4.8 HYDROLOGY AND WATER QUALITY

4.8.1 INTRODUCTION

The Hydrology and Water Quality chapter of the EIR describes existing drainage and water resources for the project site, and evaluates potential impacts of proposed project with respect to flooding, surface water resources, and groundwater resources. Information for the Hydrology and Water Quality chapter was primarily drawn from the *Preliminary Stormwater Control Plan* prepared for the proposed project by Balance Hydrologics, Inc. (Appendix H).[1] In addition, information from the *City of Antioch General Plan*[2] and associated EIR,[3] the *Water Supply Assessment* prepared for the proposed project by West Yost Associates (Appendix I),[4] and the *Groundwater Evaluation* prepared by ENGEO, Inc.[5] were used. It should be noted that impacts associated with water supply and capacity are addressed in Chapter 4.11 of this EIR, Public Services, Recreation, and Utilities.

4.8.2 EXISTING ENVIRONMENTAL SETTING

The section below describes the existing hydrological features of the project site and the surrounding region, including groundwater, as well as the water quality of the existing resources in and around the project site.

Regional Drainage

The following existing regional drainage discussion is based on information from the City's General Plan and associated EIR.

Regional Waterways and Water Bodies

The principal waterways within the City of Antioch include the San Joaquin River, East Antioch Creek, West Antioch Creek, Markley Creek, Sand Creek, Marsh Creek, and Deer Creek. Parts of the City's naturally occurring floodplains are paved and stretches of creek channels have been covered by culverts. In addition to naturally occurring creeks, other waterways occur within the City, such as the Contra Costa Canal, owned by the Bureau of Reclamation. The Contra Costa Canal is a channelized potable water conveyance canal. A spillway leads from the Contra Costa Canal and flows north to the San Joaquin River. The East Bay Municipal Utility District

1 Balance Hydrologics, Inc. *Preliminary Stormwater Control Plan for The Ranch Project.* May 19, 2017.
2 City of Antioch. *City of Antioch General Plan*. Updated November 24, 2003.
3 City of Antioch. *Draft General Plan Update Environmental Impact Report*. July 2003.
4 West Yost Associates. *Water Supply Assessment for The Ranch Project*. August 2017.
5 ENGEO, Inc. *Groundwater Evaluation*. May 24, 2017.

Aqueduct is a water transmission facility that runs from the Central Valley to the East Bay region. The lines are located south of State Route (SR) 4 and are aboveground for roughly 350 feet north of Buchanan Road and west of Somersville Road.

The Contra Loma Reservoir, built by the Bureau of Reclamation as part of the Central Valley Water Project and currently managed by the Contra Costa Water District, is supplied by the Contra Costa Canal and provides peak demand and emergency water supplies for the Contra Costa Water District. The Antioch Municipal Reservoir is also a key component of the City's water system, as the reservoir provides a means of equalizing demand and ensuring the reliability of the supply from the Contra Costa Canal. Although not situated on the main stem of the creek, some flood protection is also provided in the West Antioch Creek watershed by the Antioch Municipal Reservoir. Another lake, Lake Alhambra, which is a private recreation lake for the surrounding residential area, is located on East Antioch Creek.

Regional Flooding

Most flooding that occurs within the City of Antioch is a result of heavy rainfall, high tides, and subsequent runoff volumes that cannot be adequately conveyed by the existing storm drainage system and surface water.

According to the City's General Plan EIR, the Bureau of Reclamation Division of Dam Safety conducted a safety analysis of the Contra Loma Reservoir in 1983 and determined that safe performance of the dam can be expected under all anticipated loading conditions, including the MCE (maximum credible earthquake) and PMF (probable maximum flood) events. The overall safety classification of the dam is registered as satisfactory. According to the City's General Plan EIR, in the unlikely event of dam failure, the estimated inundation area would essentially follow the West Antioch Creek drainage from the dam to the San Joaquin River. The inundation area would extend to a half-mile-wide area south of SR 4, and a more than a half-mile-wide area at West 10th Street. The anticipated maximum depth would be 19 feet directly south of the dam to seven feet at West 10th Street and 11 feet at the San Joaquin River.

The City continues to implement flood prevention measures, including construction of detention basins. The most significant detention basins are the Trembath, Oakley, and Lindsay basins on East Antioch Creek and the Sand Creek Basin on Sand Creek. In addition, significant portions of Markley Creek, West Antioch Creek, and East Antioch Creek have been improved to contain the 100-year flood within their channels. A flap gate protects the Lake Alhambra area where the East Antioch Creek enters the San Joaquin River. The gate is adequate in normal tides; however, during high tides, the river overflows the adjacent banks and contributes to flooding potential upstream.

Regional Stormwater System

Stormwater collection in the City is overseen by the Contra Costa County Flood Control and Water Conservation District (CCCFCWCD). The City has over 110 miles of trunk lines to collect stormwater, which are independent from the wastewater collection system. The stormwater trunk lines discharge to channels owned and maintained by both the City of Antioch

and the CCCFCWCD. The CCCFCWCD releases stormwater from the channels to the San Joaquin River and is the holder of a National Pollution Discharge Elimination System (NPDES) permit. Contra Costa County Clean Water Program staff monitors the quality of the released water to comply with the specifications of the NPDES permit. The Central Valley Regional Water Quality Control Board (CVRWQCB) regulates stormwater discharged from the City.

Local Drainage

The topography of the site is varied, ranging from relatively level areas in the eastern and central portions of the site, gently-sloping hills immediately north and south of Sand Creek, and moderate to steep slopes in the western portion of the site. The main development areas of the project are concentrated on relatively level land that slopes slightly parallel to Sand Creek with elevations ranging from 320 feet at the western boundary to 230 feet along the eastern boundary. The slope across the main development areas of the project site are relatively constant at approximately 1.4 percent for the northern section and 1.2 percent for the southern section. The southern section of the site backs to a series of hills that would be developed with a limited amount of low-density residential units. The southern area of the site has a peak elevation of 481 feet.

