Geology and Soils
Chapter 3.6

SUMMARY OF FINDINGS

The proposed Project will result in less than significant impacts related to Geology and Soils with mitigation. A detailed review of potential impacts is provided in the analysis that follows.

INTRODUCTION

California Environmental Quality Act (CEQA) Requirements

This section of the Draft Environmental Impact Report (DEIR) addresses potential impacts to Geology and Soils. As required in Section 15126, all phases of the proposed Project will be considered as part of the potential environmental impact.

As noted in Section 15126.2 (a), "[a]n EIR shall identify and focus on the significant environmental effects of the proposed Project. In assessing the impact of a proposed Project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the Project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the Project might cause by bringing development and people into the area affected. For example, an EIR on a subdivision astride an active fault line should identify as a significant effect the seismic hazard to future occupants of the subdivision. The subdivision would have the effect of attracting people to the location and exposing them to the hazards found there. Similarly, the EIR should evaluate any potentially significant impacts of locating development in other areas susceptible to hazardous conditions (e.g., floodplains, coastlines, wildfire risk areas) as identified in authoritative hazard maps, risk assessments or in land use plans addressing such hazards areas."[1]

The environmental setting provides a description of the Geology and Soils in the County. The regulatory setting provides a description of applicable Federal, State and Local regulatory policies that were developed in part from information contained in the Tulare County 2030 General Plan, the Tulare County General Plan Background Report and/or the Tulare County

[1] 2012 CEQA Guidelines, Section 15126.2 (a)

General Plan Revised DEIR incorporated by reference and summarized below. Additional documents utilized are noted as appropriate. A description of the potential impacts of the proposed Project is provided and includes the identification of feasible mitigation measures (if necessary and feasible) to avoid or lessen the impacts.

Thresholds of Significance

The thresholds of significance for this section are established by the CEQA checklist item

- Located on a Fault line
- Hazard to people or property
- Project subject to landslides
- Located on a liquefaction zone

ENVIRONMENTAL SETTING

"Seismicity varies greatly between the two major geologic provinces represented in Tulare County. The Central Valley is an area of relatively low tectonic activity bordered by mountain ranges on either side. The Sierra Nevada Mountains, partially located within Tulare County, are the result of movement of tectonic plates which resulted in the creation of the mountain range. The Coast Range on the west side of the Central Valley is also a result of these forces, and the continued uplifting of Pacific and North American tectonic plates continues to elevate these ranges. The remaining seismic hazards in Tulare County generally result from movement along faults associated with the creation of these ranges."[2]

"Earthquakes are typically measured in terms of magnitude and intensity. The most commonly known measurement is the Richter Scale, a logarithmic scale which measures the strength of a quake. The Modified Mercalli Intensity Scale measures the intensity of an earthquake as a function of the following factors:

- Magnitude and location of the epicenter;
- Geologic characteristics;
- Groundwater characteristics;
- Duration and characteristic of the ground motion;
- Structural characteristics of a building."[3]

"Faults are the indications of past seismic activity. It is assumed that those that have been active most recently are the most likely to be active in the future. Recent seismic activity is measured in geologic terms. Geologically recent is defined as having occurred within the last two million years (the Quaternary Period). All faults believed to have been active during Quaternary time are considered "potentially active."[4]

[2] General Plan Background Report, page 8-5
[3] Ibid.
[4] Ibid.

"Settlement can occur in poorly consolidated soils during groundshaking. During settlement, the soil materials are physically rearranged by the shaking and result in reduced stabling alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils, or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence due to groundshaking is not available. Fluctuating groundwater levels also may have changed the local soil characteristics. Sufficient subsurface data is lacking to conclude that settlement would occur during a large earthquake; however, the data is sufficient to indicate that the potential exists in Tulare County."[5]

"Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged groundshaking. Areas most prone to liquefaction are those that are water saturated (e.g., where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are low to medium density. In addition to necessary soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction. Scientific studies have shown that the ground acceleration must approach 0.3g before liquefaction occurs in a sandy soil with relative densities typical of the San Joaquin alluvial deposits. Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, tilting, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation, such as that which occurred along the coastline near Seward, Alaska during the 1964 earthquake. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted."[6]

