3.6 - Geology and Soils

This section of the Recirculated Draft EIR (RDEIR) includes information related to the geologic properties of the land and soils on the project site and the ability of the land to support development. Descriptions and analyses in this section are based on information contained in the following documents:

- The Pass Area Plan (County of Riverside 2003a)
- 2013 Response to Review Comments by Riverside County, TLMA-Planning Regarding the I-10 Gateway Job Center (Ginter & Associates 2013b)
- October 2014 Preliminary Hydrology Study by Albert A. Webb Associates

Geotechnical documents can be found in Appendix E, and Hydrology documents can be found in Appendix G.

The Ginter & Associates’ Grading Plan Review(s)—based on the results of the investigation, engineering analyses, and evaluations, combined with professional experience and judgment from a geologic and geotechnical engineering standpoint—indicate the project site is considered suitable for the proposed project.

3.6.1 - Existing Conditions

This section describes the regional and local geology and soils setting.

Local

The 2014 San Gorgonio Crossing Biological Technical Report (Appendix C.1), prepared by HELIX Environmental Planning, Inc. (HELIX), identifies overall site drainage to be to the west and southwest. Soils on-site are primarily Hanford coarse sandy loam and terrace escarpments with Gorgonio gravelly loamy fine sand, Greenfield sandy loam, Hanford cobbly coarse sandy loam, and Ramona sandy loam.

The Pass Area Plan identifies the Pass as one of the most densely faulted areas in Riverside County. The Pass is considered the narrow gap between Southern California’s San Bernardino and San Jacinto Mountains. A majority of the faults are located in the steep slopes of the surrounding mountain
ranges. The San Andreas and the San Jacinto fault zones are two of the most active fault systems in southern California. Other smaller faults associated with the San Andreas fault system also have the potential for generating earthquakes that would result in strong ground shaking, and perhaps surface rupture, in the Pass Area.

The project site is located at the juncture of the Transverse Range and the Peninsular Range in the Western end of the San Gorgonio Pass area. In this area, the Mojave Desert segment and the Coachella Valley segment of the San Andreas Fault Zone are a part of a complex combination of strike-slip faults (in which the rupture is nearly vertical and during an earthquake one side slides past the other) and thrust-and-tear faults (in which the ground on one side of the fault moves up and over adjacent ground) that include the Banning Fault and the San Gorgonio Valley Fault Zones. The Cherry Valley Fault Zone of the project area is considered a western extension of the San Gorgonio Pass Fault Zone (Ginter & Associates 2013a).

The project site is located in what is called the “Badlands” area, which has relatively low hills located southeast of Calimesa. The floor and edges of the San Gorgonio Pass trough consist of dissected old alluvial terrace deposits and younger alluvial sands and gravels. These units are present in the southern portion of the project site (Ginter & Associates 2013a).

The County’s Geographic Information System (GIS) shows that the project site is within a County Fault Zone, which runs through the northern portion of the project site. The project site is shown to be in a zone of extremely high (greater than 40 percent) general ground shaking risk.

The northern portion of the project site contains foothills and steep slopes. As shown in the 2008 County of Riverside General Plan Figure S-4, Earthquake Induced Slope Instability Map, the project site appears to be within an area with low to locally moderate susceptibility to seismically induced landslides and rockfalls.

The many regional faults have the potential to generate strong ground motions at the project site. The intensity of ground shaking at a given location depends primarily on the earthquake magnitude, the distance from the epicenter to the site, the type of fault that causes the earthquake, and the response characteristics of the soils or bedrock units underlying the site.

Different types of faults are described below to provide background information for the reader:

- Strike-slip faults are faults in which the rupture is nearly vertical and during an earthquake one side slides past the other.
- Thrust fault are faults in which the ground on one side of the fault moves up and over adjacent ground.
- Tear-faults are relatively small-scale, local strike-slip faults.
- Reverse faults are the opposite of a normal fault. Reverse faults indicate compressive shortening of the crust and for a thrust fault, the ground on one side of the fault moves up and over adjacent ground.
The major faults in the region are discussed below.

**San Andreas Fault**
The primary strand of the San Andreas Fault in southern California is divided into two segments—the Mojave Desert segment, which separates the San Bernardino Mountains from the San Gabriel Mountains, and the Coachella Valley segment, that separates the Peninsular Ranges from the San Bernardino Mountains. The main strand of the San Andreas Fault deflects west in the San Gorgonio Pass area where the fault zone becomes more complex. The Banning and San Gorgonio Pass Faults, including the Cherry Valley Fault Zone, are a part of this complex fault system in the San Gorgonio Pass Area (Ginter & Associates 2013a).

**San Gorgonio Pass Fault Zone**
The San Gorgonio Pass Fault Zone is characterized by discontinuous reverse-and-thrust faults (a reverse fault is the opposite of a normal fault—reverse faults indicate compressive shortening of the crust and for a thrust fault, the ground on one side of the fault moves up and over adjacent ground) and associated tear-faults (relatively small-scale, local strike-slip faults), which are generally located at the base of the San Bernardino Mountains. From west to east, this fault zone includes the Cherry Valley Fault Zone (CVFZ), a fault along the toe of the Banning Bench, and a northeast-trending segment crossing the lower part of the Millard Canyon Fan. The CVFZ, which is located in the vicinity of the project site, has been mapped as two sub-parallel faults which merge to the east to form one trace near the eastern property boundary of the project site and then veers northeast (Ginter & Associates 2013a).

**Banning Fault**
The Banning Fault is considered an ancestral trace of the San Andreas Fault and is no longer active. This fault is located approximately 0.25 mile north of the project site, where it consists of a prominent high-angle trace, which separates Pleistocene San Timoteo Formation on the south from granitic rock to the north (Ginter & Associates 2013a).

**Mill Creek Fault**
The Mill Creek Fault is located approximately 10 miles north of the project site. It is believed that this strand is no longer an active part of the San Andreas Fault Zone, although it may have been locally reactivated by dip-slip movement (Ginter & Associates 2013a).

**Beaumont Plain Fault Zone**
The Beaumont Plain Fault Zone has four north-northwest trending normal faults, which terminate near the southeast corner of the project site. These are considered an extensional zone of faults irregularly expressed as scarps in mid-Pleistocene and older surfaces and are considered inactive (Ginter & Associates 2013a).

**San Jacinto Fault**
The San Jacinto Fault is located approximately 6 miles southwest of the project site and consists of a system of northwest-trending, right-lateral, strike-slip faults. This fault is the closest known active fault to the project site and is considered the most influential regarding the potential for ground shaking and rupture. More large historic earthquakes have occurred on the San Jacinto Fault than on any other fault in southern California (Ginter & Associates 2013a).
Site Geology

The main geologic units within the project site include the Pilo-Pleistocene San Timoteo formation in the northeast and the old alluvium of a dissected alluvial fan in the southwest, with young alluvium along the valley floors. Structurally, the site is dominated by two splays of the Cherry Valley Fault—the North Branch and the South Branch which transect the site in a northwest to southeast trend. Undocumented artificial fill is present on-site as backfill for the fault trenches of former geologic investigations conducted on-site (Ginter & Associates 2013a).

