11 SOILS, GEOLOGY, AND SEISMICITY

The Soils, Geology, and Seismicity chapter of the EIR describes the geologic and soil characteristics of the project site and evaluates the extent to which implementation of the proposed project could be affected by seismic hazards such as ground shaking, liquefaction, and expansive soil characteristics. The analysis also addresses potential effects of the proposed project on erosion. Information sources for this evaluation include the *Revised Geotechnical Engineering Study* conducted by Youngdahl Consulting Group, Inc.[1] (See Appendix M), the *Phase I Environmental Assessment* conducted by Youngdahl Consulting Group, Inc.[2] (See Appendix N), the *Phase II Soil Investigation*, conducted by Youngdahl Consulting Group, Inc.[3] (See Appendix O), the *Placer County General Plan* (PCGP),[4] the *PCGP EIR*,[5] and the *Granite Bay Community Plan* (GBCP).[6]

All impacts in the Rancho Del Oro Estates Initial Study were identified as *potentially significant* and are therefore addressed within this chapter (See Appendix C).

11.1 Environmental Setting

The proposed Rancho Del Oro Estates project is situated at the foot of the Sierra Foothills region of the Sierra Nevada Mountain Range in the Sacramento Valley. The Sacramento Valley is part of the Great Valley Geomorphic Province (Central Valley of California).

Topography

The topography of the site consists of rolling hills along the western, southern, and eastern edges with a relatively flat area located in the north central portion of the site. Vegetation on the site consists of a dense growth of trees along the western, southern, and eastern edges of the property with a moderate growth of grass throughout the site.

Regional Geology

Once a large inland sea, the Great Valley Province was filled mostly by sediments eroded from ancient mountains to the east. Basin infilling and lowering of sea level resulted in the retreat of the inland sea, which changed the geologic environment to one of continental deposition. The Great Valley is now dominated by recent deposits of alluvial sediments laid down on floodplains and within stream and riverbeds. Thus, the Great Valley Geomorphic Province is characterized by a great thickness of generally flat-lying sedimentary rocks overlain by alluvial soils.

Regional Seismicity

A fault is defined as a fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side. A fault zone is a zone of related

faults that commonly are braided and subparallel, but may be branching or divergent. Movement within a fault causes an earthquake. When movement occurs along a fault, the energy generated is released as waves that cause ground shaking. Ground shaking intensity varies with the magnitude of the earthquake, the distance from the epicenter, and the type of rock or sediment the seismic waves move through.

The Alquist-Priolo Special Studies Zone Act of December 1972 (AP Zone Act) regulates development near active faults so as to mitigate the hazard of surface fault rupture. The AP Zone Act requires that the State Geologist (Chief of the California Department of Mines and Geology [CDMG]) delineate "special study zones" along known active faults in California. Cities and counties affected by these zones must regulate certain development projects within these zones. The AP Zone Act prohibits the development of structures for human occupancy across the traces of active faults. According to the AP Zone Act, "active faults" have experienced surface displacement during the last 11,000 years. "Potentially" active faults are those that show evidence of surface displacement during the last 1.6 million years. A fault may be presumed to be inactive based on satisfactory geologic evidence; however, the evidence necessary to prove inactivity sometimes is difficult to obtain and locally may not exist. The Great Valley is generally considered less seismically active than other areas of California.

Local Seismicity

The proposed project is not located within an Alquist-Priolo Special Study Zone (AP Zone) nor is any active fault near the project site. The *Revised Geotechnical Engineering Study* determined that actives faults were not located on the project site. The nearest known faults are related to the Bear Mountains and Melones Fault Zones and located approximately 6 to 22 miles to the east of the site. The nearest known active fault is the Dunnigan Hills fault which is located approximately 37 miles to the west of the site.

Project Site Characteristics

The proposed project site is located in the southern portion of Placer County in the northwestern portion of the Community of Granite Bay and West of the City of Roseville. The proposed project is an existing agricultural site, used for winter cattle grazing with riparian habitat along swales and Miner's Ravine, which forms the northern boundary of the project site.

