4.4 GEOLOGY AND SOILS

The information presented in this chapter is based on sources including a Geotechnical Investigation for the Placer Retirement Residence prepared by Geocon dated March 2016, the XRD Analysis of Soil Material from the Placer Retirement Residence by Willamette Geologic Service dated November 2016, the Placer County General Plan, and Granite Bay Community Plan. This chapter presents the results of these investigations and published geologic information, serving as the basis for the evaluation of geologic and seismic impacts associated with implementation of the proposed project. A copy of the geotechnical investigation and soils reports are included in Appendix G of this EIR.

4.4.1 ENVIRONMENTAL SETTING

Geology

Regional Physiography. California has been divided into 12 geomorphic provinces that are topographic-geologic groupings of convenience based primarily on landforms and geologic history. The project site is located in the eastern portion of the Great Valley geomorphic province of California or what is more commonly referred to as the Central Valley. The Sacramento Valley comprises the northern portion of the Central Valley and is bounded by the Sierra Nevada and southern Cascade Range to the east and the Coast Ranges and Klamath Mountains to the west. The Sierra Nevada is composed of granitic and metamorphic rocks tilted gently from the summit near Donner Lake to the west, where the block dips under the sedimentary and alluvial units of the valley. The proposed project is located in the western foothills of the Sierra Nevada, at the eastern edge of Sacramento Valley.

Most of the Granite Bay Community Plan area is underlain by granitic rocks ranging from 125 to 136 million years old. The granitic rocks were intruded in molten form at great depth into layered sedimentary and volcanic rocks, which were folded, faulted, crushed, and uplifted. In the process, these layered rocks were metamorphosed into amphibolite, greenstone, slates, and phyllites. This band of metamorphic rocks trends slightly west of north and has been called the “Mother Lode” because of the gold-rich quartz veins that were intruded along steep faults in the metamorphic rocks.

Stream erosion during the episodic uplifts of the Sierra Nevada, combined with varied volcanic activity, produced the variety of sedimentary rock units present in the Granite Bay Community Plan area. During the last million years, erosion and sedimentation have led to the formation of alluvial deposits that overlay the granitic bedrock.

The present-day landscape is comprised of rounded hills of decomposed granite, scattered outcrops of more resistant rocks, and steep bluffs supported by the Mehrten Conglomerate or Volcanics, which are dominant elements of Granite Bay.

Site Geology. The site consists of early-Pleistocene Turlock Lake Formation, which extends at least 21.5 feet below the ground surface. The Turlock Lake Formation is an alluvial fan deposit mainly comprising granitic, older alluvium derived from the Sierra Nevada. The alluvium generally consists of very stiff to hard, sandy loam clay and is moderately expansive. The proposed project also contains fill material within the eastern portions of the site that overlays the Turlock material. Fill was encountered up to 7 feet deep and generally consisted of sandy, lean clay with variable amounts of gravel. The relative compaction of the fill averages was approximately 82 percent of maximum dry density. Based on the characteristics, the existing fill is not suitable for direct support of structural improvements or additional fill. The soils would require complete removal and re-compaction prior to development.

Geologic Hazards

***Seismicity*.** The project site is not located on any active fault zone, according to the California Department of Conservation Fault Activity Map of California (DOC, 2017). The nearest fault is the Foothills Fault system near Auburn, approximately fifteen miles to the northeast and the Melones Fault further east. There is potential for significant ground shaking because of seismicity associated with these potentially active, regional earthquake faults, although, no active faults are known to exist within Granite Bay. The Willows Fault is located near the middle of Granite Bay but is believed to have been inactive since the beginning of the Pleistocene epoch. In addition, earthquakes could occur on more well-known California faults, including the San Andreas, Hayward and Calaveras faults, although they are not expected to result in significant ground shaking in the project area.

***Fault Rupture*.** Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. The project site does not lie within an Alquist-Priolo Earthquake Fault Zone (AP Fault Zone) as currently designated by the State of California and is not located on any known “active” earthquake fault trace. The closest AP Fault Zone is the northern reach section (Cleveland Hills Fault) of the Foothills Fault located approximately 15 miles northeast of the project site. The potential for fault rupture is low.

Ground shaking. The intensity of seismic shaking, or strong ground motion, during an earthquake depends on the distance of a site to the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the area. Earthquakes occurring on faults closest to the site would have the potential to generate the largest ground

motions. The maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault based on the current understanding of the regional tectonic structure.

Based on geotechnical factors, the intensity of earthquake-induced ground motions and the potential forces that could affect the project site were calculated. Using the fault magnitudes and distances, the peak bedrock acceleration was calculated using the middle portion of the proposed project, and the recommended peak ground acceleration (PGA) for the project site is 0.159g.

Landslide and Slope Stability. Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, triggered either by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience soil slumps, rapid debris flows, and deep-seated rotational slides. Earthquake motions can also induce substantial stresses in slopes, causing earthquake-induced landslides or ground cracking when the slope fails. Slope stability can depend on several complex variables, including the geology, structure, topography, slope geometry, and amount of groundwater present, as well as external processes such as climate and human activity.

The project site generally slopes from north to south. The elevation at the northern border ranges from 215 to 220 feet above mean sea level (MSL), while the southern portion of the site ranges from an elevation of 195 to 200 feet MSL. The existing slopes on the project site do not show evidence of global instability, although localized erosion and surficial sloughing is present at some locations.

Expansive Soils. Expansive soils are characterized by their ability to undergo significant volume change (i.e., to shrink and swell) as a result of variations in moisture content. Changes in soil moisture can result from rainfall, landscape irrigation, utility leakage, roof drainage, and/or perched groundwater. Expansive soils are typically very fine-grained and have a high to very high percentage of clay. Expansion and contraction of expansive soils in response to changes in moisture content can damage buried utilities and building foundations and increase maintenance requirements.

Two soil samples that were considered representative of the project site within the proposed cut and fill areas were taken and evaluated for their expansion potential using ultrasonic size separation and x-ray diffraction analysis (XRD). Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM)

or other suggested procedures. The selected samples were tested and found to have a medium expansion potential classification per ASTM D4829.