Sand Creek, an intermittent creek, flows west to east through the proposed project site eventually entering Marsh Creek in the City of Brentwood. The creek receives urban runoff from developments to the northwest, and from a larger, yet undeveloped, watershed further to the northwest. The average distance between ordinary high-water marks (OHWM) in Sand Creek is 12 feet. Sand Creek flows in a highly-incised channel through the site. The Sand Creek channel ranges from 150 to 300 feet wide, as measured from the top of the banks, with the top of the bank ranging in elevation from 300 feet at the upper (western) end of the proposed project to 230 feet on the lower (eastern) end of the site. The creek bed elevations range from 274 feet to 210 feet over a stream distance of roughly 10,415 feet, which is equivalent to a channel slope of roughly 0.6 percent.

The mean annual precipitation at the site is roughly 14.4 inches. Annual temperature patterns are typical of interior areas of the State, although somewhat tempered by cooling breezes originating at sea and in the San Francisco Bay system. Evaporation rates are quite high in summer; exceeding rainfall in all but the wettest winter months. Mean annual pan evaporation is likely on the order of 71 inches, or over five times mean annual precipitation. Existing impervious surfaces are limited to Snodgrass Lane and the existing ranch development. As such, little precipitation falling on the project site is intercepted, and most of the runoff on the site follows the natural slope and drainage ways.

The project site is primarily underlain by seven different types of soil: Altamont clay, 9-15% slopes (AbD), Altamont clay, 15-30% slopes (AbE), Altamont-Fontana Complex (AcF), Briones loamy sand (BdE), Capay clay (CaA), Clear Lake clay (Cc), and Rincon clay loam (RbA). All the soils are classified as group C under the National Resources Conservative Service (NRCS) hydrologic soil group system, with the exception of Briones loamy sand (BdE) which is classified as group A. The Group C soils underlying the site generally have low natural percolation rates and can severely limit the potential for direct infiltration of stormwater. The

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. Group A soils comprise approximately 1.2 percent of the project site, while the remaining 98.8 percent of the site is underlain by Group C soils. As such, a majority of the soils currently produce runoff rates that are relatively high.

Currently, the stormwater drainage pattern for the majority of the site consists entirely of sheetflow that follows the terrain, draining to Sand Creek. However, approximately 16.5 acres along the northern edge of the site currently drain to a ditch system associated with the existing developments to the north of the site.

Local Flooding

The Federal Emergency Management Agency (FEMA) categorizes flood prone areas based on the frequency of occurrence. As shown in Figure 4.8-1 the project site is within Flood Insurance Rate Map (FIRM) number 06013C0331. According to the FIRM, the entirety of the project site is within Flood Hazard Zone A and Zone X. Zone A is described by FEMA as an area subject to inundation by the one-percent-annual-chance flood event. The area of the site identified as Zone A follows the course of Sand Creek. The remaining areas of the site, which represents the majority of the site, is designated as Zone X, which is described by FEMA as an area of moderate to low flood risk, usually between the 100-year to 500-year flood levels.

Water Quality

Water is essential to recreation, the viability of agriculture, and the development of housing, commerce, and industry, as well as the maintenance of high-quality fish and wildlife habitats. Land uses and activities that the City must consider in protecting the quality of the City's water include construction activities, agricultural land uses, and urban runoff.

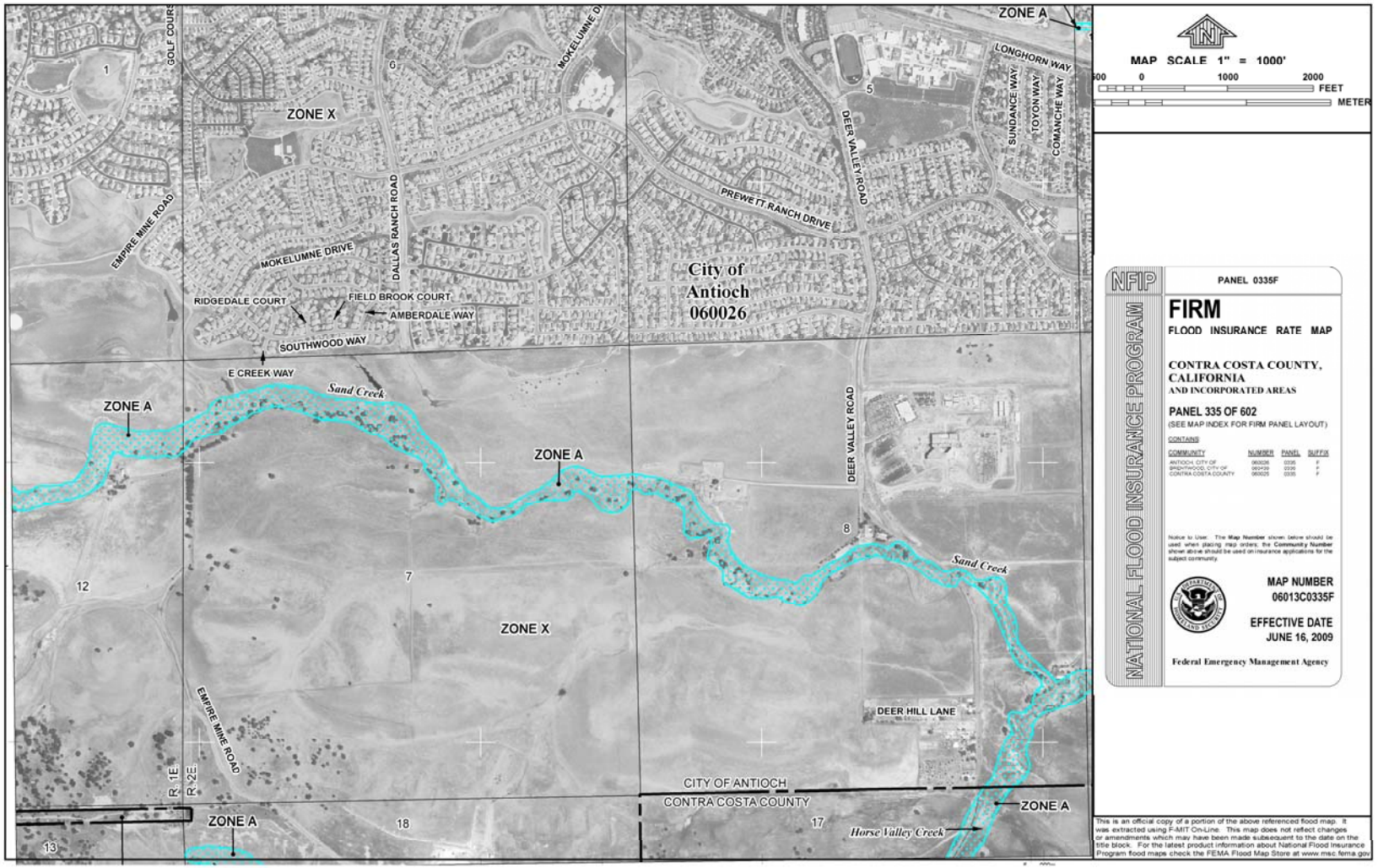
Construction Activities

Construction activities generally have the potential to cause erosion and sedimentation associated with groundbreaking and clearing activities. Such effects could result in impacts to nearby water bodies. Unstabilized soil could be washed or wind-blown into nearby surface water. Due to the use of heavy equipment during construction activities, during rainfall events, petroleum products and other pollutants from construction equipment have the potential to enter nearby drainages.