Site Geology

The proposed project is predominantly underlain by dioritic rocks of the Mesozoic Age as identified by the Geologic Map of Placer County and according to the *Revised Geotechnical Engineering Study*.

Soil Conditions

The *Phase I Environmental Assessment* conducted by Youngdahl Consulting Group, Inc. encountered surface materials with varying soil conditions consisting of interbedded sands, silty

sands, and clayey sands during field investigations. In addition, the *USDA National Resources Conservation Service Placer County Soil Survey* was consulted to determine the soil types.

A review of the U.S. Department of Agriculture, Soil Conservation Service (SCS) Soil Survey of Placer County, California, prepared in 1980, indicates that the near surface soils of the proposed project consist of four different soil types. The soil type that covers most of the property is the Caperton-Andregg coarse sandy loams, while the Xerorthents covers the northern portion of the proposed project site, the Caperton gravelly coarse sandy loam occur in the southeast portion of the property, and the eastern portion is covered in Andregg coarse sandy loam. The soils are described as follows:

- The Caperton-Andregg, consists of 50 percent Caperton soil and 30 percent Andregg soil. The major limitation to urban use is the depth of rock, generally eight to 40 inches.
- The Caperton gravelly coarse loam is shallow, somewhat excessively drained soul that formed in residuum from granitic rock.
- The Andregg coarse sandy loam is moderately deep, well drained soil that also formed in the residuum from granitic rock.
- The Xerorthent, consists of stony, cobbly, and gravelly material commonly adjacent to streams that have been placer mined. The soil material is derived from a mixture of rocks. Permeability, available water capacity, runoff, erosion hazard, and drainage are variable. Areas in streambeds are frequently flooded during the rainy season. These soils have some value for grazing and watering livestock.

Liquefaction

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary, but essentially total loss of shear strength (any compression stress with support on one side) because of pore pressure build-up, which is the interstitial pressure of water within a mass of soil, rock, or concrete under the reversing cyclic shear stresses associated with earthquakes. The primary factors determining liquefaction potential of a soil deposit are: (1) the level and duration of seismic ground motions; (2) the type and consistency of the soil; and (3) the depth to groundwater. The geotechnical study found portions of the site at elevations of 265 feet or more consisted of relatively dense site materials. However, portions of the site in lower elevations were found to have saturated sands which are considered to have a higher liquefaction potential.

Expansive Soils

Expansive soils are those that greatly increase in volume when they absorb water and shrink when they dry out. These soils are typically characterized by large amounts of finer grained materials such as silts and clays within the soil matrix. Expansion is measured by shrink-swell potential, which is the relative volume change in a soil with a gain in moisture. The soils found on-site are non-plastic soils which are considered to be relatively non-expansive.

Groundwater

During the investigative borings, Youngdahl Consulting Group, Inc. encountered seepage at two to six feet below the current site grade. Groundwater was encountered at a depth of five to 11.5 feet below current site grade.

Excavation

The *Revised Geotechnical Engineering Study* determined underlying rock materials are likely to be present several feet below the surface soils. In addition to excavation using conventional earthmoving equipment such as a Caterpillar D6 to D10, blasting could be required to remove areas of resistant rock outcrops. Furthermore, utility trenches would require the use of special rock trenching excavators or large excavators such as a CAT 235 or CAT 245.

11.2 Regulatory Setting

The following section is a brief summary of the regulatory context under which soils and geologic hazards are managed at the federal, state, and local levels.

State Regulations

National Pollutant Discharge Elimination System (NPDES)

As required under the federal Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources, such as construction sites, that discharge pollutants into waters of the United States. In California, NPDES permit issues are overseen by the nine individual Regional Water Quality Control Boards. Placer County and the Community of Granite Bay would be overseen by the Central Valley Regional Water Quality Control Board. For further discussion of NPDES, please refer to Chapter 12 (Hydrology and Water Quality) of this Draft EIR.