Two main faults, the North and South Branches of the CVFZ, have been mapped on the project site. These two fault splays (parallel strands) associated with the Cherry Valley Fault Zone trend from northwest to southeast across the site. Lineaments and geomorphic evidence suggest a zone of faulting and deformation associated with the CVFZ that may be as wide as 500 to 700 feet. The North Branch is characterized by steeply dipping (near vertical) faulting that is located approximately 200 to 300 feet north-northeast of—and roughly parallel to—the South Branch. The South Branch is characterized by a northwest to east-west-trending, north-dipping reverse fault. Significant changes in stratigraphy, topography, geomorphology, and streamflow direction, are present along the entire mapped trace of this fault.

During the fault investigation by Neblett & Associates (September 2008), there was no attempt to age-date the South Branch or the North Branch of the Cherry Valley Fault. The fault investigation focused on refining the location and attitude of the South Branch of the Cherry Valley Fault to position future structures outside the restricted use zone at final grades. There is relatively strong geomorphic and topographic evidence that indicates that the Cherry Valley Fault Zone is potentially active. Thus, Neblett & Associates delineated a setback for the South Branch and “Recommended Restricted Use Zone” from the South Branch extending to the north and northeast property line as shown in Exhibit 3.6-1. No evidence of faulting was observed southerly of the South Branch of the CVFZ in any of the excavations (Ginter & Associates 2013a).

Based on the results of Neblett & Associates’ fault investigation (September 22, 2008) using aerial photo lineament analyses, fault trenching, geologic field mapping, observation of exposed roadcuts, and review of previous fault investigations by others, Neblett & Associates located the South Branch of the CVFZ on-site. These analyses have resulted in a structural setback zone located 50 feet south of and 100 feet north of the South Branch. Ginter & Associates also established a Restricted Use Zone (RUZ), which is located north and northeast of the South Branch to the north and northeast property boundary.

On-site Soils

Artificial and Undocumented Fill

Artificial fill is located within and in the vicinity of the San Gorgonio Pass Water Agency Pipeline easement that traverses the northern portion of the project site. Some of the fault trenches identified by Ginter & Associates indicated that past agricultural activities and trenching have spilled fill along the edges of the flat-topped ridges in the southern half of the project site. Undocumented fill on the project site consists of heterogeneous mixture of pebbly sand, silty sand, sandy silt, and coarse sand with cobbles and an occasional boulder (Ginter & Associates 2013a).
**Alluvium**

Younger alluvial units are located on-site in the active drainages, which generally trend southerly to southwesterly. These materials were only exposed in one of the fault study trenches (NT-4), at the west end of the fault study trench. In this study trench, younger alluvial materials consisted of silty sands and lesser gravelly sands. On-site older alluvial units consist of reddish-brown clayey sands and yellowish-brown silty sands (Ginter & Associates 2013a).

**Groundwater**

None of the borings excavated on-site (to a depth of 71 feet) encountered groundwater. Two groundwater wells that were previously used for irrigation are located in the western portion of the site. Measurements of the groundwater in the on-site wells indicated the depth to groundwater to be approximately 198 to 223 feet below ground surface. Based on the measurements of the regional aquifer and the absence of noted perched water in the borings, high groundwater is not expected to be a constraint to the proposed project (Ginter & Associates 2013a).

**3.6.2 - Regulatory Setting**

**Federal Regulation**

**National Earthquake Hazards Reduction Program**

The National Earthquake Hazards Reduction Program (NEHRP) was established by the U.S. Congress when it passed the Earthquake Hazards Reduction Act of 1977, Public Law 95–124. In establishing the NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early-warning systems, coordinated emergency preparedness plans, and public education and involvement programs. The four basic goals remain unchanged:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems.
- Improve earthquake hazards identification and risk assessment methods, and their use.
- Improve the understanding of earthquakes and their effects.

Several key federal agencies contribute to earthquake mitigation efforts. There are four primary NEHRP agencies:

- National Institute of Standards and Technology of the Department of Commerce
- National Science Foundation
- USGS of the Department of the Interior
- Federal Emergency Management Agency (FEMA) of the Department of Homeland Security

Implementation of NEHRP priorities is accomplished primarily through original research, publications, and recommendations to assist and guide state, regional, and local agencies in the development of plans and policies to promote safety and emergency planning.
State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

In response to the severe fault rupture damage of structures by the 1971 San Fernando earthquake, the State of California enacted the Alquist-Priolo Earthquake Fault Zoning Act in 1972. This act required the State Geologist to delineate Earthquake Fault Zones along known active faults that have a relatively high potential for ground rupture. An “active fault” is defined as a fault that has experienced movement in the last 11,000 years (i.e., Holocene Epoch). Faults that are zoned under the Alquist-Priolo Act must meet the strict definition of being “sufficiently active” and “well-defined” for inclusion as an Earthquake Fault Zones. The Earthquake Fault Zones are revised periodically. No structures for human occupancy may be built across an identified active fault trace. An area of 50 feet on either side of an active fault trace is assumed to be underlain by the fault, unless proven otherwise. Proposed construction in an Earthquake Fault Zone is permitted only following the completion of a fault location report prepared by a California Registered Geologist.

Under the Act, the California State Geologist identifies areas in the State that are at risk from surface fault rupture. The main purpose of the Act is to prevent construction of buildings used for human occupancy where traces of active faults are evident on the earth’s surface. Fault rupture generally occurs within 50 feet of an active fault line and is limited to the immediate area of the fault zone where the fault breaks along the surface. Such a rupture could potentially displace and/or deform the ground surface.

California Building Standards Code (Seismic Hazards Mapping Act of 1990)


In the context of earthquake hazards, the California Building Standards Code’s design standards have a primary objective of assuring public safety and a secondary goal of minimizing property damage and maintaining function during and following a seismic event. Recognizing that the risk of severe seismic ground motion varies from place to place, the California Building Standards Code seismic code provisions vary depending on location—Seismic Zones 0, 1, 2, 3, and 4, with 0 being the least stringent and 4 being the most stringent.

Local Regulations

County of Riverside General Plan

Code Conformance and Development Regulation

The County of Riverside has zoned fault systems and requires special studies prior to development (County of Riverside 2008). These are referred to as County Fault Zones. They generally represent zones that have been identified from groundwater studies. Until solid field evidence is generated to prove or disprove their existence, they should continue to be considered a hazard.
The County Department of Building and Safety provides technical expertise in reviewing and enforcing the County Building and Fire Codes. These codes establish site-specific investigation requirements, construction standards, and inspection procedures to ensure that development does not pose a threat to the health, safety, and welfare of the public. Every 3 years, the County’s Building and Fire Codes are adapted from the Uniform Building and Fire Codes. They contain baseline minimum standards to guard against unsafe development. As discussed in the Technical Background Report, project variables may modify the implementation of a particular standard.

At a minimum, it is imperative to enforce the most recently adopted regulatory codes for new development and significant redevelopment, including the County’s Land Use Ordinance and Land Division Ordinance, which support the Building and Fire Codes. The California Environmental Quality Act (CEQA) adds another level of safety review, requiring that environmental constraints be considered prior to approval of significant projects. Additional guidelines and standards are introduced through the Safety Element.

