4.9 GEOLOGY AND SOILS

4.9.1 EXISTING CONDITIONS

TOPOGRAPHY AND RELIEF

Zone 40 is located in the central portion of Sacramento County. The topography of the county is represented by three physiographic regions: the Sierra Nevada foothills to the northeast, the lower Sacramento Valley extending through the western and central portions of the county (including Zone 40), and the Sacramento-San Joaquin River Delta in the southwest. The lower Sacramento Valley is generally characterized by flat to gently rolling topography. Elevations range from sea level in the southwest to approximately 400 feet above mean sea level (msl) in the eastern areas of the county (SCS 1993). Deer Creek and the Cosumnes River are located along the southeastern border of Zone 40.

Zone 40 lies in the Great Valley geomorphic province. A geomorphic province consists of an area of similar geologic origin and erosional/depositional history. The Great Valley geomorphic province is characterized by a relatively flat alluvial plain made up of deep sediment deposits. The youngest geomorphic features in Sacramento County are low floodplains, which are found primarily along the Sacramento, American, and Cosumnes rivers. These landforms include nearly level tidal, freshwater, and back swamps in the Delta area; natural levees; floodplain alluvial plains; and floodplains bordering the Sacramento, American, and Cosumnes rivers and many smaller channels. Bar and channel topography is evident on the low floodplains along the American River and in a few areas along the Cosumnes River. The low floodplains not protected by levees or upstream dams are frequently inundated (SCS 1993).

SOILS

Soils in the Sacramento Valley are developed almost entirely from river and lake basin deposits on various geomorphic surfaces. Valley land soils are found in central Sacramento County. These soils are alluvial in nature and are highly valued for irrigated crops.

Soils in Sacramento County have been significantly influenced by human activities. Generally, soils used for cultivation and urban development have been altered and in many areas have undergone considerable modification. Historic gold dredging, hydraulic mining, drainage system development, creation of levees, and cut and fill have all contributed to modification the original soils (SCS 1993). The Sacramento County General Plan identifies Sacramento County soils, including those in Zone 40, as having low expansiveness properties, low landslide potential, and moderate erosional properties (Sacramento County 1993a).

Seismicity and Faults

The closest known active fault to Zone 40 is the Dunnigan Hills fault, located approximately 19 miles northwest of the City of Sacramento (DMG 1992). The San Andreas fault system is located to the west, with the closest active branches of this fault being the Antioch (42 miles

southwest) and the Green Valley and Concord faults (45 miles southwest). The Midland fault, also historically known to be active, is located approximately 22 miles west of the City of Sacramento. The Sacramento County General Plan classifies Zone 40 as seismic severity zone I, which is a low-intensity ground-shaking zone (Sacramento County 1993a).

Subsidence

Subsidence is the gradual settling or sinking of the earth's surface with little or no horizontal motion. Sacramento County is affected by five causes of land subsidence: (1) compaction of unconsolidated soils from earthquakes; (2) compaction by heavy structures; (3) erosion of peat soils; (4) peat oxidation; and (5) groundwater withdrawal (Sacramento County 1992). Minor land subsidence was observed between 1912 and the late 1960s for all groundwater basins within Sacramento County. Generally, subsidence did not exceed 0.40 foot during this period (Water Forum 1999).

Liquefaction

Liquefaction is the loss of soil strength due to seismic forces acting on water-saturated granular soils which leads to a "quicksand" condition generating various types of ground failure. There are two areas within Sacramento County which have been identified as being susceptible to liquefaction. These include the downtown core of the City of Sacramento and the Delta area (Sacramento County 1993).

Lateral Spreading

Lateral spreading is the horizontal movement or spreading of soil toward an open face such as a stream bank, the open side of a fill embankment, or the sides of levees. In Sacramento County, the areas most prone to lateral spreading are those with artificial fills that have been improperly engineered or have steep, unstable banks or those areas with high groundwater tables.

