing skills training for RBC-affiliated jobs, instituting a campus community arts program, and promoting new retail outlets to serve the RBC and local communities. The 2014 LRDP would develop a research and development campus and provide a new employment center consistent with General Plan Goal ED8. The campus would conform to General Plan Policy ED8.1 by partnering with the City of Richmond to promote advanced technology, research, and development. New RBC building types, uses, and scale would complement nearby industrial and commercial operations in accordance with General Plan Policy ED8.2. An appropriate buffer zone is proposed between proposed new RBC development and existing residential uses and the natural areas such as the Western Stege Marsh and Meeker Slough. The natural areas would remain undisturbed by development in accordance with General Plan Policies LU4.1, LU4.2, and LU4.3. The existing contamination on the RBC site would be addressed consistent with General Plan Policy LU4.4. Although the proposed 2014 LRDP is designed to avoid land use conflict with nearby existing and future land uses, the University will evaluate and as appropriate prepare CEQA documentation for new RBC facilities. Early in the design process, the University will evaluate the proposed campus developments for consistency with the 2014 LRDP and will consider the off-campus implications as described in LRDP Impact AES-1.

Given the proposed 2014 LRDP land use designations, planning principles, and the pre-project design review process described above, the proposed 2014 LRDP would not conflict with the City of Richmond General Plan 2030 goals and policies. This impact is considered less than significant.

Eastshore State Park General Plan

A portion of the Eastshore State Park, the South Richmond Shoreline, is adjacent to the RBC site. The Eastshore State Park General Plan indicates that the RFS, which is a portion of the proposed RBC, is expanding and transitioning toward cleaner and higher technology uses. The 2014 LRDP

would indeed further develop the RBC site to accommodate research and development in technologically advanced and environmentally proactive ways. The 2014 LRDP would protect the site's natural resources, including those near the South Richmond Shoreline. This resource protection would conform to Eastshore State Park General Plan policies. The University would work with the East Bay Regional Park District to identify possible natural resource enhancements and thus further promote the Park's General Plan policies. The 2014 LRDP would not conflict with the General Plan for the Eastshore State Park. This impact is considered less than significant.

Mitigation Measure: No mitigation measure is required.

Cumulative Impacts and Mitigation Measures

LRDP Cumulative Impact LU-1: **Development under the 2014 LRDP, together with other reasonably foreseeable regional growth, would not result in development that would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project. (*Less than Significant*)**

The South Shoreline Specific Plan is currently under preparation. The Planning Area comprises the City of Richmond southeastern portion that is west and south of I-580. It includes areas designated for light industrial, commercial, and residential uses, and it includes the entire RBC site and adjacent sites. This plan tiers off the recently adopted City of Richmond General Plan 2030. Therefore, the Specific Plan is anticipated to include policies promoting higher residential densities and continued industrial, research, and development uses. The 2014 LRDP would be complemented by Specific Plan policies that anticipate RBC site development through the year 2050.

There is one foreseeable project near the RBC site. Bio-Rad Laboratories, on a 4-acre site at 3110 Regatta Boulevard and immediately west of the Regatta parcel, proposes to replace six existing structures with a new 16,888 gsf building to accommodate laboratory office, research, and development uses. As the new structure would be in the same location and used for the same activities as the current on-site buildings, a land use change in conflict with an applicable plan would not occur.

It is anticipated that development of future off-campus projects near the RBC site would be reviewed for consistency with the City of Richmond General Plan 2030 land use plans and policies; the University would evaluate projects for 2014 LRDP consistency and would analyze consistency with nearby land uses. Future development is therefore assumed to be consistent with applicable plans or polices would result in a less than significant cumulative land use impact.

Mitigation Measure: No mitigation measure is required.

4.9.5 References

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