Special development regulations can reinforce and augment existing code standards by raising the level of hazard-conscious project design and mitigation engineering. Examples include additional geologic/geotechnical investigation and additional reinforcement of foundations in areas of potential ground failure. While foundation investigations are required by the County’s Building Code, it is important to emphasize expected levels of investigation and protection. Furthermore, some requirements that may only apply to critical facilities, such as detailed seismic analyses, could be expanded to include other structures and lifelines. Where engineering methods cannot mitigate the hazards, avoidance of the hazard is appropriate, such as where ground rupture along active or potentially active fault traces are identified during project investigation. Special minimum setbacks away from active faults, which are already required for critical facilities, can also be defined for other structures and lifeline

Below are policies regarding seismic hazards and hazard reduction from the Safety Element of the County of Riverside, General Plan.

- **S 1.1:** Mitigate hazard impacts through adoption and strict enforcement of current building codes, which will be amended as necessary when local deficiencies are identified.

The project would comply with this policy, as it would be required to construct buildings in accordance with the current 2013 California Building Code.

- **S 1.2:** Enforce state laws aimed at identification, inventory, and retrofit of existing vulnerable structures.

This policy does not apply to the project, as there are no existing structures on the project site.

*Hazard Reduction*

Primary ground damage due to earthquake fault rupture typically results in a relatively small percentage of the total damage in an earthquake, but proximity to a rupturing fault can cause profound damage. It is difficult to reduce this hazard through structural design. The primary
mitigative technique is to set back from, and avoid, active faults. The challenge comes in identifying all active faults. Faults throughout southern California have formed over millions of years. Some of these faults are generally considered inactive under the present geologic conditions; that is, they are unlikely to generate further earthquakes. Other faults are known to be active. Such faults have either generated earthquakes in historical times (within the last 200 years), or show geologic and geomorphic indications of relatively recent movement. Faults that have moved in the relatively recent geological past are generally presumed to be the most likely candidates to generate damaging earthquakes in the lifetimes of residents, buildings, or communities.

The State Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting. Surface rupture is the most easily avoided seismic hazard. The main purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The Alquist-Priolo Earthquake Fault Zoning Act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. Alquist-Priolo Earthquake Fault Zones have been designated by the California Division of Mines and Geology for the Elsinore, San Jacinto, and San Andreas fault zones in Riverside County.

Within the rapidly growing county, State Alquist-Priolo mapping has not kept pace with development. The County of Riverside has zoned fault systems and required similar special studies prior to development. These are referred to as County Fault Zones on Figure S-2 and in the Technical Background Report. They generally represent zones that have been identified from groundwater studies, and should be viewed as doubtful. However, until solid field evidence is generated to prove or disprove their existence, they should continue to be considered a hazard.

Within Alquist-Priolo and County Fault Zones, proposed tracts of four or more dwelling units must investigate the potential for and setback from ground rupture hazards. This is typically accomplished by excavation of a trench across the site, determining the location of faulting, and establishing building setbacks.

As there are many active faults in Riverside County, with new fault strands being continually discovered, all proposed structures designed for human occupancy should be required to investigate the potential for and setback from ground rupture. Also of concern are structures, not for human occupancy, that can cause harm if damaged by an earthquake, such as utility, communications, and transportation lifelines.

The County regulates most development projects within earthquake fault zones. Projects include all land divisions and most structures for human occupancy. Exempted projects include single-family, wood-frame and steel-frame dwellings that are one or two stories, are not part of a development of four units or more, and are not located within 50 feet of a fault.

Before a project can be permitted within an Alquist-Priolo Earthquake Fault Zone, County Fault Zone, or within 150 feet of any other potentially active or active fault mapped in published United States Geological Survey (USGS) or California Division of Mining and Geology reports, a geologic investigation must demonstrate that proposed buildings will not be constructed across active faults. A site-specific evaluation and written report must be prepared by a licensed geologist. If an active
fault is found, a structure for human occupancy must be set back 50 feet from the fault, unless adequate evidence, as determined and accepted by the County Engineering Geologist, is presented to support a different setback.

- **S 2.1:** Minimize fault rupture hazards through enforcement of Alquist-Priolo Earthquake Fault Zoning Act provisions and the following policies:
  a. Require geologic studies or analyses for critical structures, and lifeline, high-occupancy, schools, and high-risk structures, within 0.5 miles of all Quaternary to historic faults shown on the Earthquake Fault Studies Zones map.
  b. Require geologic trenching studies within all designated Earthquake Fault Studies Zones, unless adequate evidence, as determined and accepted by the County Engineering Geologist, is presented. The County may require geologic trenching of non-zoned faults for especially critical or vulnerable structures or lifelines.
  c. Require that lifelines be designed to resist, without failure, their crossing of a fault, should fault rupture occur.
  d. Support efforts by the California Department of Conservation, Division of Mining and Geology to develop geologic and engineering solutions in areas of disseminated ground deformation due to faulting, in those areas where a through-going fault cannot be reliably located.
  e. Encourage and support efforts by the geologic research community to define better the locations and risks of County faults. Such efforts could include data sharing and database development with regional entities, other local governments, private organizations, utility agencies or companies, and local universities.

The project would comply with this policy, as all project buildings would be set back more than 50 feet from all known fault traces. The site has been designed to leave the northern area (which contains active faults) undeveloped, with proposed buildings closer to Cherry Valley Boulevard.

**Hillside Development and Slope**

Natural slopes are one of Riverside County’s primary aesthetic resources. Foothill and mountain areas, which are visible throughout the County, create a dramatic backdrop for local communities and help define the character of the County.

Hillside areas also provide an important location for habitat as well as for certain lifestyle choices. In addition, there are public safety issues, such as slope failures, landslides, and mudslides, that occur naturally or as a result of development, grading, and landscaping.

The severity of these slopes, the ability to provide infrastructure and services (such as transportation, water, sewer, etc.), and safety considerations can drastically alter the use and development potential of individual properties. Development on hillsides within the County, where land use designations permit, will require careful siting, grading, and design in order to minimize exposure to hazards and to maintain and enhance the scenic quality of the County.

Below is a policy regarding hillside development and slopes from the Land Use Element of the 2015 County of Riverside General Plan:
**LU 12.1:** Apply the following policies to areas where development is allowed and that contain natural slopes, canyons, or other significant elevation changes, regardless of land use designation:

a. Require that hillside development minimize alteration of the natural landforms and natural vegetation.

b. Allow development clustering to retain slopes in natural open space whenever possible.

c. Require that areas with slope be developed in a manner to minimize the hazards from erosion and slope failures.

d. Restrict development on visually significant ridgelines, canyon edges and hilltops through sensitive siting and appropriate landscaping to ensure development is visually unobtrusive.

e. Require hillside adaptive construction techniques, such as post and beam construction, and special foundations for development when the need is identified in a soils and geology report, which has been accepted by the County of Riverside.

f. In areas at risk of flooding, limit grading, cut, and fill to the amount necessary to provide stable areas for structural foundations, street rights-of-way, parking facilities, and other intended uses.

The proposed project complies with this policy because the site has been designed to leave the northern area, with its steeper hills and slopes, undeveloped and undisturbed, while the proposed on-site buildings are proposed closer to Cherry Valley Boulevard, to minimize development on hillsides/slopes.