California Building Standards Code / Uniform Building Code

The State of California provides minimum standards for building design through the California Building Standards Code (California Code of Regulations (CCR), Title 24). The California Uniform Building Code (CUBC) is based on the Federal Uniform Building Code (UBC) used widely throughout the U.S. and has been modified for California conditions with numerous more detailed and/or more stringent regulations.

Geologic and soils conditions would also determine the proper installation of underground communications and utility lines.

Local Regulations

Granite Bay Community Plan

The GBCP establishes the following goals and policies applicable to soils, geology, and seismicity.

Health and Safety Element

Seismic Safety

Goal To protect the lives and property of the citizens of the Granite Bay Area from unacceptable risk resulting from seismic and geologic hazards.

Policy 1 Maintain strict enforcement of seismic safety standards for new construction contained in the Uniform Building Code.

Policy 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.

Policy 3 Require soils or geologic reports from construction or extensive grading in potential seismic problems areas.

11.3 Impacts and Mitigation Measures

Standards of Significance

The following thresholds of significance related to Geology, Soils, and Seismicity are derived from the criteria listed in Appendix G of the CEQA Guidelines.

Impacts resulting from the project would be considered significant if the project would:

- Expose people or structures to substantial adverse effects as a result of strong ground-shaking, seismic-related ground failure, liquefaction, lateral spreading, landslides, or lurch cracking;
- Result in substantial erosion or unstable slope soil conditions through alteration of topographic features, dewatering, or changes in drainage patterns;
- Expose people, structures, or infrastructure components to increased risk of injury or damage due to the presence of expansive soils, soil settlement/compaction, or other geotechnical constraints; or
- 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.

Method of Analysis

The environmental setting section and the impact discussions below are based primarily on the *Revised Geotechnical Engineering Study*, *Phase I Environmental Assessment*, and *Phase II Soil Investigation* prepared by Youngdahl Consulting Group, Inc. in June 2006, March 2006, and March 2008, respectively. Other documents were also reviewed including, but not limited to, the PCGP and the *PCGP EIR*.

The Youngdahl field investigation for the project site consisted of general site reconnaissance, the excavation of 15 test pits (See Figure 11-1) in February 2006 and June 2006, and the review of available geologic literature pertaining to the property. In addition, undisturbed and disturbed samples were obtained from the test borings and taken in for laboratory testing, to determine the engineering characteristics of the on-site soil.

The logs of the borings and a key for the classification of the soils are included in the appended technical reports (See Appendices M, N, and O).

As stated earlier, all impacts in the Rancho Del Oro Estates Initial Study were identified as *potentially significant* and are therefore addressed within this chapter.