Agricultural Land Uses

Water running off irrigated agricultural fields may contain fertilizers and pesticides. Improper use and disposal of farm chemicals can contaminate surface and groundwater resources. Agricultural procedures can result in erosion of unstabilized soil, especially during conversion of vegetation. Aerial spraying can result in drift of sprayed chemicals into nearby water bodies.

Figure 4.8-1
Flood Hazard Zones



Source: Federal Emergency Management Agency. Flood Insurance Rate Map: 06013C0335F. Effective June 16, 2009.

Urban Runoff

Stormwater runoff from urban areas could contain a variety of pollutants that may reduce the quality of groundwater when introduced into groundwater aquifers or surface water when allowed to flow untreated to water bodies. Pollutants typically found in urban runoff include household and lawn-care chemicals (insecticides, herbicides, fungicides and rodenticides), heavy metals (such as copper, zinc and cadmium), oils and greases, and nutrients (nitrogen and phosphorus).

Groundwater and Groundwater Recharge

The City is located within the Tracy subbasin within the greater San Joaquin Valley Groundwater Subbasin. The City of Antioch receives water supplies from the San Joaquin River and the Sacramento-San Joaquin Delta. According to the Water Supply Assessment prepared for the proposed project, the City does not currently pump groundwater and does not intend to pump groundwater from the local groundwater basin in the future. Policy 10.7.2(d) of the City's General Plan requires protection of groundwater recharge areas, such as protection of stream sides from urban encroachment.

4.8.3 REGULATORY CONTEXT

The following is a description of federal, State, and local environmental laws and policies that are relevant to the review of hydrology and water quality under the California Environmental Quality Act (CEQA) process.

Federal Regulations

The following section includes federal environmental goals and policies relevant to the CEQA review process pertaining to the hydrology and water quality aspects of the proposed project.

Federal Emergency Management Agency (FEMA)

The FEMA is responsible for determining flood elevations and floodplain boundaries based on U.S. Army Corps of Engineers (USACE) studies. FEMA is also responsible for distributing the FIRMS, which are used in the National Flood Insurance Program (NFIP). The FIRMs identify the locations of special flood hazard areas, including the 100-year floodplains.

FEMA allows non-residential development in the floodplain; however, construction activities are restricted within flood hazard areas, depending upon the potential for flooding within each area. Federal regulations governing development in a floodplain are set forth in Title 44, Part 60 of the Code of Federal Regulations (CFR). The CFR standards are implemented at the State level through construction codes and local ordinances; however, these regulations only apply to residential and non-residential structure improvements. Although roadway construction or modification is not explicitly addressed in the FEMA regulations, the California Department of Transportation (Caltrans) has also adopted criteria and standards for roadway drainage systems and projects situated within designated floodplains. Standards that apply to floodplain issues are

based on federal regulations (Title 23, Part 650 of the CFR). At the State level, roadway design must comply with drainage standards included in Chapters 800-890 of the Caltrans Highway Design Manual. CFR Section 60.3(c)(10) restricts cumulative development from increasing the water surface elevation of the base flood by more than one foot within the floodplain.

Federal Clean Water Act

The National Pollutant Discharge Elimination System (NPDES) permit system was established in the federal Clean Water Act (CWA) to regulate municipal and industrial discharges to surface waters of the U.S. Each NPDES permit contains limits on allowable concentrations and mass emissions of pollutants contained in the discharge. Sections 401 and 402 of the CWA contain general requirements regarding NPDES permits. Section 307 of the CWA describes the factors that EPA must consider in setting effluent limits for priority pollutants.

Nonpoint sources are diffuse and originate over a wide area rather than from a definable point. Nonpoint pollution often enters receiving water in the form of surface runoff, but is not conveyed by way of pipelines or discrete conveyances. As defined in the federal regulations, such nonpoint sources are generally exempt from federal NPDES permit program requirements. However, two types of nonpoint source discharges are controlled by the NPDES program – nonpoint source discharge caused by general construction activities, and the general quality of stormwater in municipal stormwater systems. The 1987 amendments to the CWA directed the federal EPA to implement the stormwater program in two phases. Phase I addressed discharges from large (population 250,000 or above) and medium (population 100,000 to 250,000) municipalities and certain industrial activities. Phase II addresses all other discharges defined by EPA that are not included in Phase I.

Section 402 of the CWA mandates that certain types of construction activities comply with the requirements of the NPDES stormwater program. The Phase II Rule, issued in 1999, requires that construction activities that disturb land equal to or greater than one acre require permitting under the NPDES program. In California, permitting occurs under the General Permit for Stormwater Discharges Associated with Construction Activity, issued to the State Water Resources Control Board (SWRCB), implemented and enforced by the nine Regional Water Quality Control Boards (RWQCBs).

As of July 1, 2010, all dischargers with projects that include clearing, grading or stockpiling activities expected to disturb one or more acres of soil are required to obtain compliance under the NPDES Construction General Permit Order 2009-0009-DWQ. The General Permit requires all dischargers, where construction activity disturbs one or more acres, to take the following measures:

1. Develop and implement a SWPPP to include a site map(s) of existing and proposed building and roadway footprints, drainage patterns and storm water collection and discharge points, and pre- and post- project topography;
2. Describe types and placement of BMPs in the SWPPP that will be used to protect storm water quality;

3. Provide a visual and chemical (if non-visible pollutants are expected) monitoring program for implementation upon BMP failure; and
4. Provide a sediment monitoring plan if the area discharges directly to a water body listed on the 303(d) list for sediment.