REGULATORY SETTING

State of California Uniform Building Code

All development within the State of California must comply with the provisions of the California Uniform Building Code (UBC) at a minimum. The UBC provides minimum requirements for grading, building siting, development, and seismic design. Typically, most local jurisdictions adopt building standards that are at least as stringent, if not more stringent than the UBC.

Sacramento County

Geologic resources and geotechnical hazards are primarily governed by local jurisdictions. Sacramento County uses the 1997 Uniform Building Code to assess the adequacy of facility

design. In addition, as part of the Safety Element of the General Plan (1993), the County has adopted polices to minimize geologic impacts associated with new construction. These policies are outlined on page 2 of the Safety Element, and the General Plan is hereby incorporated by reference. A copy of the General Plan can be reviewed at the Sacramento County Department of Environmental Review and Assessment, 827 7th Street, Room 220, Sacramento, California 95814.

4.9.2 ENVIRONMENTAL IMPACTS

THRESHOLDS OF SIGNIFICANCE

Based on the State CEQA Guidelines, a project would have a significant impact on geology or soils if it would:

- expose people or structures to major geologic hazards, including unstable slopes (e.g., landslides), ground failure, subsidence, liquefaction, and lateral spreading;
- result in substantial changes in geologic substructures that could affect human safety; or
- result in substantial soil erosion or the loss of topsoil.

IMPACT ANALYSIS

Impact 4.9-1: Changes in Geologic Structures. Development and planning of facilities proposed in the 2002 Zone 40 WSMP would require geotechnical studies and design guidelines, to identify and minimize any hazardous geologic changes to the underlying substrata. Therefore, changes in geologic substructures would be less than significant.

Facilities would be constructed in the 2030 Study Area consistent with recommendations made in the 2002 Zone 40 WSMP. Construction activities associated with these facilities could cause various forms of ground disturbance. These projects may include construction of a diversion structure, pipelines, groundwater extraction wells, pumps, groundwater injection wells, and water treatment plant facilities. Any of these future projects have the potential to alter the underlying subsurface environment to varying degrees.

As future elements of the 2002 Zone 40 WSMP are proposed and specific information relating to their site plans and construction activities become known and developed, detailed site specific analyses of those physical structures on the underlying geologic substrata would be made. Before the installation and operation of future infrastructure, soils/geotechnical investigations would be conducted relating to structural stability, and thus human safety, and design recommendations would be provided for all components of future infrastructure. These investigations may include seismic considerations and involve subsurface soil studies documenting soil-bearing capacity, groundwater presence, and trench and slope stability.

All plans and specifications would be required to implement recommendations identified in soil/geotechnical investigations conducted for the project to ensure compliance with relevant

state and local building codes and construction ordinances. In accordance with County requirements, a geotechnical engineer either would be onsite during construction or would intermittently observe all excavation activities, providing advice to the grading contractor in the field, as necessary.

Future facilities could expose operators and maintenance workers to both direct and indirect effects of ground motion from earthquakes. Although the project area is not known to support active faults, ground shaking associated with moderate to large earthquakes along any of the regionally active faults has the potential to affect those facilities, depending on their magnitude. On the basis of historical earthquake induced ground-shaking episodes, however, the level of expected disturbance is not anticipated to result in building collapse or major structural failures that would be considered a significant threat to human safety. In addition, new facilities would be required to be constructed in conformance with applicable Uniform Building Code (UBC) standards for the low seismic severity zone. Therefore, implementation of the 2002 Zone 40 WSMP would result in less-than-significant changes in geologic substructures.

Impact 4.9-2: Exposure to Major Geologic Hazards. Because the project area is relatively flat, the project is not expected to be exposed to landslides. Given the relative stability of the geologic subsurface environment in the project area and the geotechnical/soils studies and proper design practices that would be required in all future facilities, exposure to geologic hazards would be a less-than-significant impact.

As discussed for Impact 4.9 1, it is not expected that ground shaking induced by earthquakes would be of a magnitude sufficient to cause significant damage to buildings or lead to a significant risk in human safety because of the threat of major structural failures (i.e., building collapse). When facilities are proposed, the appropriate County department would be required to fully consider and evaluate specific information relating to site plans and construction activities associated with those projects. As discussed above, it is anticipated that all the recommendations (i.e., environmental mitigation guidelines) identified in any geotechnical/soils investigations prepared for the project and UBC standards would be followed and applied to construction activities.