Earthquake Hazards

"Groundshaking is the primary seismic hazard in Tulare County because of the county's seismic setting and its record of historical activity. Thus, emphasis focuses on the analysis of expected levels of groundshaking, which is directly related to the magnitude of a quake and the distance from a quake's epicenter. Magnitude is a measure of the amount of energy released in an earthquake, with higher magnitudes causing increased groundshaking over longer periods of time, thereby affecting a larger area. Groundshaking intensity, which is often a more useful measure of earthquake effects than magnitude, is a qualitative measure of the effects felt by population. The valley portion of Tulare County is located on alluvial deposits, which tend to experience greater groundshaking intensities than areas located on hard rock. Therefore, structures located in the valley will tend to suffer greater damage from groundshaking than those located in the foothill and mountain areas. However, existing alluvium valleys and weathered or decomposed zones are scattered throughout the mountainous portions of the county which could also experience stronger intensities than the surrounding solid rock areas. The geologic characteristics of an area can therefore be a greater hazard than its distance to the epicenter of the quake."[7]

[5] Ibid., page 8-9
[6] Ibid.
[7] Ibid., page 8-7

"There are three faults within the region that have been, and will be, principal sources of potential seismic activity within Tulare County. These faults are described below:

- **San Andreas Fault.** The San Andreas Fault is located approximately 40 miles west of the Tulare County boundary. This fault has a long history of activity, and is thus the primary focus in determining seismic activity within the county. Seismic activity along the fault varies along its span from the Gulf of California to Cape Mendocino. Just west to Tulare County lies the "Central California Active Area," where many earthquakes have originated.
- **Owens Valley Fault Group.** The Owens Valley Fault Group is a complex system containing both active and potentially active faults, located on the eastern base of the Sierra Nevada Mountains. The Group is located within Tulare and Inyo Counties and has historically been the source of seismic activity within Tulare County.
- **Clovis Fault.** The Clovis Fault is considered to be active within the Quaternary Period (within the past two million years), although there is no historic evidence of its activity, and is therefore classified as "potentially active." This fault lies approximately six miles south of the Madera County boundary in Fresno County. Activity along this fault could potentially generate more seismic activity in Tulare County than the San Andreas or Owens Valley fault systems. In particular, a strong earthquake on the Fault could affect northern Tulare County. However, because of the lack of historic activity along the Clovis Fault, inadequate evidence exists for assessing maximum earthquake impacts."[8]

"Older buildings constructed before current building codes were in effect, and even newer buildings constructed before earthquake resistance provisions were included in the current building codes, are most likely to suffer damage in an earthquake. Most of Tulare County's buildings are no more than one or two stories in height and are of wood frame construction, which is considered the most structurally resistant to earthquake damage. Older masonry buildings (without earthquake-resistance reinforcement) are the most susceptible to structural failure, which causes the greatest loss of life. The State of California has identified unreinforced masonry buildings as a safety issue during earthquakes. In high risk areas (Bay Area) inventories and programs to mitigate this issue are required. Because Tulare County is not a high risk area, state law only recommends that programs to retrofit URMs are adopted by jurisdictions."[9]

Soils and Liquefaction

"The San Joaquin Valley portion of Tulare County is located on alluvial deposits, which tend to experience greater groundshaking intensities than areas located on hard rock. Therefore, structures located in the valley will tend to suffer greater damage from groundshaking than those located in the foothill and mountain areas. However, existing alluvium valleys and weathered or decomposed zones are scattered throughout the mountainous portions of the county which could also experience stronger intensities than the surrounding solid rock areas. The geologic characteristics of an area can therefore be a greater hazard than its distance to the epicenter of the

[8] Ibid., pages 8-6 and 8-7
[9] Ibid., page 8-8

quake."[10]

"No specific countywide assessments to identify liquefaction hazards have been performed in Tulare County. Areas where groundwater is less than 30 feet below the surface occur primarily in the valley. However, soil types in the area are not conducive to liquefaction because they are either too coarse or too high in clay content. Areas subject to 0.3g acceleration or greater are located in a small section of the Sierra Nevada Mountains along the Tulare-Inyo County boundary. However, the depth to groundwater in such areas is greater than in the valley, which would minimize liquefaction potential as well. Detailed geotechnical engineering investigations would be necessary to more accurately evaluate liquefaction potential in specific areas and to identify and map the areal extent of locations subject to liquefaction."[11]

