3.2 HYDROLOGY AND WATER QUALITY

This section evaluates the potential for the proposed modifications to cause adverse effects to water quality, groundwater, and current flood conditions. This section combines the “Water Quality” and “Hydrology and Hydraulics” issue areas that were discussed in separate sections in the 2007 Landside EIR.

3.2.1 REGULATORY SETTING

The “Regulatory Setting” in the 2007 Landside EIR has remained unchanged and is hereby incorporated by reference. The 2007 Landside EIR addressed the federal, state, regional, and local regulations, laws, and ordinances listed below.

FEDERAL

- Clean Water Act
- Sacramento River Flood Control Project
- National Flood Insurance Program

STATE

- Porter-Cologne Water Quality Control Act
- Water Quality Control Plan for the Sacramento and San Joaquin River Basins
- Clean Water Act, Section 303(d)
- Clean Water Act, Section 401
- California Toxics Rule and State Implementation Policy
- Waste Discharge Requirements and National Pollutant Discharge Elimination System Permits (NPDES)
- California Fish and Game Code Section 1602
- Central Valley Flood Protection Board
- Sacramento-San Joaquin River Basins, California, Comprehensive Study

LOCAL

- Reclamation District 1000

3.2.2 ENVIRONMENTAL SETTING

The “Environmental Setting” in the 2007 Landside EIR is hereby incorporated by reference. The 2007 Landside EIR described existing conditions for surface water quality, groundwater quality, surface water hydrology, and groundwater hydrology. Updated information concerning the setting for groundwater hydrology is provided below.

GROUNDWATER HYDROLOGY

Basin and Aquifer Description

The Natomas Basin lies in the North American Subbasin within the Sacramento Groundwater Basin. The North American Subbasin is bounded on the north by the Bear River, on the west by the Feather and Sacramento Rivers, and on the south by the Sacramento River in the west and the American River in the east. The eastern boundary is a north-south line extending from the Bear River south to Folsom Lake, which passes about 2 miles east of the city of Lincoln. The eastern boundary represents the approximate edge of the alluvial basin, where little or no groundwater flows into or out of the groundwater basin from the rock of the Sierra Nevada (DWR 1997). The eastern portion of the subbasin is characterized by low, rolling dissected uplands. The western portion is nearly a flat flood basin for the Bear, Feather, Sacramento and American Rivers, and several small east side tributaries. The general direction of drainage is west-southwest at an average grade of about 5% (DWR 2003).

California Department of Water Resources (DWR) Bulletin 118 (DWR 2003) describes the aquifer system in the subbasin as heterogeneous and consisting of many discontinuous beds of clay, silt, sand, and gravel. The water-bearing materials of the subbasin are dominated by unconsolidated continental deposits of Late Tertiary and Quaternary age deposits that include Miocene/Pliocene volcanics, older alluvium, and younger alluvium. Younger alluvium consisting of alluvial flood basin and stream channel deposits is present in the upper 100 feet in areas along and adjacent to the Sacramento and American Rivers. Sand and gravel zones, along with dredger tailings that are found sporadically along the American River, are highly permeable and yield significant quantities of water to wells. Older alluvium, deposited during Pliocene and Pleistocene times and occurring over the area between the Sierra foothills and the valley axis, consists of loosely to moderately compacted sand, silt, and gravel. Permeability varies considerably in these alluvial deposits (Valley Springs, Laguna, and Fair Oaks formations), which occupy the upper 200 to 300 feet of the aquifer system. Groundwater in the older alluvium is typically unconfined, although semiconfined conditions exist on localized levels. The Mehrten and older geologic units can be characterized as composing the lower aquifer system, which is generally deeper than 300 feet toward the west side of the subbasin. Typically, the level of confinement increases with depth. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 2,000 feet along the western margin of the subbasin. Most of the groundwater is produced in the northern portion of the subbasin. (DWR 2003.)