To obtain coverage, a SWPPP must be submitted to the RWQCB electronically and a copy of the SWPPP must be submitted to the City of Antioch. When project construction is completed, the landowner must file a Notice of Termination (NOT).

Construction Site Runoff Management

In accordance with NPDES regulations, in order to minimize the potential effects of construction runoff on receiving water quality, the State requires that any construction activity affecting one acre or more must obtain a General Construction Activity Stormwater Permit. Permit applicants are required to prepare a SWPPP and implement BMPs to reduce construction effects on receiving water quality by implementing erosion and sediment control measures.

State Regulations

The following section includes the State regulations relevant to the CEQA review process pertaining to the hydrology and water quality aspects of the proposed project.

State Water Resources Control Board

The SWRCB and the RWQCBs are responsible for ensuring implementation and compliance with the provisions of the federal CWA and California's Porter-Cologne Water Quality Control Act. Contra Costa County includes areas within the CVRWQCB (Region 5S) and the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) (Region 2) jurisdictional boundaries. The project site is situated within the jurisdictional boundaries of the CVRWQCB. The CVRWQCB has the authority to implement water quality protection standards through the issuance of permits for discharges to waters at locations within their jurisdiction. It should be noted that all areas west of the City of Antioch in Contra Costa County are within the SFBRWQCB jurisdictional area.

The County Watershed Program is responsible for ensuring that the County complies with NPDES permits, which include the Municipal Regional Permit (MRP) (NPDES Permit No. CAS612008) and the East Contra Costa County Municipal Stormwater Permit (EC3MSP) (NPDES Permit No. CAS083313). The MRP was adopted by the SFBRWQCB on October 14, 2009, and applies to 76 Bay Area municipalities and discharges to the San Francisco Bay. The EC3MSP was adopted by the CVRWQCB on September 23, 2010, and applies to the cities of Antioch, Oakley, Brentwood, unincorporated Contra Costa County and the CCCFCWCD and discharges to the Delta. The EC3MSP largely mimics the MRP.

The MRP and EC3MSP contain a comprehensive plan to reduce the discharge of pollutants in stormwater to the maximum extent practicable in order to protect water quality. To accomplish such, a number of provisions are included in the permits, such as Provision C.3, New

Development and Redevelopment. Provision C.3 requires new development and redevelopment projects that create and/or replace 10,000 square feet or more of impervious surface over the whole site to include appropriate source control, site design, and stormwater treatment measures to address stormwater runoff pollutant discharges and prevent increases in runoff flows primarily through the implementation of low impact development (LID) techniques. To aid in the design of appropriate stormwater system design consistent with the Provision C.3 requirements, the *Stormwater C.3 Guidebook* was developed.[6]

Local Regulations

The following section includes the local regulations relevant to the CEQA review process pertaining to the hydrology and water quality aspects of the proposed project.

City of Antioch General Plan

The following objectives and policies of the Antioch General Plan, including policies from Section 4.4.6.7 specific to the Sand Creek Focus Area, are applicable to the hydrology and water quality aspects of the proposed project.

Policy 4.4.6.7.r Sand Creek, ridgelines, hilltops, stands of oak trees, and significant landforms shall be preserved in their natural condition. Overall, a minimum of 25 percent of the Sand Creek Focus Area shall be preserved in open space, exclusive of lands developed for golf course use.

Policy 4.4.6.7.s Adequate buffer areas adjacent to the top of banks along Sand Creek to protect sensitive plant and amphibian habitats and water quality shall be provided. Adequate buffer areas shall also be provided along the edge of existing areas of permanently preserved open space adjacent to the Sand Creek Focus Area, including but not limited to the Black Diamond Mines Regional Park. Buffers established adjacent to existing open space areas shall be of an adequate width to minimize light/glare, noise, fire safety, public safety, habitat, public access impacts within the existing open space areas, consistent with the provisions of Section 10.5, Open Space Transitions and Buffers Policies of the General Plan.

Objective 8.7.1 Conduct all storm water via adequately sized storm drains and channels.

[6] Contra Costa Clean Water Program and Dan Cloak Environmental Consulting. *Stormwater C.3 Guidebook, Stormwater Quality Requirements for Development Applications, 6th Edition*. February 15, 2012.

Policy 8.7.2.a Continue working with the Contra Costa County Flood Control District to ensure that runoff from new development is adequately handled.

Policy 8.7.2.b Require adequate infrastructure to be in place and operational prior to occupancy of new development, such that:

- New development will not negatively impact the performance of storm drain facilities serving existing developed areas and
- The performance standards set forth in the Growth Management Element will continue to be met.

Policy 8.7.2.c Design flood control within existing creek areas to maximize protection of existing natural settings and habitat.

Policy 8.7.2.d Provide retention basins in recreation areas where feasible to reduce increases in the amount of runoff resulting from new development.

Policy 8.7.2.e Require new developments to provide erosion and sedimentation control measures to maintain the capacity of area storm drains and protect water quality.

Policy 8.7.2.f Require implementation of BMPs in the design of drainage systems to reduce discharge of nonpoint source pollutants originating in streets, parking lots, paved industrial work areas, and open spaces involved with pesticide applications.

Objective 10.3.1 Maintain, preserve, and acquire open space and its associated natural resources by providing parks for active and passive recreation, trails, and by preserving natural, scenic, and other open space resources.

Policy 10.3.2.d Where significant natural features are present (e.g., ridgelines, natural creeks), require new development to incorporate natural open space areas into project design. Require dedication to a public agency or dedication of a conservation easement, preparation of maintenance plans, and provision of appropriate maintenance in perpetuity of such open space areas.

Policy 10.3.2.f Encourage public access to creek corridors through the establishment of trails adjacent to riparian resources.

Objective 10.7.1 Ensure that adequate supply of water is available to serve existing and future needs of the City.

Policy 10.7.2.a As part of implementing the City's residential growth management program development review process for non-residential development, ensure that adequate long-term water supplies are available to serve the development being granted new allocations, including consideration of peak drought and peak fire fighting needs.

Policy 10.7.2.b Require new development to be equipped with drought-tolerant landscaping and water conservation devices.

Policy 10.7.2.d Protect, where possible, groundwater recharge areas, including protection of stream sides from urban encroachment.

