5.4 GEOLOGY

This section evaluates the potential for the San Joaquin Apartments project to be adversely affected by seismic hazards, including earthquake-related ground rupture and ground shaking. The evaluation of potential seismic hazards is based primarily on information obtained from a geologic investigation conducted at the project site and described in the following report: Fault Study, San Joaquin Residence Apartments and Precinct Improvements Planning Study (Fugro, 2012). This report is incorporated into this EIR by reference and is available review in the UCSB Office of Design and Construction Services during normal business hours.

5.4.1 Setting

Regional Geologic Setting

The San Joaquin Apartments project site is located on the coastal plain south of the Santa Ynez Mountains, which are part of the western Transverse Ranges. The Transverse Ranges are a predominately east-west trending mountain block extending eastward approximately 75 miles from Point Arguello in western Santa Barbara County into Ventura County. The Santa Ynez Mountains and the adjacent alluvial plain are composed almost entirely of sedimentary rocks. The Santa Barbara and Goleta area is located on the coastal plain, which contains east-west trending faults and related folds.

The More Ranch/Mission Ridge/Arroyo Parida faults are the principal fault system on the coastal plain and forms the northern boundary of a marine terrace, which is a wave-cut surface that is typically covered with a thin layer of marine sands and alluvium. The proposed project site is located near the northern boundary of the marine terrace. The topography of the marine terrace is gently sloping to the south to generally flat-lying. Stream erosion has subsequently dissected the terrace to produce mesa surfaces with intervening drainages.

Project Site Geologic Setting

The San Joaquin Apartments project site is underlain by artificial fill, alluvium, marine terrace deposits, and the Pico Formation. The artificial fill varies in thickness from a thin layer to about three feet, and is likely associated with previous construction activities on the project site. The alluvium deposits consist primarily of clays and sands and extend from near the ground surface to depths of up to 20 to 30 feet. The marine terrace deposits are composed of dense to very dense silty sand and sand, and are generally about 15 feet thick. The Pico Formation is located below the marine terrace deposits and is composed of siltstones and sandstones.

Groundwater levels at the project site were measured during March and May of 2012. Those measurements determined that groundwater levels at the site were approximately 15 to 20 feet below the ground surface (Fugro, 2012). Similar groundwater conditions were determined to exist in 2002 with measured levels approximately 12 to 22 feet below the ground surface (Fugro, 2002).
Faulting

Santa Barbara County is located to the southwest of the San Andreas Fault, which is considered the primary boundary between the Pacific and North American tectonic plates. Compressional forces are created in the “Big Bend” portion of the plate boundary zone where the San Andreas fault deviates to the west from its predominant northwest trend. These forces have created the Transverse Ranges and a series of east-west faults and folds referred to as the Santa Barbara Fold Belt.

Many of the faults in the project region are extensive and are classified as being active faults. Agencies such as the California State Mining and Geology Board and the California Geological Survey consider a fault to be “active” when there is evidence of fault movement occurring over the past 11,000 years. Other faults in the project area are shorter and could be potentially active or inactive. Potential active faults show evidence of movement between 11,000 and about two million years ago. Inactive faults show no evidence of movement during the past two million years.

Seismically induced ground rupture is a break or deformation of the ground surface resulting from movement along a fault. Primary fault rupture refers to cracking and offset of the ground surface along a rupturing fault during an earthquake. As the rupture reaches the ground surface, it may spread into complex patterns of secondary faulting and ground deformation.

Faults identified as being located on or near the UCSB campus include the More Ranch, Campus, Coal Oil Point, Goleta Point, and North Channel Slope faults. The locations of these faults are depicted on Figures 5.4-1 and 5.4-2 and each is described below.

More Ranch Fault. The More Ranch fault is the western segment of the More Ranch/Mission Ridge/Arroyo Parida fault system. This fault system is topographically well expressed from Ellwood west of the project site to Ojai, and is the principal onshore fault on the Santa Barbara coastal plain. The More Ranch fault is a south-dipping, south side up reverse fault located along the north margin of the UCSB-Isla Vista-Devereux terrace.