Corrosion. Many factors can affect the corrosion potential of soil. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Chloride and sulfate ion concentrations and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete (PCC) by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. The soils were tested for their pH, resistivity, chloride, and sulfate content. The soils did not exceed allowable thresholds.

Liquefaction. Liquefaction is a phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of strong ground shaking such as during an earthquake. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects.

During cyclic ground shaking, such as earthquakes, cyclically-induced stresses may cause increased pore water pressures within the soil matrix, which results in liquefaction. Soils most susceptible to liquefaction are loose to moderately dense, saturated, non-cohesive soils with poor drainage, such as sands and silts with interbedded or capping layers of relatively low permeability soil. Liquefied soil may lose shear strength that may lead to large shear deformations and/or flow failure. Liquefied soil can also settle as pore pressures dissipate following an earthquake. Based on the subsurface conditions encountered at the site and relatively low seismicity in the area, liquefaction is not considered a hazard for the project.

Lateral Spreading. Lateral Spreading typically occurs as a form of horizontal displacement of relatively flat-lying alluvial material toward an open or “free” face such as an open body of water, channel, or excavation. In soils, this movement is generally due to failure along a weak plane (soil structure) and may often be associated with liquefaction.

4.4.2 REGULATORY AND PLANNING SETTING

STATE AND FEDERAL

Alquist-Priolo Earthquake Fault Zoning Act. The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the state geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and has published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace because many active faults are complex and consist of more than one branch that may experience ground surface rupture.

Title 14 of the California Code of Regulations (CCR), Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. Although the structures that would be constructed under the proposed project meet this definition, the proposed project does not cross any AP Fault Zones. Therefore, the proposed project would not be subject to the requirements of the Alquist-Priolo Earthquake Fault Zoning Act.

Seismic Hazards Mapping Act. The Seismic Hazards Mapping Act was passed in 1990 following the 1989 Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. The Act directs the California Department of Conservation to identify and map areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified ground shaking. The Act requires site-specific geotechnical investigations to identify potential seismic hazards and formulate mitigation measures before permitting most developments designed for human occupancy within the Zones of Required Investigation.

Under the Seismic Hazards Mapping Act, areas of potential liquefaction and earthquake-induced landslides are mapped on a broad scale based on regional information. A project evaluation must be conducted in accordance with guidelines established by the California Geological Survey. The project site is not mapped on the Seismic Hazard Zone Maps and is not located within a hazard zone.

California Building Code. The California Building Code (CBC), which is codified in CCR Title 24, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction,

quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable.

The CBC is based on the International Building Code. The 2016 CBC is based on the 2015 International Building Code published by the International Code Conference. In addition, the CBC contains necessary California amendments that are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-10. ASCE 7-10 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion in building codes. In accordance with these standards, the CBC design provisions prescribe minimum lateral forces to withstand ground shaking. Seismic design provisions of building code generally prescribe minimum lateral forces applied statically to the structure, combined with the gravity forces of dead and live loads. The prescribed lateral forces are generally considered to be substantially smaller than the actual peak forces that would be associated with a major earthquake. Consequently, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake. However, it is reasonable to expect that a well-designed and well-constructed structure would not collapse or cause loss of life in a major earthquake.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California including the proposed project.

LOCAL

Placer County General Plan. The Placer County General Plan includes policies that call for the County to ensure that land uses and new development are compatible with the local geologic

and soil resources. General Plan health and safety policies applicable to the proposed project are discussed in *Table 4.4-1: General Plan Goals and Policies - Geology and Soils.*

Granite Bay Community Plan. The Seismic Safety Element of the Granite Bay Community Plan (GBCP) seeks to identify and appraise seismic hazards in the area and recommend goals and policies to reduce the loss of life, injuries, damage to property and economic and social dislocations resulting from future seismic activity. Also included are safety considerations dealing with the potential hazards of fire and flooding. Goals and policies related to seismic safety in the GBCP are discussed in *Table 4.4-2: Granite Bay Community Plan Goals and Policies - Geology and Soils*.

4.4.3 POTENTIAL IMPACTS AND MITIGATION MEASURES

Significance Criteria

Based upon the criteria derived from Appendix G of the CEQA Guidelines, the proposed project would result in a significant impact if it would:

- Expose people or structures to unstable earth conditions or changes in geologic substructures?
- Result in significant disruptions, displacements, compaction or overcrowding of the soil?
- Result in substantial change in topography or ground surface relief features?
- Result in any significant increases in wind or water erosion of soils, either on or off site?
- Result in changes in deposition or erosion or changes in siltation which may modify the channel of a river, stream, or lake?
- Result in exposure of people or property to geologic and geomorphological (i.e. avalanches) hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards?
- 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 offsite landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Chapter 18 of the California Building Code, creating substantial risks to life or property?

Table 4.4-1: General Plan Goals and Policies – Geology and Soils

General Plan Goals and Policies	Consistency Determination	Analysis
Goal 8.A: To minimize the loss of life, injury, and property damage due to seismic and geological hazards.	Consistent	The project is consistent with this goal. The project would implement Mitigation Measures GEO-1a through GEO- 1c requiring the applicant to demonstrate that the project design and construction is consistent with applicable geotechnical standards to ensure stability and seismic safety. The proposed building would be built to conform to California Building Code which prescribes design provisions for minimum lateral forces to withstand ground shaking. The building design is checked by County staff during the building plan review process as well as field inspections during construction.
Policy 8.A.1: The County shall require the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., ground shaking, landslides, liquefaction, critically expansive soils, avalanche).	Consistent	The project is consistent with this policy. The area is not prone to geological or seismic hazards. The project would implement Mitigation Measure GEO-1c which would require the applicant to comply with the results of a geotechnical investigation.
Policy 8.A.2: The County shall require submission of a preliminary soils report, prepared by a registered civil engineer and based upon adequate test borings, for every major subdivision and for each individual lot where critically expansive soils have been identified or are expected to exist.	Consistent	The project is consistent with this policy. Critically expansive soils are not known to exist within the project site. If such soils are encountered during detailed geotechnical investigations, appropriate design and construction methods would be implemented. The project would implement Mitigation Measure GEO-1c which would require the applicant to comply with the results of a geotechnical investigation.
Policy 8.A.3: The County shall prohibit the placement of habitable structures or individual sewage disposal systems on or in	Consistent	The project is consistent with this policy. Please see discussion under Policy 8.A.2 above. The project does not propose any individual sewage disposal systems.

