3.9 HYDROLOGY AND WATER QUALITY

3.9.1 AFFECTED ENVIRONMENT

The SPA is located in eastern Sacramento County in the City of Rancho Cordova. The SPA lies within the eastern edge of the Sacramento Valley, which is a nearly flat alluvial plain that extends almost 180 miles from the Sacramento-San Joaquin Delta on the south to Redding on the north. The topography of the SPA falls gently to the west and southwest with average slopes of approximately 0.006 feet per foot. The climate in the Sacramento Valley is characterized by warm, dry summers with an almost complete absence of rain, and mild winters will relatively light rains.

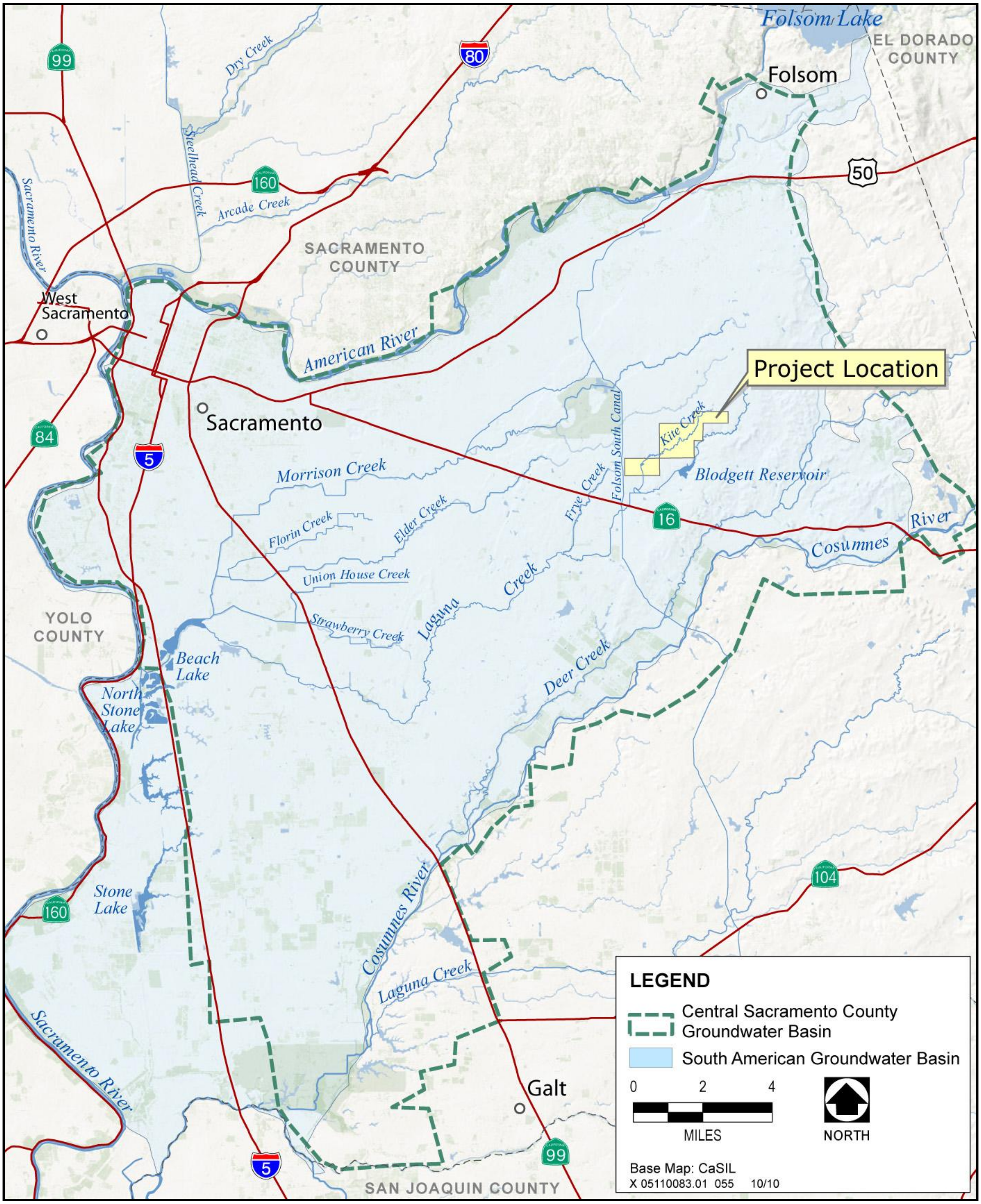
SURFACE WATER HYDROLOGY

The SPA is situated between the American and Cosumnes Rivers to the north and south, and to the east of the Sacramento River (see Exhibit 3.9-1, "Regional Hydrologic Features"). The SPA is comprised mostly of annual grasslands, interspersed with occasional groups of non-native trees, seasonal wetlands, and drainages typical of eastern Sacramento County. The SPA is currently undeveloped land with relatively poor agricultural soils and has been used for dry farming and livestock grazing. The terrain consists of slightly rolling terraces, with elevations ranging from 120 to 230 feet above sea level. The SPA is situated within the upper reaches of the Laguna Creek Watershed. Laguna Creek conveys storm water southwest towards the junction of Sunrise Boulevard and Jackson Highway in well-defined grassy swales located just south of the SPA. Blodgett Reservoir is located between Kiefer Boulevard and Grant Line Road, to the south of the SPA. The Laguna Creek Watershed encompasses approximately 50 square miles of land draining to Laguna Creek and its tributary streams (Sacramento Stormwater Quality Partnership [SSQP] 2009a:Appendix A-4, 162).

Kite Creek is a tributary to Laguna Creek and transverses through the middle of the SPA, generally sloping from the northeast to the southwest. Kite Creek exits the SPA's southern boundary and meanders in a southerly direction approximately 4,000 feet where it joins Laguna Creek south of Blodgett Reservoir. Another unnamed tributary to Laguna Creek flows through the eastern portion of the SPA and connects to Laguna Creek approximately 3,100 feet south of the SPA. Laguna Creek flows in a southwesterly direction through Elk Grove to Morrison Creek, which then connects to Beach Lake, and eventually to the Sacramento River.

A small portion of the northwest corner of the SPA is located in the Morrison Creek Watershed. The Morrison Creek Watershed is located north of the Laguna Creek Watershed. The area adjacent to the SPA within the Morrison Creek Watershed has been developing the last several years. The Montelena Drainage Study (prepared by Wood Rodgers in September 2007, cited in MacKay & Somps 2010b) indicated that a portion of the runoff from the 100-year, 24-hour storm occurring in the Morrison Creek Watershed spills (Morrison Spill) into the Laguna Creek Watershed. The Morrison Spill occurs within an open space preserve area located north of Kiefer Boulevard and east of Sunrise Boulevard. The Morrison Spill traverses through the open space preserve, crosses under Kiefer Boulevard, continues through the SPA, and eventually connects to Kite Creek (MacKay & Somps 2011b). In addition to the Morrison Spill, local flooding currently occurs along Laguna Creek at Jackson Highway and Sunrise Boulevard, to the south of the southwestern corner of the SPA.

A portion of the SunCreek Drainage Study Area is adjacent to an existing single-family development called Anatolia III. Anatolia III is a 200-acre subdivision and is the only developed land within the SunCreek Drainage Study Area. Prior to the Anatolia III development, Kite Creek entered the Anatolia III property's eastern boundary and meandered for approximately 3,000 feet through the undeveloped property until it exited the site through the southern boundary. The Anatolia III development has filled approximately 2,400 feet of the original Kite Creek stream course and routed it around the perimeter of the Anatolia III Project in a trapezoidal cross section channel. In addition to the on-site channel improvements, the Anatolia III project constructed a water quality basin and an off-channel detention basin. The water quality basin and off-channel detention basin are sized to treat and detain the developed Anatolia III design storm runoff to pre-development water quality, runoff flow rates, and volumes. A



Sources: DWR 2010, Sacramento Central Groundwater Authority 2008, AECOM 2010

Regional Hydrologic Features **Exhibit 3.9-1**

construction defect at the downstream end of the Anatolia III channel and Kiefer Boulevard box culverts has resulted in a backwater condition occurring within the box culverts and the lower reaches of the Anatolia III channel.

The most recent Federal Emergency Management Agency's (FEMA) Flood Insurance Study (FIS) Flood Insurance Rate Maps (FIRMs) revised September 30, 1988, situates the SPA in the unshaded Zone X (see Exhibit 3.9-2) (MacKay & Somps 2011b). Unshaded Zone X is an area of minimal flood hazard, located outside the 500-year flood and protected by levees from the 100-year flood. In addition, the background report to the Sacramento County General Plan (as amended) does not identify the SPA as being located in an area historically prone to flooding (County of Sacramento Undated:371). However, the California Department of Water Resources (DWR) Awareness Floodplain Mapping Project has identified the area surrounding Laguna Creek, including the SPA, as being within the DWR Awareness Floodplain (County of Sacramento Undated:376). DWR Awareness Floodplain areas are flood-prone areas that are not mapped under the FEMA National Flood Insurance Program.

Folsom Dam, the largest dam on the American River, provides a maximum storage capacity of one million acre-feet of water in Folsom Lake, which is a major source of surface water for the region and provides flood protection. The SPA is not located within the Folsom Dam failure flood area (County of Sacramento Undated:384, Figure III-4).

The Sacramento County Water Agency (SCWA)'s service area (i.e., Zone 40) encompasses the SPA and SCWA would be the primary water purveyor. The Zone 40 area is separated into three major service areas, of which the SPA is located in the North Service Area (NSA). Zone 41 would be responsible for the operations and maintenance of all the water supply facilities within the SPA and the project vicinity and would serve as the retail water supplier. SCWA is operated by the Sacramento County Department of Public Works, Water Resources Division, and is authorized to provide water supply, drainage, and flood control for all of Sacramento County.

GROUNDWATER HYDROLOGY

The SPA is located within the Central Sacramento County Groundwater Basin (i.e., Central Basin). The Central Basin is roughly bordered to the north by the American River, to the south by the Cosumnes and Mokelumne Rivers, to the west by Interstate 5 and the Sacramento River, and to the east by the Sierra Nevada foothills. The Central Sacramento County Groundwater Forum (CSCGF) was formed in February 2002 to provide recommendations on a basin governance body, and the CSCGF defined the Central Basin boundary using the Sacramento County groundwater model. The model took into account the hydrogeologic boundaries and the political boundaries of organized water purveyors/districts, cities, and the County of Sacramento (SCWA et al. 2006:ES-4).

The Central Basin boundary essentially overlies the South American Subbasin that is used by DWR; however, the boundaries are slightly different because the Central Basin boundary was developed from the Sacramento County groundwater model grid (see Exhibit 3.9-1, "Regional Hydrologic Features"). The South American Subbasin, of which the Central Basin is a portion, is defined as the area bounded on the west by the Sacramento River, on the north by the American River, and on the south by the Cosumnes and Mokelumne rivers. The Sierra Nevada mountains represent the approximate eastern edge of the alluvial basin, where little groundwater flows into or out of the groundwater basin from the Sierra Nevada foothills. There is, however, interaction between groundwater of adjacent subbasins at greater depths (DWR 2004).

Groundwater underlying the Central Basin is contained within a shallow aquifer (Laguna or Modesto Formation) and in a deep aquifer (Mehrten Formation). The Laguna or Modesto Formation consists of older alluvial deposits of loosely to moderately compacted sand, silt, and gravel deposited in alluvial fans. These deposits are moderately permeable and have a thickness of about 100 to 650 feet (DWR 2004). The deeper, Mehrten Formation is a sequence of fragmented volcanic rocks, which crops out in a discontinuous band along the eastern margin of the basin. It is composed of intervals of black volcanic sands, stream gravels, silt, and clay interbedded with intervals of dense tuff breccia. The sand and gravel intervals are highly permeable and the tuff breccia intervals act as confining layers. The thickness of the Mehrten Formation is between 200 and 1,200 feet. Groundwater is located from 20 to 100 feet below the ground surface (bgs) depending on when and where the measurement is taken. The base of the potable water portion of the deep aquifer averages approximately 1,400 feet bgs.

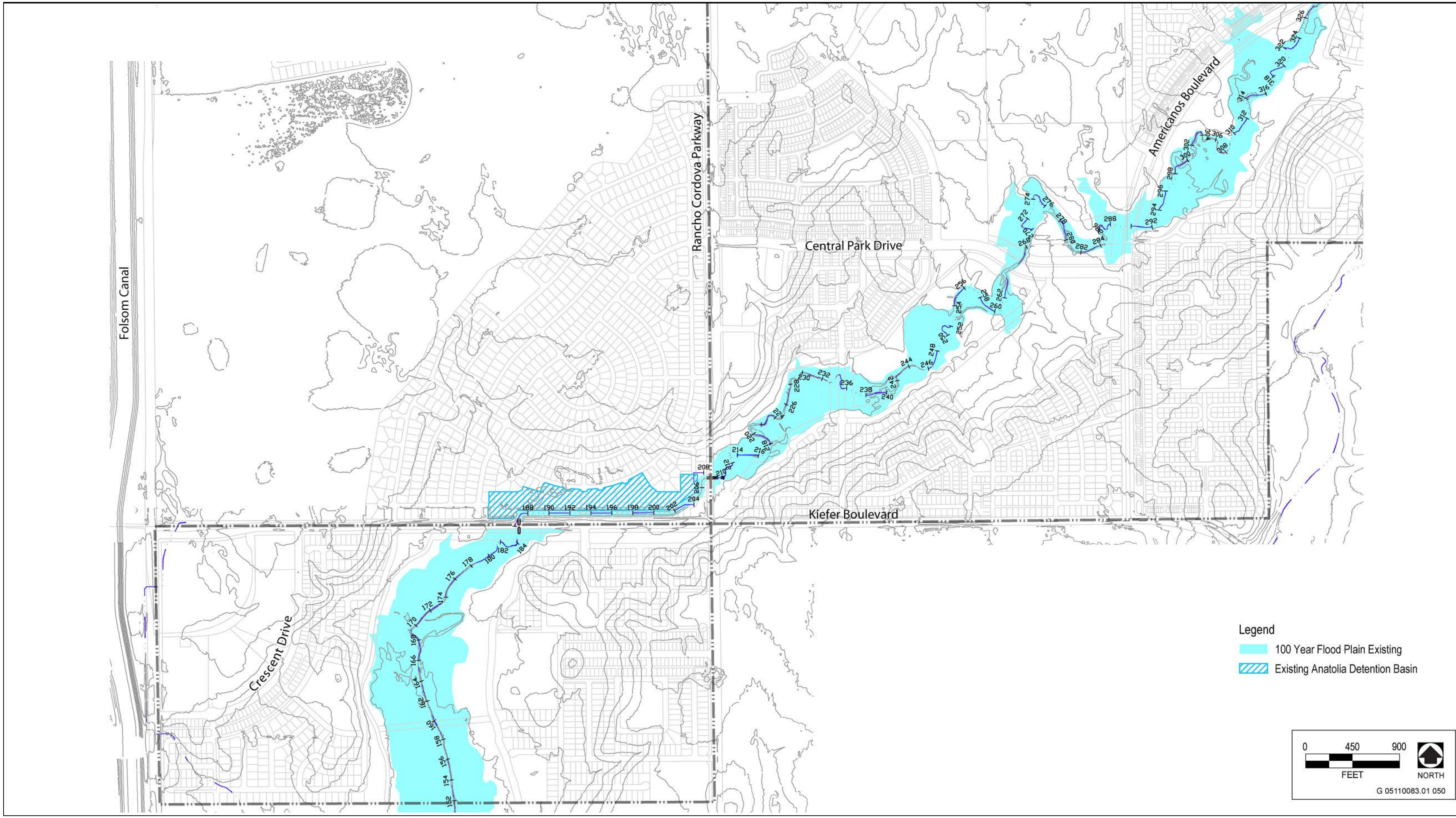
The City of Rancho Cordova covers a shallow unconfined aquifer system that is part of the South American Subbasin. The shallow unconfined aquifer system is approximately 200 hundred feet bgs and a deeper confined groundwater aquifer system ranges from a few hundred feet to over 2,000 feet bgs (City of Rancho Cordova. 2006b:4.9-11). The deep aquifer is separated from the shallow aquifer by a discontinuous clay layer that serves as a semi-confining layer, but is not completely impermeable.

Intensive use of groundwater over the past 60 years has resulted in a general lowering of groundwater elevations. Over time, isolated groundwater depressions have grown and coalesced into a single cone of depression that is centered in the southwestern portion of the Central Basin, approximately 15 miles southwest of the SPA. Groundwater level trends through much of the Central Basin have generally declined consistently from the 1950s and 1960s to about 1980 by 20–30 feet (SCWA et al. 2006:2-27). From 1980 through 1983, water levels recovered by about 10 feet and remained stable until the beginning of the 1987-1992 drought, when water levels declined by about 15 feet. From 1995 to 2003, most groundwater levels in the Central Basin recovered generally higher than levels prior to the 1987–1992 drought; however, wells in the vicinity of Rancho Cordova appear to have recovered less than the other wells in the subbasin since 1995 (generally less than 10 feet) (DWR 2004). The CSCGF determined the estimated long term average annual sustainable yield of groundwater from the Central Basin to be 273,000 acre-feet per year (afy) (SCWA et al 2006:ES-5). Currently, groundwater extractions are estimated to be 250,000 afy.

Recharge of the aquifer system occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly along the American, Cosumnes, and Sacramento River channels. Additional recharge occurs along the eastern boundary of Sacramento County at the transition point from the consolidated rocks of the Sierra Nevada to the alluvial-deposited basin sediments (SCWA et al. 2006:2-26). This recharge is classified as subsurface recharge along with underground flow into and out of the Central Basin with adjacent groundwater basins. Other sources of recharge include deep percolation from applied surface water and precipitation. Induced recharge can occur from recharge basins and injection of water through wells. Due to soil characteristics within the City of Rancho Cordova, groundwater recharge capabilities are considered low (City of Rancho Cordova 2006b:4.9-12). Recharge capabilities on the SPA are generally characterized as poor; however, a portion of the SPA along Laguna and Kite Creeks has moderate to high recharge capabilities, as it consists of unconsolidated deposits along the floodplain (County of Sacramento 2009:18, Figure 4). The specific hydrologic soils groups found in the SPA primarily consist of Type D soils, which have the highest runoff potential (lowest infiltration rates), and Type C soils are found along the creeks. See Exhibit 3.7-1 in Section 3.7, "Geology, Soils, Minerals, and Paleontological Resources" for a depiction of on-site soil types.

The Central Sacramento County Groundwater Management Plan (CSCGMP) was completed in 2006 by Central Sacramento County Groundwater Basin stakeholders, in coordination with the Sacramento County Water Agency, to establish a framework for maintaining a sustainable groundwater resource for the various users overlying the basin in Sacramento County between the American and Cosumnes Rivers (SCWA et al. 2006:ES-1). The CSCGMP assists overlying water users in maintaining a safe, sustainable, and high quality groundwater resource within a given groundwater basin. The five basin management objectives that have been proposed for the Central Basin are listed below. Each objective focuses on managing and monitoring the basin to benefit all groundwater users in the basin and are intended to be specific enough to result in numerical criteria for the basin, but also able to be modified or adapted to new information on groundwater basin behavior over time:

- Maintain the long-term average groundwater extraction rate at or below 273,000 afy.
- Maintain specific groundwater elevations within all areas of the basin consistent with the Water Forum.



Source: MacKay & Somps 2011b, Adapted by AECOM in 2011

100-Year Floodplain Map **Exhibit 3.9-2**

- Protect against any potential inelastic land surface subsidence by limiting subsidence to no more than 0.007 feet per 1 foot of drawdown in the groundwater basin.

- Protect against any adverse impacts to surface water flows in the American, Cosumnes, and Sacramento rivers.

- Water quality objectives for several constituents of concern:

  - Maintain total dissolved solids (TDS) concentration of less than 1,000 milligrams per liter (mg/L);

  - Maintain nitrate (NO_3) concentration of less than 45 mg/L; and

  - Monitor volatile organic compounds (VOC) migration and consider any measurable trace of VOC in private or public wells as significant.

WATER QUALITY

Surface Water

Laguna Creek and Kite Creek do not currently have any specific designated beneficial uses attributed to them in the water-quality control plan (Basin Plan) adopted by the Central Valley Regional Water Quality Control Board (RWQCB) (described in Section 3.9.2 "Regulatory Framework" below). Consequently, the Central Valley RWQCB applies the Basin Plan's "tributary rule" and assigns to these creeks the beneficial uses designated for the nearest downstream location. The Central Valley RWQCB also regulates waste discharges in undesignated streams to ensure that downstream water quality conditions and beneficial uses are not degraded. Thus, these creeks are subject to regulation for the existing designated uses in their receiving waterbodies. Thus, Laguna and Kite Creeks are subject to regulation for the existing designated uses in the Sacramento River, which consist of:

- municipal and domestic water supply;
- agricultural supply;
- industrial supply and hydropower generation;
- contact and noncontact recreation;
- warm and cold freshwater migration and spawning habitat; and
- wildlife habitat.