Groundwater Recharge and Local Levels

Major recharge to the local aquifer system generally occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly in the American River and Sacramento River channels (SGA 2002). Where surface water is hydrologically disconnected from groundwater, it percolates through the unsaturated zone beneath the streambed to the groundwater and is a function of the underlying aquifer materials and water levels in the stream. Some evidence suggests this occurs in parts of the Sacramento River in northern Sacramento County (SGA 2003). In Western Placer County (northeast section of the subbasin), the rivers adjacent to the subbasin, including the Sacramento and Bear Rivers, and the major streams, ravines, and creeks that cross the valley floor are the main sources of recharge (Placer County Water Agency 2003). Other sources of recharge within the system include inflow of groundwater generally from the northeast; subsurface recharge from fractured geologic formations to the east; and deep percolation from applied surface water, precipitation, and small streams. The extensive agricultural operations in the Natomas Basin have also contributed to recharge there, with the portion of applied irrigation water in excess of crop demands becoming recharge water through deep percolation (SGA 2003).

Groundwater levels average 10 to 25 feet below ground surface in the Natomas Basin (MWH 2001). According to the Sacramento Groundwater Authority, hydrographs for wells in the western part of the North American Subbasin show groundwater levels varying between -5 and 20 feet mean spring groundwater level between wells.

Groundwater Storage

DWR’s Bulletin 118 assumes a specific yield of 7% and an aquifer thickness of 200 feet for 200,000 acres within the North American Subbasin. Storage capacity can be estimated for the North American Subbasin by applying the same assumptions as previous DWR studies (DWR 1997), which indicated a specific yield of 7% and an assumed thickness of 200 feet over the entire 351,000-acre subbasin. The result is an estimated storage capacity of approximately 4.9 million acre-feet (DWR 2003).

Groundwater Budget

Luhdorff & Scalmanini Consulting Engineers (LSCE) prepared a report in August 2008 evaluating the potential groundwater impacts of the Natomas Levee Improvement Program (NLIP) (see Appendix B2). The report includes a groundwater budget for existing conditions (without SAFCA construction activities) in the Natomas Basin based on the final water year of the 1970–2004 calibration period for the Sacramento County Integrated Groundwater and Surface Water Model. The model results for 2004, shown in Table 3.2-1, are grouped into inflow and outflow components, with the change in storage representing the difference between the inflow and the outflow. The simulated change in storage shows a decline of almost 5,000 acre-feet per year (afy). Divided by the area of the Natomas Basin, this represents a small decrease in storage on a per-acre basis of less than 0.1 acre-foot per acre per year.

Table 3.2-1
Simulated Groundwater Budget for Natomas Basin—Existing Conditions

	Water Budget Component	2004 Simulation (AFY)
Inflow	Deep Percolation (Including Canal Seepage)	31,429
	Recharge from Sacramento River	6,469
	Recharge from American River	1,086
	Boundary Inflow from West	10,365
	Subsurface Inflow from North and South	2,955
	Total Inflow	**52,304**
Outflow	Groundwater Pumping	35,537
	Subsurface Outflow to East	21,738
	Subsurface Outflow to South	0
	Total Outflow	**57,275**
Inflow minus Outflow	**Change in Storage**	**-4,971**

Note: AFY = acre-feet per year
Source: Data adapted from Luhdorff & Scalmanini Consulting Engineers in 2008

3.2.3 Environmental Impacts and Mitigation Measures

Hydrologic impacts associated with the proposed modifications to the Phase 2 Project were evaluated based on changes in drainage, runoff, or groundwater storage. Water quality impacts that could result from project construction activities associated with the proposed modifications were evaluated based on the construction practices and materials used, the location and duration of the construction activities, and the potential for degradation of water quality or beneficial uses of project area waterways.

3.2.3.1 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the California Environmental Quality Act Guidelines. The proposed project was determined to result in a significant effect on water quality, drainage, or groundwater if it would:

- violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality.
- substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;

- create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

- place housing within a 100-year flood hazard area or place within a 100-year flood hazard area structures that would impede or redirect flood flows;

- expose people or structures to a significant risk of loss, injury, or death involving flooding; or

- substantially alter the existing drainage pattern of a site or an area, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site.