**Seismic**

The Pass is one of the most densely faulted areas in Riverside County. Most of the faults are located in the steep slopes of the surrounding mountain ranges. The San Andreas and the San Jacinto fault zones are two of the most active fault systems in southern California. The San Bernardino Mountain segment of the San Andreas fault, while not within the boundaries of this area plan, does have enormous influence on the seismic activity of the region. The Banning fault has a central segment that extends from Calimesa to Whitewater Canyon. Other smaller faults associated with the San Andreas fault system also have the potential for generating earthquakes that would result in strong ground shaking, and perhaps surface rupture, in the Pass Area.

The San Gorgonio fault zone consists of a series of faults dissipating from the mountain westward into the Cherry Valley vicinity. The San Jacinto fault zone, west of the Pass, is part of the San Andreas fault system. The two systems separate near the San Gabriel mountains where the San Jacinto fault extends southeastward toward the San Jacinto Mountains and the San Timoteo Badlands. Additional faults in the area include the Beaumont Plain fault zone, Pinto Mountain fault, and the Crafton Hills fault zone.

A further complication associated with fault activity is liquefaction, which can occur with ground shaking, and in areas where certain soil conditions and shallow groundwater levels exist. The valley between the San Bernardino and the San Jacinto Mountain ranges is prone to moderate liquefaction around Calimesa and westward north of San Timoteo Creek toward San Bernardino County.
Structures built on soils that liquefy during a seismic event may sink, rupture, or even topple over as the soil loses its bearing strength during severe shaking.

Below are policies from The Pass Area Plan related to geology/seismicity.

- **PAP 19.1**: Protect life and property from seismic-related incidents through adherence to the Seismic Hazards section of the General Plan Safety Element.

**Slope**

San Gorgonio Pass is surrounded by severe slopes associated with the San Bernardino and San Jacinto mountain ranges. This spectacular terrain is an integral part of the character and atmosphere of the Pass, providing a visual backdrop and containing important habitat and recreational resources. Many of these areas require special development standards and care to prevent erosion and landslides, preserve significant views, and minimize grading and scarring. The following policies are intended to protect life and property while maintaining the special character of the Pass. Figure 14, Steep Slope, depicts areas of steep slopes in this Area Plan. Also refer to Figure 15, Slope Instability, for areas of possible landslide.

The proposed project complies with this policy, because the project will adhere to applicable seismic design requirements of the County of Riverside.

- **PAP 20.1**: Identify the ridgelines that provide a significant visual resource for the Pass through adherence to the Hillside Development and Slope section of the General Plan Land Use Element.

The proposed project complies with this policy, because development of buildings on-site is concentrated to the south, near Cherry Valley Boulevard, which avoids development on ridgelines.

- **PAP 20.2**: Protect life and property and maintain the character of the Pass through adherence to the Hillside Development and Slope section of the General Plan Land Use Element and the Slope and Instability section of the General Plan Safety Element.

The proposed project complies with this policy, because development of the proposed project includes careful siting, grading, and design in order to minimize exposure to hazards.

Chapter 15.60—Earthquake Fault Area Construction Regulations, in the County of Riverside Municipal Code states, “All applications for a permit, for a project that lies within an earthquake fault zone shown on the maps prepared by the State Geologist pursuant to the Alquist-Priolo Earthquake Fault Zoning Act, shall be accompanied by a geologic report or request for waiver thereof.”

**3.6.3 - Thresholds of Significance**

The County of Riverside utilizes Appendix G of the State CEQA Guidelines as its thresholds of significance for CEQA analysis. Further, the County provides a number of additional environmental considerations as part of the County’s Environmental Assessment Checklist.
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death?

b) Be subject to 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?

c) Be subject to seismic-related ground failure, including liquefaction?

d) Be subject to strong seismic ground shaking?

e) Be located 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, collapse, or rockfall hazards?

f) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in ground subsidence?

g) Be subject to geologic hazards, such as seiche, mudflow, or volcanic hazard?

h) Change topography or ground surface relief features?

i) Create cut or fill slopes greater than 2:1 or higher than 10 feet?

j) Result in grading that affects or negates subsurface sewage disposal systems?

k) Result in substantial soil erosion or the loss of topsoil?

l) Be located on expansive soil, as defined in Section 1802.3.2 of the California Building Code (2007), creating substantial risks to life or property?

m) Have soils incapable of adequately supporting use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

n) Change deposition, siltation, or erosion that may modify the channel of a river or stream or the bed of a lake?

o) Result in any increase in water erosion either on- or off-site?

p) Be impacted by or result in an increase in wind erosion and blowsand, either on- or off-site?

According to the County of Riverside CEQA thresholds, to determine whether impacts to geology and soils are significant environmental effects, the following questions are analyzed and evaluated.

Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) 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? Refer to Division of Mines and Geology
Special Publication 42.
ii) Strong seismic ground shaking?
iii) Seismic-related ground failure, including liquefaction?
iv) Landslides?

b) Result in substantial soil erosion or the loss of topsoil?

c) Be located 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?

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code
(1994), creating substantial risks to life or property?

e) 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?

3.6.4 - Project Impact Analysis and Mitigation Measures

This section discusses potential impacts associated with the proposed project and provides
mitigation measures where necessary.

Earthquakes

Impact GEO-1: The project would not expose people or structures to potential substantial adverse
effects, including the risk of loss, injury or death involving:

i) 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?
   ii) Strong seismic ground shaking.
   iii) Seismic-related ground failure, including liquefaction.
   iv) Landslides.

Impact Analysis

Fault or Ground Rupture

The site is not located within an Alquist-Priolo Earthquake Fault Zone. However, the northern
portion of the site is located within a County of Riverside designated Earthquake Fault Zone, based
on the Riverside County GIS Fault Zone Map.¹

The County of Riverside established a Fault Hazard Management Zone for the CVFZ within and near
the project site. It depicts three strands of the CVFZ in the northeast portion of the site (Neblett &
Associates 2008).

¹ Verified via Riverside County GIS system on April 23, 2014.
CHJ Inc. (CHJ) performed a site-specific subsurface investigation of faulting in its report dated August 3, 2005. The results of this investigation identified two fault splays associated with the CVFZ trending northwest to southeast across the site (Neblett & Associates 2008).

One of the objectives of the Fault Investigation for the project site is to refine the location of the South Branch of the CVFZ, with particular attention to the eastern portion of the project site where potential structural setback zones from faulting could impact proposed development. As shown in the latest (October 2014) Grading Plan Review for the proposed project, the North Branch of the Cherry Valley Fault runs through the project site; however, this fault is located over 200 feet north of the development footprint of the proposed project. The overall site plan for the project site shows Buildings 1 and 2 located south of the South Branch of the Cherry Valley Fault. However, this branch of the Cherry Valley Fault runs through the parking lot area north of Building 2.

As addressed in the County of Riverside General Plan EIR’s Geology and Soils section, for design purposes, a worst-case scenario earthquake (the maximum credible earthquake [MCE]) for Riverside County is a magnitude 7.9 based on the rupture of the entire southern segment of the San Andreas fault from the Cajon Pass to the Salton Sea. While other scenarios will expose portions of Riverside County to intense ground shaking that is locally as severe as the MCE, the MCE exposes most of the County to very high-intensity ground shaking. Modeling for an MCE within Riverside County found that horizontal ground displacements as great as 25 feet along the San Andreas Fault could occur, with reduced displacement occurring on smaller faults such as the CVFZ. Further, although the project site is not located within a State-designated Alquist-Priolo Earthquake Fault Zone, the standards related to the siting of buildings within the vicinity of an active fault can still apply to the proposed project, as the basic goal of Alquist-Priolo Act (i.e., minimizing structural and human impacts during an earthquake) will also apply to the project. Thus, as typically recommended for structures within or near an Alquist-Priolo Earthquake Fault Zone, on-site structures for human occupancy are not placed upon the fault and are set back from the trace by at least 50 feet or more.