Table 4.4-1: General Plan Goals and Policies – Geology and Soils

General Plan Goals and Policies	Consistency Determination	Analysis
critically expansive soils unless suitable mitigation measures are incorporated to prevent the potential risks of these conditions.		
Policy 8.A.4: The County shall ensure that areas of slope instability are adequately investigated and that any development in these areas incorporates appropriate design provisions to prevent landsliding.	Consistent	The project is consistent with this policy. The project is not located on a site with any steep slopes that would be subject to landsliding. If such soils are encountered during detailed geotechnical investigations, appropriate design and construction methods would be implemented. The project would implement Mitigation Measure GEO-1c which would require the applicant to comply with the results of a geotechnical investigation.
Policy 8.A.7: In areas subject to severe ground shaking, the County shall require that new structures intended for human occupancy be designed and constructed to minimize risk to the safety of occupants.	Consistent	The project is consistent with this policy. Mitigation Measure GEO 1-c requires that the project design and construction be consistent with applicable geotechnical standards to ensure stability and seismic safety. The proposed building would be built to conform to California Building Code which prescribes design provisions for minimum lateral forces to withstand ground shaking. The building design is checked by County staff during the building plan review process as well as field inspections during construction.
Policy 8.A.8: County shall continue to support scientific geologic investigations which refine, enlarge, and improve the body of knowledge on active fault zones, unstable areas, severe ground shaking, avalanche potential, and other hazardous conditions in Placer County.	Consistent	The project is consistent with this policy. Mitigation measure GEO-1c requires the preparation of a final geotechnical investigation that would evaluate the geological conditions of the project site and would provide Placer County with additional information regarding the geotechnical conditions of the site.

Table 4.4-1: General Plan Goals and Policies – Geology and Soils

General Plan Goals and Policies	Consistency Determination	Analysis
Policy 8.A.9: The County shall require that the location and/or design of any new buildings, facilities, or other development in areas subject to earthquake activity minimize exposure to danger from fault rupture or creep.	Consistent	The project is consistent with this policy. Mitigation Measures GEO-1a through GEO 1-c require that the project design and construction is consistent with applicable geotechnical standards to ensure stability and seismic safety.

Table 4.4-2: Granite Bay Community Plan Goals and Policies – Geology and Soils

Granite Bay Community Plan Goals and Policies	Consistency Determination	Analysis
Goal 8.2.1: Protect the lives and property of the citizens of the Granite Bay area from unacceptable risk resulting from seismic and geologic hazards.	Consistent	The project is consistent with this goal. Mitigation Measure GEO 1-c requires the preparation of a final geotechnical investigation. The proposed building would be built to conform to California Building Code which prescribes design provisions for minimum lateral forces to withstand ground shaking. The building design is checked by County staff during the building plan review process as well as field inspections during construction.
Policy 8.2.1: Maintain strict enforcement of seismic safety standards for new construction contained in the Uniform Building Code.	Consistent	The project is consistent with this policy. Please see discussion under Goal 8.2.1 above.
Policy 8.2.2: Review future developments using all available seismic data and considering recommendations from the Health and Safety Chapter of the Countywide General Plan Policy Document.	Consistent	The project is consistent with this policy. Mitigation measure GEO-1c requires the preparation of a geotechnical investigation that would evaluate the geological conditions of the project site and make specific recommendations for grading and foundation construction based on engineering practice for the specific conditions at the project site. The geotechnical investigation would provide information regarding: • Road, pavement, and parking area design; • Structural foundations, including retaining wall design (if applicable); • Grading practices; • Erosion/winterization; • Special problems discovered on-site, (i.e., groundwater, expansive/unstable soils, etc.) • Slope stability

Table 4.4-2: Granite Bay Community Plan Goals and Policies – Geology and Soils

Granite Bay Community Plan Goals and Policies	Consistency Determination	Analysis
Policy 8.2.3: Require soils or geologic reports for construction or extensive grading in identified geologic hazard areas.	Consistent	The project is consistent with this policy. The project is not located in a geologic hazard area. Mitigation measure GEO-1c requires the preparation of a geotechnical investigation that would evaluate the geological conditions of the project site and make specific technical recommendations based on engineering practice for grading and foundation construction based on the specific conditions at the project site.

Based on the proposed project's location, no impacts are anticipated with respect to the below criterion:

- Result in the destruction, covering or modification of any unique geologic or physical features?

As discussed in the Initial Study (included in Appendix A) prepared for the project, the Preliminary Geotechnical Report described the project site and its geology. Nothing in the report indicates the existence of any unique geologic or physical features. Therefore, there would be no impact and no mitigation is required. No further analysis of this issue is required in the EIR. No impacts associated with either of the proposed frontage improvement options in relation the destruction, covering or modification of any unique geologic or physical features would occur. Impacts of both options are expected to be substantially the same.

EXPOSURE TO UNSTABLE CONDITIONS

Significance Criteria 4.4-1: Expose people or structures to unstable earth conditions or changes in geologic substructures? (Less Than Significant Impact with Mitigation Incorporated)

The project site is not located on a fault zone, according to the California Department of Conservation Fault Activity Map of California. There are no active faults within the project area and it is in an area that is considered seismically inactive. The closest active fault to the is the Foothills Fault system approximately fifteen miles to the northeast and the Melones Fault in the western Sierra Nevada Mountains, which is located approximately 45 miles east (DOC, 2017). Ground shaking could occur regionally and be felt on the project site from activity on these or from larger faults such as the San Andreas, Hayward, and Calaveras in the northern California region. However, activity from these three faults is not be expected to result in significant ground shaking on the project site.