Landslides

"Landslides are a primary geologic hazard and are influenced by four factors:
- Strength of rock and resistance to failure, which is a function of rock type (or geologic formation);
- Geologic structure or orientation of a surface along which slippage could occur;
- Water (can add weight to a potentially unstable mass or influence strength of a potential failure surface); and,
- Topography (amount of slope in combination with gravitation forces)."[12]

REGULATORY SETTING

Federal Agencies & Regulations

None that apply to the proposed Project

State Agencies & Regulations

California Building Code

"The California Building Code is another name for the body of regulations known as the California Code of Regulations (C.C.R.), Title 24, Part 2, which is a portion of the California Building Standards Code. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards."[13]

Alquist-Priolo Earthquake Fault Zoning Act

"The Alquist- Priolo Earthquake Fault Zoning Act (formerly the Alquist- Priolo Special Studies Zone Act), signed into law December 1972, requires the delineation of zones along active faults

[10] Ibid., page 8-7
[11] Ibid., page 8-9
[12] Ibid., page 8-10
[13] Ibid., page 8-3

in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazards associated with fault rupture and to prohibit the location of most structures for human occupancy across these traces."[14]

Local Policy & Regulations

Tulare County General Plan Policies

The General Plan has a number of policies that apply to projects within Tulare County. General Plan policies that relate to the proposed Project are listed below.

ERM-7.2 Soil Productivity
The County shall encourage landowners to participate in programs that reduce soil erosion and increase soil productivity. To this end, the County shall promote coordination between the Natural Resources Conservation Service, Resource Conservation Districts, UC Cooperative Extension, and other similar agencies and organizations.

ERM-7.3 Protection of Soils on Slopes
Unless otherwise provided for in this General Plan, building and road construction on slopes of more than 30 percent shall be prohibited, and development proposals on slopes of 15 percent or more shall be accompanied by plans for control or prevention of erosion, alteration of surface water runoff, soil slippage, and wildfire occurrence.

HS-2.1 Continued Evaluation of Earthquake Risks
The County shall continue to evaluate areas to determine levels of earthquake risk.

HS-2.4 Structure Siting
The County shall permit development on soils sensitive to seismic activity permitted only after adequate site analysis, including appropriate siting, design of structure, and foundation integrity.

HS-2.7 Subsidence
The County shall confirm that development is not located in any known areas of active subsidence. If urban development may be located in such an area, a special safety study will be prepared and needed safety measures implemented. The County shall also request that developments provide evidence that its long-term use of ground water resources, where applicable, will not result in notable subsidence attributed to the new extraction of groundwater resources for use by the development.

HS-2.8 Alquist-Priolo Act Compliance
The County shall not permit any structure for human occupancy to be placed within designated Earthquake Fault Zones (pursuant to and as determined by the Alquist-Priolo Earthquake Fault Zoning Act; Public Resource code, Chapter 7.5) unless the specific provision of the Act and Title 14 of the California Code of Regulations have been satisfied.

[14] Ibid., page 8-3

IMPACT EVALUATION

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.