The proposed project will be constructed at the approximate elevations listed in the grading plan prepared by Webb & Associates, used as a base for Ginter & Associates Grading Plan (2014), included in Appendix E.

The proposed buildings would be located up to 48.3 feet below the elevation of Cherry Valley Boulevard. Specifically, the proposed buildings on-site are located south of both the North and South Branches of the CVFZ. Thus, the proposed buildings would not be constructed across a fault line.

Neblett & Associates conducted a Fault Investigation (2008), which delineated the South Branch of the CVFZ and concurred with CHJ’s location of the North Branch of the CVFZ. Only the South Branch would impact the proposed development. Neblett & Associates determined there is no direct evidence that either the South Branch or the North Branch (located northeast of the South Branch) is inactive.

Neblett & Associates designated the South Branch of the Cherry Valley Fault as potentially active, concluding it may be subject to relatively small movements at depth due to sympathetic movement.
from regional faults and earthquakes (Ginter & Associates 2013a). These analyses have resulted in the following project design features: (1) a structural setback zone located 50 feet south of and 100 feet north of the South Branch and (2) establishing a Restricted Use Zone (RUZ) to be located north and northeast of the South Branch to the north and northeast property boundary (Ginter & Associates 2013a). See Mitigation Measure (MM) GEO-1a regarding reassessment of the structural setback and RUZ.

The September 22, 2008 Fault Investigation by Neblett & Associates indicated that the location of the South Branch of the CVFZ could impact the need for structural setback zones from faulting, which could affect the location of proposed development. To ensure that proposed development is adequately set back from existing fault lines, Mitigation Measure GEO-1a below shall be implemented.

The fault traces located on the project site, which are identified in Figure 4 of the project’s Fault Investigation, are located north of the proposed buildings on the project site and therefore are not anticipated to have a significant impact regarding ground rupture for the two buildings proposed on-site. Based on the potentially active designation for the South Branch of the Cherry Valley Fault, and a lack of evidence for the surface faulting in this area from observations from a magnitude 5.9 earthquake on July 8, 1986 approximately 10 kilometers northwest of North Palm Springs (epicenter near Mission Creek Fault), the potential for surface rupture of the South Branch of the Cherry Valley Fault that affects the proposed development is considered remote (Ginter & Associates 2013a).

Every 3 years, the County’s Building and Fire Codes are adapted from the Uniform Building Code and Fire Codes. They contain baseline minimum standards to guard against unsafe development. The proposed project will be designed in conformance with applicable building standards, such as the Uniform Building Code, and County of Riverside standards regarding structure design such that the proposed project will not expose people or structures to potential substantial adverse effects including the risk of loss, injury, or death.

**Strong Seismic Ground Shaking**

The area’s regional faults have the potential to generate strong ground motions at the project site. The intensity of ground shaking at a given location depends primarily on the earthquake magnitude, the distance from the epicenter to the site, the type of fault that causes the earthquake, and the response characteristics of the soils or bedrock units underlying the site. The Peak Horizontal Ground Acceleration (PHGA—the measure of earthquake acceleration on the ground) for the site was estimated using USGS data based on currently available earthquake and fault information. Based on this information, the PHGA with a 10 percent probability of being exceeded in 50 years is estimated to be approximately 0.61 g (Ginter & Associates 2013a). Acceleration between 0.34 g and 0.65 g can result in severe perceived ground shaking and moderate to heavy structural damage to older and/or poorly designed buildings. Structures designed to the specifications of modern building requirements, including those set forth in the California Building Code, can withstand high acceleration velocities for short to moderate lengths of time.

Based on the results of Neblett & Associates’ fault investigation, using aerial photo lineament analyses, fault trenching, geologic field mapping, observation of exposed roadcuts, and review of
previous fault investigations by others, Neblett & Associates has successfully located the South Branch of the CVFZ on-site (Neblett 2008). Based on the analysis presented in the fault investigation, Neblett & Associates established a structural setback zone located 50 feet south of, and 100 feet to the north of, the South Branch. Additionally, Ginter & Associates established a Restricted Use Zone (RUZ) located north and northeast of the South Branch to the north and northeast property boundary (Ginter & Associates 2013a). Mitigation Measure GEO-1b, regarding reassessment of the structural setback and RUZ, would reduce impacts to a less than significant level.

Liquefaction and Settlement

The County’s GIS shows that the project site is designated as having low and moderate susceptibility to liquefaction.2 A Grading Plan Review was prepared for the project site to look specifically at the potential impacts of the proposed project regarding geology (Ginter & Associates 2013a). The majority of liquefaction hazards are associated with un-compacted, saturated, or nearly saturated, non-cohesive sandy and silty soils. According to the 2013 Grading Plan Review for the project site, based upon field mapping and the subsurface exploration, the older alluvium consists of unsaturated clayey to silty sands and the younger alluvium consists of unsaturated silty sands and lesser gravelly sands. Thus, the lack of saturated or nearly saturated soils on-site indicates that the potential for liquefaction is low. Groundwater was not encountered at any of the borings excavated on-site to a maximum depth of 71 feet. Because of the absence of groundwater less than 50 feet below ground surface and the 200- to 300-foot depth of the regional groundwater, the potential for liquefaction is considered low.

Some settlements are expected to occur due to potential seismic activity (ground shaking), loading from compacted fill placement, and loading from proposed structures. With the removal of the younger alluvium (Qya) and replacement with compacted fill, seismically induced settlement caused by ground shaking is expected to be generally uniform (Ginter & Associates 2013a).

Regarding fill settlement, the area loading from compacted fill placement will cause settlement due to the compressibility of the fill materials and will include immediate (elastic) and long-term (primary and secondary) settlements. The magnitude of fill settlements would depend on the thickness and the compressibility characteristics of compacted fill and the underlying older alluvium (Qoa). The elastic component of fill settlement will be immediate and complete upon placement of fill. The primary and secondary fill settlements are time-dependent and will occur over a long period. Ginter & Associates proposes positioning settlement monuments at strategic locations in the deeper fill areas as depicted in Figure 1 of the 2014 Grading Plan Review document. These will be monitored on a regular basis until the primary settlement has stabilized (Ginter & Associates 2013a).

Although settlement may occur on-site because of ground shaking from earthquakes, a less than significant impact after mitigation is anticipated, because settlement monuments will be placed at key locations on-site in the deep fill areas, and monitoring will occur until primary settlement has stabilized. Thus, the proposed project is anticipated to have a less than significant impact.

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2 Verified based on Riverside County GIS system March 13, 2015.
Landslides
Elevations on-site rise from southwest to northeast, ranging from approximately 2,388 to 2,708 feet above mean sea level. The southern and central portions of the project site consist of broad sloping grasslands that transition to steeper ridges and canyons on the north portion of the project site.