Geologic maps published by various researchers and previous geologic studies have mapped or identified faults in the project vicinity that are generally associated with the More Ranch/Mission Ridge/Arroyo Parida fault system. However, the mapped locations and names of the faults have varied somewhat. The More Ranch fault has been mapped as consisting of a north and south branch in the project area. The locations of the north and south fault branches are depicted on Figures 5.4-1 and 5.4-2.

North Branch. The North Branch of the More Ranch fault is expressed as a discontinuous, north-facing scarp along the northern margin of the marine terrace. Studies conducted in 1973 exposed the North Branch in trench excavations at six locations and observed
Not to Scale
Source: Fugro, 2012

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San Joaquin Apartments and Precinct Improvements Project
Source: Minor, et. al, 2009

Figure 5.4-2
Project Area Fault Map
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offsets in terrace deposits of approximately two feet. Based on the results of previous studies, the North Branch has been mapped at a location approximately 1,000 feet north of the project site. Based on the estimated faulting rate for the North Branch, the amount of total displacement and the relatively young geomorphic features located near the fault, the North Branch is likely the major fault accommodating strain deformation in the More Ranch fault zone. The Santa Barbara County General Plan Seismic Safety Element classifies the North Branch as an active fault.

South Branch. The South Branch of the More Ranch fault extends from Mescalitan Island near the Santa Barbara Airport westward across the Isla Vista mesa to the seaciff west of the project site. The location of the South Branch has been mapped in several locations in the vicinity of the project site. Minor et. al. (2009) depicts the South Branch trending east-west in the area of El Colegio Road immediately south of the project site (Figure 5.4-2). Gurrola (2004) mapped the South Branch as trending east-west to northeast-southwest through the southern portion of the project site (Figure 5.4-1). The alignment of the South Branch as described by Gurrola was depicted on Figure 4.5-2, Local Faulting, of the 2010 LRDP EIR.

As reported by Fugro (2012), a geologic investigation performed in 2000 reportedly encountered evidence suggestive of faulting located in the parking lot/access road area for the West Campus Family Apartments, which is located on the west side of Storke Road adjacent to the project site. This investigation reported that the fault offsets marine sands and the underlying bedrock contact on the order of 12 feet with earth materials on the south side displaced upward relative to the north. The fault was projected to extend to the east onto the San Joaquin Apartments project site. The Fugro 2002 preliminary geotechnical investigation of the project site supplemented data from the 2000 investigation and determined that the fault was located on the southern portion of the project site. Additional information regarding the location of this fault is provided in Section 5.4.3 of this EIR.

Campus Fault. A fault known as the “Campus fault” was mapped in 1982 and its location is generally well documented. Studies conducted in 1987 and 1997 mapped the location of the Campus fault based on elevation differences of the marine terrace/Sisquoc Formation contact observed in borings. The location of the Campus fault mapped in 1997 is reasonably consistent with other investigations, including an investigation that found a distinct ending of the feature about 500 to 1,000 feet east of the Humanities and Social Sciences Building on the Main Campus. The Campus fault is located approximately one mile east of the San Joaquin Apartments project site.

Coal Oil Point Fault. The Coal Oil Point fault has been documented offshore of the UC Santa Barbara campus and Isla Vista areas. The fault is located about 200 feet south of both Coal Oil Point and Goleta Point. The fault trends east-west and has resulted in at least 5,400 feet of vertical separation. Detailed mapping of the sea floor has revealed no surface expression of this fault. The Coal Oil Point fault is located approximately 4,000 feet south of the San Joaquin Apartments project site.

Goleta Point Fault. The Goleta Point fault has been mapped trending southwest-northwest, crossing Goleta Point. The specific location of this fault varies between investigators;
however, the existence of the fault is based on exposures of highly fractured bedrock at Goleta Point and a fault located in the area of the Goleta gas field east and northeast of the Main Campus. The Goleta Point fault is located approximately 1.3 miles southeast of the San Joaquin Apartments project site.