The 2006 version of the Section 303(d) list for California issued by the Central Valley RWQCB (discussed below in Section 3.9.2 "Regulatory Framework") identifies impaired status for a 26-mile stretch of Morrison Creek for chlorpyrifos (an insecticide), from Elk Grove/Florin Road to Beach Lake. However, in the 2009 Final Staff Report on proposed changes to the 303(d) list, this listing for chlorpyrifos was removed and new listings have been added for pentachlorophenol (PCP) (a pesticide) and pyrethroids (insecticides) (Central Valley RWQCB and CalEPA 2009). The source of PCP is unknown and the source of pyrethroids is listed as agriculture and urban runoff/storm sewers. The expected total maximum daily load (TMDL) completion date for both of these pollutants is 2021. Morrison Creek has also been listed as impaired for diazinon, with potential sources listed as agriculture, and the TMDL for diazinon was approved by the U.S. Environmental Protection Agency (EPA) in 2003. Chlorpyrifos and diazinon are organophosphorus pesticides used for urban and agricultural pest control. Neither Laguna Creek nor Kite Creek are listed on the 303(d) list as impaired.

Laguna Creek eventually flows to the Sacramento River, which is listed on the 303(d) list as impaired between Knights Landing and the Delta (16 miles) for mercury and unknown toxicity (Central Valley RWQCB 2006). The potential source of mercury is abandoned mines/resource extraction and the source of the unknown toxicity is unknown. In addition, the 2009 Final Staff Report on proposed changes to the 303(d) list has also listed the Sacramento River between Knights Landing and the Delta for chlordane, DDT, and dieldrin (pesticides) from agricultural sources (Central Valley RWQCB and CalEPA 2009). Expected TMDL completion dates for these pollutants are 2021, 2021, and 2022, respectively. In addition, the Sacramento River has been listed as impaired for polychlorinated biphenyls (PCBs) from unknown sources, with an expected TMDL completion date of 2021. Finally, diazinon is no longer listed as an impairment for the Sacramento River, as a TMDL for diazinon was approved by the EPA in 2003.

In the 2009 Final Staff Report on proposed changes to the 303(d) list, Beach Lake is proposed for listing for mercury from resource extraction with an expected TMDL completion date of 2021 (Central Valley RWQCB and CalEPA 2009).

Water quality monitoring in Laguna Creek was conducted during the 2008/2009 fiscal year (July 1, 2008 – June 30, 2009) in compliance with the Sacramento Municipal Separate Storm Sewer System National Pollutant Discharge Elimination System (NPDES) Stormwater Permit No. CAS082597. Monitoring activities required by the permit included urban tributary (creek) water quality monitoring, bioassessment, and additional pesticide monitoring. In addition, continuous monitoring was conducted for pH, temperature, and dissolved oxygen in Laguna Creek during three wet-weather events. The closest water quality monitoring stations were located approximately 10 miles west of the SPA, to the east and west of Highway 99 (at Franklin Boulevard and East Stockton Boulevard).

Continuous flow stage recorders and water quality data collection devices were initially installed at Laguna Creek at Franklin Boulevard (location LC01) on September 16, 2008, but were subsequently relocated to Laguna Creek at Hwy 99/Stockton Blvd (location LC02) on December 10, 2008 due to stagnant flow conditions at the Franklin site that showed little response to wet-weather events. Continuous monitoring data values taken during three wet-weather events were averaged and are provided in Table 3.9-1.

Table 3.9-1
Average Hydrologic Parameters in Laguna Creek

Constituent	Laguna Creek at Franklin Blvd (LC01) October 31, 2008	Laguna Creek at Hwy 99/ Stockton Blvd (LC02) December 14, 2008	Laguna Creek at Hwy 99/ Stockton Blvd (LC02) February 11, 2009
pH	7.0	7.0	6.7
Dissolved Oxygen (mg/L)	4.6	5.8	[1]
Temperature (°C)	16.0	7.8	9.5
EC (uS/cm)	136.5	223.6	150.8
Turbidity (NTU)	35.2	23.8	60

Notes:
mg/L = milligrams per liter (parts per million); uS/cm = microsiemens per centimeter; EC = electrical conductivity;
NTU = nephelometric turbidity units
1 No reading available.
Source: SSQP 2009a Appendix A-7, 11, 15, and 19.

For the 2008/2009 monitoring years, Laguna Creek at both the Franklin Boulevard and Hwy 99/Stockton Boulevard sampling locations showed dissolved oxygen levels below the water quality objective of 7 mg/L for coldwater spawning and pH that was within the Basin Plan range of 6.5 to 8.5. Exceedances of water quality objectives were reported in the 2008/2009 monitoring report and are presented in Table 3.9-2 (SSQP 2009a: Appendix A-7, 56). Monitoring of Laguna Creek showed exceedances for dissolved copper, *E. coli*, fecal coliform, and for the polycyclic aromatic hydrocarbon (PAHs) constituents benzo(a)pyrene, benzo(b)flouranthene, chrysene, and indeno(1,2,3-cd)pyrene. No other exceedances of water quality objectives were reported (SSQP 2009a).

Table 3.9-2 2008/09 Exceedances of Water Quality Objectives in Laguna Creek at Franklin Blvd and Hwy 99/Stockton Blvd				
Constituent	**Water Quality Objective as Specified in the NPDES Permit**	**Laguna Creek at Franklin Blvd (LC01) October 31, 2008**	**Laguna Creek at Hwy 99/Stockton Blvd (LC02) December 15, 2008**	**Laguna Creek at Hwy 99/Stockton Blvd (LC02) February 11, 2009**
Chrysene (μg/L)	0.0044[1]	0.0096	NA	0.0165
Copper – Dissolved (μg/L)	4.27[2]	5.3	NA	NA
Escherichia Coli (MPN/100mL)	235[3]	30,000	NA	1,100
Fecal Coliform (MPN/100mL)	400[3]	50,000	1,300	1,100
Benzo(a)pyrene (μg/L)	0.0044[1]	NA	NA	0.0124
Benzo(b)flouranthene (μg/L)	0.0044[1]	NA	NA	0.0067
Indeno(1,2,3-cd)pyrene (μg/L)	0.0044[1]	NA	NA	0.0072

Notes:
mg/L = milligrams per liter (parts per million); μg/L = micrograms per liter (parts per billion); NA = not applicable
MPN/100mL = most probable number per 100 milliliters
1 California Toxics Rule, human health based on consumption of water and organisms
2 California Toxics Rule, freshwater aquatic life
3 Basin Plan
Source: SSQP 2009a Appendix A-7, Tables 34, 56.

Wet and dry weather water quality data for Laguna Creek at Franklin Blvd is also available in Appendix F of the "Technical Study of Hydrology, Geomorphology and Water Quality in the Laguna Creek Watershed" prepared in support of the Laguna Creek Watershed Management Action Plan and the Upper Laguna Creek Corridor Master Plan (Geosyntec 2007:Table 3-3a and Table 3-3b).

Groundwater

Water quality in the shallow aquifer zone is considered to be good with the exception of arsenic detections in a few locations. The shallow aquifer is typically used for private domestic wells requiring no treatment unless high arsenic values are encountered, in which case other water-bearing units are targeted. Water in the deep aquifer typically has higher concentrations of TDS, iron, and manganese and typically requires treatment (SCWA et al. 2006:2-24). Iron and manganese are known to cause mineral deposits and affect the taste of water. At depths of approximately 1,400 feet or greater, TDS concentrations exceed 2,000 mg/L and groundwater is considered non-potable unless treated by reverse osmosis (SCWA et al 2006:2-30).

The three major groundwater types are: magnesium calcium bicarbonate or calcium magnesium bicarbonate; magnesium sodium bicarbonate or sodium magnesium bicarbonate; and sodium calcium bicarbonate or calcium sodium bicarbonate. Groundwater in the basin is generally characterized as calcium magnesium bicarbonate or magnesium calcium bicarbonate (DWR 2004). Total dissolved solids ranges in the South American Basin are from 24 to 581 mg/L and averages 221 mg/L based on 462 records.

There are several sources of groundwater contamination within the Central Basin. These sources include: Mather Field, Aerojet, Boeing, the former Sacramento Army Depot, the Union Pacific railyards, and present and former landfills (SCWA et al. 2006:ES-4). The known extent of contamination from these sources does not extend south of Douglas Road, with the exception of contamination from the inactive Boeing Rancho Cordova Test Site. None of the groundwater contamination extends underneath the SPA.

Kiefer Landfill

Kiefer Landfill is located approximately three-quarter mile southeast of the SPA boundary. The landfill is classified as Class III and accepts a variety of wastes, including mixed municipal, sludge (biosolids), and construction/demolition materials. Samples from some of the monitoring wells at the landfill indicated that wastes have been released to the groundwater. The major groundwater contaminants are VOCs, including perchloroethylene (PCE); trichloroethylene (TCE); 1,1,1-trichloroethane (1,1,1-TCA); 1,2-dichloroethylene (1,2-DCE); benzene; and vinyl chloride. VOCs were first detected in the landfill monitoring wells in 1998, with trace detections in the well closest to the SPA boundary (approximately one-half mile away to the south). The County monitors three water bearing zones, to a depth of 150 feet below mean sea level (msl). The County operates a groundwater extraction and treatment (GET) system on the landfill site, including 50 groundwater monitoring wells in various locations around the landfill. Treated water is discharged southwest of the landfill, over one mile south of the SPA. The contaminant plume is monitored by the landfill operator and results are sent to the Sacramento County Environmental Management Department on a weekly basis. The plume is not located within the SPA boundary.

Inactive Rancho Cordova Test Site (Aerojet/Boeing)

The Inactive Rancho Cordova Test Site (IRCTS) is located approximately one mile north of the northernmost portion of the SPA. The site consists of a 2,728-acre area north of Douglas Road, south of White Rock Road, and east of Sunrise Boulevard. Gold-dredging activities occurred over approximately 70% of the site from the early 1900s until 1962. Since the mid-1960’s it has been used by several aerospace companies including Aerojet and Boeing, which has resulted in groundwater contamination with various VOCs.

Groundwater investigations at the IRCTS have been ongoing since 1984 to characterize the site’s hydrology, evaluate the direction of groundwater flow, assess the extent of groundwater contamination, and provide remediation. The site was divided into three separate groundwater study areas based on the sources of chemicals and their potential effects on the groundwater. These consist of the Western Groundwater Operable Unit, the Northern Groundwater Study Area and the Southern Groundwater Study Area. The Southern Groundwater Study Area (SGSA) is closest to the SunCreek SPA (EDAW [now AECOM] 2006:Section 3.13).

The SGSA was designated to address chemicals in groundwater originating from the Alpha Complex and the Administration Area (Security Park) Operable Units. Numerous monitoring wells and GET wells have been installed at various locations within the SGSA. Additional GET wells were installed along Douglas Road and south of Douglas Road (on land that is part of the Sunrise Douglas Community Plan area) to remediate contaminated groundwater moving south from Security Park. Sampling data indicate that VOCs, mostly TCE and perchlorate, are the primary chemicals of concern in the groundwater, and that the directions of groundwater flow range from south at the Security Park to southwest at other locations further west. The groundwater contaminant plumes from Security Park and Alpha Complex have not migrated beneath the SunCreek SPA. However, the groundwater contaminant plume from Security Park is migrating south, toward the SunCreek SPA. Perchlorate is not present in the plume from Security Park or in the eastern TCE plume from Alpha Complex; however, perchlorate is present within the western side of the TCE plume from the Alpha Complex (EDAW [now AECOM] 2010:Chapter 5). One extraction well and a temporary GET system were installed during 2004 at the intersection of Douglas Road near the center of the IRCTS. The GET system began operating on a limited basis during July 2005 and began continuous operations in October 2005. Two additional extraction wells were installed along Douglas Road during 2005 and were connected to the GET system along with three extraction wells located south of Douglas Road. These wells are intended to remediate contaminated groundwater moving south from the Security Park. The extracted water is pumped from these wells to the GET system and the treated water is discharged to Morrison Creek. The second phase of the groundwater remediation includes the installation of three additional extraction wells on the Ranch at Sunridge project site within the northeastern portion of the existing transmission line easement. The Remedial Action Plan incorporates requirements for progress evaluations and modifications to the remedies recommended in the plan until perchlorate and TCE are removed from the groundwater to the satisfaction of the Central Valley RWQCB.

Mather Field

Mather Field, formerly Mather Air Force Base (AFB) is a state and Federal "Superfund-status" site located approximately 2¼ miles west of the SPA. The site is currently home to the Mather Regional Park, which houses a business airport (Sacramento Mather Airport) and a light industrial area. The Mather Army Aviation Support Facility (AASF) is located on a 30-acre parcel within the Mather Regional Park, and the airport is a joint-use facility, with military operations located on the north side of the runways (California State Military Museum 2007). Mather AFB opened in 1918 as a flight training school for the U.S. military and its allies. It remained a training base until 1993, when it was determined to be surplus under the Base Realignment and Closure Act.

Operations at the base, including fire training, spill sites, landfills, and sewage treatment plants, contributed to the current soil and groundwater contamination issues, which occurred at 89 designated sites (EPA2011). Remediation efforts at Mather Field are ongoing, and there is still a potential for human exposure through accidental ingestion, inhalation, or direct contact with contaminated soil or groundwater.

Chemicals of concern include VOCs, gasoline, diesel fuel, metals, and pesticides. To date, excavation and treatment of soils has remediated all but 13 of the 82 total sites. Although remediation efforts have been in place since 1995, there are still five distinct groundwater plumes. Contaminants associated with the plumes include benzene, carbon tetracholoride, chloromethane, 1 and2-dicholoroethance, methylene chloride, TCE, and tetrachloroethylene. Remediation efforts have resulted in decreased concentrations of hazardous chemicals (EPA 2011).

The closest Mather Field contaminant plume is located approximately 1½ miles west of the SPA and the plumes are generally migrating to the southwest, away from the SPA.

The depth to groundwater in the project vicinity is approximately 130 feet (EDAW [now AECOM] 2006:Section 3.13). The project is expected to rely primarily on surface water supplied by the North Service Area Pipeline (NSAP). The small amount of water that could be used at full project buildout to meet peaking demands (if needed) from on-site SCWA groundwater wells is not expected to result in a substantial change in the movement of the contaminated groundwater plumes.

GEOMORPHOLOGY

A geomorphic assessment of Kite Creek was conducted at the SPA in 2008 and Kite Creek was delineated into two reaches, lower and upper Kite Creek (cbec inc 2008 [Appendix A within DEIR/DEIS Appendix D]). Depending on the location along the creek, the contents of the creek bed range from silty sand absent of gravels, to a gravel bed with fines (cbec inc 2008:7).

The lower reach of Kite Creek extends downstream of Kiefer Boulevard and is surrounded by heavily grazed grasslands with abundant cattle trails into and crossing the creek. Approximately 1,200 feet downstream of Kiefer Boulevard in this reach, the creek appears to have been realigned and straightened and signs of seasonal flooding were observed (cbec inc 2008:3). The lower reach of Kite Creek has incised, or downcut, up to 3-4 feet and overall, the lower reach is actively incising with slumping, eroding banks. The overall erodability risk classification of the lower reach is high, meaning that the creek has already undergone substantial levels of degradation and therefore will be highly susceptible to future anthropogenic (i.e., human-caused) disturbances (cbec inc 2008:4).

The upper reach of Kite Creek, located upstream of Rancho Cordova Parkway, has more stable conditions than the lower reach and has been less anthropogenically affected to date. Little development has occurred in the upper reach at this time and therefore this reach has only been affected by grazing and other agricultural activities (cbec inc 2008:6). This reach is dimensionally smaller with lower banks as compared to the lower reach of Kite Creek and has not been artificially straightened. The impacts of cattle are also not as prevalent, but there is some bank slumping and a few creek modifications have been made, including berming and culvert crossings. The overall erodability risk classification of the upper reach of Kite Creek is "medium," meaning that the channel has undergone partial degradation (cbec inc 2008).

3.9.2 REGULATORY FRAMEWORK

Numerous Federal, state, regional, and local laws, rules, regulations, plans, and policies define the framework for regulating hydrology and water quality in the SPA and surrounding area. The following discussion focuses on hydrology and water quality requirements applicable to the project.

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

Federal Clean Water Act

The EPA is the lead Federal agency responsible for managing water quality. The Clean Water Act (CWA) of 1972 is the primary Federal law that governs and authorizes EPA and the individual States to implement activities to control water quality. The various elements of the CWA that address water quality and are applicable to the project are discussed below. Wetland protection elements administered by the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA, including permits for the discharge of dredged and/or fill material into waters of the U.S., are discussed in Section 3.3, "Biological Resources."

Water Quality Criteria and Standards

Under Federal law, EPA has published water quality regulations under Volume 40 of the Code of Federal Regulations. Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the U.S. As defined by the CWA, water quality standards consist of two elements: (1) designated beneficial uses of the water body in question, and (2) criteria that protect the designated uses. Section 304(a) requires EPA to publish advisory water quality criteria that accurately reflect the latest scientific knowledge on the kind and extent of all effects on health and welfare that may be expected from the presence of pollutants in water. Where multiple uses exist, water quality standards must protect the most sensitive use. EPA is the Federal agency with primary authority for implementing regulations adopted under the CWA. EPA has delegated the State of California as the authority to implement and oversee most of the programs authorized or adopted for CWA compliance through the Porter-Cologne Water Quality Control Act of 1969 (Porter-Cologne Act), described below.

National Pollutant Discharge Elimination System Permit Program

The NPDES permit program was established in the CWA to regulate municipal and industrial discharges to surface waters of the U.S. A discharge from any point source is unlawful unless the discharge is in compliance with an NPDES permit. Federal NPDES permit regulations have been established for broad categories of discharges, including point-source municipal waste discharges and nonpoint-source stormwater runoff. NPDES permits generally identify effluent and receiving water limits on allowable concentrations and/or mass emissions of pollutants contained in the discharge; prohibitions on discharges not specifically allowed under the permit; and provisions that describe required actions by the discharger, including industrial pretreatment, pollution prevention, self-monitoring, and other activities.

In November 1990, EPA published regulations establishing NPDES permit requirements for municipal and industrial stormwater discharges. Phase 1 of the permitting program applied to municipal discharges of stormwater in urban areas where the population exceeded 100,000 persons. Phase 1 also applied to stormwater discharges from a large variety of industrial activities, including general construction activity if the project would disturb more than 5 acres. Phase 2 of the NPDES stormwater permit regulations, which became effective in

March 2003, required that NPDES permits be issued for construction activity for projects that disturb 1 acre or more. Phase 2 of the municipal permit system (known as the NPDES General Permit for Small Municipal Separate Storm Sewer Systems [MS4s]) required small municipal areas of less than 100,000 persons to develop stormwater management programs. The nine RWQCBs in California are responsible for implementing the NPDES permit system (see additional information below).

Section 401 Water Quality Certification or Waiver

Under Section 401 of the CWA, an applicant for a Section 404 permit (to discharge dredged or fill material into waters of the U.S.) must first obtain a certificate from the appropriate state agency stating that the fill is consistent with the state's water quality standards and criteria. In California, the authority to either grant water quality certification or waive the requirement is delegated by the SWRCB to the nine RWQCBs. The Proposed Project Alternative would require a Section 401 water quality certification because it would require a Section 404 permit and is under the jurisdiction of the Central Valley RWQCB.

Antidegradation Policy

The Federal antidegradation policy, established in 1968, is designed to protect existing uses, water quality, and national water resources. The Federal policy directs states to adopt a statewide policy that includes the following primary provisions:

- Existing in-stream uses and the water quality necessary to protect those uses shall be maintained and protected.
- Where existing water quality is better than necessary to support fishing and swimming conditions, that quality shall be maintained and protected unless the state finds that allowing lower water quality is necessary for important local economic or social development.
- Where high-quality waters constitute an outstanding national resource, such as waters of national and state parks, wildlife refuges, and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

Safe Drinking Water Act

Under the Safe Drinking Water Act (Public Law 93-523), passed in 1974, EPA regulates contaminants of concern to domestic water supply. Contaminants of concern relevant to domestic water supply are defined as those that pose a public health threat or that alter the aesthetic acceptability of the water. These types of contaminants are regulated by EPA's primary and secondary maximum contaminant levels (MCLs), which are applicable to treated water supplies delivered to the distribution system. MCLs and the process for setting these standards are reviewed triennially. Amendments to the Safe Drinking Water Act enacted in 1986 established an accelerated schedule for setting MCLs for drinking water.

EPA has delegated to the California Department of Public Health (CDPH) the responsibility for administering California's drinking-water program. CDPH is accountable to EPA for program implementation and for adopting standards and regulations that are at least as stringent as those developed by EPA. The applicable state primary and secondary MCLs are set forth in Title 22, Division 4, Chapter 15, Article 4 of the California Code of Regulations (CCR). Provisions of the Safe Drinking Water Act would apply to water supplies being sought for the project.