The project’s mass grading activities would involve on-site cut of 6 million cubic yards and fill of approximately 6 million cubic yards, with a balance of soils on-site. The design of the project will seek to balance the earthwork necessary from grading and avoid the import or export of soil, as all cut and fill of soils are anticipated to balance on-site. All grading and earthwork activities will be performed in accordance with the general earthwork and grading specifications of the County of Riverside.

Based on the sloping terrain of the project site, a number of manufactured slopes, and possibly retaining walls, will be needed to develop the site. The project site currently consists of sloping terrain. Without manufactured slopes or retaining walls, development on the project site would be limited to the southern portion of the project site along Cherry Valley Boulevard, and the steeper terrain in the northern portion of the site would remain undeveloped. The topography of the project site will be altered greatly by the proposed project; however, manufactured slopes up to 2:1 will be developed on-site. The proposed project’s grading plan and geotechnical documents will be reviewed for consistency with the County’s grading regulations and with applicable codes and requirements.

The Tentative Parcel Map dated October, 2014 by Albert A. Webb Associates, and the Overall Preliminary Landscape Plan dated October 2015, by Hunter Landscape, shows that slopes on the project site will exceed 10 feet in height; however, the project would not create cut or fill slopes greater than 2:1. Although the proposed project will result in slopes that are higher than 10 feet, less than significant impacts are anticipated because the project will be designed in conformance with recommendations made in the Grading Plan Review, which include design and construction measures that will stabilize the on-site soils and reduce the project’s exposure to landslide risk. Additionally, compliance with the Grading Development Standards of the County of Riverside would be assured through county review of grading plans. The project would be required to conform to county design standards for grading and site design, which would result in a safe design of stable slopes for the proposed project. Based on the Grading Plan Review by Ginter & Associates (2014), the results of the slope stability analyses indicate that the proposed on-site slope safety factors will conform to the County of Riverside standards and are acceptable as planned.

No landslides or other evidence of gross slope instability were observed during Ginter & Associates’ investigations on-site, and no landslides are denoted on the published geologic maps and aerial photographs reviewed within and adjacent to the site. Stability of slopes within the San Timoteo Formation is generally considered moderate to locally poor. The proposed cut slope north of Building 2 will expose San Timoteo Formation bedrock, which will likely reveal day-lighted bedding conditions, and a small area of non-engineered fill, which will require removal and replacement with compacted engineered fill located in the cut slope east of Building 2 (Ginter & Associates 2013a). Accordingly, Mitigation Measure MM GEO-1c below is proposed to reduce impacts from landslides to a less than significant level.
Development of the proposed project could result in hydroconsolidation (soil collapse), which would cause soil to become unstable as a result of the proposed project. Although the regional groundwater is at 200 to 300 feet below ground surface and can be ruled out as a potential source for hydrocollapse, shallow perched groundwater from landscape irrigation may saturate some areas and result in hydroconsolidation. CHJ evaluated the potential soil collapse of the loose soils with testing on selected samples. Their results indicate a mild to high potential of hydroconsolidation (Ginter & Associates 2013a). Therefore, impacts from hydroconsolidation are considered potentially significant. Mitigation Measures GEO-1c to GEO-1e below are anticipated to reduce potential impacts from soil collapse to a less than significant level, by ensuring that all recommendations related to grading, engineered fill, and cut slope are implemented prior to issuance of grading and/or building permits.

The County of Riverside 2008 General Plan, Figure S-4, Earthquake Induced Slope Instability Map shows the project site’s location to be within an area with low to locally moderate susceptibility to seismically induced landslides and rockfalls. The proposed project would also have a less than significant impact regarding rockfall hazards because the proposed warehouse buildings are sited away from the steep terrain located in the northern portion of the project site.

**Level of Significance Before Mitigation**

Potentially significant impact.

**Mitigation Measures**

**MM GEO-1a**  
Upon the development of a grading plan, the County of Riverside shall verify that consistent with Section 8.0, Future Work, in the Neblett & Associates’ 2008 Fault Investigation, the grading plans shall reflect the re-positioning of the structural setback zone based on the proposed grades for the proposed project.

It is recommended that a structural setback zone shall be located 50 feet south and 100 feet north of the trace of the South Branch of the Cherry Valley Fault Zone that transgresses the proposed development envelopes. Additionally, a Restricted Use Zone (RUZ) shall be located north and northeast of the South Branch to the north and northeast property boundary. The RUZ shall be utilized for non-habitable facilities, such as horse stables, soccer fields, etc., that will have fewer than 1,000 hours of human occupancy per year. Future fault investigation in the RUZ area shall be required and approved by the controlling agencies to remove any portions of the RUZ for construction of potential habitable structures.

The footprint of the proposed project shall then be analyzed for conformance with the re-positioned structural setback and the restricted use zone.

**MM GEO-1b**  
Prior to the issuance of building permits for each structure, the project applicant shall submit a design-level Geotechnical Investigation to the County Engineering Geologist for review and approval. The investigation shall be prepared by a qualified engineer and identify necessary grading and building practices necessary to achieve compliance with the latest adopted edition of the California Building Standards Code.
geologic, soils, and seismic requirements. The measures identified in the approved report shall be incorporated into the project plans.

**MM GEO-1c** To mitigate potential landslide impacts from the proposed cut slope north of Building 2, the County of Riverside shall ensure that during project construction a stabilization fill prism shall be established for this cut slope as depicted in the January 7, 2013 Grading Plan Review by Ginter & Associates, Inc. Additionally, the County of Riverside shall ensure that during construction, conditions will be observed by a qualified individual and additional recommendations will be provided, as appropriate.

**MM GEO-1d** Recommendations contained within the November 24, 2014 Ginter & Associates Grading Plan (contained in Appendix E of this RDEIR) shall be implemented in the design of the project to the satisfaction of the County, prior to issuance of grading and/or building permits.

**MM GEO-1e** To mitigate for hydroconsolidation, prior to issuance of a construction permit, the project applicant shall ensure the complete removal of the younger alluvium (Qya) approximately 20 feet in depth and replacement with compacted engineered fill to the design grades.

**Level of Significance After Mitigation**
Less than significant impact. Implementation of the above mitigation would ensure that habitable structures are adequately set back from fault lines and restrictions are in place to create a restricted use zone to limit the creation of habitable facilities in inappropriate locations. As with other similar development projects within the Southern California region and the State as a whole, the proposed project would be designed and constructed to meet the specifications contained within the 2013 California Building Code (CBC), Chapter 16, Section 1613—Earthquake Loads. The building and safety standards set forth by the CBC have been established to address structural integrity and to prevent substantial loss and injury during a seismic event. Mitigation Measure GEO-1c will ensure that potential landslide impacts are reduced to less than significant. Mitigation Measures GEO-1d and GEO-1e will ensure the implementation of design and construction measures that will stabilize the on-site soils and reduce the project’s exposure to hydroconsolidation and landslide risk.