**North Channel Slope Fault.** The North Channel Slope fault is generally considered to be a blind thrust fault located approximately four miles offshore from UC Santa Barbara that dips to the north beneath the Santa Barbara-Goleta coastal plain at depth. The North Channel Slope fault is considered by most investigators to be a high potential seismic source for the project region. Since the fault is buried at depth north of the coastline, it is not considered to represent a ground rupture hazard for buildings and infrastructure at UC Santa Barbara, however it is considered to be a potential source of earthquakes.

**Seismicity**

The Santa Barbara area is located in a seismically active region that has experienced moderate to large earthquakes during historic times. The faults closest to the campus with reported historic seismic activity are offshore in the Santa Barbara Channel. These faults have generated earthquakes of magnitude 6.3 in 1925, 5.5 in 1926, 6.0 in 1941, 5.2 in 1968, and 5.1 in 1978. The epicenters of these earthquakes were reportedly located approximately 5 to 10 miles south of the Santa Barbara coast. The project region has also experienced strong ground motion due to earthquakes along the San Andreas fault in 1812, 1857 and 1952.

The characteristics of the major faults located in the project region, along with estimated peak ground accelerations\(^1\) that could result from movement along the faults, are provided on Table 5.4-1. The listed faults have been selected based on their proximity to the project site and their potential to generate strong ground motion. A “maximum moment\(^2\)” magnitude earthquake is the largest earthquake that appears to be capable of occurring within the known tectonic framework. As indicated by Table 5.4-1, the North Channel Slope fault would have the potential to generate the highest level of ground shaking in the project area.

A probabilistic analysis of potential earthquake-related ground accelerations at the project site has also been conducted. This analysis describes the likelihood of peak ground acceleration exceeding a specific level due to an earthquake over a specified period of time. For this analysis, peak ground accelerations were estimated for a design-basis earthquake, which is an earthquake having a ten percent chance of being exceeded in 50 years, or a statistical return period of

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\(^1\) Peak ground acceleration is the maximum acceleration experienced by a particle on the earth’s surface during the course of the earthquake motion. It is a measure of how hard the earth shakes, as distinguished from magnitude, which is a measure of the total size of the earthquake.

\(^2\) The moment magnitude scale for measuring earthquakes was developed in 1978 and is the scale most commonly used today. The moment magnitude scale is related to the physical size of the fault rupture and movement across the fault, which provides a uniform measure of the strength of an earthquake.

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5.4-8
approximately 475 years; and an upper-bound earthquake, which is an earthquake having a ten percent chance of being exceeded in 100 years, or a statistical return period of approximately 950 years. A summary of the probabilistic evaluation is presented in Table 5.4-2. The table includes ground accelerations for design-basis and upper-bound earthquakes for selected individual faults as well as for all faults within 100 kilometers of the project site.

Table 5.4-1
Characteristics of Major Faults in the UC Santa Barbara Campus Region

<table>
<thead>
<tr>
<th>Fault</th>
<th>Approximate Distance from Site (km)</th>
<th>Maximum Moment Magnitude Earthquake</th>
<th>Estimated Peak Horizontal Ground Acceleration Mean (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Channel Slope</td>
<td>0.1 (1)</td>
<td>7.1</td>
<td>0.66</td>
</tr>
<tr>
<td>More Ranch-Mission Ridge-Arroyo Parida</td>
<td>0 - 0.3</td>
<td>6.7</td>
<td>0.53</td>
</tr>
<tr>
<td>Channel Island Thrust (Eastern)</td>
<td>49</td>
<td>7.4</td>
<td>0.33</td>
</tr>
<tr>
<td>Santa Ynez (west)</td>
<td>15</td>
<td>6.9</td>
<td>0.24</td>
</tr>
<tr>
<td>Red Mountain</td>
<td>21</td>
<td>6.8</td>
<td>0.22</td>
</tr>
<tr>
<td>Montalvo-Oak Ridge Trend</td>
<td>26</td>
<td>6.6</td>
<td>0.19</td>
</tr>
<tr>
<td>Santa Ynez (east)</td>
<td>21</td>
<td>7.0</td>
<td>0.18</td>
</tr>
<tr>
<td>Ventura (Pitas Point)</td>
<td>31</td>
<td>6.8</td>
<td>0.16</td>
</tr>
<tr>
<td>Los Alamos-West Baseline</td>
<td>30</td>
<td>6.8</td>
<td>0.15</td>
</tr>
<tr>
<td>Oak Ridge (Blind Thrust Offshore)</td>
<td>32</td>
<td>6.9</td>
<td>0.16</td>
</tr>
<tr>
<td>Santa Cruz Island</td>
<td>39</td>
<td>6.8</td>
<td>0.12</td>
</tr>
<tr>
<td>Santa Rosa Island</td>
<td>44</td>
<td>6.9</td>
<td>0.10</td>
</tr>
<tr>
<td>San Andreas (1857 rupture)</td>
<td>72</td>
<td>7.8</td>
<td>0.11</td>
</tr>
</tbody>
</table>