Section 303(d) Impaired Waters List

Under Section 303(d) of the CWA, states are required to develop lists of water bodies that would not attain water quality objectives after implementation of required levels of treatment by point-source dischargers (municipalities and industries). Section 303(d) requires that the state develop a TMDL for each of the listed pollutants. The TMDL is the amount of loading that the water body can receive and still be in compliance with water quality objectives. The TMDL can also act as a plan to reduce loading of a specific pollutant from various sources to achieve compliance with water quality objectives. The TMDL prepared by the state must include an allocation of allowable loadings to point and nonpoint sources, with consideration of background loadings and a margin of safety. The TMDL must also include an analysis that shows links between loading reductions and the attainment of water quality objectives. The EPA must either approve a TMDL prepared by the state or, if it disapproves the state's TMDL, issue its own. NPDES permit limits for listed pollutants must be consistent with the waste load allocation prescribed in the TMDL. After implementation of the TMDL, it is anticipated that the problems that led to placement of a given pollutant on the Section 303(d) list would be remediated.

Federal Emergency Management Agency

FEMA administers the National Flood Insurance Program to provide subsidized flood insurance to communities that comply with FEMA regulations that limit development in floodplains. FEMA also issues FIRMs that identify which land areas are subject to flooding. These maps provide flood information and identify flood hazard zones in the community. The design standard for flood protection covered by the FIRMs is established by FEMA, with the minimum level of flood protection for new development determined to be the 1-in-100 (0.01 annual exceedance probability [AEP]) (i.e., the 100-year flood event). As developments are proposed and constructed FEMA is also responsible for issuing revisions to FIRMs, such as Conditional Letters of Map Revision (CLOMR) and Letters of Map Revision (LOMR) through the local agencies that work with the National Flood Insurance Program. Requirements of California Senate Bill (SB) 5 regarding the 200-year flood (i.e. the 1-in-200 [0.005 AEP]) are discussed below.

U.S. Army Corps of Engineers Sacramento and San Joaquin River Basins Comprehensive Study

The Sacramento and San Joaquin River Basins Comprehensive Study is a joint effort by the Central Valley Flood Protection Board (formerly the State Reclamation Board) and USACE, in coordination with Federal, state, and local agencies, groups, and organizations in California's Central Valley, to develop a comprehensive plan for flood damage reduction and environmental restoration for the Sacramento and San Joaquin River Basins. The study is a regionwide planning effort, rather than a regulatory program; however, consistency with its goals and objectives is important for any project affecting flood control in the Sacramento and San Joaquin River basins.

State Plans, Policies, Regulations, and Laws

In California, the SWRCB has broad authority over water-quality control issues for the state. The SWRCB is responsible for developing statewide water quality policy and exercises the powers delegated to the state by the Federal government under the CWA. Other state agencies with jurisdiction over water quality regulation in California include CDPH (for drinking-water regulations), the California Department of Pesticide Regulation, the California Department of Fish and Game (DFG), and the Office of Environmental Health Hazard Assessment (OEHHA).

Regional authority for planning, permitting, and enforcement is delegated to the nine RWQCBs. The regional boards are required to formulate and adopt Basin Plans for all areas in the region and establish water quality objectives in the plans. California water quality objectives (or "criteria" under the Clean Water Act) are found in the Basin Plans adopted by the SWRCB and each of the nine RWQCBs. The Central Valley RWQCB is responsible for the regional area in which the SPA is located.

Title 22 Standards

Water quality standards are enforceable limits composed of two parts: (1) the designated beneficial uses of water, and (2) criteria (i.e. numeric or narrative limits) to protect those beneficial uses. Municipal and domestic supply

(MUN) is among the “beneficial uses” as defined in Section 13050(f) of the Porter-Cologne Act, which defines them as uses of surface water and groundwater that must be protected against water quality degradation. MCLs are components of the drinking water standards adopted by the CDPH pursuant to the California Safe Drinking Water Act. California MCLs may be found in Title 22 of the CCR, Division 4, Chapter 15, Domestic Water Quality and Monitoring. The CDPH is responsible for Title 22 of the CCR (Article 16, Section 64449) as well, which also defines secondary drinking water standards, established primarily for reasons of consumer acceptance (i.e., taste) rather than because of health issues. Table 3.9-3 lists the Title 22 constituent standards, as well as those for the Central Valley Basin Plan above and the California Toxics Rule described below.

Drinking water MCLs are directly applicable to water supply systems “at the tap,” i.e. at the point of use by consumers in their home, office, etc., and are enforceable by the California Department of Health Services. California MCLs, both Primary and Secondary, are directly applicable to groundwater and surface water resources when they are specifically referenced as water quality objectives in the pertinent Basin Plan. In such cases, MCLs become enforceable limits by the State and Regional Water Boards. When fully health protective, MCLs may also be used to interpret narrative water quality objectives prohibiting toxicity to humans in water designated as a source of drinking water (MUN) in the Basin Plan.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Act is California’s statutory authority for the protection of water quality. Under the act, the state must adopt water quality policies, plans, and objectives that protect the state’s waters for the use and enjoyment of the people. The act sets forth the obligations of the SWRCB and RWQCBs to adopt and periodically update Basin Plans. Basin Plans are the regional water quality control plans required by both the CWA and Porter-Cologne Act in which beneficial uses, water quality objectives, and implementation programs are established for each of the nine regions in California. The act also requires waste dischargers to notify the RWQCBs of their activities through the filing of reports of waste discharge (RWDs) and authorizes the SWRCB and RWQCBs to issue and enforce waste discharge requirements (WDRs), NPDES permits, Section 401 water quality certifications, or other approvals. The RWQCBs also have authority to issue waivers to RWDs and/or WDRs for broad categories of “low threat” discharge activities that have minimal potential for adverse water quality effects when implemented according to prescribed terms and conditions.

California State Nondegradation Policy

In 1968, as required under the Federal antidegradation policy described above, the SWRCB adopted a nondegradation policy aimed at maintaining high quality for waters in California. The nondegradation policy states that the disposal of wastes into state waters shall be regulated to achieve the highest water quality consistent with maximum benefit to the people of the state and to promote the peace, health, safety, and welfare of the people of the state. The policy provides as follows:

- Where the existing quality of water is better than required under existing water quality control plans, such quality would be maintained until it has been demonstrated that any change would be consistent with maximum benefit to the people of the State and would not unreasonably affect present and anticipated beneficial uses of such water.

- Any activity which produces waste or increases the volume or concentration of waste and which discharges to existing high-quality waters would be required to meet waste discharge requirements, which would ensure (1) pollution or nuisance would not occur and (2) the highest water quality consistent with the maximum benefit to the people of the State would be maintained.

Table 3.9-3
Surface Water and Groundwater Quality Standards of Conventional Contaminants

Constituent	Minimum Level Required for Detection[1]	Water Quality Objective (WQO) Source	WQO Value
Conventional Pollutants	**mg/L [2]**		
Oil and Grease	5	Basin Plan	Narrative (3)
Cyanide	0.005	Primary MCL, DPH Title 22 of CCR	150
pH	0–14	Basin Plan	6.5 to 8.5 (range)
Temperature	None	Basin Plan	Narrative (4)
Dissolved Oxygen	Sensitivity to 5 mg/L	Basin Plan	7.0
Bacteria			
Total coliform	<20 mpn/100ml	Basin Plan	Narrative (6)
Fecal coliform	<20 mpn/100ml	Basin Plan	Narrative (6)
E. coli (fresh waters)	<20 mpn/100ml	Basin Plan	Narrative (6)
General	**mg/L [2]**		
Total Phosphorus	0.05	--	--
Turbidity	0.1NTU	Basin Plan	Narrative (7)
Suspended Sediments	2	Basin Plan	Narrative (10)
Total Dissolved Solids	2	Secondary MCL, DPH Title 22 of CCR	500 mg/L
Total Petroleum Hydrocarbon	5	Basin Plan	Narrative (8)
Nitrate	0.1	Primary MCL, DPH Title 22 of CCR	45 mg/L (or 10 mg/L as N)
Nitrite	0.1	Primary MCL, DPH Title 22 of CCR	1 mg/L
Specific Conductance	1umho/cm	Secondary MCL, DPH Title 22 of CCR	900 µmhos/cm
Chloride	2	Secondary MCL, DPH Title 22 of CCR	250 mg/L
Fluoride	0.1	Primary MCL, DPH Title 22 of CCR	2 mg/L
Methyl tertiary butyl ether (MTBE)	1	Primary MCL, DPH Title 22 of CCR	13 µg/L
Metals	**µg/L**		
Aluminum	100	Primary MCL, DPH Title 22 of CCR	1000
Antimony	0.5	Primary MCL, DPH Title 22 of CCR	6
Arsenic	1	EPA Section 304(a)	10 (EPA MCL) 50 (DPH MCL)
Beryllium	0.5	Primary MCL, DPH Title 22 of CCR	4
Cadmium	0.25	Primary MCL, DPH Title 22 of CCR	5
Chromium (total)	0.5	Primary MCL, DPH Title 22 of CCR	50
Copper	0.5	Primary MCL, DPH Title 22 of CCR	1300
Iron	NA	Secondary MCL, DPH Title 22 of CCR	300
Lead	0.5	Primary MCL, DPH Title 22 of CCR	15
Manganese	NA	Secondary MCL, DPH Title 22 of CCR	50
Magnesium		EPA Section 304(a)	10 (EPA MCL) 50 (DPH MCL)

Table 3.9-3
Surface Water and Groundwater Quality Standards of Conventional Contaminants

Constituent	Minimum Level Required for Detection[1]	Water Quality Objective (WQO) Source	WQO Value
Mercury	0.5	Primary MCL, DPH Title 22 of CCR	2
Nickel	1	Primary MCL, DPH Title 22 of CCR	100
Selenium	1	Primary MCL, DPH Title 22 of CCR	50
Silver	0.25	Secondary MCL, DPH Title 22 of CCR	100
Thallium	1	Primary MCL, DPH Title 22 of CCR	2
Zinc	1	Secondary MCL, DPH Title 22 of CCR	5000
Organophosphate Pesticides	**ng/L**		
Chlorpyrifos	10.0	DFG	83 (9)
Diazinon	50.0	DFG	17 (9)
Molinate	2	Primary MCL, DPH Title 22 of CCR	20
Carbofuran	2	Primary MCL, DPH Title 22 of CCR	18
Herbicides	**µg/L**		
Glyphosate	5	Primary MCL, DPH Title 22 of CCR	700
2,4-D	0.02	Primary MCL, DPH Title 22 of CCR	70
2,4,5-TP-SILVEX	0.2	Primary MCL, DPH Title 22 of CCR	50

Notes:
MCL = Maximum Contaminant Level
DPH = California Department of Public Health
CCR = California Code of Regulations
DPH = California Department of Public Health
EPA = U.S. Environmental Protection Agency
WDR = Waste Discharge Requirements
mg/L = milligrams per liter (parts per million)
µg/L = micrograms per liter (parts per billion)
ng/L = nanograms per liter (parts per trillion)
NA = not applicable

[1] From the State Implementation Plan of the California Toxics Rule (SIP CTR), Appendix 4. Note that some Water Quality Objective values are lower than the Minimum Level values.
[2] Unless otherwise noted.
[3] Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
[4] The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Central Valley RWQCB that such alteration in temperature does not adversely affect beneficial uses.
[5] Placeholder.
[6] The most probable number of coliform organisms over any seven-day period shall be less than 2.2MPN/100 ml. This limit would only be applicable for groundwater used for domestic or municipal supply.
[7] The 30-day average for turbidity shall not exceed the following limits:
- More than 1 Nephelometric Turbidity Units (NTUs) where natural turbidity is between 0 and 5 NTUs.
- More than 20% where natural turbidity is between 5 and 50 NTUs.
- More than 10 NTUs where natural turbidity is between 50 and 100 NTUs.
- More than 10% where natural turbidity is greater than 100 NTUs.

[8] The Central Valley RWQCB has prohibited the discharge of oil or any residuary product of petroleum to the waters of the State, except in accordance with waste discharge requirements or other provisions of Division 7, California Water Code.
[9] Aquatic Life guidance Value for 4-Day Average Concentration.
[10] Central Valley RWQCB Basin Plan Narrative Objective: Water shall not contain constituent concentrations that would cause nuisance or adversely affect beneficial uses.

Sources: Central Valley RWQCB 2007a, 2007b

California Toxics Rule and State Implementation Plan

The California Toxics Rule (CTR) was issued in 2000 in response to requirements of the EPA National Toxics Rule (NTR), and establishes numeric water quality criteria for approximately 130 priority pollutant trace metals and organic compounds. The CTR criteria are regulatory criteria adopted for inland surface waters, enclosed bays, and estuaries in California that are subject CWA Section 303(c). The CTR includes criteria for the protection of aquatic life and human health. Human health criteria (water and organism based) apply to all waters with a Municipal and Domestic Water Supply Beneficial Use designation as indicated in the Basin Plans.

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California, also known as the State Implementation Plan (SIP), was adopted by the SWRCB in 2000. It establishes provisions for translating CTR criteria, NTR criteria, and Basin Plan water quality objectives for toxic pollutants into NPDES permit effluent limits, effluent compliance determinations, monitoring for 2,3,7,8-TCDD (dioxin) and its toxic equivalents, chronic (long-term) toxicity control provisions, initiating site-specific water quality objective development, and granting of exceptions for effluent compliance. The goal of the SIP is to establish a standardized approach for the permitting of discharges of toxic effluents to inland surface waters, enclosed bays, and estuaries in a consistent fashion throughout the state.

NPDES Permit System and Waste Discharge Requirements for Construction

The SWRCB and Central Valley RWQCB have adopted specific NPDES permits for a variety of activities that have potential to discharge wastes to waters of the state. The SWRCB's statewide stormwater general permit for construction activity (Order 2009-0009-DWQ) is applicable to all land-disturbing construction activities that would disturb 1 acre or more. The Central Valley RWQCB's general NPDES permit for construction dewatering activity (Order 5-00-175) authorizes direct discharges to surface waters up to 250,000 gallons per day for no more than a 4-month period each year. All of the NPDES permits involve similar processes, including submittal to the Central Valley RWQCB of notices of intent (NOI) to discharge, and implementation of storm water pollution prevention plans (SWPPPs) that include best management practices (BMPs) to minimize those discharges. As mentioned above, the Central Valley RWQCB may also issue site-specific WDRs, or waivers to WDRs, for certain waste discharges to land or waters of the state. In particular, Central Valley RWQCB Resolution R5-2003-0008 identifies activities subject to waivers of RWDs and/or WDRs, including minor dredging activities and construction dewatering activities that discharge to land.

Construction activities subject to the general construction activity permit include clearing, grading, stockpiling, and excavation. Dischargers are required to eliminate or reduce non-stormwater discharges to storm sewer systems and other waters. The permit also requires dischargers to consider the use of permanent postconstruction BMPs that would remain in service to protect water quality throughout the life of the project. All NPDES permits also have inspection, monitoring, and reporting requirements. In response to a court decision, the Central Valley RWQCB also implemented mandatory water quality sampling requirements in Resolution 2001-046 for visible and nonvisible contaminants in discharges from construction activities. Water quality sampling is now required if the activity could result in the discharge of turbidity or sediment to a water body that is listed as impaired under Section 303(d) because of sediment or siltation, or if a release of a nonvisible contaminant occurs. Where such pollutants are known or should be known to be present and have the potential to contact runoff, sampling and analysis is required. NPDES permits require the implementation of design and operational BMPs to reduce the level of contaminant runoff. Types of BMPs include source controls, treatment controls, and site planning measures.

Discharges subject to the SWRCB NPDES general permit for construction activity are subject to development and implementation of a SWPPP. The SWPPP includes a site map and description of construction activities and identifies the BMPs that would be employed to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, and cement) that could contaminate nearby water resources.

On September 2, 2009 the SWRCB approved a new construction general permit (Order 2009-0009-DWQ), which went into effect and replaced Order 99-08-DWQ on July 1, 2010. The new permit differs from Order 99-08-DWQ in the following important ways:

- Risk-Based Permitting Approach: the new general permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk. Risk Level 1 is considered the lowest risk, and Level 3 is considered the highest.

- Rainfall Erosivity Waiver: the new general permit includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their project's given location and time frame compute to be less than or equal to 5.

- Project Site Soil Characteristics Monitoring and Reporting: the new general permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.

- Minimum Requirements Specified: the new general permit imposes more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.

- Technology-Based Numeric Action Levels (NAL): the new general permit includes daily average NALs for pH and turbidity, applicable to projects in Risk Level 2.

- Technology-Based Numeric Effluent Limitations (NEL): the new general permit contains daily average NELs for pH during any construction phase where there is a high risk of pH discharge and daily average NELs turbidity for all discharges in Risk Level 3. The daily average NEL for turbidity is set at 500 NTU to represent the minimum technology that sites need to employ (to meet the traditional Best Available Technology Economically Achievable (BAT)/Best Conventional Pollutant Control Technology (BCT) standard) and the traditional, numeric receiving water limitations for turbidity.

- Effluent Monitoring and Reporting: the new general permit requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to determine compliance with the NELs and evaluate whether NALs included in the General Permit are exceeded.

- Receiving Water Monitoring and Reporting: the new general permit requires some Risk Level 3 dischargers to monitor receiving waters and conduct bio assessments.

- Post-Construction Storm Water Performance Standards: the new general permit specifies runoff reduction requirements for all sites not covered by a Phase I or Phase II MS4 NPDES permit, to avoid, minimize and/or mitigate post-construction storm water runoff impacts. These requirements would not apply to the project due to Phase 1 NPDES MS4 permit described below.

- Rain Event Action Plan: the new general permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.

- Annual Reporting: the new general permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information.

- Certification/Training Requirements for Key Project Personnel: the new general permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific qualifications or certifications as well as attend state-approved training by September 2, 2011 to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.

- Linear Underground/Overhead Projects: the new general permit includes requirements for all Linear Underground/Overhead Projects (LUPs).

NPDES Municipal Stormwater Permit Program

The SWRCB Municipal Storm Water Permitting Program regulates storm water discharges from MS4s. MS4 permits are issued in two phases. Under Phase I, which started in 1990, the RWQCBs have adopted NPDES storm water permits for medium (serving between 100,000 and 250,000 people) and large (serving 250,000 people) municipalities. Most of these permits are issued to a group of co-permittees encompassing an entire metropolitan area. As part of Phase II, the SWRCB adopted a General Permit for the Discharge of Storm Water from Small MS4s (WQ Order No. 2003-0005-DWQ) to provide permit coverage for smaller municipalities. The MS4 permits require the discharger to develop and implement a Storm Water Management Plan/Program with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in Section 402(p) of the CWA. The management programs specify what BMPs will be used to address certain program areas. The program areas include public education and outreach; illicit discharge detection and elimination; construction and post construction; and municipal operations. In general, medium and large municipalities are required to conduct water quality monitoring, though small municipalities are not.

Sacramento County and City of Rancho Cordova Phase I National Pollutant Discharge Elimination System MS4 Permit

Sacramento County and the Cities Rancho Cordova, Folsom, Elk Grove, Citrus Heights, Galt, and Sacramento are co-permittees to the Sacramento Areawide NPDES MS4 permit (Sacramento MS4 permit) issued and enforced by the Central Valley RWQCB. First issued in 1990, the latest permit was adopted on September 11, 2008 (NPDES Permit No. CAS082597, WDR Order No. R5-2008-0142). The permittees formed the SSQP, described in more detail in the next section, to coordinate and implement permit compliance activities. A Stormwater Quality Improvement Plan (SQIP) developed for compliance with the NPDES permit is the guiding document for the permittees (SSQP 2009b) and describes the activities that will be implemented to reduce pollutant discharges in urban runoff to the MEP. The SSQP, in association with the City of Roseville, published the “Stormwater Quality Design Manual for the Sacramento and South Placer Regions” (Stormwater Quality Design Manual) in May 2007, which is currently the guiding technical design document for development and major redevelopment in the City of Rancho Cordova (SSQP 2007).

The City has identified a range of BMPs and measurable goals to address the stormwater discharges in the City. As part of the SQIP, there are several regulations/procedures in place that implement the SQIP that include the Grading and Erosion Control Ordinance (Chapter 16.44 of the existing County Code) and construction standards. A key component of this compliance is implementation of the SQIP new development element that requires stormwater quality treatment and/or BMPs in project design for both construction and operation. Postconstruction stormwater quality controls for new development require use of control measures set forth in the Stormwater Quality Design Manual. This includes the sizing and design criteria for regional detention basins as well as the design and maintenance criteria for on-site stormwater quality source, treatment, and runoff reduction measures.

An important component of the Sacramento MS4 permit requires each permittee (including the City) to update and continue to implement the planning and new development element of its SQIP to minimize the short- and long-term impacts on receiving water quality from new development and redevelopment. The permit requires the continued implementation of the permittees’ development standards during the entitlement and CEQA process and the development plan review process. Specifically, the Sacramento MS4 permit identifies the need to address changes in the hydrograph, defined as hydrograph modification or hydromodification, which could result from urbanization of a watershed, and to require low impact development (LID) controls to more closely mimic the pre-developed hydrologic condition. To address hydromodification, the permit requires the permittees to prepare and implement a Hydromodification Management Plan (HMP), which will entail revising development standards and associated technical guidance (aka Stormwater Quality Design Manual). Technical guidance will also be updated to incorporate new LID requirements.