The proposed project would result in grading activities including excavation and recompaction of soils. These activities would occur to an approximate depth of 15-feet below the ground surface, would only occur within soil layers, would not extend below bedrock, and would not disrupt any known fault. A conceptual grading plan for the project is shown in **Figure 4.4-1: Conceptual Grading Plan**. The proposed project would not affect the geologic substructures underlaying the project site or expose people to unstable earth conditions. Implementation of Mitigation Measures GEO-1a through GEO-1c and conformance to all recommendations of the geotechnical investigation would reduce impacts associated with unstable earth conditions to **less than significant**.

Source: Kimley-Horn, 2018

FIGURE 4.4-1: Conceptual Grading Plan
Placer Retirement Residence
Placer County

Not to scale

Kimley»Horn

Option 1: Full Frontage Improvements – (Less Than Significant Impact with Mitigation Incorporated)

Development under the Full Frontage Improvements option would not affect the geologic substructure. Implementation of Mitigation Measures GEO-1a through GEO-1c and conformance to all recommendations of the geotechnical investigation would reduce impacts associated with unstable earth conditions to **less than significant**.

Option 2: Modified Frontage Improvements (the Proposed Project) – (Less Than Significant Impact with Mitigation Incorporated)

Impacts from the Modified Frontage Improvements option would be the same as discussed above. Although the project site is not in the vicinity of any active fault, the proposed project could experience ground shaking from activity on faults in the northern California region. To reduce potential impacts, Mitigation Measures GEO 1-a through GEO-1c would be implemented. Implementation of Mitigation Measures GEO-1a through GEO-1c and conformance to all recommendations of the Geotechnical Investigation would reduce impacts associated with unstable earth conditions to **less than significant**. No additional mitigation is required in this regard.

Mitigation Measures

GEO-1a: Engineering Improvement Plans. The applicant shall prepare and submit Improvement Plans, specifications and cost estimates (per the requirements of Section II of the Land Development Manual [LDM] that are in effect at the time of submittal) to the Engineering and Surveying Division (ESD) for review and approval. The plans shall show all physical improvements as required by the conditions for the project as well as pertinent topographical features both on and off site. All existing and proposed utilities and easements, on site and adjacent to the project, which may be affected by planned construction, shall be shown on the plans. All landscaping and irrigation facilities within the public right-of-way (or public easements), or landscaping within sight distance areas at intersections, shall be included in the Improvement Plans. The applicant shall pay plan check and inspection fees with the 1st Improvement Plan submittal. (NOTE: Prior to plan approval, all applicable recording and reproduction cost shall be paid). The cost of the above-noted landscape and irrigation facilities shall be included in the estimates used to determine these fees. It is the applicant's responsibility to obtain all required agency signatures on the plans and to secure department approvals. If the Design/Site Review process and/or Development Review Committee (DRC) review is required as a condition of approval for the project, said review process shall be completed prior to submittal of Improvement Plans. Record drawings shall be prepared and signed by a California Registered Civil Engineer at the applicant's expense and shall be submitted to the ESD in both hard

copy and electronic versions in a format to be approved by the ESD prior to acceptance by the County of site improvements.

- Conceptual landscape plans submitted prior to project approval may require modification during the Improvement Plan process to resolve issues of drainage and traffic safety.

- The applicant shall provide five (5) copies of the approved Tentative Subdivision Map(s) and two copies of the approved conditions with the plan check application. The Final Subdivision Map(s) shall not be submitted to the Engineering and Surveying Division (ESD) until the Improvement Plans are submitted for the second review. Final technical review of the Final Subdivision Map(s) shall not conclude until after the Improvement Plans are approved by the ESD. Any Building Permits associated with this project shall not be issued until, at a minimum, the Improvement Plans are approved by the Engineering and Surveying Division.

- Prior to the County's final acceptance of the project's improvements, submit to the Engineering and Surveying Division two copies of the Record Drawings in digital format (on compact disc or other acceptable media) in accordance with the latest version of the Placer County Digital Plan and Map Standards along with two blackline hardcopies (black print on bond paper) and two PDF copies. The digital format is to allow integration with Placer County's Geographic Information System (GIS). The final approved blackline hardcopy Record Drawings would be the official document of record.

GEO-1b: Grading and Drainage Improvement Plans. The Improvement Plans shall show all proposed grading, drainage improvements, vegetation and tree removal and all work shall conform to provisions of the County Grading Ordinance (Ref. Article 15.48, Placer County Code) and Stormwater Quality Ordinance (Ref. Article 8.28, Placer County Code) that are in effect at the time of submittal. No grading, clearing, or tree disturbance shall occur until the Improvement Plans are approved and all temporary construction fencing has been installed and inspected by a member of the Development Review Committee (DRC). All cut/fill slopes shall be at a maximum of 2:1 (horizontal: vertical) unless a soils report supports a steeper slope and the Engineering and Surveying Division (ESD) concurs with said recommendation.

- The applicant shall revegetate all disturbed areas. Revegetation, undertaken from April 1 to October 1, shall include regular watering to ensure adequate growth. A winterization plan shall be provided with project Improvement Plans. It is the applicant's responsibility to ensure proper installation and maintenance of erosion control/winterization before, during, and after project construction. Soil stockpiling or borrow areas, shall have proper erosion control measures applied for the duration of the construction as specified in the

Improvement Plans. Provide for erosion control where roadside drainage is off of the pavement, to the satisfaction of the Engineering and Surveying Division (ESD).

- The applicant shall submit to the ESD a letter of credit or cash deposit in the amount of 110 percent of an approved engineer's estimate for winterization and permanent erosion control work prior to Improvement Plan approval to guarantee protection against erosion and improper grading practices. One year after the County's acceptance of improvements as complete, if there are no erosion or runoff issues to be corrected, unused portions of said deposit shall be refunded to the project applicant or authorized agent.