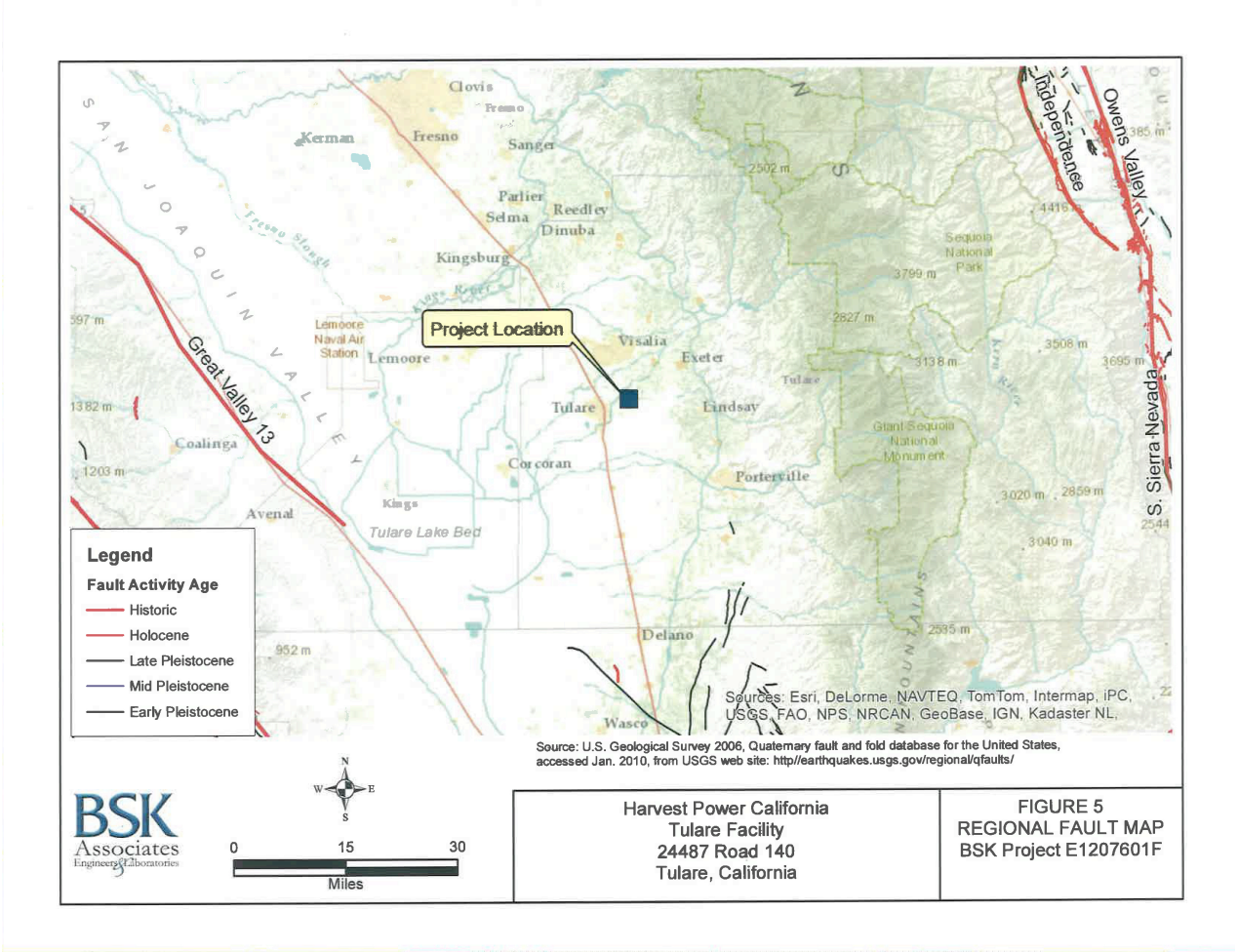
According to the Division of Mines and Geology Publication 42 and the "GIS files of Official Alquist-Priolo Earthquake Fault Zones, Central California Region," the proposed site does not lie within an Alquist-Priolo Special Studies Zone. According to the USGS Quaternary faults and fold database for the United States, there are no mapped active faults at the site. According to the Safety element of the 2010 Tulare County General Plan, the site is not intersected by known faults. There are few faults associated with surface rupture from faults in the vicinity of the Project and hence area and hence there is no impact.[15]

ii) Strong seismic ground shaking?

"The site is located in an area of California with low to moderate seismicity. The site is located in an area of California with low to moderate seismicity. Deaggregation of the seismic hazard was performed by using the USGS Interactive Deaggregation website. The deaggregation at the Maximum Considered Earthquate (MCE) hazard level results in distance, magnitude, and epsilon (round motion undertainty) for each source which contributes to the hazard. In general, the site may experience relatively moderate ground motion, primarily from the California Crustal Gridded Source (background seismicity), which is capable of a 5.9 magnitude earthquake. Other active faults include San Andreas (7.9 magnitude) and Great valley 7.1 magnitude), which are located 66 and 40 miles away. Ground motion acceleration parameters are dependent on the amplification properties of the subsurface units present at the site: a Geotechnical investigation would be required to characterize site ground motion acceleration values."[16] The impact to the area is less than significant, however because the Project will be constructed to CalRecycle and Environmental Health Standards the Project will create no impact.

[15] Preliminary Soil and Geology Study, page 3
[16] Ibid., age 4

Figure 3.6-1
Earthquake Faults



iii) Seismic-related ground failure, including liquefaction?

"The site is not currently located in a Seismic Hazard Zone (liquefaction) specified by the State of California or Tulare County. Liquefaction potential depends on soil type, void ratio, depth to groundwater, duration of shaking and confining pressures over the potentially liquefiable soil mass. Fine, well sorted, loose sand, shallow groundwater, sever seismic ground motion, and particularly long durations of ground shaking are conditions conducive for liquefaction.