While the topography of Zone 40 is can be characterized as nearly level (i.e., less than 1% slope), slope instability could be a potential concern in localized areas including proposed locations for water diversion structures. The potential exists for levee slopes to be destabilized. Owing to the importance of flood levees in the Sacramento region, any activities associated with their physical structure are strictly regulated (e.g., Reclamation Board, U.S. Army Corps of Engineers) and all precautions taken to avoid any effects to levee integrity.

Subsidence is the gradual settling or sinking of the earth's surface with little or no horizontal motion. Zone 40 is affected by subsidence resulting from either groundwater withdrawal or gas withdrawal (Sacramento County 1992). On page 4.2-19 of the Water Forum EIR, land subsidence within the central and Galt groundwater basins would decline by 0.007 foot per

each foot of groundwater decline. Projections indicate that if buildout of the Sacramento County General Plan were to occur in Zone 40 (without conjunctive use), groundwater levels would drop an additional 160 feet over the planning horizon of the General Plan potentially leading to land subsidence of 1.1 feet. However, implementation of the 2002 Zone 40 WSMP would result in the implementation of a conjunctive water supply plan that would result in groundwater level declines of 10 to 20 feet over the planning period. These groundwater level declines could result in land subsidence of up to approximately 0.14 foot within the Central groundwater basin, which would be less than conditions without the project. The data, based on historical evidence, indicated that the project's land subsidence impacts would be minor. It is not likely that there would be infrastructure damage to private or public property because project land subsidence would likely exhibit the same regional trends of minor land subsidence. In addition, land subsidence that would occur would be gradual as the estimated extend would occur over several decades as groundwater levels gradually decline. This would be a less-than-significant impact.

Impact 4.9-3: Increased Soil Erosion by Wind or Water. Soils in Zone 40 and along the Sacramento River could be exposed to wind and water erosion. Further, construction activities (i.e., trenching, dewatering) could result in the sedimentation of local waterways and the Sacramento River. This would be a significant impact.

Construction of facilities would result in short term soil-disturbing activities including cut and fill, grading, trenching, boring, and removal of vegetation. The project area is generally flat with little potential for slope failure and surficial erosion during and after construction. The proposed intake facility would be located on the levee of the Sacramento River, which could result in disturbance of soils within the river channel. Further, construction activities (i.e., trenching, dewatering) could result in the sedimentation of local waterways and the Sacramento River. This would be a significant impact.

4.9.3 ENVIRONMENTAL MITIGATION GUIDELINES

No environmental mitigation guidelines are necessary for the following less-than-significant impacts.

4.9-1: Changes in Geologic Substructure

4.9-2: Exposure to Major Geologic Hazards

Mitigation is recommended for the following significant impact:

4.9-3: Increased Soil Erosion by Wind or Water.

- Projects proposed in the 2002 Zone 40 WSMP shall comply with the Regional Water Quality Control Board's (RWQCB) requirements for discharges from general construction activity and trench dewatering in accordance with National Pollutant Discharge Elimination System (NPDES) requirements. These requirements call for the

implementation of a Storm Water Pollution Prevention Program (SWPPP) identifying Best Management Practices (BMPs) to be employed during and following project construction to control soil erosion and waste discharges into waterways. BMPs may include, but would not be limited to, construction of berms and runoff diversion ditches, construction of temporary cofferdams to dewater work areas, hydroseeding, use of sediment detention devices, and similar measures. The SWPPP shall also specify measure for removing sediment from water pumped for trench dewatering before it is released to waterways.

- SCWA shall prepare on a project-by-project basis an Erosion Control plan that complies with the County's Erosion and Sedimentation Control Ordinance (1993).

4.9.4 LEVEL OF SIGNIFICANCE AFTER MITIGATION

Adherence to the above mitigation would reduce the project's geology and soils impacts to a less-than-significant level.