Policy 10.7.2.e Oppose proposals with the potential to increase the salinity of the Delta and/or endanger the City's rights to divert water from the San Joaquin River.

Policy 10.7.2.f Participate in the Contra Costa Clean Water program to reduce stormwater pollution and protect the water quality of the City's waterways.

Policy 10.7.2.g Require public and private development projects to be in compliance with applicable National Pollution Discharge Elimination System (NPDES) permit requirements, and require the implementation of best management practices to minimize erosion and sedimentation resulting from new development.

Policy 10.7.2.i Design drainage within urban areas to avoid runoff from landscaped areas and impervious surfaces from carrying pesticides, fertilizers, and urban and other contaminants into natural streams.

Objective 11.4.1 Minimize the potential for loss of life, physical injury, property damage, and social disruption resulting from flooding.

Policy 11.4.2.a Prohibit all development within the 100-year floodplain, unless mitigation measures consistent with the National Flood Insurance Program are provided.

Policy 11.4.2.b Minimize encroachment of development adjacent to the floodways in order to convey flood flows without property damage and risk to public safety. Require such development to be capable of withstanding flooding and to minimize the use of fill.

Policy 11.4.2.c Prohibit alteration of floodways and channelization of natural creeks if alternative methods of flood control are technically and financially feasible. The intent of this policy is to balance the need for protection devices with land use solutions, recreation needs, and habitat preservation.

Policy 11.4.2.d Require new development to prepare drainage studies to assess storm runoff impacts on the local and regional storm drain and flood control system, along with implementation of appropriate detention and drainage facilities to ensure that the community's storm drainage system capacity will be maintained and peak flow limitations will not be exceeded.

Policy 11.4.2.e Where construction of a retention basin is needed to support new development, require the development to provide for the perpetual funding and ongoing maintenance of the basin.

Policy 11.4.2.f Eliminate hazards caused by local flooding through improvements to the area's storm drain system or creek corridors.

Objective 11.8.1 Maintain a level of preparedness to adequately respond to emergency situations to save lives, protect property, and facilitate recovery with minimal disruption.

Policy 11.8.2.a Maintain and update the City's Emergency Response Plan, as required by State law.

Policy 11.8.2.f Regularly review and clarify emergency evacuation plans for dam failure, fire, and hazardous materials releases.

City of Antioch Code of Ordinances

The following sections of the Antioch Code of Ordinances are applicable to the hydrology and water quality aspects of the proposed project.

Section 8-13.01: Stormwater Control Plan Required

Because construction activity during land development has the potential to result in pollution of nearby waterways, the Section 8-13.01 requires the implementation of stormwater pollution control measures during all construction phases.

4.8.4 IMPACTS AND MITIGATION MEASURES

The following section describes the standards of significance and methodology utilized to analyze and determine the proposed project's potential impacts related to hydrology and water quality. A discussion of the project's impacts, as well as mitigation measures where necessary, is also presented.

Standards of Significance

Consistent with Appendix G of the CEQA Guidelines and the City's General Plan, a significant impact would occur if the proposed project would result in any of the following:

- Substantially alter the existing drainage pattern of the site or area;
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Violate any water quality standards or waste discharge requirements, or otherwise substantially degrade water quality;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or flood hazard delineation map, or place structures within a 100-year floodplain structures which would impede or redirect flood flows;
- 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; or
- Inundation by seiche, tsunami, or mudflow.

The proposed project's impacts associated with water supply and capacity are further addressed in Chapter 4.11 of this EIR, Public Services, Recreation, and Utilities.

Method of Analysis

Site conditions and impacts analysis for this chapter are based primarily on the Preliminary Stormwater Control Plan prepared for the proposed project by Balance Hydrologics, Inc. The

Preliminary Stormwater Control Plan was prepared in compliance with the *Stormwater C.3 Guidebook* and includes sizing calculations for the proposed on-site integrated management practices (IMPs). In accordance with the *Stormwater C.3 Guidebook*, the Preliminary Stormwater Control Plan demonstrates the project's compliance with applicable requirements of Provision C.3 to minimize imperviousness, retain or detain stormwater, slow runoff rates, incorporate required source controls, treat stormwater prior to discharge from the site, control runoff rates and durations, and provide for operation and maintenance of treatment and flow-control facilities. The Preliminary Stormwater Control Plan includes analysis of the proposed on-site stormwater management system's adequacy for water quality treatment, flow-duration controls (hydromodification management), and peak flow reduction (flood control). Calculations for storage capacity and flow rate sufficient to store and treat the required water quality treatment volume were conducted. Calculation details are included in the Preliminary Stormwater Control Plan, which is included as Appendix H to this EIR.

The Preliminary Stormwater Control Plan was peer reviewed by RMC Water & Environment and Dan Cloak Environmental Consulting. Following the completion of the peer reviews, Balance Hydrologics, Inc. prepared response letters to each peer review. The peer reviews and response letters confirm that the Preliminary Stormwater Control Plan prepared for the project provided adequate information needed to analyze the potential impacts of the project.

In addition to the Preliminary Stormwater Control Plan, information from the Water Supply Assessment prepared for the proposed project, as well as a *Groundwater Evaluation* were used in preparation of this chapter. Determinations of significance were made based on the existing or planned infrastructure's ability to accommodate the proposed project.

The analysis included in the foregoing plans and studies included consideration of both proposed development scenarios currently under consideration for the project site, as discussed in Chapter 3 of this EIR, Project Description.

Project Impacts and Mitigation Measures

As discussed in Chapter 3 of this EIR, Project Description, two development scenarios for the proposed project are currently being considered: a Multi-Generational Plan and a Traditional Plan. The following discussion of impacts is based on implementation of either of the development scenarios. Where impacts would be similar under both of the development scenarios, the discussion of impacts as presented is applicable for both scenarios. However, where impacts would differ between the two development scenarios, the impacts are discussed separately for each scenario. It should be noted that while potential impacts related to both development scenarios are analyzed, ultimately, only one development scenario would be implemented.