(1) The North Channel Slope fault is located offshore but dips north beneath the coastal plain. Source: UCSB, 2010; Fugro, 2012.

Table 5.4-2
Results of the Probabilistic Seismic Hazard Analysis

<table>
<thead>
<tr>
<th>Fault of Fault Segment</th>
<th>Peak Horizontal Ground Acceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design-Basis Earthquake</td>
</tr>
<tr>
<td></td>
<td>(10% chance of being exceeded in 50 years)</td>
</tr>
<tr>
<td>North Channel Slope</td>
<td>0.30</td>
</tr>
<tr>
<td>More Ranch-Mission Ridge-Arroyo Parida</td>
<td>0.15</td>
</tr>
<tr>
<td>Santa Ynez (West)</td>
<td>0.28</td>
</tr>
<tr>
<td>San Andreas – 1857 Rupture</td>
<td>0.15</td>
</tr>
<tr>
<td>All Faults within 100 km</td>
<td>0.52</td>
</tr>
<tr>
<td>Upper-Bound Earthquake</td>
<td>(10% chance of being exceeded in 100 years)</td>
</tr>
<tr>
<td>North Channel Slope</td>
<td>0.53</td>
</tr>
<tr>
<td>More Ranch-Mission Ridge-Arroyo Parida</td>
<td>0.28</td>
</tr>
<tr>
<td>Santa Ynez (West)</td>
<td>0.37</td>
</tr>
<tr>
<td>San Andreas – 1857 Rupture</td>
<td>0.20</td>
</tr>
<tr>
<td>All Faults within 100 km</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Source: Fugro, 2012

Regulatory Setting

Building Codes. The Uniform Building Code was a model building code published approximately every three years until 1997 when it was replaced in 2000 by the International Building Code. In 2010, the California Building Standards Commission adopted the 2009
International Building Code, as amended, which became the 2010 California Building Standards Code. This Code is commonly referred to as the California Building Code (California Code of Regulations, Title 24). Development in the State must comply with the requirements of the California Building Code as amended and adopted by local jurisdictions. Among other things, the California Building Code provides standards pertaining to conducting soil and geotechnical investigations for new construction, minimum building design requirements, and grading requirements.

Section 1613.1.2 of the 2010 California Building Code states: “State-owned buildings, including those of the University of California…shall not be constructed where any portion of the foundation would be within a mapped area of earthquake-induced liquefaction of landsliding or within 50 feet of a mapped fault rupture hazard as established by Section 1802.7.” California Building Code section 1802.7 indicates that geologic and earthquake engineering reports shall be prepared for new construction. The purpose of the engineering geologic report is to identify geologic and seismic conditions that may require project mitigations.

**University of California Seismic Safety Policy.** This policy was originally adopted in 1975 and was last updated on August 25, 2011. The purpose of the policy is “to the maximum extent feasible by present earthquake engineering practice to provide an acceptable level of earthquake safety for students, employees, and the public who occupy University buildings and other facilities, at all locations of University operations and activities.”

Among other things, the policy provides requirements related to: standards for new construction and renovation, including requirements that the design and construction of buildings on University premises comply, at a minimum, with the current seismic provisions of California Building Code; and for conducting independent seismic peer reviews of building plans.