Based on historical shallow depth to groundwater the potential for liquefaction may exist at the site and should be evaluated in the Geotechnical Investigation. To evaluate the site soil density and liquefaction potential, the investigation should include soil borings completed to depths of 50 feet bgs."[17]

[17] Ibid.

iv) Landslides?

Landslides are not a significant threat as the topography in the Project area is relatively flat. The site is not currently located in the Seismic Hazard Zone (Landslide) specified by State of California or Tulare County.[18]

Project Impact Analysis: ***Less than Significant Impact with Mitigation***

According to the Geotechnical Report, the existing site in not located within a published Earthquake Fault Zone and the potential for ground rupture is low. As earthquakes are possible throughout the State of California, the Project will have to comply with all Environmental Health and CalRecycle requirements for the construction of tanks and equipment, including the CNG/CHU tanks. In addition, the existing site is not located in a Liquefaction Hazard Zone. As the site is relatively flat, there is no potential for landslides. Less than significant Project-specific impacts related to this checklist item will occur.

Cumulative Impact Analysis: ***No Impact***

The geographic area of this cumulative analysis is Tulare County. This cumulative analysis is based on the information provided in the Tulare County 2030 General Plan, General Plan background Report, and/or Tulare County 2030 General Plan EIR.

The proposed Project will not increase geotechnical related impacts off-site. No cumulative impacts related to this checklist item will occur.

Mitigation Measures:

3.6-1 The Project shall incorporate all recommendations contained within the Preliminary Soil and Geology Phase 1 Study. During Project site design, construction, and operations to reduce any potential geotechnical hazards at the Project site. These recommendations shall be stipulated in the construction contracts and specifications.

Conclusion: ***Less than Significant Impact with Mitigation***

With implementation of the aforementioned mitigation measures, potential Project-specific and cumulative impacts related to this checklist item will be reduced level considered less than significant.

[18] Ibid., page 6

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

Project Impact Analysis: ***Less than Significant Impact with Mitigation***

The Project site is not located on a slope and is not located along a stream, river, or other designated waterway. The Project is relatively flat and prone to inundation and sedimentation by standing water than to soil erosion by the runoff of water. With respect to potential soil erosion by wind, earthwork at the sites during construction might cause some disturbed soils to be affected by wind erosion. After construction at the proposed sites, vehicles in high traffic areas will contribute to pulverization of soil making it susceptible to wind entrainment (erosion). Implementation of mitigation measures may be necessary during construction and operation of the proposed facility to minimize potential soil entrainment by wind at the site. The site is primarily flat and soil erosion is not anticipated. As such no Project-specific impacts related to this checklist item will occur.

Cumulative Impact Analysis: ***No Impact***

The geographic area of this cumulative analysis is Tulare County. This cumulative analysis is based on the information provided in the Tulare County 2030 General Plan, General Plan background Report, and/or Tulare County 2030 General Plan EIR.

The Project site is not located on slope or adjacent to a designated waterway. The proposed Project also does not involve changes that will affect offsite hillsides or designated waterways. In addition, the composting at the site will not reduce topsoil on other parcels. No cumulative impacts related to this checklist item will occur.

Mitigation Measures:

See mitigation measure 3.6-1.

See mitigation measure 3.9-6.

Conclusion: ***Less than Significant Impact with Mitigation***

As noted earlier, no Project-specific or cumulative impacts related to this checklist item will occur.

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?

Project Impact Analysis: ***Less than Significant Impact with Mitigation***

"The site is located on units mapped as Recent Alluvial Fan Deposits. They are unlikely to become instable. Land subsidence in CA generally occurs in areas of fluid removal and in arid areas… This site is not located in an area known for potential hydro-compaction or regional settlement from petroleum and groundwater withdrawal.[19]"

Cumulative Impact Analysis: ***Less than Significant Impact***

The geographic area of this cumulative analysis is Tulare County. This cumulative analysis is based on the information provided in the Tulare County 2030 General Plan, General Plan background Report, and/or Tulare County 2030 General Plan EIR.

The proposed Project will have a minor impact on soil compaction on the Project site. This minor compaction will have a *de minimus* impact of on-site soils. Although the proposed Project will include minor amounts of excavation for the construction of the anaerobic digester, this excavation will not impact the soils in the immediate area. As such, less than significant cumulative impacts related to this checklist item will occur.

Mitigation Measures:

See mitigation measure 3.6-1.