4.8-1 Substantially alter the existing drainage pattern of the site or area, or create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems. Based on the analysis below, the impact is *less than significant.*

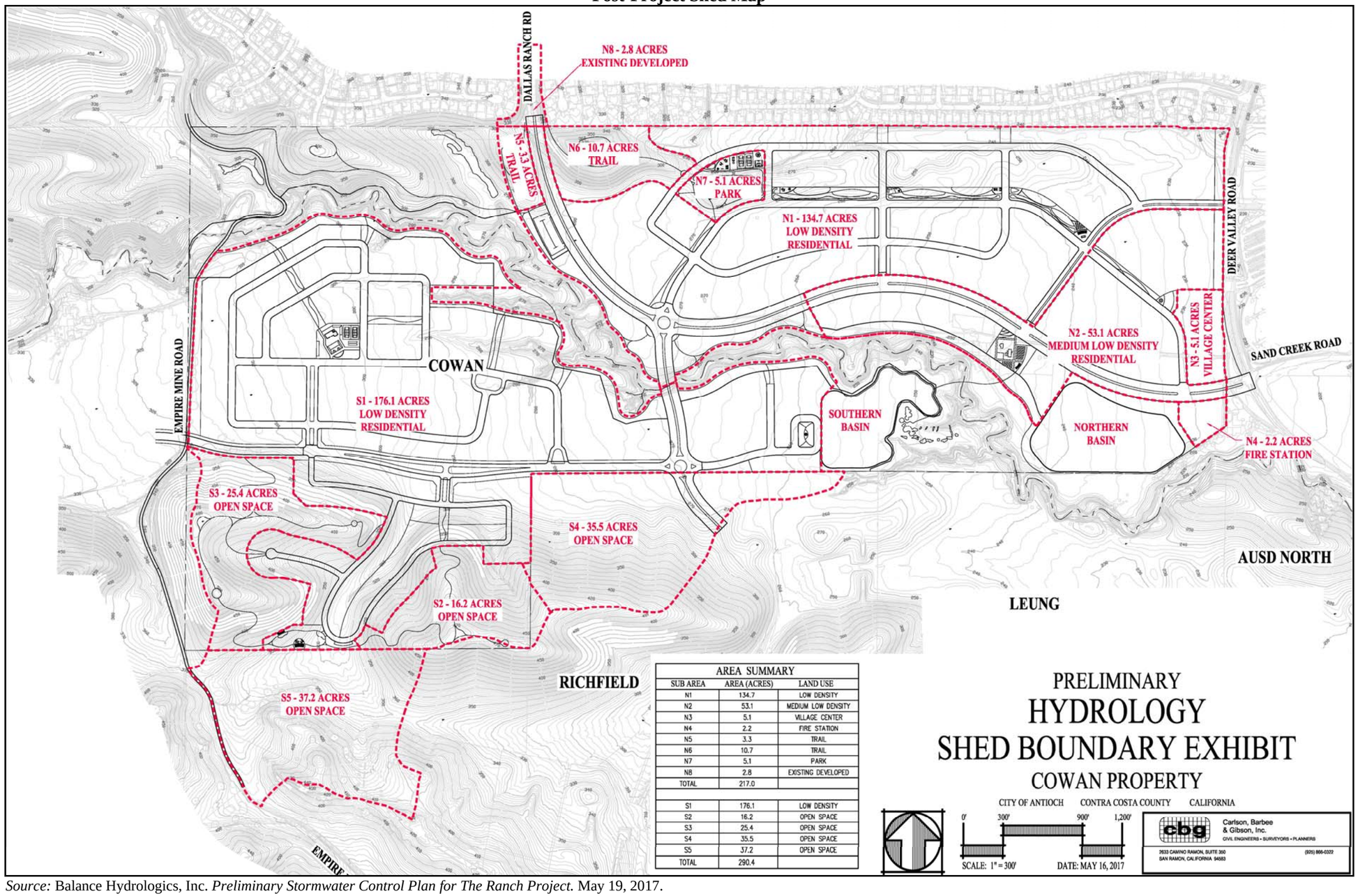
Multi-Generational Plan and Traditional Plan

When complete, the proposed project, under either proposed scenario, would result in new impervious surfaces where none currently exists. Although existing site soils have low permeability, introduction of new impervious surfaces as part of the project would result in an incremental reduction in the amount of natural soil surfaces available for the infiltration of rainfall and runoff, which would have the potential to generate additional runoff from the site during storm events. The proposed project site is under the jurisdiction of the CVRWQCB and is subject to the EC3MSP and Provision C.3 requirements, and, thus, must include appropriate LID techniques to address stormwater runoff pollutant discharges and prevent increases in runoff flows.

According to the Stormwater Control Plan prepared for the proposed project, the project site would be divided into two main drainage areas, as shown in Figure 4.8-2. Sand Creek provides a natural break for the watershed delineation, with the respective drainage management areas located to the north or south of the Sand Creek. It should be noted that approximately 2.8 acres of land to the north of the project site, encompassing a portion of Dallas Ranch Road, currently drains to the project site and would continue to drain to the project site following implementation of the proposed project. The Stormwater Control Plan includes consideration of the existing run-off from the off-site portion of Dallas Ranch Road.

The north drainage area encompasses approximately 217 acres, while the south drainage area includes approximately 290 acres. Stormwater from the development area would be captured in a network of 12-inch to 72-inch storm drain pipes that would connect to the cistern and bioretention areas. The two main drainage areas are further divided into sub-sheds based on drainage and land uses. Under either development scenario, both of the primary watersheds would include a cistern and bioretention area. The cistern in each of the main drainage areas signifies separate storage volumes, where stormwater would be impounded in a traditional open basin, prior to being directed into separate bioretention areas in a controlled manner. Stormwater entering the bioretention areas would be allowed to percolate through bioretention medium prior to entering undrain piping. Percolation through the bioretention medium would provide water quality treatment to the stormwater prior to discharge.

Figure 4.8-2
Post-Project Shed Map



Source: Balance Hydrologics, Inc. *Preliminary Stormwater Control Plan for The Ranch Project.* May 19, 2017.

The stormwater cistern and bioretention systems would be designed to provide both stormwater volume and water quality control. The north stormwater basin cistern would be designed to handle a volume of 22.5 acre-feet, while the south stormwater basin cistern would have a design capacity of 25.49 acre-feet. Stormwater from the north and south drainage areas would be directed to the respective cisterns, which would capture the stormwater and meet the County's hydrograph modification performance (HMP) requirements. Following capture of the stormwater within one of the two cisterns, stormwater would be discharged to the connected bioretention area, which would provide full water-quality treatment per C.3 criteria. The integration of a cistern with the bioretention area would avoid excessive ponding depths in the bioretention areas except under very large storm events in excess of the 10-year design storm. Each bioretention area would feature an outfall into Sand Creek, where treated stormwater would be discharged.