**Alquist-Priolo Earthquake Fault Zoning Act.** The purpose of this Act (Public Resources Code Section 2621 et. seq.) is to prohibit the location of most structures for human occupancy across the trace of an active fault, thereby mitigating the hazard of fault rupture (Hart, et. al., 1997). The Earthquake Fault Zoning Act prohibits the construction of buildings for human occupancy across active faults, and structures covered by the Act must be setback from the location of the fault. A common setback distance is approximately 50 feet, however, the actual setback requirement may be increased or decreased depending on the type of structure proposed and its intended use, and the results of required site-specific investigations. There are currently no designated Alquist-Priolo designated Earthquake Fault Zones located on or near the UCSB campus.

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3 California Building Code Section 1802.7 is from the 2007 building code. The requirements for geologic and earthquake engineering reports are provided in Section 1803.7 of the 2010 California Building Code.
LRDP Requirements

The 2010 LRDP policy related to the reduction of potential geologic hazard impacts is provided below.

GEO-2. Subsurface geotechnical and soil studies shall be conducted to determine proper building foundation and infrastructure design to address potential seismic and liquefaction hazards, if any.

5.4.2 Impact Identification and Significance Thresholds

Initial Study Evaluation of Potential Impacts

Less Than Significant Impacts. The Initial Study prepared for the San Joaquin Apartments project indicated that a preliminary geotechnical report previously prepared for the project site (Fugro, 2002) concluded that the potential for liquefaction or seismic settlement to occur at the project site was low, and compliance with the requirements of the California Building Code (Title 24) and LRDP policy GEO-2 would be adequate to reduce potential liquefaction-related hazards at the project site to a less than significant level. Therefore, no further analysis of this geologic hazard by the EIR is required.

The Initial Study indicates that the proposed project would be required to file a Notice of Intent to comply with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, and to develop and implement a site-specific Storm Water Pollution Prevention Plan (SWPPP). It is an objective of the SWPPP to identify, implement and maintain appropriate best management practices to reduce or eliminate pollutants in stormwater discharges from construction sites. In addition, policies of the 2010 LRDP require the implementation of a variety of erosion control best management practices at construction sites. With the implementation of existing regulatory and policy requirements, the project would result in less than significant short-term erosion-related impacts and no additional analysis by the EIR is required.

The Initial Study also concluded that potential impacts related to ground subsidence, soil collapse, lateral spreading, and expansive soils would be reduced to a less than significant level by complying with existing building regulations. These regulations require project-specific soils investigations to be conducted and that the buildings foundations be designed to eliminate or minimize these potential impacts. The project site is relatively level and the project would not result in the creation of substantial cut or fill slopes that would have the potential to result in significant landslide impacts. In addition, the proposed project would be connected to a sewer system and would have no impact related to the use of septic systems.

Potentially Significant Impacts. Impacts identified by the Initial Study as requiring additional evaluation by the Project EIR include the potential for on-site faulting to adversely affect proposed buildings, and other project-related structures and infrastructure; and the potential for proposed structures to be adversely affected by earthquake-related ground shaking.
Potential impacts that could result if a long-term source of erosion and sedimentation were to exist on the project site after the completion of construction activities is to be evaluated in the Water Quality section of the EIR.

**Impact Evaluation Significance Thresholds**

The geologic hazards analysis provided by the EIR includes the potential effects of earthquake-related ground rupture and ground shaking. The applicable threshold provided by Appendix G of the CEQA Guidelines is provided below. This threshold indicates that a project would have the potential to result in a significant environmental impact if it would:

1. Expose people or structures to potential substantial adverse effects resulting from: rupture of a known earthquake fault, strong seismic ground shaking, liquefaction, or landslides.

**5.4.3 Impact Evaluation**

**On-Site Faulting**

As described in Section 5.4.1, data acquired by the Fugro (2002) geotechnical evaluation of the project site indicated that a zone of soil and bedrock displacement had the potential to exist on the site. The location of the suspected displacement zone appeared to correlate with a zone of faulting and ground displacement previously identified on the West Campus Family Apartments site, which is located adjacent to Storke Road west of the project site. To gather additional information regarding the possible presence or absence of ground displacement due to faulting on the San Joaquin Apartments project site, it was determined that a fault exploration program should be conducted using closely spaced cone penetration test soundings. Such a testing program would identify and correlate geologic units (i.e., layers of soil and bedrock material) beneath the project site, and assess the potential for faulting by evaluating offsets in the correlated units. Using this analysis method, apparent fault-related offsets as small as one or two feet could be detected. A similar testing program conducted on the West Campus Family Apartments site provided good data regarding the correlation of soil and bedrock units at that site.