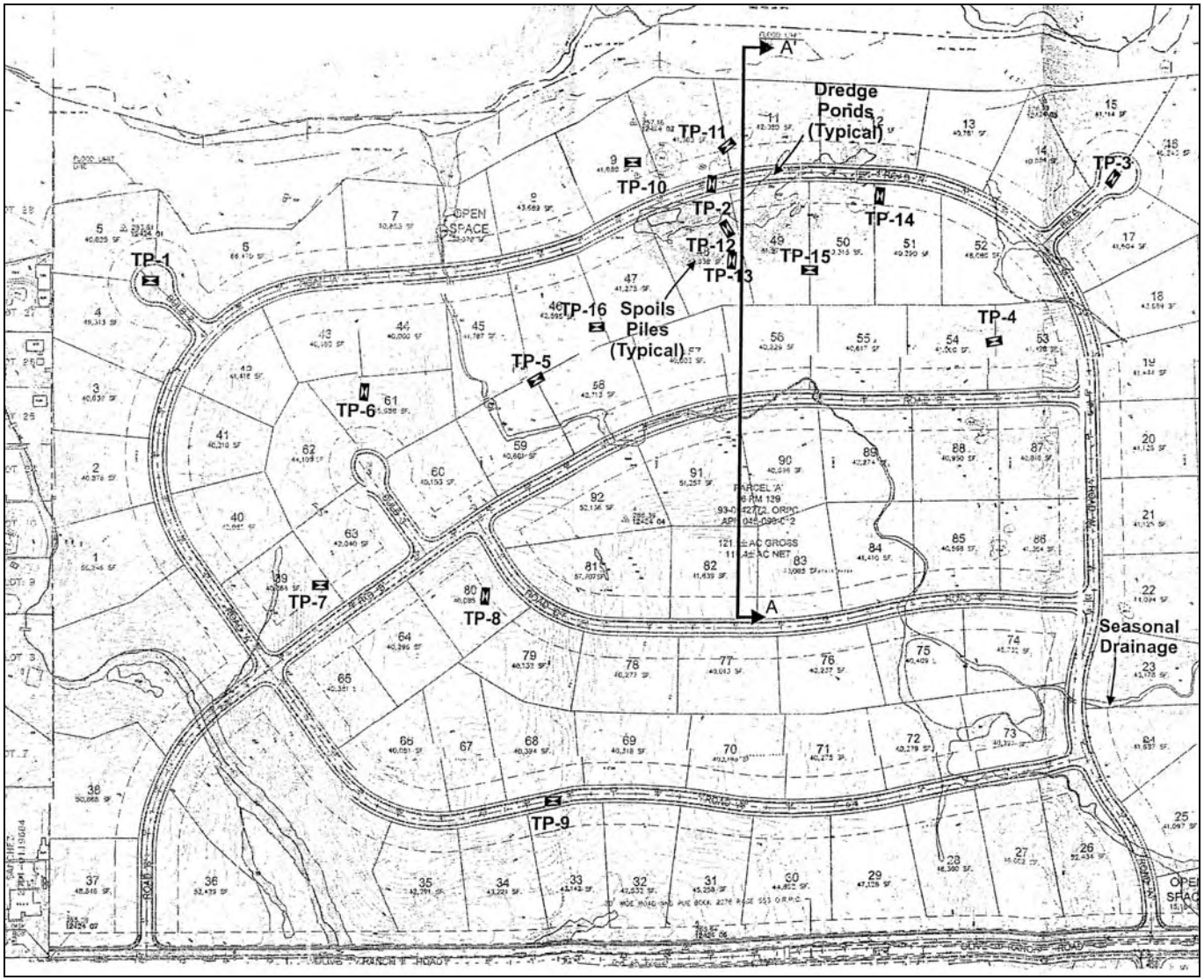
Project-Specific Impacts and Mitigation Measures

11-1 Loss of structural support due to liquefaction.

According to the *Revised Geotechnical Engineering Study* prepared for the project site by Youngdahl, test pits encountered saturated sands which have a high liquefaction potential. The geotechnical report identifies measures necessary to ensure that foundations are not damaged by liquefiable soils. For example, the report states that proper reinforcement of slabs-on-grade and foundations, and pavement design will be particularly crucial in areas underlain by liquefiable soils. The report further states that in the opinion of Youngdahl, the site is suitable for the proposed development, provided the concerns regarding liquefiable soils and possible loose soils in previously filled areas are addressed by implementation of recommended mitigation measures. As a result, without implementation of the geotechnical investigation recommendations, a ***potentially significant*** impact would result.

<u>Mitigation Measure(s)</u>
Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

Figure 11-1
Locations of Test Pits



Source: Youngdahl Consulting Group, Inc., 2006.

11-1(a) *The preliminary geotechnical engineering study performed by Youngdahl Consulting Group, Inc., dated June 2006, indicated the presence of loose, saturated surface soils or other soil problems which, if not corrected, would lead to structural defects. Prior to Improvement Plan approval, the applicant shall submit for review and approval by the Engineering and Surveying Department a soil investigation of each non-pad graded lot in the subdivision produced by a California Registered Civil or Geotechnical Engineer (Section 17953-17955 California Health and Safety Code).*