**Erosion or Loss of Topsoil**

<table>
<thead>
<tr>
<th>Impact GEO-2:</th>
<th>The project could result in substantial soil erosion or the loss of topsoil.</th>
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**Impact Analysis**

**Soil Erosion**

As detailed in the County of Riverside 2015 General Plan, the project area has a moderate wind erodibility rating. On-site soils are subject to erosion by wind and water. The potential for erosion is greatest during grading and construction of the site. Project development will require extensive grading operations including excavation and fill throughout the project site in order to provide adequate support for the proposed project. Since erosion is greatest during construction, the project is anticipated to have a short-term impact related to soil erosion.
The Ginter & Associates report describes loose surficial soils mantle the natural slopes within the proposed sphere of development, which are prone to erosion, resulting in shallow and surficial failures and debris flow. In addition, two relatively broad drainage channels that trend southwesterly towards the western portion of the project site, and an east-west to southwest trending drainage channel in the northeast portion of the site, have the potential for water surface flows.

Existing drainage flows from off-site areas, including the hilly undeveloped portions of the site to the north, would be conveyed through the site and would ultimately be conveyed off-site to the west side of the project site. As included in the Hydrology analysis for Tentative Parcel Map 36564 and discussed in Section 3.9, Hydrology and Water Quality, there are two drainage areas that exist on-site: Drainage area “A” and “B.” The project includes a number of drainage facilities designed to safely convey the off-site 100-year storm runoffs through the project site, limit the storm flow resulting from project activities including: use of bio-treatment best management practices (BMPs) such as extended detention basins and trenches, sized to accommodate the first flush flows generated in the proposed development area; storm drain facilities that would collect and route on-site runoff through a detention basin that is sized to limit 10-year storm discharge from the site to be equal to or less than flows (volume and velocity) under the existing condition; and a detention basin that would incorporate hydro modification requirements by limiting the increase in the 2-year storm flow caused by the proposed development to less than 10 percent more than existing conditions. The project also includes 4 acres of on-site riparian mitigation along the project frontage.

The installation of these features would control surface drainage and help mitigate the potential erosion and debris flows during storm events. The slopes should be planted as soon as possible upon completion of grading with drought-resistant plants to help mitigate surficial erosion. With incorporation of mitigation, potential impacts from soil erosion are anticipated to be reduced to a less than significant level.

Additionally, regarding slope stability, the Ginter & Associates report and grading plan (2014) gives the results of the slope stability analyses, which indicates the proposed on-site slope safety factors will conform to the County of Riverside standards and are acceptable as planned (2013a). Similarly, the factors for safety for the surficial stability conditions also meet the required minimum safety factor or 1:5.

Water Erosion
According to the Tentative Parcel Map 36564 Off-Site Hydrology & Hydraulics Report (Appendix G) prepared for the proposed project and provided in Section 3.9, Hydrology, the rate of runoff from the project site would not increase by more than 10 percent above pre-development conditions (Albert A. Webb Associates 2014b). According to the Off-Site Hydrology and Hydraulics Report prepared for the project, there are two drainages in existing condition: Drainage Area “A” and “B” (Exhibit 3.9-2). Drainage Area “A” comprises approximately 903.3 acres, with peak stormwater discharge rates of approximately 739.7 cubic feet per second (cfs) and 1171.4 cfs for 10-year and 100-year storms, respectively. Drainage Area “B” comprises approximately 258.1 acres with peak discharge rates of 359.4 cfs and 563.2 cfs for 10-year and 100-year storms, respectively.
The proposed project would not result in an increase in water erosion either on-site or off-site. The project includes a number of drainage facilities designed to:

1. Safely convey the off-site 100-year storm runoffs through the project site;
2. Limit the storm flow resulting from project activities, including use of bio-treatment BMPs such as extended detention basins and trenches that are sized to accommodate the first flush flows\(^3\) generated in the proposed development area;
3. Provide storm drain facilities that would collect and route on-site runoff through a detention basin that is sized to limit 10-year storm discharge from the site to be equal to or less than flows under the existing condition;
4. Provide detention basin that would incorporate hydromodification requirements by limiting the increase in the 2-year storm flow caused by the proposed development to less than 10 percent more than existing conditions.

The project also includes 4 acres of on-site riparian mitigation along the project frontage.

Under the post-project conditions, Drainage Area “A” would comprise approximately 917.2 acres, with peak stormwater discharge rates of approximately 729.0 cfs and 1,165.1 cfs for 10-year and 100-year storms, respectively (compared with prior rates of 739.7 cfs and 1,171.4 cfs). Drainage Area “B” would comprise approximately 244.2 acres with peak discharge rates of 344.5 cfs and 537.4 cfs for 10-year and 100-year storms, respectively (Albert A. Webb Associates 2014b). To minimize the increase of the runoff due to the site development, two on-site extended detention basins (one for each sub-watershed) are proposed for water quality treatment and hydromodification.

Runoff will be dispersed to the extended detention basins, further discussed below. Landscaped areas on the north and south will be self-treating pervious areas that will convey the flows generated by the respective areas directly off-site. Runoff will enter Basin A primarily from the on-site storm drain system. The middle of the basin will be the lowest elevation and slope up to the north and south at 0.5 percent. A low-flow trench and collector trenches will convey the runoff to the bottom stage and outlet structure that will be located in the middle of the basin on the east side. The outlet structure has been designed to allow for treatment of the Design Capture Volume. The Design Capture Volume (Vbmp) depth is 3.4 feet. The outlet structure has also been designed to mitigate the 2-year 24-hour and 10-year 24-hour events with orifices and the 100-year event will spill over the top of the outlet structure. The basin depth will be 7.2 feet, including 1 foot of freeboard.

Runoff will enter Basin B primarily from the on-site storm drain systems. The middle of the basin will be the lowest elevation and slope up to the north and south at 0.5 percent. A low-flow trench and collector trenches will convey the runoff to the bottom stage and outlet structure that will be located in the middle of the basin on the west side. The outlet structure has been designed to allow for treatment of the Vbmp. The Vbmp depth is 1.9 feet. The outlet structure and the 100-year event will spill over the top of the outlet structure. The basin depth will be 4.6 feet, including 1 foot of freeboard.

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\(^3\) First flush flows refers to the initial surface runoff of a rainstorm. During this phase, water pollution entering stormdrains in areas with high proportions of impervious surfaces is typically more concentrated compared with the remainder of the storm.
As provided in the Preliminary Water Quality Management Plan, the proposed detention basin has been sized to incorporate hydromodification requirements by limiting the increase in runoff during a 2-year storm event to less than 10 percent more than existing conditions (Albert A. Webb 2014a).

Runoff from the project site is conveyed in a southwesterly direction to an existing storm drain. Project runoff flows discharge to the west at the southwest project boundary and sheet flow to the west, southwest approximately 2.7 miles via existing storm drain improvements to San Timoteo Creek Channel, then northwesterly approximately 15 miles to its confluence with the Santa Ana River. The runoff rate from the project site is anticipated to be slowed by landscaping, bioswales, and extended detention basins proposed on-site. The proposed project is not anticipated to significantly change the deposition, siltation, or erosion that may modify the channel of a river or stream because the proposed project includes stormwater drainage improvements that will convey and collect off-site and on-site stormwater runoff, while limiting both the quantity and velocity of stormwater discharged off-site and subsequently downstream.