Cone penetration testing uses a small steel probe that is pushed into the ground under constant pressure, and sensors in the probe can collect a wide variety of data regarding subsurface geological, geotechnical, groundwater and/or geoenvironmental (i.e., contamination) conditions. For example, subsurface soils can be classified using a probe that measures pressure and friction as it is pressed into the ground.

**Fault Investigation.** Numerous cone penetration test soundings were performed on the San Joaquin project site between May 2011 and April 2012 (Fugro, 2012). The soundings were conducted in a phased manner and were located in 14 lines that extended across the project site in a roughly north-south direction.
After the majority of the cone penetration test data were obtained and interpreted, 17 soil borings were drilled at various locations throughout the project site. The core samples were evaluated and compared to the cone penetration test results, and carbon samples were collected from the core samples and used for radiocarbon dating. Radiocarbon dates were obtained from selected carbon samples and those results suggested that focused fault trenches could be useful in determining the date of detected fault offsets, which would determine the activity of faulting at the site. Three relatively short fault trenches were excavated on the project in May, 2012. The on-site trenches ranged from approximately 45 to 75 feet in length, and approximately seven to 14 feet in depth.

Detailed geologic profiles of the project site were developed based on data obtained from the cone penetration test soundings and the fault trenches. On the basis of the data obtained from the fault study, three faults were identified on the project site.

The most significant of the observed faults is referred to as the “central” fault, which was mapped as extending across the entire project site. The central fault is a south-side-up reverse fault that dips to the south and offsets the base of the marine terrace deposits by about 10 to 11 feet on the west side of the project site, and offsets the marine terrace deposits on the east side of the project site by about 15 feet.

A fault referred to as the “northern” fault was mapped as extending across the eastern portion of the project site, north of the location of the central fault. The western segment of the northern fault was observed to be a north-side-up reverse fault that dips to the north, and offsets the base of the marine terrace deposits by about two to three feet. On the eastern portion of the project site, the fault was observed to be south-dipping. Although one fault segment dips to the north and the other dips to the south, it is believed that the faults may be related because they both form the northern border of a small “graben,” which is a block located between the northern fault and the central fault that has slipped downward. It is also believed that northern fault is likely a splay off of the central fault.

A fault referred to as the “southern” fault was mapped as extending across the western portion of the project site, south of the central fault. The southern fault is a south-side-up reverse fault that dips to the south, and offsets the base of the marine terrace deposits by as much as 10 feet. Efforts were made to detect an eastward projection of the southern fault, however, the results of cone penetration testing and observations made in a fault trench suggested that a broad zone of ground warping over 200 feet wide has occurred without recognizable fault offset.

4 A reverse fault indicates compression or a shortening of the ground surface due to tectonic activity. When ground movement occurs along a reverse fault, the hanging wall (i.e., the portion of the ground surface located above the fault plane) moves upward relative to the footwall (i.e., the portion of the ground surface located below the fault plane.)
Fugro (2012) also indicated that in the southeastern portion of the project site Holocene strata are not cut by active faults, however, there is a potential for deformation and uplift of the ground surface caused by tectonic movement at depth that has not yet propagated through to the surface. Another area on the project site that could also be affected by ground deformation is located north of the central fault near the center of the project site. The proposed Portola Dining Commons building would be located in the possible ground deformation zone in the southeast portion of the project site. No buildings are proposed for the smaller potential deformation zone identified in the central portion of the project site.

**Age of Faulting.** Gurrola and Keller (2000) reported that the More Ranch segment of the More Ranch-Mission Ridge-Arroyo Parida fault zone is “apparently active.” They define the term “apparently active” as having very young (probably Holocene) topographic expression of activity. Although they consider the fault to be “apparently active,” the State Geologist has not yet designated an Alquist-Priolo Earthquake Hazard Zone for the More Ranch fault.