Conclusion: ***Less than Significant Impact with Mitigation***

As noted above, mitigation measure 6.1 will reduce impacts Project-specific impacts to a level considered less than significant. Less then significant cumulative impacts will occur.

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?

Project Impact Analysis: ***Less than Significant Impact with Mitigation***

"The Site Soils Engineering Properties presents characteristics for Western Tulare County. The native soils are (Nord find sandy loam) are predominantly sandy soils with non-plastic fines... These soils types are generally considered as having none to very low expansion potential. Although native soils are anticipated to have none to low expansion potential, the existing site operation involve the aerobic digestion mulching of manure and green waste. The import of material to the site over time may have resulted in expansive soils being

[19] Ibid., page 8

brought in and placed on site. Determination of the expansion potential of the existing near surface soils would be performed as part of the Geotechnical Investigation.[20]

Cumulative Impact Analysis: ***No Impact***

The geographic area of this cumulative analysis is Tulare County. This cumulative analysis is based on the information provided in the Tulare County 2030 General Plan, General Plan background Report, and/or Tulare County 2030 General Plan EIR.

The proposed Project will have no impacts related to expansive soils. As such, no impacts related to this checklist item will occur.

Mitigation Measures:

See mitigation measure 3.6-1.

Conclusion: ***Less than Significant Impact with Mitigation***

As noted earlier, Mitigation Measure 3.6-1 will reduce impacts Project-specific impacts to a level considered less than significant. Less than significant cumulative impacts will occur.

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?

Project Impact Analysis: ***Less than Significant Impact with Mitigation***

There is an existing septic tank on the Project site. No additional septic tank or absorption field. However, the site will be used to hold effluent from the digester that will be stored in tanks or in a covered lagoon on site. The spoils underneath these holding facilities will be required to undergo a geotechnical investigation for structural components prior to the issuance of a building permit.

Cumulative Impact Analysis: ***No Impact***

The geographic area of this cumulative analysis is Tulare County. This cumulative analysis is based on the information provided in the Tulare County 2030 General Plan, General Plan background Report, and/or Tulare County 2030 General Plan EIR.

The proposed Project will have no impacts related to soils suitable for septic tanks. In addition, the proposed Project will have no impacts related to the use of septic tanks on other properties. As such, no impacts related to this checklist item will occur.

[20] Ibid., page 6

Mitigation Measures:

See mitigation measure 3.6-1.

Conclusion: ***Less than Significant Impact with Mitigation***

As noted above, mitigation measure 3.6-1 will reduce impacts Project-specific impacts to a level considered less than significant.

DEFINITIONS/ACRONYMS

Definitions

Fault
"A fault is a fracture in the Earth's crust that is accompanied by displacement between the two sides of the fault. An active fault is defined as a fracture that has shifted in the last 10,000 to 12,000 years (Holocene Period). A potentially active fault is one that has been active in the past 1.6 million years (Quaternary Period). A sufficiently active fault is one that shows evidence of Holocene displacement on one or more of its segments or branches (Hart, 1997)."[21]

Liquefaction
"Liquefaction in soils and sediments occurs during earthquake events, when soil material is transformed from a solid state to a liquid state, generated by an increase in pressure between pore space and soil particles. Earthquake-induced liquefaction typically occurs in low-lying areas with soils or sediments composed of unconsolidated, saturated, clay-free sands and silts, but it can also occur in dry, granular soils or saturated soils with partial clay content."[22]

Magnitude
"Earthquake magnitude is measured by the Richter scale, indicated as a series of Arabic numbers with no theoretical maximum magnitude. The greater the energy released from the fault rupture, the higher the magnitude of the earthquake. Magnitude increases logarithmically in the Richter scale; thus, an earthquake of magnitude 7.0 is thirty times stronger than one of magnitude 6.0. Earthquake energy is most intense at the point of fault slippage, the epicenter, which occurs because the energy radiates from that point in a circular wave pattern. Like a pebble thrown in a pond, the increasing distance from an earthquake's epicenter translates to reduced groundshaking."[23]

[21] General Plan Background Report, page 8-2
[22] Ibid.
[23] Ibid.

REFERENCES

Tulare County 2030 General Plan, August 2012

Tulare County 2030 General Plan Background Report, February 2010

Preliminary Soil and Geology Phase 1 Study, BSK Associates, December 5, 2012

2012 CEQA Guidelines