Use of cisterns and bioretention areas would control the discharge of stormwater thus, reducing the potential for the proposed project to result in increased stormwater discharges to Sand Creek. As shown in Table 4.8-1, implementation of the proposed project, including the cistern and bioretention systems, would ensure that post-project discharges to Sand Creek do not exceed pre-project discharges.

Table 4.8-1
Stormwater Discharge

Design Storm	Peak Discharge at Outlet (cubic feet per second)	
	Pre-Project	**Post-Project**
Northern Basin		
10-year 3-hour	84.0	9.3
10-year 24-hour	81.7	23.0
100-year 3-hour	144.6	79.7
100-year 24-hour	161.1	95.4
Southern Basin		
10-year 3-hour	129.4	10.2
10-year 24-hour	126.1	10.3
100-year 3-hour	218.6	89.4
100-year 24-hour	240.7	104.3

Source: Balance Hydrologics, Inc. *Preliminary Stormwater Control Plan for The Ranch Project.* May 19, 2017.

Overall, the proposed stormwater facilities and outlet control structures would be effective in attenuating post-project peak flow rates to below existing conditions during large storm events. As a result, the subsequent flow being drained into Sand Creek via the new outfall structures would be less than what is currently discharged into the creek and would not cause any negative effects downstream.

The proposed stormwater facilities would be maintained regularly, with maintenance including monitoring of water drawdown rates to verify infiltration through the

bioretention medium, replacement or leveling of mulch, reconditioning of biofiltration medium, clean-out of underdrain piping, and inspection of vegetation.

It should be noted that under either development scenario, the project is anticipated to be built out in three phases, with Phases I and II being located in the northern drainage area, and Phase III encompassing the entire southern drainage area. Rather than constructing both the northern and southern stormwater facilities within the first phase of development, only the stormwater infrastructure needed for the northern drainage area would be developed during development of Phase I and Phase II. Development of the stormwater infrastructure within the southern drainage area would only be completed concurrent with initiation of development of Phase III. Because the storm drainage infrastructure in the north and south drainage areas operates independently from each other, buildout of the project in phases would not affect the ability of the proposed infrastructure to control and treat stormwater from the drainage areas.

In conclusion, although implementation of the proposed project would alter the existing drainage pattern of the site and area, with incorporation of the proposed stormwater facilities, the resultant contribution of runoff water to Sand Creek would be equal to or less than under existing conditions. Therefore, impacts would be considered ***less than significant***.

Mitigation Measure(s)
None required.

4.8-2 Violate any water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality during construction. Based on the analysis below, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

Construction of either development scenario would require grading, excavation, and other construction-related activities that could cause soil erosion at an accelerated rate during storm events. All of these activities have the potential to affect water quality and contribute to localized violations of water quality standards if stormwater runoff from construction activities enters receiving waters.

Construction activities such as grading, excavation, and trenching for site improvements would result in the disturbance of on-site soils. The exposed soils have the potential to affect water quality in two ways: 1) suspended soil particles and sediments transported through runoff; or 2) sediments transported as dust that eventually reach local water bodies. Spills or leaks from heavy equipment and machinery, staging areas, or building sites also have the potential to enter runoff. Typical pollutants include, but are not limited to, petroleum and heavy metals from equipment and products such as paints, solvents, and cleaning agents, which could contain hazardous constituents. Sediment from erosion of graded or excavated surface materials, leaks or spills from equipment, or inadvertent

releases of building products could result in water quality degradation if runoff containing the sediment or contaminants should enter receiving waters in sufficient quantities. Impacts from construction-related activities would generally be short-term and of limited duration.

Chapter 9 of the City's Municipal Code, Storm Water Management and Discharge Control, requires projects that require disturbance of more than one acre of land, such as the proposed project, to comply with the City's NPDES permit. Consequently, the applicant would be required by the State to obtain a General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit), which pertains to pollution from grading and project construction. Compliance with the Permit requires the project applicant to file a Notice of Intent (NOI) with the SWRCB and prepare a SWPPP prior to construction. The SWPPP would incorporate BMPs in order to prevent, or reduce to the greatest feasible extent, adverse impacts to water quality from erosion and sedimentation. It should be noted that additional BMPs and permits would be required for the installation of the proposed new stormwater outfall structures in Sand Creek in order to avoid impacts to Sand Creek (see Chapter 4.4 of this EIR, Biological Resources). The required compliance with the SWRCB standards and additional BMPs and permits would ensure that construction activities related to either of the proposed development scenarios would not result in degradation of downstream water quality. Therefore, the proposed project would result in a ***less-than-significant*** impact related to short-term construction-related water quality.

Mitigation Measure(s)
None required.

4.8-3 Violate any water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality during operations. Based on the analysis below, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

The facilities related to either development scenario (e.g., homes, paved driveways, and roads) would involve a substantial amount of new impervious surface, which could increase the amount of surface runoff as well as convey non-point-source contaminants to surface waters during storm events. Additional runoff could accelerate soil erosion and stream channel scour and provide a more lucrative means of transport for pollutants to enter the waterways. Contaminated runoff waters could flow into Sand Creek and degrade the water quality.

During the dry season, vehicles and other urban activities release contaminants onto the impervious surfaces, where they would accumulate until the first storm event. During this initial storm event, or "first flush", the concentrated pollutants would be transported via runoff to stormwater drainage systems. Runoff contaminants associated with the either proposed scenario could include sediment, pesticides, oil and grease, nutrients, metals,

bacteria, and trash. It should be noted that some of these contaminants may have occurred in the past related to the previous agricultural uses on the project site.

As discussed above, both development scenarios would include on-site stormwater facilities that would be designed sufficient to reduce stormwater discharge from the project site below existing conditions. The stormwater facilities include bioretention basins for water quality treatment as well as smaller LID measures throughout the proposed developments.

Landscaping and site design of either scenario would incorporate various measures to increase infiltration of stormwater throughout the site, and reduce off-site flows. Anticipated LID measures to reduce off-site flows include integration of pervious ground covers where appropriate, the use of vegetative swales, and other measures consistent with the Tier I Standards of the California Green Building Code.