Recycled Wastewater Requirements

A non-potable (i.e., recycled or remediated groundwater) water distribution system would be implemented as part of the project. Wastewater recycling in California is regulated under Title 22, Division 4, of the CCRs under the jurisdiction of CDPH. The intent of these regulations is to ensure protection of public health associated with the use of recycled water. Because the project includes a reclaimed water distribution system, also known as a “purple pipe” system, these regulations would apply (purple is the color commonly used to identify reclaimed water conveyance facilities). The regulations establish acceptable levels of constituents in recycled water for a range of uses and prescribe means for ensuring reliability in the production of recycled water. Using recycled water for nonpotable uses is common throughout the state and is an effective means of maximizing use of water resources. The Central Valley RWQCB establishes water reclamation requirements under the Title 22 regulations and is responsible for implementing wastewater recycling projects.

Senate Bill 5

SB 5, signed into law on October 10, 2007, enacts the Central Valley Flood Protection Act of 2008. Requirements of DWR and the CVFP Board (previously known as the State Reclamation Board) under SB 5 are:

- To prepare and adopt a Central Valley Flood Protection Plan (the Plan) (described below) by 2012.
- To establish 200-year (0.005 AEP) protection as the minimum urban level of flood protection, effective with respect to specific development projects as of 2015 or 2025, as explained below.
  - DWR is directed to produce preliminary (i.e. Best Available) maps for 100-year (0.01 AEP) and 200-year (0.005 AEP) floodplains protected by project levees, and to make them available to cities and counties in the Sacramento-San Joaquin Valley (“Central Valley”). (California Water Code Section 9610[a].) These best available maps were made available on September 8, 2008, and can be found at the California Department of Water Resources website: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/. The 200-year floodplain (0.005 AEP) as defined by California Water Code Section 9610[a], pursuant to SB 5 has not been delineated within the SPA.
- Sets deadlines for cities and counties in the Central Valley to amend their general plans and their zoning ordinances to conform to the Plan within 24 months and 36 months (i.e., approximately 2014 and 2015), respectively, of its adoption.
- Obligates Central Valley counties to develop flood emergency plans within 24 months of adoption of the Plan.

DWR must propose amendments to the California Building Standards Code (Building Code) to protect areas with flood depths anticipated to exceed 3feet for the 200-year flood (0.005 AEP) event. SB 5 requires that the Building Code amendments are designed to reduce the risk of flood damage and increase safety.

No later than 2015, but potentially sooner depending on when the Central Valley Flood Protection Plan takes effect, SB 5 prohibits local governments from entering development agreements or approving entitlements or permits, including ministerial permits resulting in construction of a new residence in a flood hazard zone, which result in construction of a new residence in a flood zone unless one of three conditions are met:

- flood management facilities provide level of protection necessary to withstand 200-year flood event (0.005 AEP);

- the development agreement or other entitlements include conditions that provide protections necessary to withstand 200-year flood event (0.005 AEP); or

- the local flood management agency has made adequate progress on construction of a flood protection system that shall result in protections necessary to withstand 200-year flood event (0.005 AEP) by 2025.

Central Valley Flood Protection Plan

The Central Valley Flood Protection Plan (as set forth in California Water Code, Section 9614) is a descriptive document that includes the following elements:

- a description of the Flood Management System, its performance, and the challenges to modifying it;

- a description of the facilities included in the State Plan of Flood Control;

- a description of probable impacts of projected climate change, land-use patterns, and other potential challenges;

- an evaluation of needed structural improvements and a list of facilities recommended for removal; and

- a description of both structural and nonstructural methods for providing an urban level of flood protection to currently urbanized areas in the Central Valley.

Regional and Local Plans, Policies, Regulations, and Ordinances

City of Rancho Cordova General Plan

Goals and policies of the *City of Rancho Cordova General Plan* (City General Plan 2006) related to hydrology and water quality that are applicable to the Proposed Project and the alternatives under consideration are listed in Appendix K.

Sacramento Stormwater Quality Partnership

The permittees of the NPDES Municipal Stormwater Permit described above, i.e. the Sacramento County and the Cities of Rancho Cordova, Sacramento, Citrus Heights, Elk Grove, Galt, and Folsom, have joined together to form the SSQP. The SSQP is a collaborative partnership that protects and improves water quality in local waterways for the benefit of the community and the environment. The goals of the SSQP are to:

- improve the quality of urban runoff;
- increase public awareness about water quality and encourage pollution prevention behavior;
- strive for countywide consistency between permittee agency programs;
- improve internal communication and coordination to facilitate agency wide compliance;
- use public funds efficiently and effectively; and
- keep apprised of new and evolving regulations that may affect the Program in the future.

The permittees cooperatively participate in decision-making and goal-setting for the monitoring program, are involved in consultant selection and review, and comment on compliance reports and other work products. Annual Reports are produced that describe the activities conducted to comply with the NPDES permit.

The stormwater pollution prevention efforts needed to satisfy the NPDES permit (Order R5-2008-0142) requirements are implemented by the SSQP through its SQIP, either jointly or by the individual permittees. The major categories of SQIP activities, conducted jointly by the SSQP, are:

- program management – including legal authority and funding, inter- and intra-agency coordination, effectiveness assessment;
- target pollutant program (including implementation of plans to target mercury and pesticides);
- monitoring program to satisfy monitoring requirements specified in the monitoring and reporting program (MRP) portion of the NPDES permit;
- some planning and new development standards such as Hydromodification and LID standards;
- special studies; and
- regional public outreach.

3.9.3 Environmental Consequences and Mitigation Measures

Thresholds of Significance

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Project or alternatives under consideration were determined to result in a significant impact related to hydrology and water quality if they would do any of the following:

- violate any water quality standards or waste discharge requirements, including NPDES waste discharge or stormwater runoff requirements, state or Federal antidegradation policies, enforceable water quality standards contained in the Central Valley RWQCB Basin Plan or statewide water quality control plans, or Federal rulemakings to establish water quality standards in California;
- substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a substantial lowering of the level of the local groundwater table;
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on-site or off-site; or that would increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;
- create or contribute runoff water that would exceed the capacity (peak flow) of existing or planned stormwater drainage systems;
- substantially degrade water quality;
- place within a 100-year (0.01 AEP) flood hazard area housing, or structures that would impede or redirect flood flows; or
- expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.

ANALYSIS METHODOLOGY

This analysis relies on information provided by various public agencies, as well as site-specific technical planning studies generated to support proposed development. Hydrology and drainage-related studies reviewed in support of this analysis include the following documents:

- *Regional Master Drainage Study for SunCreek Specific Plan.* (MacKay & Somps Civil Engineers Inc. 2011b, Appendix D);
- *Updated Storm Drain Demands SunCreek Specific Plan Rancho Cordova, CA* (MacKay & Somps Civil Engineers Inc. 2010a, Appendix Q);
- *Shalako Detention Basin Alternative* (MacKay & Somps Civil Engineers Inc. 2010b, Appendix E);
- *Community Park Detention Basin* (MacKay & Somps Civil Engineers Inc. 2010c, Appendix F);
- *Stand-Alone Detention Basin Alternative* (MacKay & Somps Civil Engineers Inc. 2010d, Appendix G);
- *Sacramento City/County Drainage Manual Volume 2: Hydrology Standards*. County of Sacramento Department of Water Resources, December 1996 (Sacramento County 1996); and
- *Stormwater Quality Design Manual for the Sacramento and South Placer Regions* (SSQP 2007).

Impacts associated with drainage, hydrology, and water quality that could result from construction and operational activities related to buildout of the project were evaluated based on expected construction practice, the materials used, and the locations and duration of the activities. The effects of the proposed development were compared to environmental baseline conditions (i.e., existing conditions) to determine the duration and magnitude of impacts. Impacts associated with the use of the proposed non-potable water system are evaluated in Section 3.16, "Utilities and Service Systems."

ISSUES NOT EVALUATED FURTHER IN THIS EIR/EIS

Potential Damage from a 200-Year Flood Event—The requirements of SB 5 are not applicable to the SPA for the following reasons: (1) the SPA is not located within an area protected by either on- or off-site levees; (2) the project has been designed such that the 100-year floodplain within the SPA would be contained within the on-site preserve area and would not encroach into developable portions of the SPA; (3) neither the City nor the County have required flood analysis of the SPA above the 100-year event; and (4) the project has been designed to ensure that post-development 100-year runoff is equal to or lower than existing 100-year runoff. Therefore, there would be no impact related to SB 5 requirements for flood protection for a 200-year storm event, and this issue is not evaluated further in this EIR/EIS.

IMPACT ANALYSIS

Impacts that would occur under each alternative development scenario are identified as follows: NP (No Project), NCP (No USACE Permit), PP (Proposed Project), BIM (Biological Impact Minimization), CS (Conceptual Strategy), and ID (Increased Development). The impacts for each alternative are compared relative to the PP at the end of each impact conclusion (i.e., similar, greater, lesser).

IMPACT 3.9-1 **Potential Temporary, Short-Term Construction-Related Drainage and Water Quality Effects.** *Construction activities during project implementation would involve extensive grading and movement of earth, which would substantially alter on-site drainage patterns and could generate sediment, erosion, and other nonpoint source pollutants in on-site stormwater that could drain to off-site areas and degrade local water quality.*

NP

Under the No Project Alternative, the project would not be developed and no project-related construction disturbances would occur. Therefore, there would **no direct** or **indirect** project-related impacts to drainage patterns or water quality. ***[Lesser]***

NCP, BIM, CS

The No USACE Permit Alternative, Biological Impact Minimization Alternative, or the Conceptual Strategy Alternative would have reduced construction activity as compared to the Proposed Project Alternative and the total number of residential units that would be constructed would be smaller. However, implementation of these alternatives would still include substantial construction activity over approximately 655, 840, and 940 acres, respectively. Under the No USACE Permit Alternative, because project components would be reconfigured to avoid the placement of dredged or fill material into wetlands and other waters of the U.S., approximately 360 fewer acres would be disturbed and developed as compared to the Proposed Project Alternative. Impacts under the Biological Impact Minimization Alternative would also be less than those of the Proposed Project Alternative because an additional approximately 180 acres of land across the SPA would be preserved for biological habitat. Finally, the Conceptual Strategy Alternative would preserve an additional approximately 107 acres more than the Proposed Project Alternative as a conservation area. This would result in fewer acres of development and associated disturbance than the Proposed Project Alternative. However, under all of these alternatives, substantial temporary, construction-related alteration of the existing drainages would still occur, which could result in impacts on water quality within on-site drainage channels and ultimately off-site drainage channels. Temporary, short-term construction-related disturbances at the SPA would have the potential to result in the discharge of polluted and/or contaminated stormwater or sedimentation. Impacts would likely occur at a similar or slightly lower level than under the Proposed Project Alternatives because similar construction activities would occur over a smaller extent of the SPA. Therefore, the **direct** and **indirect** project-related erosion and water quality impacts would be **significant**. ***[Lesser]***

Mitigation Measure 3.9-1: Acquire Appropriate Regulatory Permits and Prepare and Implement an Erosion and Sediment Control Plan, SWPPP, and BMPs.

As required by the Land Grading and Erosion Control Ordinance (Chapter 16.44 of County and City of Rancho Cordova Municipal Codes), projects disturbing 350 cubic yards or more of soil or one or more acres of land shall prepare an erosion and sediment control plan specifying best management practices (BMPs) for erosion and sediment control. This erosion and sediment control plan shall be checked in the field by the City inspector during construction.

Prior to the issuance of grading permits, the project applicants for any particular discretionary development application disturbing one or more acres (including phased construction of smaller areas which are part of the larger project) shall obtain coverage under the SWRCB's NPDES stormwater permit for general construction activity (Order 2009-0009-DWQ), including preparation and submittal of a project-specific storm water pollution prevention plan (SWPPP) at the time the NOI to discharge is filed. The project applicants shall also prepare and submit any other necessary erosion and sediment control and engineering plans and specifications for pollution prevention and control to the City of Rancho Cordova Public Works Department. The SWPPP and other appropriate plans shall identify and specify:

- the use of an effective combination of robust erosion and sediment control BMPs and construction techniques accepted by the City for use in the project area at the time of construction, that shall reduce the potential for runoff and the release, mobilization, and exposure of pollutants, including legacy sources of mercury from project-related construction sites. These may include but would not be limited to temporary erosion control and soil stabilization measures, sedimentation ponds, inlet protection, perforated riser pipes, check dams, and silt fences;

- the implementation of approved local plans, non-stormwater management controls, permanent post-construction BMPs, and inspection and maintenance responsibilities;

- the pollutants that are likely to be used during construction that could be present in stormwater drainage and nonstormwater discharges, including fuels, lubricants, and other types of materials used for equipment operation;

- the means of waste disposal;

- spill prevention and contingency measures, including measures to prevent or clean up spills of hazardous waste and of hazardous materials used for equipment operation, and emergency procedures for responding to spills;

- personnel training requirements and procedures that shall be used to ensure that workers are aware of permit requirements and proper installation methods for BMPs specified in the SWPPP; and

- the appropriate personnel responsible for supervisory duties related to implementation of the SWPPP.

Where applicable, BMPs identified in the SWPPP shall be in place throughout all site work and construction/demolition activities and shall be used in all subsequent site development activities. BMPs may include, but are not limited to, such measures as those listed below.

- Implementing temporary erosion and sediment control measures in disturbed areas to minimize discharge of sediment into nearby drainage conveyances, in compliance with state and local standards in effect at the time of construction. These measures may include silt fences, staked straw bales or wattles, sediment/silt basins and traps, geofabric, sandbag dikes, and temporary vegetation.

- Establishing permanent vegetative cover to reduce erosion in areas disturbed by construction by slowing runoff velocities, trapping sediment, and enhancing filtration and transpiration.

- Using drainage swales, ditches, and earth dikes to control erosion and runoff by conveying surface runoff down sloping land, intercepting and diverting runoff to a watercourse or channel, preventing sheet flow over sloped surfaces, preventing runoff accumulation at the base of a grade, and avoiding flood damage along roadways and facility infrastructure.

A copy of the approved SWPPP shall be maintained and available at all times on the construction site.

Implementation: Project applicants for any particular discretionary development application.

Timing: Submittal of the State Construction General Permit NOI and SWPPP (where applicable) and development and submittal of any other locally required plans and specifications before the issuance of grading permits for each particular discretionary development application and implementation throughout project construction.

Enforcement: City of Rancho Cordova Public Works Department, State Water Resources Control Board, and Central Valley Regional Water Quality Control Board.

PP

Implementation of the Proposed Project Alternative would take place over approximately 1,000 acres. Construction activities associated with the project, including vegetation removal, grading, staging, trenching, and excavation, would expose soils to erosive forces and might transport sediment into local drainages, increasing turbidity, degrading water quality, and resulting in siltation to local waterways. Although the SPA is generally characterized as rolling terrain, the greatest topographic changes occur along the tributaries of Laguna Creek (e.g., Kite Creek), which generally slope from the northeast to the southwest. Localized erosion hazards may be high where the SPA topography is steeper. Intense rainfall and associated stormwater runoff in relatively flat areas could result in short periods of sheet erosion within areas of exposed or stockpiled soils. If uncontrolled, these soil materials could cause sedimentation and blockage of drainage channels. Further, the compaction of soils by heavy equipment may further reduce the infiltration capacity of soils and increase the potential for runoff and erosion.

Non-stormwater discharges could result from activities such as construction dewatering procedures, or discharge or accidental spills of hazardous substances such as fuels, oils, petroleum hydrocarbons, concrete, paints, solvents, cleaners, or other construction materials. This contaminated runoff could enter on-site drainage channels and ultimately drain off-site to downstream waterbodies, including Kite Creek, Laguna Creek, and ultimately the Sacramento River. Erosion and construction-related wastes have the potential to degrade existing water quality and beneficial uses by altering the dissolved oxygen content, temperature, pH, suspended sediment and turbidity levels, or nutrient content, or by causing toxic effects in the aquatic environment. Therefore, project-related construction activities could violate water quality standards or cause direct harm to aquatic organisms.

As described in the Draft SunCreek Specific Plan (2010:I.6-5, attached as Appendix C), nonstructural as well as structural BMPs would be used during construction activities to decrease storm water discharge. The nonstructural measures could include grading controls such as timing, staging, setbacks and buffers, and restrictions on open areas. Nonstructural measures could also include housekeeping techniques involving limitations on material storage and disposal, soil stabilization of all roads and entrances, dust control, and mandatory site cleanup. Because the Proposed Project Alternative would disturb large areas of land, substantially alter on-site drainage patterns, and could result in impacts on water quality within on-site drainage channels and ultimately off-site drainage channels as a result of temporary, short-term construction activities, the **direct** and **indirect** project-related erosion and water quality impacts would be **significant**. ***[Similar]***

Mitigation Measure: Implement Mitigation Measure 3.9-1.

ID

Implementation of the Increased Development Alternative would include substantial construction activity over approximately 1,170 acres. This alternative would preserve approximately 150 acres less than the Proposed Project Alternative for conservation/wetlands. In addition, the Increased Development Alternative would include a larger number of total dwelling units than the Proposed Project Alternative. Because the Increased Development Alternative would disturb large areas of land, substantially alter on-site drainage patterns, and could result in impacts on water quality within on-site drainage channels and ultimately off-site drainage channels as a result of temporary, short-term construction activities, the **direct** and **indirect** project-related erosion and water quality impacts would be **significant**. ***[Greater]***

Mitigation Measure: Implement Mitigation Measure 3.9-1.

Implementation of Mitigation Measure 3.9-1 would reduce the significant temporary, short-term construction-related drainage and water quality impacts under the No USACE Permit, Proposed Project, Biological Impact

Minimization, Conceptual Strategy, and Increased Development Alternatives to **a less-than-significant level** by requiring preparation and implementation of a SWPPP with appropriate BMPs such as source control, revegetation, and erosion control, to maintain surface water quality conditions in adjacent receiving waters.

Several technical studies have been conducted regarding the impacts of water quality control features on groundwater (e.g., City of Fresno Nationwide Urban Runoff Project [as summarized in EPA 1983] and *California Storm Water Best Management Practices Handbook* prepared by the California Stormwater Quality Association [CASQA] [CASQA 2010]) and surface water (e.g., *Preliminary Data Summary of Urban Storm Water Best Management Practices* [EPA 1999] and *Truckee River Basin Stormwater Management Program, Program Years 2007-2012* [County of Placer 2007]). These studies have identified that water quality control features such as revegetation, erosion control measures detention/sedimentation, and infiltration basins have been successful in controlling water quality and avoiding water quality impacts (metals and organic compounds associated with stormwater are typically lost within the first few feet of the soil of the retention basins associated with groundwater). Further, technical studies associated with the Lahontan Development demonstrated that the use of a variety BMPs such as source control, detention/sedimentation basins, revegetation, and erosion control, have been able to maintain surface water quality conditions in adjacent receiving waters.

IMPACT 3.9-2 **Potential Increased Risk of Flooding and Hydromodification from Increased Stormwater Runoff.** *Project implementation would increase the amount of impervious surfaces on the SPA, thereby increasing surface runoff. This increase in surface runoff would result in an increase in both the total volume and the peak discharge rate of stormwater runoff, and therefore could result in greater potential for on- and off-site flooding.*

NP

Under the No Project Alternative, the existing hydrology and drainage conditions at the SPA would not be altered because no project-related development would occur. Thus, **direct** and **indirect** project-related impacts from increased flooding and hydromodification would be **less than significant**. ***[Lesser]***

NCP, BIM, CS

The amount of stormwater runoff would likely be lower under the No USACE Permit, Biological Impact Minimization, and Conceptual Strategy Alternatives than under the Proposed Project Alternative because of the decreased development areas (approximately 38%, 16%, and 7 % less than the Proposed Project Alternative, respectively) and associated decreases in impervious surfaces of residential and commercial land uses, as shown in Exhibits 2-20 (NCP), 2-22 (BIM), and 2-24 (CS) in Chapter 2, "Alternatives."

To eliminate any flow increase, exceedances of the capacity (peak flow) of existing or planned stormwater drainage systems, or unacceptable hydromodification caused by project development to Kite Creek, stormwater detention facilities and basin outlet control devices would be constructed to maintain peak storm flows at no greater than the level existing before development. However, since final designs, specifications, and modeling for these three alternatives have not been performed, or submitted to or approved by the City, implementation of the No USACE Permit, Biological Impact Minimization, and Conceptual Strategy Alternatives could result in **potentially significant, direct** and **indirect** impacts related to stormwater runoff and the subsequent risk of flooding. ***[Lesser]***

Mitigation Measure 3.9-2: Prepare and Submit Updated Regional Master Drainage Studies and Final Drainage Plans and Implement Requirements Contained in Those Plans.