- If, at any time during construction, a field review by County personnel indicates a significant deviation from the proposed grading shown on the Improvement Plans, specifically with regard to slope heights, slope ratios, erosion control, winterization, tree disturbance, and/or pad elevations and configurations, the plans shall be reviewed by the DRC/ESD for a determination of substantial conformance to the project approvals prior to any further work proceeding. Failure of the DRC/ESD to make a determination of substantial conformance may serve as grounds for the revocation/modification of the project approval by the appropriate hearing body.

GEO-1c: Geotechnical Recommendations. The applicant shall prepare and submit a final geotechnical engineering report produced by a California Registered Civil Engineer or Geotechnical Engineer for Engineering and Surveying Division Review and approval. The report shall address and make recommendations on the following:

A) Road, pavement, and parking area design;

B) Structural foundations, including retaining wall design (if applicable);

C) Grading practices;

D) Erosion/winterization;

E) Special problems discovered on-site, (i.e., groundwater, expansive/unstable soils, etc.)

F) Slope stability

Once approved by the Engineering and Surveying Division (ESD), two copies of the final report shall be provided to the ESD and one copy to the Building Services Division for its use. It is the responsibility of the applicant to provide for engineering inspection and certification that earthwork has been performed in conformity with recommendations contained in the report.

RESULT IN SOIL DISRUPTION, DISPLACEMENT OR COMPACTION

Significance Criteria 4.4-2: Result in significant disruptions, displacements, compaction or overcrowding of the soil? (Less Than Significant Impact with Mitigation Incorporated)

The eastern portion of the site contains undocumented fill generally consisting of sandy, lean clay with variable amounts of gravel according to the geotechnical investigation prepared for the project site. Based on the characteristics, the existing fill is not suitable for direct support of structural improvements or other fill material to build up the project site and would require complete removal and re-compaction prior to development. Below the areas of fill and at the ground surface within the western and southern portions of the site, alluvium (Turlock Formation) is present and extends at least 21.5 feet below the ground surface. The alluvium generally consists of very stiff to hard, sandy loam clay and is moderately expansive.

Laboratory testing on two soil samples from the project site indicate that the selected samples have a medium expansion potential classification per ASTM D4829. Within the proposed building areas, existing fill would require complete removal and re-compaction prior to placing additional fill or constructing improvements. Accordingly, the geotechnical investigation prepared for the proposed project includes project-specific recommendations based on generally accepted construction methods. Recommendations included measures pertaining to grading including, excavation requirements, the construction of cut and fill slopes, use of materials for fill, ground water, seepage, and soil moisture conditions. The geotechnical investigation also included requirements pertaining to construction of the proposed structures in regards to foundations, slabs and slab moisture protection, retaining walls and lateral loads, concrete for sidewalks, driveways and flatwork, pavement, and site drainage. Implementation of Mitigation Measures GEO-1a through GEO-1c, and GEO-2 would reduce potential impacts to **less than significant**.

Mitigation Measure

GEO-2: Staging Areas. The applicant shall submit Improvement Plans that identify the stockpiling and/or vehicle staging areas in locations as far as practical from existing dwellings and protected resources in the area.

<u>Option 1: Full Frontage Improvements</u> – (Less Than Significant Impact with Mitigation Incorporated)

Development under the Full Frontage Improvements option would occur within the same project area with the exception of the Old Auburn Road roadway improvements within the Linda Creek Treelake Tributary. All other existing site conditions and construction methodology including soil excavation, removal, use of fill and recompaction would be the same. While some additional

work within the tributary area would occur, this would occur within the same overall geologic setting and impacts would be substantially the same. In addition, Mitigation Measure GEO-1c would be required and would reduce impacts associated with disruptions, displacements, and compaction or overcrowding of the soil. Implementation of these measures would reduce impacts to **less than significant**. No additional mitigation is required.

Option 2: Modified Frontage Improvements (the Proposed Project) – (Less Than Significant Impact with Mitigation Incorporated)

The proposed project with the Modified Frontage Improvements option would occur within the same project area. Existing site conditions and construction methodology including soil excavation, removal, use of fill and recompaction would be the same as described above. While some additional work within the tributary area would occur, this would occur within the same overall geologic setting and impacts would be substantially the same. In addition, Mitigation Measure GEO-1c would be required and would reduce impacts associated with disruptions, displacements, and compaction or overcrowding of the soil. Implementation of these measures would reduce impacts to **less than significant**. No additional mitigation is required.

CHANGE IN TOPOGRAPHY

Significance Criteria 4.4-3: Result in substantial change in topography or ground surface relief features? (Less Than Significant Impact with Mitigation Incorporated)

The majority of the project site would be graded to enable construction of the proposed project. The project site generally slopes gently from north to south and does not contain any unique topography such as steep rises, plateaus, valleys, or substantial ground surface relief features. The project site has been used as horse pasture and is typical of other undeveloped areas in the vicinity. The southerly portion of the site contains the Linda Creek Treelake Tributary, which is a perennial stream flowing on the southern boundary of the project site. The proposed project would be building into the slope on the property and the building pad elevation would be 16 feet below the existing grade at its northernmost point. **Figure 4.4-2: Elevation Cross Section from Sierra College Boulevard** shows how the building would be set into the slope in relation to the current slope of the property.