Radiocarbon dates obtained from material obtained from the project site indicate that uplift along the central fault offsets strata (layers of geologic material) of Holocene age (within the past 11,000 years). Therefore, the central fault should be considered active.

The age of faulting for the southern fault has not been determined. Since it cannot be demonstrated that Holocene sediments have not been cut by the southern fault, it should be considered active for purposes of determining the potential for fault-related impacts. However, it was determined that the warped sediment layers located to the east of the southern fault are of pre-Holocene age, therefore, ground movement in that area should be considered inactive.

Since the absence of Holocene fault offset cannot be demonstrated for the northern fault, and the fault appears to be a splay of the central fault, the northern fault should be considered active for the purposes of determining the potential for fault-related impacts.

Fugro (2012) also indicated that in the southeastern portion of the project site Holocene strata are not cut by active faults, therefore, structural setbacks to minimize fault rupture-related impacts are not required.

In summary, the fault investigation concluded at the project site (Fugro, 2012) determined that active faults exist on the project site. Therefore, the project would have the potential to expose people or structures to substantial adverse effects resulting from: rupture of a known earthquake fault.

**Hazard Reduction Measures.** Based on the results of the 2012 fault study, Fugro recommended that consistent with the general standard of practice, 50-foot building setbacks be provided on both sides of the mapped locations of the identified faults. The recommended setback areas are depicted on Figure 5.4-3, which shows that all proposed buildings have been located outside of the recommended setback areas. With the implementation of the recommended building setbacks from the fault locations and the design of the project, potential impacts to people or structures resulting from the rupture of a known earthquake fault are less than significant and no mitigation measures are required.
Fugro (2012) recommended that geotechnical and/or structural measures be implemented for any building located in the potential ground deformation area located in the southeastern portion of the project site. Such measures would likely include appropriate building foundation and structural design that addresses estimated ground surface deformation. The precise design measures to be implemented would be identified by engineering efforts, such as those required by University and UCSB LRDP policies, and the requirements of CCR Title 24. With the implementation of appropriate design measures identified by required geotechnical studies and proposed mitigation measure GEO-1a, potentially significant impacts to people or structures on the project site would be reduced to a less than significant level.

The proposed project design and hazard reduction mitigation measure are consistent with the requirements of California Building Code Section 1613.1.2, which requires a 50-foot building setback from mapped fault rupture hazard areas identified by a project-specific engineering geologic report. The engineering geologic report prepared for the project (Fugro, 2012) recommended a 50-foot building setback from identified potential fault rupture areas, and other structural mitigations for areas of the project site that could be affected by ground deformation.

Faulting Impacts to Utilities. Utilities such as potable water, water used for emergency fire flows, reclaimed water and sewer conveyance lines would cross the faults located on the project site. Movement of an on-site fault could result in an uncontrolled release of water or sewage, and could interfere with fire suppression activities. Uncontrolled water and sewage releases due to pipeline damage caused by fault movement could have the potential to result in significant environmental impacts. These potential impacts could be reduced to a less than significant level by providing emergency shut-off valves on both sides of pipeline that cross the identified location of the onsite faults, which would facilitate the control of released fluids and facilitate the repair of damage utility pipes. Proposed mitigation measure GEO-2a requires the installation of shutoff valves on major on-site utility pipelines that cross an on-site fault.

Proposed fire suppression water pipelines would provide a connection loop with points of connection along El Colegio Road and Storke Road. The proposed pipeline extending northward from El Colegio Road would cross the central fault located on the east side of the project site. Damage to that fire suppression water pipeline due to fault movement would have the potential to result in a significant impact to fire suppression capabilities. The proposed fire suppression water pipeline connection along Storke Road would extend eastward along the access way that would be located south of the North Village Precinct. This water pipeline would not cross any of the identified on-site faults. Therefore, in the unlikely event of pipeline damage caused by fault movement on the project site, emergency water supplies would remain available from the...
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Figure 5.4-3
Proposed Setback Areas

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pipeline connection along Storke Road and potential impacts would be reduced to a less than significant level by providing emergency shut-off valves as required by proposed mitigation measure GEO-2a.