Before approval of the first large lot tentative subdivision map in the SPA, the project applicants shall:

1. Submit an updated Regional Master Drainage Study for the SPA to the City demonstrating to the satisfaction of the City of Rancho Cordova Public Works Department that:

   - the proposed stormwater detention basins are appropriately sized in compliance with the SSQP's NPDES Permit and the draft Hydromodification Management Plan (as finally adopted by the Central Valley RWQCB) so that hydromodification would not increase from predevelopment levels enough to alter existing stream geomorphology. Drainage improvements shall be designed to address hydromodification impacts caused by development using methods approved by the SSQP and/or City of Rancho Cordova Public Works Department;

   - the stormwater detention basins will drain by gravity;

   - the stormwater detention basins can be designed to minimize long-term maintenance, especially as it relates to the basin outlet structures; and

   - the depth and duration of the existing flooding problem at the Sunrise Boulevard crossing of Laguna Creek is not substantially increased by project development.

2. Prepare and submit a Conditional Letters of Map Revision (CLOMR) to FEMA showing the existing 100-year (0.01 AEP) floodplain for the existing site (existing conditions).

Furthermore, before the approval of grading plans, site improvements, and/or building permits, the project applicants for any particular discretionary development application shall obtain an approved CLOMR from FEMA and submit a final construction level drainage study and plans to the City demonstrating that project-related on-site runoff would be appropriately contained in detention basins or managed with other improvement s (e.g., source controls using LID techniques) to maintain peak storm flows at no greater than the level existing before development and to accommodate flows based on a 100-year storm event, as required by the Sacramento County Flood Control Ordinance.

The drainage study and plans shall include all the items required for tentative map level study. In addition, the drainage study and plans shall include, but not be limited to, the following items:

- an accurate calculation of pre-project and post-project runoff for the final design scenario, obtained using appropriate engineering methods, that accurately evaluates potential changes to runoff, including increased surface runoff;

- runoff calculations for the 10-year and 100-year (0.01 AEP) storm events (and other, smaller storm events as required) shall be performed and the trunk drainage pipeline sizes confirmed based on alignments and finalized detention facility locations;

- a description of the proposed maintenance program for the on-site drainage system; and

- City flood control design requirements and measures designed to comply with them.

Implementation of stormwater management BMPs that avoid increases in the erosive force of flows beyond a specific range of conditions shall limit hydromodification and maintain current stream geomorphology. BMPs may include, but are not limited to, the use of LID techniques to limit increases in stormwater runoff at the point of origination (these may include, but are not limited to: surface swales; replacement of conventional impervious surfaces with pervious surfaces [e.g., porous pavement]; impervious surfaces disconnection; and trees planted to intercept stormwater). These BMPs may be designed and constructed in accordance with the forthcoming SSQP Hydromodification Management Plan (to be adopted by the Central Valley RWQCB), as appropriate.

The final drainage plan shall demonstrate to the satisfaction of the City of Rancho Cordova Community Development and Public Works Departments that 100-year (0.01 AEP) flood flows would be appropriately channeled and contained, such that the risk to people or damage to structures within or down gradient of the SPA would not occur, and that hydromodification would not be increased from pre-development levels such that existing stream geomorphology would be changed. The range of conditions should be calculated for each receiving water (if feasible), as approved by the SSQP and/or City of Rancho Cordova Public Works Department).

Implementation: Project applicants during each particular discretionary development phase.

Timing: Before approval of grading plans and building permits of all project phases.

Enforcement: City of Rancho Cordova Public Works Department.

PP

Project implementation would include development on approximately 863 acres of land, most of which has not been previously developed. The Proposed Project Alternative includes residential and commercial development, and supporting facilities and services, including parks, schools, and major circulation and roadway infrastructure. The various types of proposed land uses would each contribute different relative amounts of stormwater runoff corresponding to the percentage of impervious surface associated with each land use category, which ranges from 2% (wetlands/open space) to 95% (major roads, parking, and stormwater detention) (County of Sacramento Department of Water Resources 1996:5-7). This increase in impervious surface would increase the peak discharge rate of stormwater runoff generated on the SPA.

A Regional Master Drainage Study (RMDS) has been prepared that details the proposed drainage system (MacKay & Somps 2011b) and includes modeling of additional drainage alternatives. The proposed stormwater drainage system has been designed to satisfy the design criteria of the SSQP, FEMA National Flood Insurance Program requirements, and the NPDES requirements. The Proposed Project Alternative would use an on-site conveyance and detention/water quality treatment system and the conveyance of off-site flows through the property as described in detail in Chapter 2, “Alternatives.”

The hydrologic analysis in the RMDS is based on procedures outlined in the Sacramento City/County Drainage Manual, Volume 2 Hydrology Standards (County of Sacramento Department of Water Resources 1996), the County of Sacramento Municipal Services Agency Improvement Standards (County of Sacramento 2006), and the Floodplain Management Ordinance (County of Sacramento 2007). The USACE HEC-RAS program (version 3.1.3) was used to model the Proposed Project Alternative using the unsteady state routines to determine the peak flow and hydraulic grade line for the 10-year 24-hour, 100-year 24-hour, and 100-year 10-day design storms. The 100-year, 10-day storm was found to generate larger detention volume and therefore, all detention basins were sized based on the 100-year, 10-day storm (see Table 3.9-5). The following three scenarios were modeled:

1. **Existing Conditions:** This scenario establishes existing base flow conditions without project development. The only developed land within the SunCreek Drainage Study Area is a 200-acre subdivision known as Anatolia III. The remainder of the watershed is modeled as undeveloped land. (This scenario is the “CEQA baseline” condition.)

2. **Developed Condition**: This scenario is based on a fully developed SPA, utilizing the Existing Conditions model as a starting point and adding in the SunCreek land use plan without peak flow attenuation. The Anatolia III development was modeled the same as in the Existing Conditions scenario (developed) and the remainder of the watershed was also modeled the same as Existing Conditions (undeveloped).

3. **“Baseline” Conditions:** This scenario includes the fully developed SPA with water quality and detention basins sized so that the post-project flow rates and durations do not exceed the pre-project conditions flow rates (i.e., with peak flow attenuation). The Anatolia III development was modeled the same as in the Existing Conditions scenario (developed) and the remainder of the watershed was also modeled the same as Existing Conditions (undeveloped). This modeling scenario is not the “CEQA baseline”; rather, it serves as the necessary starting point for modeling of additional hydrologic alternatives where the SPA is fully developed and flow rates are attenuated, so that the effects of existing and projected development adjacent to the project site can be studied in various ways and the most effective on-site hydrologic solutions (with peak flow attenuation) can be determined.

There are two upstream undeveloped off-site areas that drain into the SPA, one of which is a portion of The Ranch at Sunridge project located north of North Campus Drive, and the other is the Anatolia III project, located at the southeast corner of Rancho Cordova Parkway and Kiefer Boulevard. The RMDS assumes that these two upstream off-site areas are developed and they are therefore included in the sizing of the downstream SPA extended duration detention basin.

As described in Section 3.9.1, “Affected Environment,” the Morrison Creek Watershed is located north of the Laguna Creek Watershed. A portion of the runoff from the 100-year, 24-hour storm occurring in the Morrison Creek Watershed has been found to spill (“Morrison Spill”) into the Laguna Creek Watershed. The Morrison Spill occurs within an open space preserve area located north of Kiefer Boulevard and east of Sunrise Boulevard and traverses through the open space preserve, cross’s under Kiefer Boulevard, continues through the SPA and eventually connects to Kite Creek. To minimize the impact to the SPA, the Morrison Spill would be intercepted at the Kiefer Boulevard culverts and routed around the SPA. The 72-inch diameter pipeline used to accomplish the rerouting of the Morrison Spill was sized to convey the higher peak flow of 243 +/- cubic feet per second (cfs) generated by the 100-year, 10-day storm rather than the peak flow rate of 127 +/- cfs generated by the 100-year, 24-hour storm. The velocity energy would be dissipated in the new outlet structure before the flow enters the preserve/open space area and Kite Creek. Since the Morrison Spill originates from the adjacent Morrison Creek Watershed through existing water quality and detention basins, the SunCreek RMDS treats the Morrison Spill as an existing condition flow that does not require additional water quality treatment or detention within the SPA and will be designed for stormwater quality management and hydromodification management per the SSQP’s draft Hydromodification Management Plan and the Stormwater Quality Design Manual.

Ten principles are described in the SunCreek Specific Plan to protect and manage the proposed preserve area within the SPA. Principle 3 sets the standard to “manage stormwater flows to minimize changes to the existing flow regime and to maintain or improve existing water quality in the Preserve Areas, including minimizing changes to the baseline flows in receiving waters to the extent practicable and not allowing untreated discharges to occur to the aquatic resources in the Preserve Areas” (Draft SunCreek Specific Plan:6-4, Appendix C). To meet this standard, multiple detention basins would be distributed throughout the SPA.

County guidelines require that peak storm water flows (measured at the edge of a project) after development of the SPA (post development) not exceed predevelopment peak flows. Peak runoff flows and volumes would increase in the SPA as a result of the planned development. As illustrated in Exhibit 2-5 (see Chapter 2, “Alternatives”) and McKay & Somps 2011b, the Proposed Project Alternative includes facilities that are designed to maintain stormwater flows originating on the SPA during and after buildout, at a level equal to or less than predevelopment flows. It should be noted that existing flooding currently occurs along Laguna Creek at Jackson Highway and Sunrise Boulevard, to the south of the southwestern corner of the SPA. The Proposed Project Alternative would not contribute to additional flooding at this location. On-site extended duration detention basins would be constructed as part of the project. The extended duration detention basins would reduce the developed storm runoff rates for the 10-year, 24-hour storm and the 100-year, 24-hour storms in the SPA to less than the predevelopment storm runoff rates (MacKay & Somps 2011b:44).

Summer nuisance flows have become an area of concern for the County of Sacramento. Summer nuisance flows occur during the dry (summer) season and are mostly generated from residential developments by over irrigation of landscaping, washing of vehicles, and other domestic uses that results in water running off of the development. Ephemeral tributaries that did not typically receive water runoff during the summer could become a perennial tributary due to summer nuisance flows. The County of Sacramento and the USACE require that an existing ephemeral tributary not become a perennial tributary after development occurs in the watershed. The RMDS has addressed the impacts of summer nuisance flows by designing percolation trenches into the detention basins. Summer nuisance flows that exceed the evaporation rate and percolation rate of the wet-water quality basin would be percolated into the ground through specially designed and constructed percolation trenches placed in the bottom of the extended duration detention basin. The percolation trenches would be sized to percolate 100% of the summer nuisance flows. Calculations completed in the RMDS show that the typical proposed detention basins can reduce the summer nuisance flow to a level that would not result in the conversion of existing ephemeral tributaries to perennial tributaries (MacKay & Somps 2011b:16).

In addition to the use of extended duration detention basins, BMPs would be used within the developed areas, such as vegetated swales, infiltration trenches, and constructed wetland filter strips, to manage and treat storm water. Detention in parking areas, streets, paseos, and pedestrian corridors in the form of swales and small basins would also be provided. The primary existing drainage corridor (Kite Creek) would also remain in place because this portion of the SPA would remain in permanent open space and would continue to provide natural storage capacity.

Modeling results of peak flows at 13 compliance point locations under the Proposed Project Alternative were compared for the 10-year and 100-year (0.01 AEP), 24-hour storm events, as shown in Table 3.9-4. The results in Table 3.9-4 show that the modeled developed conditions scenario, with a fully developed SPA and without peak flow attenuation, would generate peak flow storm runoff rates well above the modeled existing conditions peak flow storm runoff rates. The results presented in Table 3.9-4 also show that with the detention basin facilities as proposed, the 100-year (0.01 AEP) and 10-year storm events under the Proposed Project Alternative development conditions ("Baseline" Conditions) would remain at or below existing conditions. In one case (Compliance Point 12 under the 10-year, 24-hour scenario), a small increase in peak flow rates was identified in the modeling results. This difference is not significant since it was modeled as a "steady state" condition in SacCalc and not as an "unsteady state" condition in HEC-RAS where the effects of attenuation would be considered at a detailed level. HEC-RAS modeling was not possible on this stream at this stage in the design process. It is the professional judgment of the engineers who modeled this stream (MacKay & Somps) that this difference will be eliminated when this stream is modeled HEC-RAS during final design. Modified outlet facilities would be provided to reduce the flow to pre-project conditions if it is determined during detailed design studies (submitted with small-lot tentative subdivision maps and/or improvement plans) that downstream facilities would be affected. Table 3.9-5 summarizes the detention basin storage volumes and maximum detention basin discharge rates for each of the 12 proposed detention basins that would be required to maintain existing flow rates after project development. The proposed locations of the 12 detention basins are shown on Exhibits 2-4 and 2-5 in Chapter 2, "Alternatives."

An analysis was conducted in 2010 to update the storm drain demands to incorporate the minor land use changes that have occurred in the SunCreek Specific Plan. These changes in land use principally relate to the addition of more employment-related (commercial) land uses in place of low density, medium density and compact density residential land uses. The total impervious area of the current land use plan is slightly less than that of the prior land use plan and therefore the findings of the RMDS are slightly conservative, as the analysis was based on the prior land use plan (McKay & Somps 2011b:10). A review of updated land use plans was conducted by McKay & Somps to determine the continued adequacy of the RMDS evaluation. The results of this study indicated that total storm drain demands are nearly identical to those analyzed in the RMDS and therefore, it is reasonable to conclude that the size, location, and general approach for stormwater management provided in the RMDS are still adequate (McKay & Somps 2011b:Appendix H). A comparison of the storm drain demands resulting from the prior and updated land use plans is shown in Table 3.9-6. The 1.5% increase in cumulative projected storm drain demands, based on land use changes, would result in insignificant adjustments to the peak flow and hydromodification requirements and any adjustments to basins would be able to be contained within the developable footprint.

Table 3.9-4
Modeled Peak Flow Results at Project Compliance Point Locations

Compliance Point	Creek Section Station	Existing Conditions 10-Year, 24-hour Peak Flow Rate (cfs)	Developed Conditions 10-Year, 24-hour Peak Flow Rate (cfs)	"Baseline" Conditions 10-Year, 24-hour Peak Flow Rate[1] (cfs)	Existing Conditions 100-Year, 24-hour Peak Flow Rate (cfs)	Developed Conditions 100-Year, 24-hour Peak Flow Rate (cfs)	"Baseline" Conditions 100-Year, 24-hour Peak Flow Rate[1] (cfs)
1	0+00	1,025	1,292	N/A	1,801	2,076	1,737
2	36+00	1,036	1,306	N/A	1,810	2,086	1,740
3	70+00	989	1,244	N/A	1,741	1,957	1,632
4	76+19	848	1,040	808	1,501	1,607	1,354
5	80+95	848	1,045	809	1,504	1,607	1,354
6	82+00	849	1,048	811	1,508	1,607	1,354
7	112+05	826	1,050	763	1,518	1,773	1,321
8	152+00	402	700	372	669	1,155	631
9	61+45	N/A	N/A	N/A	127	127	127
10	184+50	386	600	293	635	994	512
11	212+00	332	499	216	591	835	347
12		157	161	161[2]	271	266	266
13		138	138	138	234	234	234

Note: cfs = cubic feet per second; N/A = not applicable

[1] "Baseline" Conditions peak flows include the rerouting of the Morrison Spill through the proposed 72-inch-diameter pipeline in Kiefer Boulevard.

[2] Modeled "Baseline" Conditions peak flows are greater than Existing Conditions peak flows. This is a reasonable conclusion since this modeling was performed as a "steady state" condition in SacCalc and not as an "unsteady state" condition in HEC-RAS. Therefore, it is the professional judgment of the engineers who modeled this stream (MacKay & Somps) that this higher peak flow rate will be eliminated when this configuration of detention basins is modeled HEC-RAS during final design.

Source: MacKay & Somps 2011b:20, 22, 26.

Table 3.9-5 Modeled Peak "Baseline" Conditions Storm Detention Capacity and Flow Rate				
Detention Basin Number	**"Baseline" Conditions 10-Year, 24-Hour Maximum Discharge Flow Rate (cfs)**	**"Baseline" Conditions 100-Year, 24-Hour Maximum Discharge Flow Rate (cfs)**	**"Baseline" Conditions 10-Year, 24-Hour Detention Basin Volume (acre-feet)**	**"Baseline" Conditions 100-Year, 10-Day Detention Basin Volume (acre-feet)[1]**
1	26	34	4.6	6.7[2]
2	17	24	13.8	21.6
3	5	7	11.5	21.3
4	14	23	18.8	28.4
5	20	27	27.7	42.0
6	13	17	14.1	21.8
7	11	14	6.6	9.2[2]
8	16	22	16.9	26.6
9	9	12	10.9	16.8
10	13	17	6.3	9.2[2]
11	5	7	1.1	1.7[2]
12	16	20	11.5	16.6

Notes: cfs = cubic feet per second

[1] The 100-year, 10-day storm generated larger detention volumes and therefore, the detention basins are sized based on the 100-year, 10-day storm.

[2] Denotes that the volume and water surface are controlled by the 100-year, 24-hour storm.

Source: MacKay & Somps 2011b:27, 28.

Table 3.9-6 Comparison of Drainage Demands				
Storm Drain Demands	**Prior land Use Plan Water Quality Flow (cfs)**	**Updated Land Use Plan Water Quality Flow (cfs)**	**Change**	**Percent Change**
Developed Acreage	997.0	964.6	-32.1	-3.2%
Cumulative Water Quality Flow	90.5	91.9	1.4	1.5%

Notes: cfs = cubic feet per second

[1] The 100-year, 10-day storm generated larger detention volumes and therefore, the detention basins are sized based on the 100-year, 10-day storm.

Source: MacKay & Somps 2011b:Appendix H.

FEMA has not mapped the flood plain within the SPA. However, the County of Sacramento and the RMDS both have identified an existing a 100-year floodplain within the preserve area, as shown in Exhibit 3.9-2. The City of Rancho Cordova will require the mapping of this flood plain per FEMA requirements prior to approval of the first large lot map.

Anatolia III Modeling Alternatives

As requested by the City of Rancho Cordova and the County of Sacramento, four drainage scenario alternatives (Anatolia III Alternatives A though D) were modeled in the RMDS (McKay & Somps 2011b:29-37). These alternatives would remove the interim drainage improvements to different degrees from the Anatolia III project and incorporate them into the drainage infrastructure improvements within the SPA. Alterations to Kite Creek and on-site detention developed as part of the Anatolia III project are described above in Section 3.9.1, "Affected Environment."

The hydrologic analysis of the Anatolia III drainage modeling alternatives used the same procedures described above for the Existing, Developed, and "Baseline" Conditions scenarios. The following four alternative scenarios were modeled (see additional information about each Anatolia III alternative in Chapter 2, "Alternatives").

1. **Anatolia III Alternative A:** This alternative uses the "Baseline" Conditions model as a starting point and removes the existing Anatolia III detention basin from the model, resulting in the need to increase the size of the SPA detention basin volumes. This alternative results in the loss of 6.78 acres of development area in the SPA as compared to the project without the Anatolia III alternative, but allows the Anatolia III Project to reclaim 29 single family lots.

2. **Anatolia III Alternative B:** This alternative uses the Anatolia III Alternative A model as a starting point and relocates a portion of the existing on-site Anatolia III channel to the southern right-of-way of Kiefer Boulevard. This alternative results in the loss of 10.38 acres of development area in the SPA as compared to the project without the Anatolia III alternative, but allows the Anatolia III project to reclaim 42 single family lots.

3. **Anatolia III Alternative C:** This alternative uses the Anatolia III Alternative A model as a starting point and removes both the existing on-site Anatolia III detention basin and channel completely from the development. This alternative results in the loss of 12.08 acres of development area in the SPA as compared to the project without the Anatolia III alternative, and 1.10 acres of developable area in the Arboretum project site, but allows the Anatolia III project to reclaim 42 single family lots.

4. **Anatolia III Alternative D:** This alternative uses the "Baseline" Conditions model with Anatolia III Alternative C as a starting point and replaces the Anatolia III channel with twin 72-inch culverts. This alternative results in the loss of 6.78 acres of development area in the SPA as compared to the project without the Anatolia III alternative, but allows the Anatolia III project to reclaim 42 single family lots.

In order to accommodate the relocation of the detention basin and/or channel infrastructure from the Anatolia III development to the SPA, larger detention basins and new box culverts would be required within the SPA and there would be a loss of developable area in the SPA to accommodate those changes. However, the planned on-site detention basins were sized such that the flow rates exiting the SunCreek project boundaries would not exceed the existing conditions flow rates even with the addition of the Anatolia III flows (MacKay & Somps 2011b:23). The peak flow rates from 100-year (0.01 AEP) and 10-year storm events under all of these Anatolia III alternatives would remain at or below existing conditions, as shown in Table 3.9-7. (As previously stated, compliance Point 12 in Table 3.9-7 shows slightly higher post development flows than existing conditions. This difference is not significant since it was modeled as a "steady state" condition in SacCalc and not as an "unsteady state" condition in HEC-RAS where the effects of attenuation in Detention Basin No. 1 would be considered. SacCalc results are known to be "conservative" when compared to HEC-RAS results. HEC-RAS modeling was not possible on this stream at this stage in the planning process. It is the professional judgment of the engineers who modeled this stream (MacKay & Somps) that this difference will be eliminated when this stream is modeled HEC-RAS during final design.)