Option 1: Full Frontage Improvements – (Less Than Significant Impact with Mitigation Incorporated)

The Full Frontage Improvements option would result in modifications to the Linda Creek Treelake Tributary. The Linda Creek Treelake Tributary has a depressed topography allowing it to carry suburban runoff and water flow to the west. Under this option, the southerly reach of the Linda

Creek Treelake Tributary would be filled to enable construction of the new westbound lane of Old Auburn Road. In addition, grading and revegetation in the northerly reach for the Linda Creek Treelake Tributary would be required to modify the channel to accommodate increased water flow. Although the southerly reach would be filled and the northerly reach would require modification to handle increased flows, this area would be recontoured to resemble the existing natural drainages. In addition, incorporation of mitigation measures GEO-1a through GEO-1c, would reduce impacts associated with modifications to topography and ground surface relief features to **less than significant.**

Option 2: Modified Frontage Improvements (the Proposed Project) – (Less Than Significant Impact with Mitigation Incorporated)

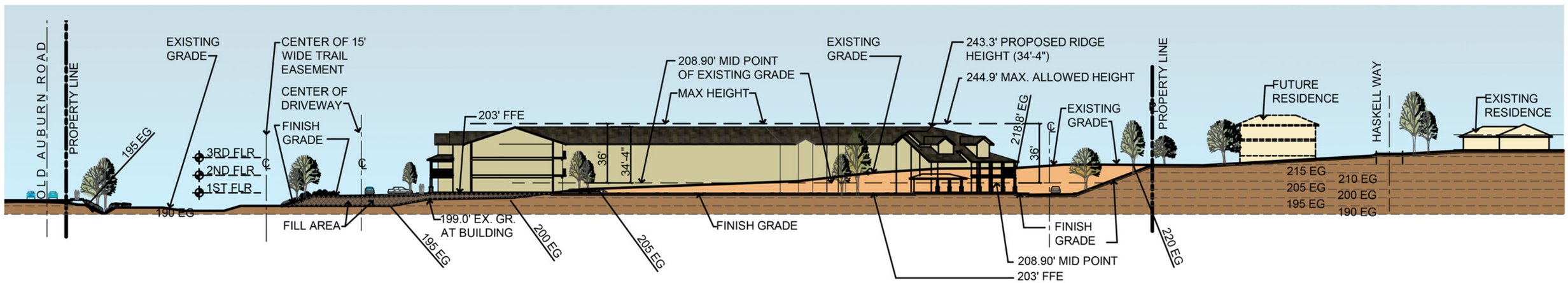
The Modified Frontage Improvements option would not result in significant changes to the existing topographic relief of the site. No grading would occur within the Linda Creek Treelake Tributary or the unnamed tributary on the eastern project boundary. Although changes to the topography and surface features would occur, this option would not result in substantial change in topography or ground surface relief features. In addition, incorporation of mitigation measures GEO-1a through GEO-1c, would reduce impacts associated with modifications to topography and ground surface relief features to **less than significant**.

RESULT IN SUBSTANTIAL EROSION

Significance Criteria 4.4-4: Result in any significant increase in wind or water erosion of soils, either on or off the site? (Less Than Significant Impact with Mitigation Incorporated)

Construction of the proposed project would result in disturbance to soils during site preparation activities, including excavation, backfilling, and grading. These construction activities would increase the risk of erosion by exposing soil to wind and rain. Without proper soil stabilization controls, these construction activities can increase the potential for soil loss and erosion by wind and stormwater runoff through the removal of stabilizing vegetation and exposure of areas of loose soil. Newly constructed and compacted engineered slopes can also undergo substantial erosion through dispersed sheet flow runoff, and more concentrated runoff can cause the formation of small erosional channels and larger gullies, each compromising the integrity of the slope and resulting in significant soil loss.

The proposed project would be required to adhere to the conditions of the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Storm Water Associated with Construction Activity (General Construction Permit). Conditions of the permit would require



Source: Lenity Architecture, Inc., 2018

FIGURE 4.4-2: Elevation Cross Section from Sierra College Boulevard
Placer Retirement Residence
Placer County

Kimley»Horn

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the preparation of a Stormwater Pollution Prevention Plan (SWPPP) that would document implementation of construction period best management practices (BMPs), monitoring and other measures designed to minimize the release of construction related wind and water pollutants and sediment from the project site. Chapter 4.6, Hydrology and Water Quality, details the site-specific impacts associated with erosion, as well as the potential for offsite erosion to occur. Mitigation Measures HYD-1 and HYD-2 from Chapter 4.6, Hydrology and Water Quality, and Mitigation Measure GEO-3 would require implementation of erosion control measures that would substantially reduce the amount of sediment from entering the Linda Creek Treelake Tributary or unnamed tributary and being carried downstream. Incorporation of these mitigation measures and conformance with the NPDES, BMP's and use of Low Impact Development (LID) designs would reduce impacts to **less than significant**. No additional mitigation is required.

Option 1: Full Frontage Improvements – (Less Than Significant Impact with Mitigation Incorporated)

Construction activities under the Full Frontage Improvements option would result in the same impacts as described above and the same mitigation measures would be incorporated. In addition, the Full Frontage Improvements option includes construction activities within Linda Creek Treelake Tributary needed for widening Old Auburn Road. To reduce impacts from erosion and sedimentation from work within the tributary, Mitigation Measures from Chapters 4.3 Biological Resources (Streambed Alteration Agreement) and 4.6 Hydrology and Water Quality, would be implemented. Incorporation of these mitigation measures would reduce impacts associated with wind or water erosion of soils to **less than significant**.

Option 2: Modified Frontage Improvements (the Proposed Project) – (Less Than Significant Impact with Mitigation Incorporated)

The Modified Frontage Improvements would result in impacts that would be the same as described above. Impacts would be **less than significant** with mitigation incorporated.

Mitigation Measure

GEO-3: Construction BMPs. The Improvement Plans shall show that water quality treatment facilities/Best Management Practices (BMPs) shall be designed according to the guidance of the California Stormwater Quality Association Stormwater Best Management Practice Handbooks for Construction, for New Development/ Redevelopment, and for Industrial and Commercial (or other similar source as approved by the Engineering and Surveying Division (ESD)).

Storm drainage from on- and off-site impervious surfaces (including roads) shall be collected and routed through specially designed catch basins, vegetated swales, vaults, infiltration basins, water

quality basins, filters, etc. for entrapment of sediment, debris and oils/greases or other identified pollutants, as approved by the Engineering and Surveying Division (ESD). BMPs shall be designed in accordance with the West Placer Storm Water Quality Design Manual for Sizing of Permanent Post-Construction Best Management Practices for Stormwater Quality Protection. No water quality facility construction shall be permitted within any identified wetlands area, floodplain, or right-of-way, except as authorized by project approvals.