The 2007 Landside EIR noted that the Phase 2 Project would not cause substantial increases in amounts of runoff or place housing or other structures, with the exception of flood control facilities, in a 100-year flood hazard area. Rather, the Phase 2 Project would result in substantial benefits by reducing flood risk. That discussion from the 2007 Landside EIR is hereby incorporated by reference, and these significance criteria are not further discussed in this SEIR.

The 2007 Landside EIR addressed temporary effects on water quality from stormwater runoff, erosion, and spills associated with construction; that analysis is hereby incorporated by reference. The proposed modifications to the Phase 2 Project would not change the types of construction activities and would not create new sources of stormwater runoff, erosion, and spills associated with their construction. This impact is not further discussed in this SEIR.

The 2007 Landside EIR addressed alteration of local drainage through relocation of drainage and irrigation canals and ditches, and that analysis is hereby incorporated by reference. The proposed project modifications would not involve design changes that would alter locatal drainage compared to what was previously analyzed. This impact is not further discussed in this SEIR. Impact 3.2a below provides additional analysis of the possible water quality effects from stormwater runoff from Garden Highway Drainage Outlets that were discussed in the 2007 Landside EIR.

The 2007 Landside EIR addressed the effects on water quality from groundwater discharged by relief wells, and that analysis is hereby incorporated by reference. The proposed modifications to the Phase 2 Project would not create new sources of potential groundwater contamination, and this impact is not further discussed in this SEIR.

In determining whether a proposed project would expose people or structures to a significant risk as a result of flooding, SAFCA uses the following thresholds:

- Would the proposed project cause encroachment on the Sacramento River Flood Control Project (SRFCP) design levee freeboard outside the project area?

- Would the proposed project cause a significant increase in flooding, defined as an increase of 0.1 foot or more, in an area that is outside the protection of the SRFCP?

- The 2007 Landside EIR addressed the potential hydraulic impacts of the Phase 2 Project, and that analysis is hereby incorporated by reference. The proposed modifications to the Phase 2 Project would not increase 100-year or "200-year" water surface elevations, and therefore would not expose people or structures to a significant risk as a result of flooding. This threshold is not further discussed in this SEIR.

3.2.3.2 IMPACT ANALYSIS

IMPACT 3.2-a **Possible Effects on Water Quality from Stormwater Runoff from Garden Highway Drainage Outlets to the Sacramento River.** *Drainage outlets would convey surface water toward the Sacramento River through subsurface laterals and waterside drainage outfalls. Stormwater runoff from Garden Highway could degrade the water quality of the Sacramento River by discharging contaminants through the proposed drainage outlets. This potential impact would be* ***significant****.*

The proposed project modifications would involve construction of a new drainage system along Garden Highway in Reaches 1–4B to collect surface water from the drainage area between the existing highway and the new adjacent levee and convey it beneath Garden Highway and toward the Sacramento River. The surface water would collect in drainage swales between Garden Highway and the adjacent setback levee and drain through pipe laterals under Garden Highway to outfalls in the berm along the east bank of the Sacramento River. Without treatment, stormwater runoff from Garden Highway could degrade the water quality of the Sacramento River by discharging water containing metals, oil and grease, solvents, phosphates, hydrocarbons, break-lining dust, and suspended solids through the proposed drainage outlets. This impact would be significant.

Mitigation Measure 3.2-a: Implement Standard Best Management Practices and Comply with NPDES Permit Conditions.

SAFCA and its engineering consultants shall implement a suite of stormwater quality best management practices (BMPs) designed to remove contaminants from water discharging through the Garden Highway outlets. These BMPs shall be based on the *Stormwater Quality Design Manual for Sacramento and South Placer Regions* (May 2007), meet “maximum extent practicable” and “best conventional technology/best available technology” requirements, and comply with NPDES permit conditions.

Implementing this mitigation measure would reduce the potential impact on water quality from stormwater runoff associated with drainage from Garden Highway caused by the Phase 2 Project modifications to a **less-than-significant** level.