In addition, prior to Final Acceptance of project improvements or consideration of early building permits, and after the completion of pad grading for Lots 8-11, 34, 36, 42, 52, 53, 55, 69, 71, 72, 75, 78, 81, 82, 86, and 89, as well as Lot G, the applicant shall submit for review and approval by the Engineering and Surveying Department a soil investigation of each pad-graded lot produced by a California Registered Civil or Geotechnical Engineer (Section 17953-17955 California Health and Safety Code). The soil investigations shall include recommended corrective action that is likely to prevent structural damage to each proposed dwelling. The applicant shall include in the Development Notebook or modify the Development Notebook to include the soil problems encountered on each specific lot, as well as the recommended corrective actions. A note that indicates the requirements of this condition shall be included on the Improvement Plans, CC&Rs, and the Informational Sheet filed with the Final Map(s). Once approved by the Engineering and Surveying Department, two copies of the final soil investigations for each lot shall be provided to the Engineering and Surveying Department and one copy to the Building Department for their use.

11-1(b) *The applicant shall submit for review and approval by the Engineering and Surveying Department a geotechnical engineering report produced by a California Registered Civil Engineer or Geotechnical Engineer. The report shall address and make recommendations on the following:*

- *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*

Once approved by the Engineering and Surveying Department, two copies of the final report shall be provided to the Engineering and Surveying

Department and one copy to the Building Department for their use. If the soils report indicates the presence of critically expansive or other soils problems which, if not corrected, could lead to structural defects, a certification of completion of the requirements of the soils report will be required for subdivisions, prior to issuance of Building Permits. This certification may be completed on a Lot by Lot basis or on a Tract basis. This shall be so noted in the CC&Rs and on the Informational Sheet filed with the Final Map(s). It is the responsibility of the developer to provide for engineering inspection and certification that earthwork has been performed in conformity with recommendations contained in the report.

11-1(c) *The project 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 Department for review and approval. The plans shall show all 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. (NOTE: Prior to plan approval, all applicable recording and reproduction costs 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 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 prior to acceptance by the County of site improvements.*

11-1(d) *All proposed grading, drainage improvements, vegetation and tree removal shall be shown on the Improvement Plans and all work shall conform to provisions of the County Grading Ordinance (Ref. Article 15.48, 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 DRC. All cut/fill slopes shall be at 2:1 (horizontal:vertical) unless a soils report supports a steeper slope and the Engineering and Surveying Department 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 assure proper installation and maintenance of erosion control/winterization during project construction. Where soil stockpiling or borrow areas are to remain for more than one construction season, proper erosion control measures shall be applied as specified in the Improvement Plans/Grading Plans. Erosion control shall be provided for where roadside drainage is off of the pavement, to the satisfaction of the Engineering and Surveying Department.

The applicant shall submit to the Engineering and Surveying Department 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. Upon the County's acceptance of improvements, and satisfactory completion of a one-year maintenance period, 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 Design Review Committee/Engineering and Surveying Department for a determination of substantial conformance to the project approvals prior to any further work proceeding. Failure of the Design Review Committee/Engineering and Surveying Department to make a determination of substantial conformance may serve as grounds for the revocation/modification of the project approval by the appropriate hearing body.

11-1(e) *Any proposed subdivision grading beyond that necessary for construction of streets, utilities, and drainage improvements (i.e., mass grading, residential pad grading) must be approved by the Design Review Committee prior to approval of project Improvement Plans. The intent of this condition is to allow detailed Design Review Committee review of lot or contour grading impacts, and to ensure that grading activities do not exceed those indicated on the preliminary grading plan for this project. Grading plans, of a suitable scale and providing specific engineering detail, including limits of grading, identification of trees, existing and proposed contours, drainage patterns, etc., shall be prepared and submitted for Design Review Committee review. If grading, beyond that indicated on the preliminary grading plan, and/or environmental*

documents is proposed with subdivision construction, the matter shall be referred back to the Planning Commission for consideration.

11-2 Structural damage from potentially expansive soils.

The *Revised Geotechnical Engineering Study* for the project site determined the site consisted of non-plastic soils which are relatively non-expansive. The report anticipated that special design considerations regarding expansive soils would not be required with implementation of the mitigation measures recommended in the report. As a result, without implementation of the geotechnical investigation recommendations, a ***potentially significant*** impact would result.