All permanent BMPs shall be maintained as required to ensure effectiveness. The applicant shall provide for the establishment of vegetation, where specified, by means of proper irrigation. Proof of on-going maintenance, such as contractual evidence, shall be provided to ESD upon request. Maintenance of these facilities shall be provided by the project owners/permittees and certification of completed maintenance reported annually to the County DPWF Stormwater Coordinator, unless, and until, a County Service Area is created and said facilities are accepted by the County for maintenance. Contractual evidence of a monthly parking lot sweeping and vacuuming and catch basin cleaning program shall be provided to the ESD upon request. Failure to do so would be grounds for discretionary permit revocation. Prior to Improvement Plan approval, easements shall be created and offered for dedication to the County for maintenance and access to these facilities in anticipation of possible County maintenance.

IMPACT OFFSITE WATER BODY

Significance Criteria 4.4-5: Result in changes in deposition or erosion or changes in siltation which may modify the channel of a river, stream, or lake? (Less Than Significant Impact with Mitigation Incorporated)

The project site contains the Linda Creek Treelake Tributary on the southern project boundary and an unnamed tributary on the eastern project boundary. Due to the proximity to these waterways, construction of the proposed project could result in deposition, erosion, or siltation that would modify the channel of a river, stream, or lake.

<u>Option 1: Full Frontage Improvements</u> – (Less Than Significant Impact with Mitigation Incorporated)

The Full Frontage Improvements option would result in a direct modification and filling of approximately 400 feet of the southerly reach of the Linda Creek Treelake Tributary to enable widening of Old Auburn Road. Due to the perennial nature of the Linda Creek Treelake Tributary, water flows would need to be redirected while construction occurred. This also would result in a modification to the hydrologic conditions as it would alter stream flows to the northerly reach of the Linda Creek Treelake Tributary. Grading and contouring would occur within the northerly

tributary channel to ensure the future flows would not undercut or saturate the substrate under the new Old Auburn Road westbound lanes. Work within the Linda Creek Treelake Tributary would be managed to reduce the potential for erosion and downstream sedimentation.

Without measures to control water flows, construction activities could result in substantial project related erosion within the Linda Creek Treelake Tributary and could increase downstream deposition of eroded materials. Mitigation Measures HYD-2 and HYD-3 from Chapter 4.6, Hydrology and Water Quality would be implemented to reduce impacts to **less than significant**.

Option 2: Modified Frontage Improvements (the Proposed Project) – (Less Than Significant Impact with Mitigation Incorporated)

The Modified Frontage Improvements option would occur near the Linda Creek Treelake Tributary and the unnamed tributary, but construction and operation of this option would not occur within either of these tributaries. As discussed above, Mitigation Measures HYD-2 and HYD-3 from Chapter 4.6, Hydrology and Water Quality would be implemented during construction to control erosion and storm water runoff. Implementation of these measures would reduce the potential for depositional material to enter the tributaries resulting in modification to either of them, or any downstream water body.

Although deposition and erosional impacts are generally more pronounced during construction activities, operation of the proposed project has the potential to result in erosion and downstream deposition of sediments. However, the proposed project includes LID design standards, and post construction BMP's including landscaping, depressed landscaped areas, vegetated swales, and bioretention areas for treatment of water runoff through physical, biological, and chemical treatment processes.

Incorporation of these features would be provided and would reduce erosion, water quality degradation, and prevent the discharge of pollutants to stormwater to the maximum extent practicable and impacts would be reduced to **less than significant**. No additional mitigation is required

GEOLOGIC OR GEOMORPHOLOGICAL HAZARDS

Significance Criteria 4.4-6: Result in exposure of people or property to geologic and geomorphological (i.e. Avalanches) hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards? (Less Than Significant Impact with Mitigation Incorporated)

As discussed in Significance Criteria 4.4.1 above, seismic ground shaking resulting from earthquakes could occur within the project site. No active faults are known to exist within the

proposed area and the project area is considered relatively seismically inactive. However, the project site is located between two areas of documented tectonic activity. There is potential for significant ground shaking from seismicity associated with the Foothills Fault system near Auburn, approximately fifteen miles to the northeast and the Melones Fault further east. In addition, ground shaking could occur as a result of seismic activity on the San Andreas, Hayward and Calaveras faults, although these three faults would not be expected to result in significant ground shaking at the project site.

Landslides, mudslides, and ground failure can result when soil becomes unstable from seismic activity, extreme slopes, or loss of vegetation. The terrain of the project site is currently gently sloped with the northern area at a higher elevation than the southern elevations. Due to the mild slopes, the project site is not currently susceptible to landslides or mudslides. Grading for the proposed project would result in a more level site to enable construction of the proposed project. The majority of manufactured slopes would be 3:1 which is less than the allowable 2:1 slopes and are less susceptible, due to reduced grade, to sliding and failure. In addition, the proposed project would comply with recommendations as required by Mitigation Measures GEO-1a, GEO-1b, and GEO-1c which would ensure all fill materials are properly mixed and compacted further reducing impacts associated with landslides, mudslides, and ground failure. Therefore, significant impacts are considered **less than significant**.

Option 1: Full Frontage Improvements – (Less Than Significant Impact with Mitigation Incorporated)

The Full Frontage Improvements option would result in impacts that would be the same as described above. Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would reduce impacts to **less than significant**.

Option 2: Modified Frontage Improvements (the Proposed Project) – (Less Than Significant Impact with Mitigation Incorporated)

The Modified Frontage Improvements option would result in impacts that would be the same as described above. Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would reduce impacts to **less than significant**.

UNSTABLE GEOLOGIC UNIT

Significance Criteria 4.4-7: 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 lateral spreading, subsidence, liquefaction, or collapse? (Less Than Significant Impact with Mitigation Incorporated)

As discussed in Significance Criteria 4.4-1 and 4.4-6 above, seismic ground shaking resulting from earthquakes could occur within the project site. Secondary seismic effects including lateral spreading, subsidence, liquefaction, or collapse could occur as a result of ground shaking.