Table 3.9-7
Modeled Peak Flow Results at Project Compliance Point Locations for Anatolia III Alternatives

Compliance Point	Creek Section Station	Existing Conditions	"Baseline" Conditions[1]	Alternative A[1]	Alternative B[1]	Alternative C[1]	Alternative D[1]
10-Year, 24-hour Peak Flow Rate (cfs)							
1	0+00	1,025	N/A	N/A	N/A	N/A	N/A
2	36+00	1,036	N/A	N/A	N/A	N/A	N/A
3	70+00	989	N/A	N/A	N/A	N/A	N/A
4	76+19	848	808	773	740	776	773
5	80+95	848	809	774	741	777	774
6	82+00	849	811	779	744	782	781
7	112+05	826	763	727	699	734	728
8	152+00	402	372	374	372	376	388
9	61+45	N/A	N/A	N/A	N/A	N/A	N/A
10	184+50	386	293	317	319	316	135
11	212+00	332	216	186	183	187	182
12		157	161[2]	161[2]	161[2]	161[2]	161[2]
13		138	138	138	138	138	138
100-Year, 24-hour Peak Flow Rate (cfs)							
1	0+00	1,801	1,737	1,702	1,688	1,675	1,685
2	36+00	1,810	1,740	1,707	1,692	1,677	1,689
3	70+00	1,741	1,632	1,575	1,568	1,574	1,564
4	76+19	1,501	1,354	1,247	1,252	1,320	1,240
5	80+95	1,504	1,354	1,281	1,271	1,320	1,272
6	82+00	1,508	1,354	1,283	1,276	1,320	1,277
7	112+05	1,518	1,321	1,266	1,263	1,312	1,259
8	152+00	669	631	631	627	525	620
9	61+45	127	127	127	127	127	127
10	184+50	635	512	543	544	407	292
11	212+00	591	347	310	309	304	292
12		271	266	266	266	266	266
13		234	234	234	234	234	234

Note: cfs = cubic feet per second; N/A = not applicable

[1] "Baseline" Conditions as well as all alternative peak flows include the rerouting of the Morrison Spill through the proposed 72-inch-diameter pipeline in Kiefer Boulevard.

[2] Modeled peak flows are greater than Existing Conditions peak flows. This is a reasonable conclusion since this modeling was performed as a "steady state" condition in SacCalc and not as an "unsteady state" condition in HEC-RAS. SacCalc results are known to be "conservative" when compared to HEC-RAS results. Therefore, it is the professional judgment of the engineers who modeled this stream (MacKay & Somps) that this higher peak flow rate will be eliminated when this configuration of detention basins is modeled HEC-RAS during final design.

Source: MacKay & Somps 2011b:31, 34, 35, 37.

Detention Basin Alternatives

Several additional detention basin alternatives were considered to address various drainage issues, as described in technical memoranda prepared by MacKay & Somps: the Shalako Detention Basin Alternative (MacKay & Somps 2010a, attached as Appendix E), the Community Park Detention Basin Alternative (MacKay & Somps 2010b, attached as Appendix F), and the Stand-Alone Detention Basin Alternative (MacKay & Somps 2010c, attached as Appendix G) (see additional details in Chapter 2, "Alternatives").

Shalako Detention Basin Alternative. The Shalako property is located at the southwestern corner of the SPA, adjacent to the Arboretum project site. In order to provide that runoff from the developed portions of the SPA does not enter the on-site preserve, several feet of fill dirt would need to be placed along the southernmost tier of lots within the Shalako property. The resulting lot pad elevations would be approximately 2-6 feet higher than the adjoining tier of lots on the Arboretum project site. The difference in elevations would create a substantial slope between adjoining lots, requiring either the construction of expensive retaining walls or requiring excessive lot depths. An alternative design solution was analyzed to determine if an acceptable grading solution could be along the common project boundary while still being able capture, treat, and attenuate the Shalako property storm runoff. This alternative analysis consisted of the following components:

1. Quantify the stand-alone hydromodification flow duration control volume requirements for basin no. 12 and separate from the total detention volume of the basin.

2. Reduce the size of basin no. 12 to allow the overland flow release from the southwestern portion of the Shalako property to pass through the basin unattenuated and discharge directly into Kite Creek while retaining the requisite water quality and hydromodification volumes.

3. Increase the flood control volumes in basins 9, 10, and 11 on an incremental basis until the hydraulic model reflects a "no net change" condition.

4. Compare the magnitude of the flows to demonstrate a "no net change" condition.

The analysis performed by MacKay & Somps (2010a:7) demonstrated that it is technically feasible to eliminate and/or minimize the grading interface problem through redistribution of the flood storage volume from detention basin no. 12 to basins Nos. 9, 10, and 11. The results of this analysis are presented in Table 3.9-8. This analysis was also able to confirm that this detention basin alternative would result in a "no net change" condition in the 100-year, 24-hour flow at the compliance point. As compared to the "Baseline" Conditions scenario, the Shalako Detention Basin Alternative would have a slightly decreased flow (613 vs. 617 cfs) at the compliance point located in Kite Creek at the southern boundary of the Shalako property for the 10-year event and a slightly increased flow (1,034 vs. 1,024 cfs) at the compliance point for the 100-year event. This is a reasonable conclusion since this modeling was performed as a "steady state" condition in SacCalc and not as an "unsteady state" condition in HEC-RAS where the effects of attenuation in detention basin nos. 9, 10, and 11 would be considered. SacCalc results are known to be "conservative" when compared to HEC-RAS results. Therefore, it is the professional judgment of the engineers who modeled this stream (MacKay & Somps) that this difference (1,034 vs. 1,024 cfs) will be eliminated when this configuration of detention basins is modeled HEC-RAS during final design. Therefore, the flood control basins could feasibly be reconfigured without an increase in peak flows from the 100-year (0.01 AEP) and 10-year storm events at the compliance point. Reconfiguring the detention basins would reduce the building pad elevations along the southernmost tier of lots within the Shalako property by approximately 1 to 3 feet; this would effectively eliminate the grading interface problem between the SPA and the Arboretum project site.

Community Park Detention Basin Alternative. As an alternative to encumbering the community park site with a large detention basin that does not provide any other uses for a majority of the year, the Community Park Detention Basin Alternative design was prepared for detention basin no. 5. This alternative design allows for the portion of the detention basin that is above the 10-year, 24-hour, hydromodification water surface elevation to

Table 3.9-8
Comparison of Detention Basin Volumes for the Shalako Detention Basin Alternative

	"Baseline" Conditions			Shalako Detention Basin Alternative		
Basin Number	1.5-Foot Hydro-Modification Storage Volume (AF)	"Baseline" Conditions Model 100-Year Storage Volume (AF)	Total Storage Volume (AF)	1.5-Foot Hydro-Modification Storage Volume (AF)	"Baseline" Conditions Model 100-Year Storage Volume (AF)	Total Storage Volume (AF)
9	3.0	14.0	17.0	3.0	26.0	5.5
10	1.5	10.1	11.5	1.5	20.0	215
11	0.2	1.0	1.2	0.2	2.3	2.5
12	3.5	13.0	16.5	3.5	0	8.2
Total	8.1	38.8	46.1	8.1	48.3	46.1

Notes: AF = acre-feet
Source: MacKay & Somps 2010a:5, 6.

have joint use capabilities so it can function as both a detention basin and a community park. This alternative analysis consisted of the following components:

1. Prepare a revised schematic layout and design of the community park and detention basin no. 5. Grading was adjusted so that (1) overland runoff from development would flow only into the detention basin and not into the on-site preserve, and (2) only the turf play fields would be inundated with runoff during a 100-year, 10-day storm event.

2. Prepare area-elevation curves for incorporation into the SacCalc model. The permanent water quality basin would retain summertime irrigation runoff. In order to maintain the health of aquatic plants and species in the basin, a minimum of depth of 4 feet is desirable; therefore, the basin would be lined to prevent loss of water through infiltration. The basin outlet structure would be set at 7 feet above the basin water, with an outflow and pipeline that connects to the associated hydromodification basin.

3. Run the SacCalc model and determine how much of the park is inundated with runoff and how long the inundation would last.

4. Determine how much park credit would be provided if the community park/detention basin no. 5 were used as a joint-use facility.

Table 3.9-9 shows the results of the SacCalc analysis, indicating that detention basin no. 5 can be designed as a joint use facility while not exceeding the Cordova Recreation & Park District (CRPD) requirements of maximum turf area inundation duration of 72 hours (MacKay & Somps 2010b). Therefore, the Community Park Detention Basin Alternative would satisfy the significance criteria that the flow rates from 100-year (0.01 AEP) storm events remain at or below pre-development flow conditions such that the downstream creek system would not experience an increase in flows over existing conditions.

Table 3.9-9
Duration of Community Park Inundation

Water Surface Elevation	Hours Water is Above Elevation (100-year, 24-hour Storm)	Hours Water is Above Elevation (100-year, 10-day storm)
162.5	0	2
162.0	0	6
161.0	3	10
160.0	10	22
159.0	14	52

Source: MacKay & Somps 2010b

Stand-Alone Detention Basin Alternative. The Stand-Alone Detention Basin Alternative analysis evaluated a scenario where the off-stream portions of the three upstream subwatersheds that extend partially off the SPA were to address their own peak flow, hydromodification, and water quality impacts within their own developments instead of within the SunCreek basins (on-site detention basins nos. 3, 5, and 9) (MacKay & Somps 2010c). In other words, to determine appropriate revisions to the size of on-site detention basins 3, 5, and 9 without the flows from the respective three off-site development areas. This alternative analysis consisted of the following components:

1. Prepare a revised watershed map that created three additional sub-watersheds for the off-site areas, and connect these areas to the SPA open-space preserve with a dedicated pipe sized to convey undeveloped flows (thereby passing the upstream off-site runoff through the SPA).

2. Revise the "Baseline" Conditions model to determine on-site basin sizes if the SPA were developed as a stand-alone project that provided water quality treatment, summertime nuisance retention, and peak flow attenuation for only that portion of the development within the SPA boundary.

3. Determine the proportionate share of the three detention basin sizes that would be due to the three off-site subswatersheds.

The modeling results indicate that the Stand-Alone Detention Basin Alternative would be technically feasible. Table 3.9-10 shows the reduction in sizes of detention basins 3, 5, and 9 under this alternative, as well as the percentage of each basin under "Baseline Conditions" that would be attributable to the runoff from the off-site watershed areas. The Stand-Alone Detention Basin Alternative would continue to maintain the stormwater runoff rates from development in the SPA to levels that would be less than the predevelopment stormwater runoff rates at the SPA boundary (MacKay & Somps 2010c).

Table 3.9-10
Comparison of Hydromodification Basin Volumes for the Stand-Alone Detention Basin Alternative

Basin Number		Stand-Alone Detention Basin Alternative (AF)	"Baseline" Conditions (AF)	Off-site Shed Area's Percent Share of Baseline
3	Shed Area (Acres)	56.0	76.9	27.2
	Water Quality	1.6	2.2	27.3
	Summertime Nuisance Flow (per day)	0.09	0.12	25.0
	10-Year, 24-Hour Storm	4.7	11.5	59.1
	100-Year, 10-Day Storm	9.6	21.3	54.9
5	Shed Area (Acres)	144.0	201.3	28.5
	Water Quality	4.1	5.7	28.1
	Summertime Nuisance Flow (per day)	0.22	0.31	29.0
	10-Year, 24-Hour Storm	11.4	27.7	58.8
	100-Year, 10-Day Storm	22.7	42.0	46.0
9	Shed Area (Acres)	54.0	82.2	34.3
	Water Quality	1.5	2.3	34.8
	Summertime Nuisance Flow (per day)	0.08	0.13	38.5
	10-Year, 24-Hour Storm	4.0	10.9	63.3
	100-Year, 10-Day Storm	7.7	16.8	54.2

Notes: AF = acre-feet
Source: MacKay & Somps 2010c:3.

Hydromodification

Potential changes to the hydrologic and geomorphic processes in a watershed as a result of impervious surfaces and drainage infrastructure from urbanization include increased runoff volumes and dry weather flows, increased frequency and number of runoff events, increased long-term cumulative duration of flows, as well as increased peak flows. These changes are referred to as "hydromodification." Hydromodification intensifies the erosion and sediment transport process, and often leads to changes in stream channel geometry, and streambed and streambank properties, which can result in degradation and loss of riparian habitat, and downgradient sediment deposition causing flooding problems. Studies have preliminarily evaluated the hydrologic and geomorphic impacts of hydromodification on Kite Creek, as described above in Section 3.9.1, "Affected Environment – Geomorphology" (cbec inc 2008 [Appendix A within DEIR/DEIS Appendix D]).

One measurement used to evaluate the amounts of hydromodification in pre- and post-development scenarios is the erosion potential. While the index of *work* measures the amount of force applied to a channel and the sediment transport capacity at a given flow rate (generally measured in foot-pound-force per square foot), the *erosion potential index* measures the relative change in the amount of erosive force applied to the channel boundary (*work*) done by flows from a watershed that undergoes a change in land use or impervious surface (e.g., the relative change between existing conditions and Baseline Conditions). An erosion potential of 1 would indicate no change in erosion potential due to hydromodification between two watershed scenarios. A study based on 45 stream channel sites in three San Francisco Bay Area watersheds showed that as the erosion potential begins to exceed 1.2 (i.e., a 20 % increase) the probability of stream channel instabilities dramatically increases (Santa Clara Valley Urban Runoff Pollution Prevention Program [SCVURPPP] 2005:3-17). A USACE study suggests a more conservative erosion potential target of 1 ±10% (Geosyntec 2007:5-13).

Based on the guidance provided by Geosyntec in their report for the Laguna Creek Watershed (Geosyntec 2007:5-14), the target index of 1 ± 20% was used in the analysis for the Proposed Project Alternative. The cbec study results indicated that both the upper and lower reaches of Kite Creek would be geomorphologically susceptible to future development unless hydromodification management techniques are used. As shown in Table 3.9-11, implementation of the Proposed Project Alternative without detention basins would result in erosion potentials above the 1.2 target at the two compliance points analyzed. In addition, the use of traditional stormwater detention methods were found to be unsatisfactory in managing hydromodification, and therefore flow duration control would be required to maintain or reduce flow duration and total "work" (as defined in the preceding paragraph) done on the creek (cbec inc 2008:22).

Table 3.9-11
Total Work Done[1] and Erosion Potential Ratios at Compliance Points

Model Scenario	Total Work Done ($ft\text{-}lbf/ft^2$)		Erosion Potential Index	
	Compliances Point #12	Compliances Point #8	Compliances Point #12	Compliances Point #8
Existing Conditions	32,372	22,068	-	-
Baseline Conditions Without Detention[2]	49,571	31,178	1.53	1.41
Baseline Conditions With Detention[3]	33,630	20,823	1.04	0.94

Notes: $ft\text{-}lbf/ft^2$ = foot pound-force per square foot (total work done)
[1] *Work* measures the amount of force applied to a channel and the sediment transport capacity at a given flow rate.
[2] "Baseline" Conditions, but assumes no flood control detention basins (i.e., Developed Conditions).
[3] "Baseline" Conditions with flood control detention basins modified for flow duration control.
Source: cbec inc 2008:Table 5.

Three approaches are typically used to manage the impacts of hydromodification: flow controls to control the discharge rate into receiving waters, LID techniques to infiltrate excess runoff, and in-stream approaches to restore and stabilize streams. Due to USACE-required limitations on construction in the wetland preserve areas, in-stream approaches cannot be used. The impacts on Kite Creek due to hydromodification from project development would be reduced by increasing the extended duration detention basin volume and by slowly metering out storm runoff from detention basins to match undeveloped runoff rates for storms ranging from 25% of the 2-year storm up to and including the 10-year storm using a flow duration control strategy. Energy dissipation structures would be constructed where the detention basins discharge to the open space preserve to reestablish the storm runoff to sheet flow and minimize erosion potential. (See Exhibits 2-6 and 2-7 in Chapter 2, “Alternatives” and Appendix D:14-16 for details.)

Modified Hydromodification Basins Modeling Alternatives

Two hydromodification modeling scenarios were evaluated in the RMDS to assess the minor land use changes that have occurred in the SunCreek Specific Plan and how they would affect peak flow rates within Kite Creek. The Modified Hydromodification Basin Alternative “A” Model used the Baseline Conditions Model as a starting point and revised it to add 30% more detention basin volume to each of the Baseline Conditions 10-year, 24-hour storm detention basins to conservatively evaluate the increase in detention volume required to achieve hydromodification mitigation. During the detailed design phase of project development (i.e., upon submittal of small-lot tentative subdivision maps and/or improvement plans), this analysis would be conducted again to more accurately meet hydromodification impacts and peak discharge requirements of the final project, but the Modified Hydromodification Basin – Alternative “A” Model scenario was used as an estimation at this time in the planning process of how much additional storage volume would be required for hydromodification to accommodate the new land use plan. The changes made to the SunCreek drainage infrastructure and analyzed under this alternative provide results indicating that this alternative meets the hydromodification requirements while maintaining the storm runoff flow volumes and peak flow rates to less than the current Existing Conditions peak 100-year, 24-hour flow rates and volumes (MacKay & Somps 2011b:41). The modeled peak flow rates for the two hydromodification basin modeling alternatives as well as the Existing Conditions scenario are displayed in Table 3.9-12. The maximum detention basin discharge flow rates for Hydromodification Basin Alternatives “A” and “B” are displayed in Table 3.9-13.

The Modified Hydromodification Basin Alternative “B” Model used the Modified Hydromodification Basin Alternative “A” Model as a starting point and revised the model to account for the loss of the Anatolia III detention basin, as was analyzed in the Anatolia III Alternative A described above. Modeling results of peak flows at 13 compliance point locations under the Modified Hydromodification Basin Alternative “B” were compared to the Existing Conditions and Baseline Conditions peak flows for the 10-year and 100-year (0.01 AEP), 24-hour storm events, as shown in Table 3.9-12. The results show that peak flows would remain at or below existing conditions. As is the case with the Baseline Conditions scenario, in only one case (Compliance Point 12 under the 10-year, 24-hour scenario), a small increase in peak flow rates was identified in the modeling results; however, this increase would be minor and is not anticipated to affect downstream facilities. This alternative meets the hydromodification requirements (see Table 3.9-13) while maintaining the storm runoff flow volumes and peak flow rates to less than the current Existing Conditions peak 100-year, 24-hour flow rates and volumes (see Table 3.9-12).

Conclusion

As described in detail in Chapter 2, “Alternatives,” the project applicants’ preferred drainage plan incorporates the following combination of elements:

1. Modified Hydromodification Basin Alternative B;
2. Anatolia III Alternative A;
3. Community Park Alternative Detention Basin;
4. Stand-Alone Detention Basins 3, 5, and 7; and
5. Shalako Detention Basin (either modified or unmodified).

Table 3.9-12
Modeled Peak Flow Results at Project Compliance Point Locations for Hydromodification Basin Alternatives "A" and "B"

		10-Year, 24-hour Peak Flow Rate (cfs)				100-Year, 24-hour Peak Flow Rate (cfs)			
Compliance Point	Creek Section Station	Existing Conditions	"Baseline" Conditions[1]	Modified Hydromodification Basin Alternative "A"	Modified Hydromodification Basin Alternative "B"	Existing Conditions	"Baseline" Conditions[1]	Modified Hydromodification Basin Alternative "A"	Modified Hydromodification Basin Alternative "B"
1	0+00	1,025	N/A	N/A	N/A	1,801	1,737	1,669	1,674
2	36+00	1,036	N/A	N/A	N/A	1,810	1,740	1,674	1,678
3	70+00	989	N/A	N/A	N/A	1,741	1,632	1,553	1,556
4	76+19	848	808	808	773	1,501	1,354	1,248	1,242
5	80+95	848	809	809	774	1,504	1,354	1,282	1,285
6	82+00	849	811	811	779	1,508	1,354	1,284	1,287
7	112+05	826	763	763	727	1,518	1,321	1,267	1,268
8	152+00	402	372	372	374	669	631	523	536
9	61+45	N/A	N/A	N/A	N/A	127	127	127	127
10	184+50	386	293	293	N/A	635	512	458	N/A
11	212+00	332	216	216	317	591	347	246	243
12		157	161[2]	161[2]	161[2]	271	266	266	266
13		138	138	138	138	234	234	234	234

Note: cfs = cubic feet per second; N/A = not applicable

1 "Baseline" Condition as well as all alternative peak flows include the rerouting of the Morrison Spill through the proposed 72-inch-diameter pipeline in Kiefer Boulevard.

2 Modeled peak flows are greater than Existing Conditions peak flows. This is a reasonable conclusion since this modeling was performed as a "steady state" condition in SacCalc and not as an "unsteady state" condition in HEC-RAS. SacCalc results are known to be "conservative" when compared to HEC-RAS results. It, therefore, is the professional judgment of the engineers who modeled this stream (MacKay & Somps) that this higher peak flow rate will be eliminated when this configuration of detention basins is modeled HEC-RAS during final design.