The project itself will not alter the channel of a river or the bed of a lake. As indicated in the Biological Technical Report for the project, direct impacts of the project to the California Department of Fish and Wildlife jurisdictional areas would result from development of the project. However, these areas are not considered river channels or lake beds. Thus, impacts would be less than significant. As previously discussed, the proposed drainage system includes a number of drainage features including: use of bio-treatment BMPs such as extended detention basins and trenches, sized to accommodate the first flush flows generated in the proposed development area; storm drain facilities that would collect and route on-site runoff through a detention basin that is sized to limit 10-year storm discharge from the site to be equal to or less than flows under the existing condition; and a detention basin that would incorporate hydro modification requirements by limiting the increase in the 2-year storm flow caused by the proposed development to less than 10 percent more than existing conditions. The project also includes 4 acres of on-site riparian mitigation along the project frontage.

Under existing conditions, water flow is erosive. As designed, the detention basins in conjunction with infiltration BMPs will limit the 2-year 24-hour storm runoff, reducing the potential for off-site erosion. Thus, the project will have a less than significant impact regarding an increase in water erosion either on-site or off-site.

**Wind Erosion**

As shown in Figure S-8, Wind Erosion Susceptibility Map in the County of Riverside General Plan, the project site is considered to have a moderate susceptibility to wind erosion. Construction activities including but not limited to grading and soil transport have the potential to result in short-term, construction-related impacts associated with wind erosion, and, thus, the project could have a potentially significant related short-term impact. County Ordinance No. 484.2 is not applicable to the proposed project because in accordance with Section (4b) of the Ordinance, the project site is located north of the Agricultural Dust Control Area No. 2 in the Beaumont Cherry Valley community. However, a Storm Water Pollution Prevention Plan is required to be prepared for the project that would reduce impacts from soil erosion during construction that could potentially cause an increase in blowsand or mineral erosion.

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4 Verified at http://www.clerkoftheboard.co.riverside.ca.us/ords/400/484.2.pdf on April 23, 2014.
During project implementation, potential impacts from wind erosion and blowsand would be less than significant because the project would be developed with landscaping and impervious surfaces (e.g., parking lots and buildings) such that soils or sand would not be exposed and subject to blowing off-site. Further, the proposed operation of the project as a warehouse will not involve the exposure of land that would increase this potential impact. Thus, the proposed project would have a less than significant impact related to an increase in wind erosion or blowsand during construction or operations.

**Level of Significance Before Mitigation**
Potentially significant impact.

**Mitigation Measures**
Implementation of Mitigation Measure GEO-1b, and the following:

**MM GEO-2a**  
As stated in the January 7, 2013 report by Ginter & Associates (RDEIR Appendix E), after the completion of on-site grading, and prior to the issuance of a final certificate of occupancy for the project, the owner shall ensure that the manufactured slopes on-site shall be planted with drought-resistant plants to help mitigate surficial erosion.

**MM GEO-2b**  
Prior to the issuance of grading permits, all grading procedures shall comply with County Grading Standards, including requirements for erosion control during rainy months. This measure shall be implemented to the satisfaction of the County of Riverside Planning Department Director.

**Level of Significance After Mitigation**
Less than significant impact. Mitigation Measures GEO-2a and GEO-2b will ensure the implementation of design and operational measures that will stabilize the on-site soils and reduce the opportunity for erosion impact.

**Unstable Geologic Units**

| Impact GEO-3: | The project could be located 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. |

**Impact Analysis**

**Subsidence**

Subsidence refers to the sudden sinking or gradual downward settling and compaction of soil and other surface material with little or no horizontal motion. It may be caused by a variety of human and natural activities, including earthquakes. Based on the County’s Transportation and Land Management Agency (TLMA) website, the proposed project site is susceptible to subsidence.\(^5\) This means the project site is located on a potentially unstable geologic unit that could be affected by the project. Therefore, impacts from subsidence are considered potentially significant, and Mitigation Measures

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\(^5\) Verified based on Riverside County GIS system, March 13, 2015.
GEO-1b and GEO-1d (above), and GEO-3(below) are required to mitigate this potential impact. Potential impacts related to liquefaction and landslides are addressed under Impact GEO-1, above.

**Seismic Design Considerations**

The site, as with all of southern California, is within a zone of seismic activity. Strong ground motion from an earthquake generated along active faults should therefore be anticipated at this site. The proposed project will be built in conformance to applicable California Building Code and Uniform building code standards, which will reduce potential impacts from ground subsidence and unstable soils.

**Level of Significance Before Mitigation**

Potentially significant impact.

**Mitigation Measures**

**MM GEO-3**  
As recommended in the January 7, 2013 report by Ginter & Associates, Inc., after completion of project construction (or sooner, regarding item “a.” below) and during project operation, the owner of the proposed project shall do the following:

a. Plant landscape planting materials that consist of appropriate drought resistant vegetation as recommended by the Landscape Architect and in compliance with Riverside County Ordinance No. 859. Landscaping should be completed as soon as possible and properly maintained.

b. Conduct proper irrigation and maintenance and repair of installed irrigation systems to minimize ground saturation. Leaks should be repaired immediately. Sprinklers should be adjusted to provide maximum coverage with a minimum of water usage and overlap. Overwatering with consequent excessive runoff and ground saturation must be avoided.

c. If automatic sprinkler systems are installed, their use must be adjusted to account for natural rainfall conditions.

d. Maintain and clean all drainage devices that have been installed.

**Level of Significance After Mitigation**

Less than significant impact. Implementation of Mitigation Measures GEO-1b, GEO-1d (specified under Impact GEO-1) and GEO-3 would ensure the project site would contain suitable soils and compaction, as well as appropriate controls related to landscaping and irrigation management, to reduce impacts from subsidence and unstable soils to less than significant.

**Expansive Soil**

**Impact GEO-4:** The project could be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

**Impact Analysis**

According to the 2013 Grading Plan Review by Ginter & Associates, in general, the site sub-grade soils are granular with very low soil expansion potential and specialized construction procedures to resist expansive soil forces are not anticipated at this time. Further, the Grading Plan Review document did not identify the project site as susceptible to expansive soils impacts; however, to
ensure that expansive soils are absent from the project and would otherwise not affect the project, incorporation of Mitigation Measure GEO-1b will require preparation of a design-level geotechnical study that complies with the applicable requirements of the latest adopted edition of the California Building Standards Code. A design-level geotechnical study would identify grading and soil engineering practices to ensure that expansive soil conditions are abated. As such, after implementation of mitigation, impacts related to expansive soils would be reduced to a level of less than significant.

**Level of Significance Before Mitigation**

Potentially significant impact.

**Mitigation Measures**

Implement Mitigation Measure GEO-1b.

**Level of Significance After Mitigation**

Less than significant impact. The above mitigation will ensure that the project site’s soil expansion potential is thoroughly evaluated and addressed prior to operation of the project.

**Septic/Sewer Systems**

**Impact GEO-5:** The project would not 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.

**Impact Analysis**

Under the existing setting, the project site is undeveloped and does not currently contain any subsurface sewage disposal systems. Thus, any grading associated with the proposed project would not affect subsurface sewage disposal systems on the project site. The proposed project will dispose sewage through a municipal treatment plant. No septic tanks or alternative wastewater disposal systems are proposed. Therefore, the project will have no impact.

**Level of Significance Before Mitigation**

No impact.

**Mitigation Measures**

No mitigation measures are required.

**Level of Significance After Mitigation**

No impact.
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