Subsidence. Subsidence generally occurs when an underlying fluid or material is removed from below a structure or area. The proposed project does not include any activities such as ground water withdrawal that would result in subsidence. In addition, there are no known uses near the proposed project that would remove fluids or materials from beneath the project site. Lastly, implementation of Mitigation Measures GEO-1a, GEO-1b, and GEO-1c, would further ensure that impacts associated with subsidence do not occur. Impacts are considered **less than significant**, and no additional mitigation is required.

***Liquefaction and Lateral Spreading*.** Liquefaction and lateral spreading can occur to landforms on gently sloping landforms underlain by unstable material. It is a phenomenon in which saturated cohesionless soils are subject to a temporary loss of shear strength due to pore pressure buildup under the cyclic shear stresses associated with intense earthquakes. Based on the existing subsurface conditions and the relatively low seismicity in the area, the potential for these effects to occur is not considered a hazard for the proposed project. Impacts are considered **less than significant**, and no additional mitigation is required.

Collapse. The proposed project would be graded such that the level of compaction and consolidation of the fill material would be appropriate to support the proposed structure and project elements would not become unstable during a seismic event and collapse. As discussed above, implementation of Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would ensure this impact remains **less than significant**. No further mitigation is required.

<u>Option 1: Full Frontage Improvements</u> – (Less Than Significant Impact with Mitigation Incorporated)

The Full Frontage Improvements option would result in impacts that would be the same as described above with regards to subsidence, liquefaction and lateral spreading, and collapse. Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would reduce impacts **to less than significant**.

<u>Option 2: Modified Frontage Improvements (the Proposed Project)</u> – (Less Than Significant Impact with Mitigation Incorporated)

The Modified Frontage Improvements option would result in impacts that would be the same as described above with regards to subsidence, liquefaction and lateral spreading, and collapse. Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would reduce impacts to **less than significant**.

EXPANSIVE SOILS

Significance Criteria 4.4-8: Be located on expansive soils, as defined in Chapter 18 of the California Building Code, creating substantial risks to life or property? (Less Than Significant Impact with Mitigation Incorporated)

Expansive Soils. Moderately expansive clay soils were found on the project site. Below the areas of fill and at the ground surface within the western and southern portions of the site, alluvium (Turlock Formation) was encountered. This formation extended beyond 21.5 feet below the ground surface. The alluvium generally consists of very stiff to hard, sandy loam clay and is moderately expansive. Expansive soils are characterized by their ability to undergo significant volume change (i.e., to shrink and swell) as a result of variations in moisture content. Some soils, such as those that are expansive, can damage buried utilities, or building foundations and increase maintenance requirements. Placement of structures on these soils could expose future structures, residents, and workers to risks associated with soil expansion.

Due to the presence of expansive soils, the proposed project would require the deepening of footings, deepened curbs in pavements areas, a layer of aggregate below concrete flatwork, and using the proper soil moisture content during soil conditioning and compaction. As discussed above, the proposed project would be required to implement all recommendations of the geotechnical investigation and comply with Mitigation Measures GEO-1a through GEO-1c. Implementation of these measures would ensure that the proposed project reduces the use of potentially expansive soils to the extent feasible and that all reasonable precautions to ensure the structural integrity of the project are made. Impacts in this regard would be **less than significant** and no additional mitigation is required.

<u>Option 1: Full Frontage Improvements Option</u> – (Less Than Significant Impact with Mitigation Incorporated)

The Full Frontage Improvements option would result in impacts that would be the same as described above with regards to expansive soils. Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would reduce impacts to **less than significant**.

<u>Option 2: Modified Frontage Improvements (the Proposed Project)</u> – (Less Than Significant Impact with Mitigation Incorporated)

The Modified Frontage Improvements option would result in impacts that would be the same as described above with regards to expansive soils. Mitigation Measures GEO-1a, GEO-1b, and GEO-1c would reduce impacts to **less than significant**.

4.4.4 CUMULATIVE IMPACTS

Chapter 5.5 of this EIR provides a list of related projects and other possible development in the area determined as having a direct potential to interact with the proposed project (to the extent that a significant cumulative effect could occur) are identified in *Table 5-1: Cumulative Projects*. Geology and soil-related impacts are generally site-specific and are determined by a particular site's soil characteristics, topography, and proposed land uses. Development projects are analyzed on an individual basis and must comply with established requirements of the County of Placer and the California Building Standards Code as they pertain to protection against known geologic hazards and potential geologic and soil-related impacts.

Cumulative effects related to geology resulting from the implementation of future development of the site and surrounding areas could expose more persons and property to potential impacts due to seismic activity. Long-term impacts related to geology include the exposure of people to the potential for seismically induced ground shaking. Implementation of other cumulative projects would incrementally increase the number of people and structures subject to a seismic event. Seismic and geologic significance would be considered on a project-by-project basis through the preparation of a design-level geotechnical study and such exposures would be minimized through strict engineering guidelines as they pertain to protection against known geologic hazards and potential geologic and soil related impacts.

Cumulative development within the County would be required to be constructed in accordance with the latest edition of the CBC and to adhere to all current earthquake construction standards, including those relating to soil characteristics. The proposed project would not contribute to any cumulatively considerable geologic and/or soils impacts. Therefore, cumulative effects of increased seismic risk would be **less than significant**.

4.4.5 REFERENCES – GEOLOGY AND SOILS

California Department of Conservation, 2017. Fault Activity Map of California (2010). Available: http://maps.conservation.ca.gov/cgs/fam/. Accessed: September 9, 2017.

County of Placer – Granite Bay Community Plan – Available: https://www.placer.ca.gov/departments/communitydevelopment/planning/documentlibrary/commplans/granitebaycp.

Geotechnical Investigation – Placer Retirement Residence 3865 Old Auburn Road, Roseville, California. Prepared by Geocon Consultants, Inc. (March 2016).

XRD Analysis of Soil Material from the Placer Retirement Residence, 3865 Auburn Road, Roseville, California. Prepared by Geocon Consultants. (November 2016).