Source: MacKay & Somps 2011b:20, 26, 39, 42

Table 3.9-13
Maximum Detention Basin Discharge Flow Rates for Hydromodification Basin Alternatives "A" and "B"

	"Baseline" Conditions				Hydromodification Basin Alternatives "A" and "B"[1]			
Basin Number	**No. of Orifices & Diameter (inches)**	**No. of Outlet Pipes & Diameter (inches)**	**10-Year, 24-Hour Flow (cfs)**	**100-Year, 24-Hour Flow (cfs)**	**No. of Orifices & Diameter (inches)**	**No. of Outlet Pipes & Diameter (inches)**	**10-Year, 24-Hour Flow (cfs)**	**100-Year, 24-Hour Flow (cfs)**
1	1-18	3-24	26	34	2-18	3-24	26	34
2	1-21	2-24	17	24	1-18	2-30	13	49
3	1-12	1-24	5	7	1-12	2-24	3	18
4	1-21	2-24	14	23	1-18	3-24	10	35
5	4-12	2-24	20	27	2-15	2-30	11	45
6	2-12	2-24	13	17	1-15	3-24	9	35
7	2-12	1-30	11	14	1-15	1-30	6	24
8	1-21	2-24	16	22	1-18	3-24	12	38
9	1-15	1-24	9	12	1-12	2-24	5	22
10	2-12	2-24	13	17	1-15	3-24	10	31
11	1-12	1-24	5	7	1-12	2-24	4	23
12	3-12	2-24	16	20	3-12	3-24	8	38

Note: cfs = cubic feet per second.

[1] The detention basin sizes are the same for Hydromodification Basin Alternatives "A" and "B" and the discharge flow rates from the outlet control structures designed to attenuate the release rates would be the same.

Source: MacKay & Somps 2011b:28, 41

The proposed detention basins have been designed in such a way that adjustments in detention volumes can be made during final design (or changes in orifice sizes and weir heights) to satisfy adopted design standards (which include assuring that the proposed detention basins empty by gravity and that maintenance issues are minimized). The proposed combination of drainage elements and alternatives listed above minimizes the area required for detention basins and maximizes the developable areas within the SPA; addresses drainage, water quality, flood control, and hydromodification issues; and provides the developers of Anatolia III the opportunity to reclaim 29 lots in the Anatolia III subdivision.

Modeling performed in the RMDS and subsequent technical memoranda based on the present stage in the SPA planning process (MacKay & Somps 2011b; 2010a; 2010b; 2010c; 2010d) indicates that the proposed drainage plan would appropriately convey upstream off-site runoff, would appropriately detain project-related on-site runoff in a manner that effectively meets current stormwater management criteria to acceptable levels, and that release rates from detention basins would be met to appropriately address hydromodification impacts. However, since detailed lotting plans at the tentative map level have not yet been prepared, the associated final detailed calculations and plans cannot be prepared at this time. Since the final designs and specifications have not been submitted to or approved by the City, it cannot be assumed that potentially significant impacts would not occur. Therefore, implementation of the Proposed Project and Modeling and Detention Basin Alternatives could result in **potentially significant**, **direct** and **indirect** impacts related to stormwater runoff and the subsequent risk of flooding and/or hydromodification. ***[Similar]***

Mitigation Measure: Implement Mitigation Measure 3.9-2.

ID

The amount of stormwater runoff would be 18% higher under the Increased Alternative than under the Proposed Project Alternative because of the increased development area (approximately 160 acres more than the Proposed Project Alternative) and associated increase in impervious surfaces of residential and commercial land uses, as shown in Exhibits 2-26 in Chapter 2, “Alternatives.”

To eliminate any flow increase or unacceptable hydromodification to Kite Creek caused by project development, stormwater detention facilities and basin outlet control devices would need to be constructed to maintain pre-development discharge rates. However, since detailed designs, specifications, and modeling under the Increased Development Alternative have not been performed, or submitted to or approved by the City, implementation of the Increased Development Alternative could result in **potentially significant, direct** and **indirect** impacts related to stormwater runoff and the subsequent risk of flooding. ***[Greater]***

Mitigation Measure: Implement Mitigation Measure 3.9-2.

Implementation of Mitigation Measure 3.9-2 would reduce the potentially significant impact associated with the potential increased risk of flooding from increased stormwater runoff under the No USACE Permit, Proposed Project, Biological Impact Minimization, Conceptual Strategy, and Increased Development Alternatives to a **less-than-significant** level because the project applicants would demonstrate to the appropriate regulatory agency that the project would conform with applicable state and local regulations regulating surface water runoff, including the procedures outlined in the Sacramento City/County Drainage Manual (County of Sacramento Department of Water Resources 1996), which are designed to meet or exceed applicable state and local regulations pertaining to stormwater runoff. Specific project design standards as required in this mitigation measure would, when implemented, provide flood protection to meet FEMA 100-year (0.01 AEP) flood protection criteria, would safely convey on-site and off-site flows through the SPA, would reduce the effects of hydromodification on stream channel geomorphology, and would prevent substantial increased flood hazard on downstream areas by limiting peak discharges of flood flows to at or below pre-project levels.

IMPACT 3.9-3 **Long-Term Water Quality and Hydrology Effects from Urban Runoff.** *Project implementation would convert a large area of largely undeveloped land to residential and commercial uses, thereby changing the amount and timing of potential long-term pollutant discharges in stormwater and other urban runoff to Kite Creek, Laguna Creek, and other on- and off-site drainages.*

NP

Under the No Project Alternative, the project would not be developed and there would be no project-related changes in long-term water quality and hydrology relating to runoff. Thus, there would be **no direct** or **indirect** impacts under the No Project Alternative. ***[Lesser]***

NCP, BIM, CS

The amount of contaminants discharged in stormwater drainage would likely be lower under the No USACE Permit, Biological Impact Minimization, and Conceptual Strategy Alternatives than under the Proposed Project Alternative because of the decreased acreage and overall amount (e.g., number of dwelling units) of residential land uses, as shown in Exhibits 2-20 (NCP), 2-22 (BIM) and 2-24 (CS) in Chapter 2, "Alternatives." Further, the contaminant amounts would likely be lower than the Proposed Project Alternative, as each would result in a substantially reduced acreage of commercial land uses. However, because final design plans and specifications have not been prepared, or submitted to or approved by the City, implementation of the No USACE Permit, Biological Impact Minimization, and Conceptual Strategy Alternatives could result in **potentially significant, direct** and **indirect** impacts related to the potential for contaminants to enter receiving waters, thus resulting in adverse effects from long-term urban runoff. ***[Lesser]***

Mitigation Measure 3.9-3: Develop and Implement a BMP and Water Quality Maintenance Plan.

Before approval of the final small-lot subdivision map for all project phases, a detailed BMP and water quality maintenance plan shall be prepared by a qualified engineer retained by the project applicants for any particular discretionary development application. Drafts of the plan shall be submitted to the City of Rancho Cordova for review and approval concurrently with development of tentative subdivision maps for all project phases. The plan shall finalize the water quality improvements and further detail the structural and nonstructural BMPs proposed for the project. The plan shall include the elements described below.

- A quantitative hydrologic and water quality analysis of proposed conditions incorporating the proposed drainage design features.
- Predevelopment and postdevelopment calculations demonstrating that the proposed water quality BMPs meet or exceed requirements established by the City of Rancho Cordova and including details regarding the size, geometry, and functional timing of storage and release pursuant to the '"Stormwater Quality Design Manual for Sacramento and South Placer Regions" and the draft Hydromodification Management Plan ([SSQP 2007] per NPDES Permit No. CAS082597 WDR Order No. R5-2008-0142, page 46).
- Source control programs to control water quality pollutants on the SPA, which may include but are limited to recycling, street sweeping, storm drain cleaning, household hazardous waste collection, waste minimization, prevention of spills and illegal dumping, and effective management of public trash collection areas.

- A pond management component for the proposed basins that shall include management and maintenance requirements for the design features and BMPs, and responsible parties for maintenance and funding.

- LID control measures shall be integrated into the BMP and water quality maintenance plan. These may include, but are not limited to:

  - surface swales;
  - replacement of conventional impervious surfaces with pervious surfaces (e.g., porous pavement);
  - impervious surfaces disconnection; and
  - trees planted to intercept stormwater.

- New stormwater facilities shall be placed along the natural drainage courses within the SPA to the extent practicable so as to mimic the natural drainage patterns. The reduction in runoff as a result of the LID configurations shall be quantified based on the runoff reduction credit system methodology described in "Stormwater Quality Design Manual for the Sacramento and South Placer Regions, Chapter 5 and Appendix D4" (SSQP 2007) and proposed detention basins and other water quality BMPs shall be sized to handle these runoff volumes.

Implementation: Project applicants for any particular discretionary development application.

Timing: Prepare plans before the issuance of grading permits for all project phases and implementation throughout project construction.

Enforcement: City of Rancho Cordova Community Development Department and Public Works Department.

PP

As described in the draft Conservation Element of the Sacramento County General Plan, surface water quality is threatened by such concerns as development, stormwater runoff, and increased diversions into both surface and sub-surface sources (County of Sacramento 2009). New developments, infrastructure improvements, redevelopment projects of existing land uses, and comprehensive planning efforts in master planned new growth areas are described in the draft Sacramento County General Plan as having an effect on water quality by both reducing potential supply as well as creating a source for increased pollutant runoff. Project development would result in the conversion of primarily undeveloped land to urban land uses, which would alter the types, quantities, and timing of contaminant discharges in stormwater runoff. Project development would result in changes to land use, natural vegetation, and infiltration characteristics of the SPA and would introduce new sources of water pollutants, thereby producing "urban runoff." Pollutants contained within urban runoff may include but are not limited to sediment, oxygen-demanding substances (e.g., organic matter), nutrients (primarily nitrogen and phosphorus), heavy metals, bacteria, oil and grease, and toxic chemicals, which can degrade receiving water quality.

Overall, the potential for the Proposed Project Alternative to cause or contribute to long-term discharges of urban contaminants (e.g., oil and grease, fuel, trash) into the stormwater drainage system and ultimate receiving waters would increase compared to existing conditions. Some contaminants associated with existing on-site agricultural activities (e.g., sediment, nutrients, pathogens, and agricultural chemicals) would decrease as these uses are phased out during project development. The potential discharges of contaminated urban runoff from paved and landscaped areas could increase or could cause or contribute to adverse effects on aquatic organisms in receiving waters. New residential uses within the SPA would generate urban runoff from streets, driveways, and parking areas. Landscaped areas may produce fertilizer wastes and/or bacterial contamination from animal excrement.

New commercial development can generate urban runoff from parking areas as well as any areas of hazardous materials storage exposed to rainfall.

Urban contaminants typically accumulate during the dry season and may be washed off when adequate rainfall returns in the fall to produce a “first flush” of runoff. The amount of contaminants discharged in stormwater drainage from developed areas varies based on a variety of factors, including the intensity of urban uses such as vehicle traffic, types of activities occurring on site (e.g., residential vs. commercial), types of contaminants used on-site (e.g., pesticides, herbicides, cleaning agents, or petroleum byproducts), contaminants deposited on paved surfaces, and the amount of rainfall.

Several policies have also been incorporated into the Draft SunCreek Specific Plan (attached as Appendix C) to protect water quality during project operations, including:

- Policy NR 13. The applicant shall install appropriate signage to deter the discharge of hazardous materials into storm drains. Such signage shall be approved by the City of Rancho Cordova.

- Policy NR 14. All Tentative Maps shall contain urban runoff control strategies and requirements that are consistent with Master Drainage Plans and the City’s urban runoff management program. Such strategies may include participation in an area-wide runoff control management effort consistent with standards developed by the Public Works Department.

- Policy NR 15. All commercial and multifamily development shall incorporate features such as grassy swales, multi-use retention or detention basins, and integrated drainage systems to enhance water quality. Where feasible the project applicants will work with the CRPD to integrate retention/detention basins into park sites and create examples of desirable and innovative natural drainage features.

- Policy NR 16. All development within the Plan area shall apply best management practices to protect receiving waters from the adverse effects of construction activities, sediment and urban runoff.

The Draft SunCreek Specific Plan (attached as Appendix C) describes that stormwater and other drainage would be carried in subsurface pipes to the detention basins throughout the SPA where it would be treated prior to release into the proposed preserve areas. Detention facilities would be located at the edge of the drainage corridor where they would intercept runoff from the adjacent development areas before the water enters the proposed preserve areas. Stormwater quality features would be designed to reflect the water volumes, terrain, and specific conditions at each site. Stormwater quality improvement facilities would generally be integrated into detention basins or may be located as independent facilities in the open space buffer areas between the developed areas and the proposed preserve area (e.g., vegetated swales, infiltration trenches, and/or constructed wetland filter strips). Stormwater quality improvement facilities would incorporate settling basins, gravel and sand or other filter medium, and biological filters such as grassy swales or other approved technologies to trap pollutants as the runoff flows through them. In addition, all facilities that discharge water to the proposed preserve area would be designed to avoid soil erosion through the use of velocity dissipation devices and other erosion controls.

Stormwater quality treatment configurations would use treatment methodologies as described in the Stormwater Quality Design Manual (SSQP 2007) and approved by the City. The Sacramento NPDES MS4 Permit (described in above in Section 3.9.2 “Regulatory Framework”), which applies to this SPA, requires that “priority new development and redevelopment projects shall integrate LID principles early in the project planning and design process.” As described above, the LID techniques may include vegetated swales, infiltration trenches, constructed wetland filter strips, underground pipes, and detention basins. Detention basins would be placed primarily along the edge of the primary drainage corridor trail to mimic the natural drainage patterns. In addition, distributed components including infiltration and bioretention (e.g., swales and bioretention planters) in parking areas, streets, paseos, and pedestrian corridors may be integrated.

The proposed water quality detention basins were sized based on criteria outlined in the Stormwater Quality Design Manual for the Sacramento and South Placer Regions (MacKay & Somps 2011b; SSQP 2007). Detention basins were sized such that the flow rates exiting the SPA boundaries would not exceed the existing conditions flow rates and outlet (MacKay & Somps 2011b:16). They should also be sized based on the criteria outlined in the Draft Hydromodification Management Plan (Submitted to the Regional Board and pending approval). Outlet control structures were designed to meter the release rates so they match the predevelopment flow rates for the same sized drainage shed area.

Table 3.9-14 shows the preliminary water quality volumes required within each proposed detention basin. The water quality basin sizing and design configuration for each watershed would be finalized during the final design stages (i.e., when small-lot tentative subdivision maps and/or improvement plans are submitted).

Water quality BMPs, including those to be used for the Proposed Project Alternative and shown in Table 3.9-14, such as vegetated swales, constructed wetlands, infiltration trenches, and detention basins have been shown to be successful in controlling water quality and avoiding water quality impacts (SSQP 2007:VS-1, CWB-1, IT-1, DB-1). Pollutants are removed from stormwater in detention basins through gravitational settling and biological processes depending on the type of basin. Some basins may incorporate permanent wet detention which may enhance pollutant removal through biological and chemical processes (SSQP 2007:DB-2).

Table 3.9-14
Project Site "Baseline" Conditions Water Quality Basins and Volumes[1]

Basin Number	Total Basin Area (acres)	Water Quality Volume (acre-feet)[2]
1	2.22	2.5
2	4.30	3.4
3	4.60	2.2
4	6.19	3.8
5	9.43	5.7
6	4.63	3.0
7	2.56	1.5
8	5.26	3.6
9	3.99	2.3
10	2.47	1.9
11	0.69	0.4
12	4.30	2.7
Total	50.64	32.9

Notes:

[1] The water quality volume contribution to the detention basin volume is considered dead storage volume and is not included in the detention storage volume calculations.

[2] Detention bases are designed with a water quality component with a wet basin minimum depth of 4 feet.

Source: MacKay & Somps 2011b:27

Modeling and Detention Basin Alternatives

The Anatolia III Modeling Alternatives and Modified Hydromodification Basins Modeling Alternatives are variations of the Proposed Project Alternative that would involve modified detention basin sizing and the potential relocation of drainage infrastructure (e.g., detention basins and/or channels and box culverts) from the adjacent Anatolia III development to the SunCreek SPA. The Detention Basin Alternatives would also involve modification of detention basin sizing to accommodate potential alternate design options. The Anatolia III Modeling Alternatives and Detention Basin Alternatives would only result in potential modifications to stormwater drainage system infrastructure design and would not be expected to increase the potential for the Proposed Project Alternative to cause or contribute to long-term discharges of urban contaminants into the stormwater drainage system and receiving waters. These alternatives would be subject to the policies that have also been incorporated into the SunCreek Specific Plan to protect water quality during project operations (described above). The Anatolia III Modeling Alternatives and Detention Basin Alternatives would also be required to use treatment methodologies as described in the Stormwater Quality Design Manual and abide by requirements of the Sacramento NPDES MS4 Permit.

Conclusion

However, because final design plans and specifications have not been submitted to or approved by the City, implementation of the Proposed Project Alternative could result in contaminants entering receiving waters, thus resulting in adverse effects from long-term urban runoff. Because the Proposed Project Alternative could result in impacts on water quality within on-site drainage channels and ultimately off-site drainage channels as a result of runoff from the SPA, the project-related water quality impacts would be both **direct** and **indirect**, and would be **potentially significant**.

Mitigation Measure: Implement Mitigation Measure 3.9-3.

ID

Under the Increased Development Alternative, the amount of contaminants discharged in stormwater drainage would likely be higher than under the Proposed Project Alternative because of the higher acreage and overall amount (e.g., number of dwelling units) of residential land uses, as shown in Exhibit 2-28 (ID) in Chapter 2, “Alternatives.” Potential contaminant discharges from commercial land uses, however, would likely be less than the Proposed Project Alternative, as this alternative would result in approximately 74 fewer acres of commercial land uses. However, because final design plans and specifications have not been prepared, or submitted to or approved by the City, implementation of the Increased Development Alternative could result in **potentially significant, direct** and **indirect** impacts related to the potential for contaminants to enter receiving waters, thus resulting in adverse effects from long-term urban runoff. ***[Similar]***

Mitigation Measure: Implement Mitigation Measure 3.9-3.

Implementation of Mitigation Measure 3.9-3 would reduce the potentially significant impact associated with potential long-term water quality effects of urban runoff under the No USACE Permit, Proposed Project, Biological Impact Minimization, Conceptual Strategy, and Increased Development Alternatives to a **less-than-significant** level because the project applicants of all project phases would develop and implement a BMP and water quality maintenance plan that would demonstrate to the City that the Project Alternative would conform to applicable state and local regulations restricting surface water runoff including the Stormwater Quality Design Manual for the Sacramento and South Placer Regions (SSQP 2007) and the draft Hydromodification Management Plan. The permanent BMPs proposed for the stormwater treatment system and described in detail in the Stormwater Quality Design Manual have been shown to be effective in reducing contaminant levels in urban runoff if designed, constructed, and maintained properly (EPA 1999, CASQA 2010) (see Table 3.9-15).

Table 3.9-15 Expected Pollutant Removal Efficiency of Structural BMPs					
BMP Type	**Typical Pollutant Removal (%)**				
	Suspended Solids	**Nitrogen**	**Phosphorus**	**Pathogens**	**Metals**
Dry detention basins	30–65	15–45	15–45	<30	15–45
Wet detention/retention basins	50–80	30–65	30–65	<30	50–80
Constructed wetlands	50–80	<30	15–45	<30	50–80
Infiltration basins	50–80	50–80	50–80	65–100	50–80
Infiltration trenches, dry wells	50–80	50–80	15–45	65–100	50–80
Porous pavement	65–100	65–100	30–65	65–100	65–100
Grassed swales	30–65	15–45	15–45	<30	15–45
Vegetated filter strips	50–80	50–80	50–80	<30	50–80
Surface sand filters	50–80	<30	50–80	<30	50–80
Other media filters	65–100	15–45	<30	<30	50–80

Note: BMP = best management practices
Source: U.S. EPA 1999:Table 5-7

IMPACT 3.9-4 **Potential Exposure of People or Structures to a Significant Risk of Flooding as a Result of the Failure of a Levee or Dam**. *The SPA is not in an area protected by levees and is not located within the Folsom Dam inundation zone.*

NP

Under the No Project Alternative, no development would occur at the SPA. Therefore, there would be **no direct** or **indirect** impacts to people or structures related to flooding as a result of the failure of a levee or dam. ***[Lesser]***

NCP, PP, BIM, CS, ID

For planning purposes, the State Office of Emergency Services (OES), with information from the U.S. Bureau of Reclamation and DWR, has the responsibility to provide local governments with critical hazard response information, including information related to potential flooding from levee failure or dam inundation.

The SPA is bordered to the west by the Folsom South Canal, which is a concrete-lined canal. The canal was constructed in the 1970s and is owned and operated by the U.S. Bureau of Reclamation. The headworks for the canal are located at Nimbus Dam on the American River, just southwest of Folsom Dam and Lake. The Folsom South Canal is bounded by bermed material which was excavated during canal construction, but these berms do not serve a flood control purpose. The project would include detention basins that would primarily be constructed above the original ground surface and would have a levee or dam structure that would regulate flows before entering the preserve. These detention basins would have a broad, flat slope and would not fall under Division of Safety of Dams (DSOD) jurisdiction. Therefore, the SPA is not in an area protected by levees and no new levees or dams are proposed as part of the project that would be considered under DSOD jurisdiction for dam safety.