**Ground Shaking**

As shown on Tables 5.4-1 and 5.4-2, the Santa Barbara region is seismically active and it is likely that the proposed buildings and building occupants will experience moderate to strong ground shaking sometime during the life of the project. Similar to other buildings on the UCSB campus and in the project region, the risk of ground shaking-related effects to proposed structures would be reduced to an acceptable level by complying with University and LRDP policies, and the requirements of CCR Title 24. With the implementation of these building requirements, ground shaking impacts would be less than significant and no mitigation measures are required.

**Future Podium Building Uses**

The existing building (i.e., the podium building) located between the two residential towers on the project site presently provides a dining commons and a variety of other student-serving uses, such as meeting and activity rooms. With the implementation of the proposed project the existing dining commons facility would be decommissioned and it is likely that the released space would be converted to other student-serving uses in the future. The conversion of the existing podium building to other student-serving uses would not substantially increase or decrease hazards or safety risks resulting from future seismic events.

In regard to the continued use of podium building, it should be noted that consistent with the requirements of the University’s Seismic Safety Policy, a structural analysis of the existing on-site buildings was conducted before the Francisco Torres property (the proposed project site) was were acquired by UCSB. As a result of the survey, measures to improve the performance of the on-site buildings during an earthquake were implemented. These modifications increased the building’s seismic performance rating from “fair” to “good” under the rating system formerly used by the Seismic Safety Policy.

**5.4.4 Cumulative Impacts**

Impacts from geologic hazards, such as how buildings and properties perform during a large earthquake, are generally site-specific and do not combine such that the risk of hazard-related impacts at any particular site may be increased. Individual development sites and projects have geologic conditions particular to that site and must be considered on a site-specific basis so that appropriate site development and construction standards can be identified and implemented.

The proposed project would increase the number of people, structures and utilities that could be exposed to the potential effects of ground rupture, ground shaking and other geological hazards. The proposed project’s compliance with hazard reduction requirements of the 2010 LRDP, the University’s Seismic Safety Policy, the recommendations of site-specific
geotechnical studies, and building code requirements prescribed by CCR Title 24, would ensure that site-specific impacts are reduced to a less than significant level. Other development projects in the project region must comply with similar applicable building codes and hazard reduction measures. Therefore, future development on the UCSB campus (see Table 3.5-1) and other development in surrounding communities would not result in or contribute to cumulative seismic hazard impacts. As a result, the proposed project’s geologic hazard impacts would not be cumulatively considerable and a less than significant impact would result.

Future development on the UCSB campus, and other development in the project region could have the potential to result in cumulative erosion-related impacts if sediment is allowed to leave the project site. Development in the project region is subject to state and local runoff and erosion control requirements, such as the provisions of the State General Construction Permit and requirements to implement and maintain best management practices identified by a Stormwater Pollution Prevention Plan. The proposed project would implement applicable regulatory and LRDP policy requirement to reduce short-term erosion-related effects to the maximum extent practicable, and other projects in the region would be subject to similar requirements. Therefore, the contribution of the proposed project to short-term erosion-related impacts would not be cumulatively considerable and a less than significant impact would result.

5.4.5 Mitigation Measures and Residual Impacts

Impacts That Can Be Reduced To a Less Than Significant Level

GEO-1. The Portola Dining Commons building would be developed on a portion of the project site that has the potential to experience ground surface deformation and uplift caused by tectonic movement at depth, rather than ground rupture caused by fault movement.

GEO-1a. Building plans for the Portola Dining Commons building shall incorporate foundation and structural recommendations provided by qualified engineering geologists and structural engineers to address ground surface deformation that could be caused by fault-related ground movement. Proposed design recommendations shall be peer reviewed consistent with the requirements of the University’s Seismic Safety Policy.

GEO-2 The proposed project would result in the construction of project-serving underground utility lines that would be required to cross active faults located on the project site.

GEO-2a. Major underground utility lines on the project site that are required to cross the mapped location of an active fault shall be provided with shut-off valves on the north and south sides of the on-site faults.

Implementation of the proposed mitigation measures would reduce potential impacts associated with potential fault movement on the project site to a less than significant level.