Mitigation Measure(s)
Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

11-2 Implement Mitigation Measures 11-1(a), 11-1(b), and 11-1(e).

11-3 Impacts related to seismic activity.

As previously described, the Granite Bay area is subject to potential ground shaking from active faults both within and outside Placer County. Although a low potential for seismic activity exists in the project area, the effects can be minimized by appropriate design and construction practices. The California Building Code (CBC) classifies Placer County as being within the Seismic Risk Zone 3. Because the GBCP requires that all construction comply with the Uniform Building Code (UBC), seismically induced ground shaking would have a ***less-than-significant*** impact on the proposed project.

Mitigation Measure(s)
None required.

11-4 Construction-related increases in soil erosion.

Construction activities typically result in disturbance of site soils, in turn leading to increased soil erosion due to loss of soil cohesiveness. Surface grading and earth-moving activities associated with construction projects would create temporary exposed earth surfaces. Once the protective vegetative cover is removed and the soil is broken into easily transported particles, exposed earth surfaces are susceptible to wind and water erosion. During dry months wind can move dry soil particles into the air creating fugitive dust emissions. Water may erode the topsoil by moving across the ground and picking up soil particles. Precipitation causes additional erosion by loosening soil particles for transport and the transport of soil particles could lead to the sedimentation of on- and off-site waterways, including Miners Ravine.

In addition, the moving of approximately 40,000 cubic yards of dirt cut for road, utility trench, and building pad formation may disturb soils and approximately 51,500 cubic

yards of fill and artificially steepened slopes created during grading are prone to erosion, as soils tend to settle into a natural angle of repose.

Grading activities in general on the proposed project site would result in the disturbance and relocation of topsoils, rendering earth surfaces susceptible to erosion from wind and water, which could affect water quality (Please refer to Chapter 12, Hydrology and Water Quality, Impact 12-2, for further detail on potential construction related impacts on water quality). Soil erosion, or the loss of topsoil, resulting from grading and excavation of the project site would be considered a ***potentially significant*** impact.

Mitigation Measure(s)
Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

11-4(a) *The project's ground disturbance exceeds one acre; therefore, the project is subject to the construction stormwater quality permit requirements of the National Pollutant Discharge Elimination System (NPDES) program. The applicant shall obtain such permit from the State Regional Water Quality Control Board and shall provide to the Engineering and Surveying Department evidence of a state-issued WDID number or filing of a Notice of Intent and fees prior to start of construction.*

11-4(b) *Water quality Best Management Practices (BMPs) shall be designed according to the California Stormwater Quality Association Stormwater Best Management Practice Handbooks for Construction, for New Development / Redevelopment, and/or for Industrial and Commercial, (and/or other similar source as approved by the Engineering and Surveying Department).*

Construction (temporary) BMPs for the project include, but are not limited to, the following: Fiber Rolls (SE-5), Hydroseeding (EC-4), Stabilized Construction Entrance (LDM Plate C-4), Storm Drain Inlet Protection (SE-10), Silt Fence (SE-1), revegetation techniques, gravel bags, diversion swales, dust control measures, limiting the soil disturbance, and concrete washout areas.

11-4(c) *Stockpiling and/or vehicle staging areas shall be identified on the Improvement Plans and located as far as practical from existing dwellings and protected resources in the area.*

11-4(d) *In order to protect site resources, grading activities of any kind shall not take place within the 100-year floodplain of Miners Ravine unless otherwise approved as a part of this project.*

Endnotes

[1] Youngdahl Consulting Group, Inc., *Revised Geotechnical Engineering Study for Rancho Del Oro*, June 2006.
[2] Youngdahl Consulting Group, Inc., *Phase I Environmental Site Assessment for Rancho Del Oro Estates*, March 2006.
[3] Youngdahl Consulting Group, Inc., *Phase II Soil Investigation*, April 2008.
[4] Placer County, *Placer County General Plan*, August 1994.
[5] Placer County, *Placer County General Plan EIR*, October 1993.
[6] Placer County, *Granite Bay Community Plan*, May 1989, amended March 2008.