IMPACT 3.2-b **Possible Effects on Groundwater.** *Installation of the proposed cutoff walls along the Sacramento River east levee could potentially increase or decrease localized near-surface groundwater levels in areas immediately east and west of the cutoff wall. A significant drop in groundwater levels could decrease the yields of nearby wells or increase pumping costs.. Modeling of these potential effects found no measurable decrease in groundwater levels or well yields. This impact would be* ***less than significant****.*

The proposed modifications include installation of approximately 11,700 feet of cutoff walls ranging in depth from 35 feet to 80 feet deep in the adjacent setback levee in Reaches 1–4 B of the Sacramento River. The presence of cutoff walls could restrict the movement of groundwater in either direction (away from or toward the Sacramento River), potentially increasing or decreasing localized near-surface groundwater levels in areas immediately east and west of the cutoff wall. A significant drop in groundwater levels could decrease the yields of nearby wells or increase the pumping costs of those wells.

Kleinfelder (Appendix B1) estimated the water-level changes caused by the cutoff walls along the Sacramento east levee using the SEEP/W groundwater model. On the river side of the levee, the predicted effect of the cutoff wall is negligible at the low stage, and there would be a slight increase in groundwater levels (less than 1 foot) at the high stage. On the land side of the levee, the simulated groundwater levels would be slightly lower (typically 0.25 to 0.5 foot) because of the cutoff wall. In both cases, any impacts would be small enough to be considered negligible even for the shallowest domestic wells (less than 100 feet deep), because the project modifications would not significantly decrease groundwater levels or well yields or cause an increase pumping costs; therefore, this impact would be less than significant.

Mitigation Measure: No mitigation is required.

IMPACT 3.2-c — **Cumulative Effects on Groundwater.** *Implementation of all phases of the NLIP in combination with existing and projected land and water use changes in the Natomas Basin could adversely affect the groundwater budget for the Natomas Basin. Modeling found a negligible cumulative effect on both the groundwater budget for the Natomas Basin and on outflow to adjacent areas. The project modifications would not contribute considerably to a significant cumulative effect. This impact would be* ***less than significant****.*

The evaluation of potential groundwater impacts prepared by LSCE investigated the impacts of the proposed project, in combination with existing and projected land and water use changes in the Natomas Basin, on the basin's groundwater budget (see Appendix B2 in this SEIR for the full report). The estimated groundwater budget for existing conditions was modeled using historical data through the year 2004. The water budget for future conditions is based on a simulation conducted by Water Resources and Information Management Engineering, Inc., to estimate the effect of proposed land and water use changes caused by the proposed developments in the North American Subbasin on groundwater conditions in 2030.

The impacts of the proposed project modifications would include reduced irrigated lands covered by the footprint of the proposed levee improvements, increased recharge from the proposed canal improvements, and changed land use and irrigation practices following excavation of soil and reclamation of the potential borrow sites. These impacts are summarized in Tables 5-3 and 5-4 of the LSCE report in Appendix B2. The report also evaluated the potential impacts on subsurface flows to and from the Natomas Basin as a result of the installation of cutoff walls in levees.

Without the proposed project, the 2004 simulation results show a reduction in groundwater storage of 4,971 afy in the Natomas Basin. With the proposed project, the decrease in groundwater storage would be slightly smaller (4,248 afy). Subsurface outflow from the Natomas Basin to the east would decrease slightly (from 21,738 to 21,118 afy) as a result of the proposed project. Overall, the proposed project would have a small positive impact on groundwater supplies in the Natomas Basin and a small negative impact on groundwater east of the Natomas Basin, based on existing conditions.

The results of the 2030 simulation without the proposed project show a positive change in groundwater storage in the Natomas Basin of 1,572 afy. With the proposed project, this positive change would be reduced slightly to 1,527 afy. The proposed cutoff walls would cause a small increase in groundwater outflow (from 1,200 to 1,238 afy). Overall, the cumulative impact of the proposed project on future groundwater conditions is predicted to be negligible.

The project modifications would not contribute considerably to a significant cumulative effect. Therefore, this impact is less than significant.

Mitigation Measure: No mitigation is required.