Although the Folsom Dam is located approximately 13 miles north of the SPA, the SPA is not located within the OES dam inundation zones. While a relatively large portion of Sacramento County would be inundated with water in the event of a dam or dike failure, the SPA is outside of the mapped inundation area (County of

Sacramento n.d.:384, Figure III-4). Implementation of any of the project alternatives would do nothing to increase the potential for dam failure. In addition, a dam failure plan, the flooding ALERT system, and evacuation procedures are integrated into Sacramento County's Emergency Operations Plan (County of Sacramento 2008:Part 2, 1). Therefore, this **direct** impact is considered **less than significant**. **No indirect** impacts would occur. ***[Similar]***

Mitigation Measure: No mitigation measures are required.

IMPACT 3.9-5 **Potential Impacts from New Impervious Surfaces and the Use of Groundwater Resources on Groundwater Recharge and Aquifer Volume.** *Shallow and deep percolation of rainwater and water used for landscape irrigation and related runoff and consequent depth to groundwater would not be substantially affected by the development of additional impervious surfaces because of the low permeability of existing on-site soils, which would not result in a substantial adverse impact on groundwater recharge. The use of groundwater resources to supply a portion of the project's water demands would not substantially deplete groundwater supplies and therefore would not result in a net deficit in aquifer volume.*

NP

Under the No Project Alternative, no development would occur at the SPA; therefore, there would be **no direct** or **indirect** project-related impacts on groundwater levels from new impervious surfaces, changes in landscape irrigation, or changes in groundwater resource extraction. ***[Lesser]***

NCP, PP, BIM, CS, ID

Effects of New Impervious Surfaces on Groundwater Recharge

Planned development of the Proposed Project and the other four action alternatives would include increases in impervious surfaces and the amount of surface runoff. Of the approximately 1,265 acres in the SPA, approximately 869 acres would be developed with residential and commercial land uses, as well as schools and infrastructure as part of the Proposed Project Alternative. The remaining approximately 396 acres would be retained as open space, including a wetland preserve and associated wetland preserve buffer area located along the existing drainage of Kite Creek. The proposed detention basins would also provide some groundwater recharge through localized infiltration where subsurface conditions allow. Under the No USACE Permit, Biological Impact Minimization, Conceptual Strategy, and Increased Development Alternatives, 606, 730, 827, and 1,072 acres of land would be developed, respectively, with the remainder retained as wetland preserve, and other undeveloped land uses. The No USACE Permit Alternative would result in the smallest increase in impervious surfaces. The Increased Development Alternative would result in greatest increase in impervious surface due to the higher amount of urban development and associated impervious surface proposed, and the decreased amount of wetland preserve and other undeveloped land uses.

As described in Subsection 3.9.1, "Groundwater Hydrology" above, soils in the SPA and surrounding area have a poor capacity for groundwater recharge, with most of the substantial recharge occurring along active stream channels. Only small amounts of precipitation per year are expected to infiltrate to the groundwater aquifer under undeveloped conditions, with the remaining water running off or consumed through evapotranspiration. Those areas within the SPA that are most conducive to groundwater recharge, e.g. Kite Creek and its tributary corridors, would generally be maintained in open space and would continue to allow for infiltration. Detention basins and percolation trenches proposed as part of the project, as well as the LID features described in Mitigation Measure 3.9-3 (if implemented), would also be designed to infiltrate excess runoff and percolate nuisance flows. Furthermore, increased seasonal groundwater recharge from landscape irrigation activities would occur with the transition of the SPA from primarily dry land farming and grazing lands. Urban land uses result in application of water, in addition to precipitation, for outdoor use. A portion of this water, although restricted by the soil conditions described above, reaches the aquifer as recharge. It should be noted, however, that indoor uses of water would not contribute to local groundwater recharge, as this water is discharged to the Sacramento River after treatment at the Sacramento Regional Wastewater Treatment Plant. Therefore, for the reasons stated above, the **direct** impact to groundwater recharge from development of new impervious surfaces would be **less than significant. No indirect** impacts would occur. ***[Similar]***

Direct Effects to Aquifer Volume from Use of Groundwater

Project-specific water supply and demand impacts are addressed in Section 3.17 "Water Supply" of this DEIR/DEIS. The analysis in this section addresses the project's potential for direct effects to depletion of groundwater supplies and aquifer volume from use of groundwater, in particular groundwater from the proposed on-site wells. SCWA anticipates that water service to the SPA would be provided in three phases, depending the start of construction activities within the SPA (MWH 2008, attached as Appendix U to this DEIR/DEIS). Phase 1 water service would involve using available groundwater supplies from the North Vineyard Well Field (NVWF) and the Mather Housing groundwater system until NSA water demands approach the capacity of these groundwater wells. Phase 2 water service would entail using available SCWA groundwater supplies and surface water delivered by the NSAP. Phase 3 water service would not occur until the water demands of the NSA begin to approach the capacity of the NSAP. At that time, SCWA anticipates that the Vineyard Surface Water Treatment Plant (WTP), NVWF, and Anatolia WTP would be expanded to their full capacity to meet water demands of the NSA, including the SPA. (MacKay & Somps 2011a:6) Furthermore, three groundwater wells and a water treatment plant on the SunCreek SPA are proposed as part of this project in order to provide an additional source of water supply, if needed (see Exhibit 2-8 in Chapter 2, "Alternatives"). The on-site groundwater wells are not projected for use until full project buildout in 2030, and would only be used to meet peaking and/or backup demands (if necessary). The primary source of water supply for the SPA is the NSAP. The NSAP, along with the other water supply sources listed above, are described in detail on pages 3.17-14 through 3.17-17 of Section 3.17, "Water Supply." In the long term, SCWA anticipates the majority of water demands in the NSA would be met with surface water. However, the year-to-year mix of surface and groundwater varies depending on a large number of variables and SCWA would adjust the amount of groundwater and surface water as necessary to meet the demands of the NSA as part of its conjunctive use program (described further in Section 3.17, "Water Supply") (MacKay & Somps 2011a:8, SCWA 2006:4-31).

The water supply impacts related to use of water from the NVWF were evaluated in the *Revised Recirculated Sunrise Douglas Community Plan and Sunridge Specific Plan Environmental Impact Report* (SDCP/SRSP EIR) (AECOM 2011), which was certified in November of 2011. The SDCP/SRSP EIR is hereby incorporated by reference. Pages 3-1 through 3-50 of the SDCP/SRSP DEIR determined that all water supply impacts were less than significant (i.e., increased demand for long-term supplies [pages 3-32 through 3-42]; contribution to impacts identified in the *Zone 40 Water Supply Master Plan Draft Environmental Impact Report* [Zone 40 WSMP EIR] [pages 3-42 through 3-43]; and the need for water conveyance facilities to deliver supplies, including contributions to impacts identified from other infrastructure supply projects such as the NSAP [pages 3-44 through 3-46]).

The amount of groundwater that would be extracted by SCWA to serve the NSA, including the SPA, was included in the Zone 40 WSMP EIR (SCWA 2003). Furthermore, the proposed groundwater wells within the SPA are not intended solely for the use of the SunCreek Specific Plan Project; rather, they are part of SCWA's regional water supply facilities that were included in the *Zone 40 Water System Infrastructure Plan* (Zone 40 WSIP) (SCWA 2006), which was prepared to address how identified 2030 water supplies in both the Zone 41 UWMP and the Zone 40 WSMP would be allocated among users within its service area. The SPA is located within Zone 40. The WSIP describes and quantifies the facilities necessary to extract, treat, and convey groundwater to the Zone 40 service area; describes provision of water purchased from the City of Sacramento to the portion of Zone 40 within the City of Sacramento American River Place of Use; describes conveyance of surface water for treatment at the Vineyard Surface WTP; and describes delivery of wholesale treated groundwater and surface water to retail water purveyors outside of the Zone 40 service area (SCWA 2006:1-3).

The Zone 40 WSIP provides the most up-to-date information on Zone 40's water supplies, demands, and infrastructure; provides project-level detail that is necessary for implementation of the preferred pipeline alignment alternatives that were identified in the 2005 Zone 40 WSMP; and it fills in the gaps of associated smaller infrastructure requirements, including a description of facility construction and phasing as well as operational requirements from existing conditions through ultimate buildout of the water system.

SCWA is a signatory to the Water Forum Agreement (WFA), which is a plan that provides for the effective long-term management of the Sacramento region's water resources. The WFA was formulated based on the two coequal objectives of the Water Forum: (1) provide a reliable and safe water supply for the region's economic health and planned development through the year 2030; and (2) preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. (Sacramento City-County Office of Metropolitan Water Planning 1999, Water Forum 2000.)

As a signatory to the WFA, SCWA undertook a comprehensive update of its water supply planning process in response to the requirements of the WFA through the Zone 40 WSMP, which was adopted in February 2005. SCWA has agreed to ensure that a series of actions and commitments related to surface-water diversions, dry-year supply, water conservation, and groundwater management—necessary steps to achieve WFA objectives—are integrated into future growth and water planning activities in its service area. The Zone 40 WSMP provides a flexible plan of water management options that can be implemented and modified if conditions that affect the availability and feasibility of water supply sources change in the future. The goal of the Zone 40 WSMP is to carry out a conjunctive-use program, which is defined as the coordinated management of surface water and groundwater supplies to maximize the yield of available water resources. The conjunctive-use program for Zone 40 includes the use of groundwater, surface water, remediated water, and recycled water supplies. It also includes a financing program for the construction of a new surface-water diversion structure; a surface-water treatment plant; water conveyance pipelines; and groundwater extraction, treatment, and distribution facilities.

The Zone 40 WSMP evaluates several options for facilities to deliver surface water and groundwater to development in a subarea within Zone 40 known as the 2030 Study Area, as well as the financing mechanisms to provide water to the 2030 Study Area. (City of Rancho Cordova 2006a). The 2030 Study Area encompasses approximately 46,600 acres (including portions of the cities of Elk Grove and Rancho Cordova, and the SPA) where development of industrial, commercial, office, and residential land uses is expected to occur and where demand for water is expected to be concentrated during the planning horizon of the WSMP (i.e., 2030) (see Exhibit 3.17-1 in Section 3.17, "Water Supply"). (City of Rancho Cordova 2006a).

SCWA prepared and adopted the Zone 41 UWMP in June of 2011 to address water supply and demand issues, water supply reliability, water conservation, water shortage contingencies, and recycled-water usage for the areas within Sacramento County where Zone 41 provides retail water services, including Zone 40. Water supplies and demands within SCWA Zone 40 would be the same during normal, single-dry, and multiple-dry years; however, the year-to-year mix of surface and groundwater would be adjusted as necessary to meet the demands as part of SCWA's conjunctive use water supply program. Groundwater use is projected to decrease from the current level now that the Vineyard Surface WTP is operational (it came online in late fall 2011); but it will increase over time as water demand continues to grow in Zone 40. In wet and normal years, groundwater pumping will be minimized because surface water becomes the major water supply source. In dry years, groundwater pumping will increase substantially as surface water availability is considerably reduced. Reduction in projected pumping in wet/normal years between 2010 and 2035 reflects the phasing and availability of surface water facilities and supplies from the Vineyard Surface WTP. Over time, groundwater production will stabilize as SCWA's conjunctive use program is fully implemented. (SCWA 2011a:4-16; SCWA 2011b:5 and 17.) This conjunctive use program is consistent with the provisions of the WFA that limited the long-term annual average of groundwater extraction rate from the Central Basin at or below 273,000 acre-feet per annum.

In summary, SCWA will provide water to the project through a combination of off-site surface and groundwater supplies, and on-site groundwater wells that were included the Zone 40 WSIP. SCWA currently exercises, and will continue to exercise, its rights as a groundwater appropriator and will extract water from the Central Basin for the beneficial use of its customers. SCWA is a signatory to the WFA, which provides for the effective long-term management of the Sacramento region's water resources to (1) provide a reliable and safe water supply for the region's economic health and planned development through the year 2030; and (2) preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. (Sacramento City-County Office of Metropolitan Water Planning 1999, Water Forum 2000).

Therefore, for the reasons stated above, the use of groundwater to meet a portion of the water supply needs of the SPA would not substantially deplete groundwater supplies and thus would not result in a net deficit in aquifer volume. Thus, this **direct** impact is considered **less-than-significant.** ***[Similar]***

Indirect Effects from Use of Groundwater

Cosumnes River Flows Water levels in the Cosumnes River have been shown to affect migratory fish species. The indirect impact of SCWA's use of groundwater on water levels in the Cosumnes River, as part of its conjunctive use program to serve its customers in the City and the region, was evaluated in the SDCP/SRSP EIR (AECOM 2011). The SDCP/SRSP EIR determined as follows:

> [As] noted in Chapter 3, "Water Supply," of this Revised DEIR, the refined SacIGSM modeling conducted for the Zone 40 WSMP FEIR confirmed that there would be no substantial changes in average groundwater levels at simulated locations near the river as a result of the additional groundwater pumping. Because of the hydraulic disconnection between the aquifer and the channel along much of the valley floor reach of the Cosumnes River channel, any project-related changes in groundwater levels would not result in direct losses or changes in surface flows in these already disconnected reaches. Moreover, average annual streamflows would increase slightly under the cumulative condition as a result of conjunctive use operations that result in reduced groundwater reliance during wet year types relative to the base condition, thus resulting in greater conservation of the groundwater supplies than would otherwise occur without conjunctive use. Additionally, SacIGSM modeling showed there would be minimal to no changes in average groundwater levels or river flows at locations near the river where hydraulic connections to the aquifer remain. Because the adverse hydrologic conditions have existed historically and because groundwater pumping, as assessed in the Zone 40 WSMP EIR, would result in minimal changes in average groundwater levels and not otherwise affect hydraulically disconnected reaches, SDCP/SRSP implementation would not result in a cumulatively considerable incremental contribution to the significant cumulative impact on fisheries and aquatic resources of the Cosumnes River. (AECOM 2011:4-28.)

Contaminated Groundwater Plumes As stated above, the project is expected to rely primarily on surface water supplied by the NSAP. The small amount of water that could be used for the SunCreek Specific Plan Project at full project buildout to meet peaking and/or backup demands (if needed) from on-site SCWA groundwater wells is not expected to result in a substantial change in the movement of the off-site contaminated groundwater plumes in the project vicinity.

Therefore, the **indirect** impacts of use of groundwater to meet part of the water supply needs of the SPA are considered **less than significant.** ***[Similar]***

Mitigation Measure: No mitigation measures are required.

3.9.4 Residual Significant Impacts

With implementation of the mitigation measures listed above, project implementation would not result in any residual significant impacts related to short-term alteration of drainages and associated surface water quality and sedimentation, increased risk of flooding or hydromodification from stormwater runoff, water quality and hydrology effects from long-term urban runoff, or groundwater levels.

3.9.5 Cumulative Impacts

Local hydrology, drainage, and water quality conditions are often affected by regional activities. Past and present projects from areas within the Sierra Nevada mountains (e.g., the construction of dams and reservoirs, mining operations, logging operations, and urban development) to projects within the Sacramento–San Joaquin Delta (e.g., water supply diversions, agricultural diversions, flood control projects, urban development, and river channelization) affect hydrology and water quality conditions in Sacramento County. The following evaluation of cumulative hydrology, drainage, and water quality impacts is made in light of the extent to which local and regional activities can affect hydrologic conditions in Sacramento County. However, the focus is on effects to water bodies in the project vicinity and immediately upstream and downstream (e.g., Kite Creek and Laguna Creek) and how the SunCreek project and related projects may affect the hydrology, drainage, and water quality conditions locally.

Surface Water Quality

Construction activities during implementation of the SunCreek project would involve extensive grading and movement of earth. Substantial construction-related alteration of on-site drainages could result in soil erosion and stormwater discharges of suspended solids, increased turbidity, and potential mobilization of other pollutants from project-related construction sites. This contaminated runoff could enter Kite Creek or other on-site drainage channels and ultimately drain off site. Intense rainfall and associated stormwater runoff in relatively flat areas could result in short periods of sheet erosion within areas of exposed or stockpiled soils. If uncontrolled, these soil materials could cause sedimentation and blockage of drainage channels. Accidental spills of construction-related contaminants, such as fuels, oils, paints, solvents, cleaners, and concrete, could occur during construction activities in the SPA, resulting in surface soil contamination. The SunCreek project applicants must prepare a SWPPP consistent with the existing statewide NPDES discharge permits from the Central Valley RWQCB. Implementation of these regulatory requirements in addition to Mitigation Measure 3.9-1 would reduce the potentially significant water quality and erosion impacts from project-related construction activities to a less-than-significant level. Although there are no assurances that the related projects would incorporate the same degree or methods of treatment as the SunCreek project, each related project that would discharge stormwater runoff would be required to comply with NPDES discharge permits from the Central Valley RWQCB. Therefore, the SunCreek project would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to construction-generated runoff and water quality impacts to receiving water bodies

The project, along with several other planned projects in the community and waste stream facilities associated with the Kiefer Landfill Buffer Planning Project adjacent to the SPA to the east would have the potential to increase stormwater runoff through the creation of new impervious surfaces and landscape features. This increase in impervious surfaces could cause or contribute to long-term discharges of urban contaminants (e.g., sediment, oil and grease, fuel) to the Laguna Creek Watershed. Under the SunCreek project, all drainage runoff would enter detention basins where it would be treated prior to release. Detention basins and other stormwater quality treatment techniques (BMPs) would use treatment methodologies as described in the Stormwater Quality Design Manual for the Sacramento and South Placer Regions (SSQP 2007) and would be required to comply with the Sacramento NPDES MS4 Permit. In addition, detention basins for the SunCreek project were sized such that the flow rates exiting the SPA boundaries would not exceed the existing conditions flow rates and outlet control structures were designed to meter the release rates so they match the predevelopment flow rates for the same sized drainage shed area. Although there are no assurances that the related projects would incorporate the same degree or methods of long-term treatment and hydromodification controls as the SunCreek project, each related project that would discharge stormwater runoff would be required to comply with the Sacramento NPDES MS4 Permit from the Central Valley RWQCB and associated requirements of the design criteria identified in the Stormwater Quality Design Manual for the Sacramento and South Placer Regions. Therefore, the SunCreek project would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to operational runoff and water quality impacts to receiving water bodies.

SURFACE DRAINAGE AND FLOOD CONTROL

The SPA is not in an area protected by levees and is not located within the Folsom Dam inundation zone. The drainage facilities identified as part of the SunCreek project would be constructed to safely control and convey stormwater runoff and have been designed to satisfy the design criteria of the Stormwater Quality Design Manual, FEMA National Flood Insurance Program requirements, and the NPDES requirements. Proposed detention/water quality basins and outlet controls are designed to reduce peak runoff leaving the site to match or be less than the predevelopment flow rates. Modeling results indicated that the 100-year (0.01 AEP) and 10-year storm events would remain at or below existing conditions. Detention basins include percolation trenches to reduce potential effects to existing stream channels from summer nuisance flows. Future development upstream of the SPA would be required to meet similar standards through project-specific mitigation. While the related projects may be located in areas protected by levees and may place housing within a 100-year floodplain, each of the related projects would be required to satisfy the design criteria of the Stormwater Quality Design Manual, FEMA National Flood Insurance Program requirements, and the NPDES requirements, including protection of residents and workers from 100-year storm events. Therefore, a cumulative impact would not occur, and the SunCreek project would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to surface drainage and flood control.

GROUNDWATER LEVELS

Changes in groundwater levels as a result of increased impervious surfaces have the potential to occur in the project vicinity as planned urban development continues to occur in the area. Planned development under the SunCreek project and the related projects would include increases in impervious surfaces and surface runoff generated by proposed development. However, soils in the SPA and surrounding area have a poor capacity for groundwater recharge, with most of the substantial recharge occurring along active stream channels. Most of the areas within the SPA that are most conducive to groundwater recharge, such as the Kite Creek and tributary corridors, would be maintained as open space and therefore would allow for continued infiltration and groundwater recharge. Detention basins proposed as part of the project, and LID features recommended in Mitigation Measure 3.9-3 (if implemented), as well as landscape irrigation activities, would contribute to groundwater recharge if they are sited or occur in areas that have conducive soils. The development of surface water supplies as part of SCWA's Zone 40 WSIP would decrease the reliance on groundwater supplies over time throughout the NSA. SCWA supplies water to its customers based on a conjunctive use program. As a signatory to the WFA, SCWA is committed to the effective long-term management of the Sacramento region's water resources to (1) provide a reliable and safe water supply for the region's economic health and planned development through the year 2030; and (2) preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. (Sacramento City-County Office of Metropolitan Water Planning 1999, Water Forum 2000). Therefore, a cumulatively significant impact would not occur, and the project itself would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to groundwater levels and recharge.

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