While the LID features throughout the development area would provide some stormwater quality improvement and runoff reductions, all runoff from developed areas of the project site would be directed to one of the two bioretention basins included in both development scenarios. Bioretention basins are shallow basins used to slow and treat on-site stormwater runoff. According to the *Stormwater C.3 Guidebook*, bioretention facilities allow runoff water collected to be evapotranspirated or infiltrated to surrounding soils, and the remaining volume would be discharged through an underdrain that carries runoff to a discharge point. Pollutants in the runoff are removed through interactions with vegetation in the basins as well as interaction with the bioretention soil medium. The bioretention basins would be constructed per Provision C.3 requirements, including the soil mix, soil and drainage layer, and subsurface volume. Perforated pipe would be bedded near the top of the gravel layer and connect directly to the downstream storm drain system. In addition, energy dissipaters would be used as necessary to reduce erosion within the bioretention areas. Overall, the on-site stormwater facilities would be sufficient to ensure that water quality standards or waste discharge requirements are not violated and water quality is not degraded as a result of the proposed project operations.

The foregoing stormwater facilities would ensure that the project would not result in the discharge of polluted runoff; however, the bioretention basins would discharge to Sand Creek, and, thus, would require the construction of two new outfalls into Sand Creek. Construction of the outfall structures is anticipated to require a 401 Water Quality Certification from the CVRWQCB. Prior to project implementation, the applicant would be required to obtain the 401 Water Quality Certification from the CVRWQCB. During the 401 Certification process, the CVRWQCB may require the applicant to implement further water quality measures. However, further measures required by the CVRWQCB would improve stormwater quality prior to discharge from the site, and would not be anticipated to result in further impacts.

For the aforementioned reasons, urban pollutants entering and potentially polluting the local water system would not be expected to occur as a result of either development scenario currently being considered. Therefore, the proposed project would not violate

any water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality during operations, and impacts would be ***less than significant***.

Mitigation Measure(s)
None required.

4.8-4 Substantially deplete groundwater supplies or interfere substantially with groundwater recharge. Based on the analysis below, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

The City of Antioch receives water supplies from the San Joaquin River and the Sacramento-San Joaquin Delta. As such, the City does not currently pump groundwater and, according to the Water Supply Assessment prepared for the proposed project, does not intend to pump groundwater from the local groundwater basin in the future. Therefore, neither scenario being considered would result in increased withdrawals from or depletion of groundwater supplies.

Both development scenarios would result in an increase in impervious surfaces (e.g., roads, driveways, and homes), which would reduce the infiltration of groundwater to the underlying groundwater aquifer. However, as noted in the Existing Environmental Setting section above, the majority of on-site soils are characterized as having high runoff rates and low soil permeability. As a consequence of the low permeability of on-site soils, the potential for direct infiltration of stormwater on the site is currently limited. Nevertheless, some stormwater is anticipated to infiltrate on-site soils, which may contribute to groundwater in the project area. Increased impervious surface area within the project site as a result of either development scenario would be anticipated to increase runoff by reducing the potential for stormwater to infiltrate the on-site soils. However, because the project site is underlain by soils with low permeability, implementation of the proposed project would have a proportionately smaller effect at the project site in comparison with a site underlain by more porous soils.

The majority of stormwater runoff from the site currently flows into Sand Creek, where waters are allowed to percolate and contribute to groundwater recharge in the area. The proposed stormwater facilities for the proposed project would include basins where percolation into the underlying groundwater could occur. Excess and treated water would be conveyed to Sand Creek. Accordingly, implementation of the proposed project would continue to allow runoff to flow into Sand Creek and contribute to groundwater recharge. Thus, development of the proposed project would not interfere substantially with groundwater recharge.

In conclusion, neither scenario included in the proposed project would increase the demand for groundwater supplies or result in development within an area of substantial groundwater recharge. Both scenarios would include continued stormwater infiltration

within basins and natural drainage channels where contributions to groundwater recharge would continue to occur on-site. Therefore, impacts to groundwater supply and recharge would be considered ***less than significant***.

Mitigation Measure(s)
None required.

4.8-5 Place housing or other structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or flood hazard delineation map, or place within a 100-year floodplain structures which would impede or redirect flood flows. Based on the analysis below and with implementation of mitigation, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

As discussed above, the majority of the site is within Zone X, which is outside of a 100-year flood hazard area. However, portions of the site are within Zone A, which is an area subject to inundation by the one-percent-annual-chance flood event. The areas designated as Zone A are limited to the portions of the site immediately adjacent and encompassing Sand Creek.[7] Both scenarios would include a substantial development setback from Sand Creek, averaging approximately 430 feet, which is anticipated to be sufficient to ensure that development of either scenario would not place housing within the 100-year flood plain.

However, both project scenarios would include the construction of a vehicle bridge, water line, 15-inch sewer line, and pedestrian bridge across Sand Creek. The proposed water line would be constructed within or adjacent to the proposed vehicle bridge. Meanwhile, the sewer line and pedestrian bridge would be constructed downstream of the vehicle bridge, with the sewer line hung below the pedestrian bridge, or constructed at a separate location. Construction of the bridges, water line, and 15-inch sewer line would occur within Zone A.

As proposed, the vehicle bridge across Sand Creek would be constructed in two phases, with an initial 42-foot right-of-way constructed to allow for two-way traffic and a pedestrian sidewalk. During future buildout of the proposed project, a second bridge, adjacent to the first, may be constructed and traffic would be split between the bridges. Both vehicle bridges would be span bridges, without piers, and would be constructed on top of bridge abutments located in the banks of Sand Creek. Although rip-rap would be lain within the ordinary high-water mark of Sand Creek, the rip-rap would not have the potential to redirect floodwaters, and other structures associated with the bridge that could redirect floodwaters would not be placed within the 100-year floodplain of Sand

[7] Federal Emergency Management Agency. *Federal Insurance Rate Map Panel 06013CO335F*. Effective June 16, 2009.

Creek. Therefore, construction of the vehicle bridges would not include the placement of structures, such as piers, within the 100-year flood zone.

Detailed design plans of the proposed pedestrian bridge and sewer line across Sand Creek were not prepared at the time of analysis for this EIR; however, the bridge would be anticipated to be built under either a clear-span design option or a design option using supporting piles. A clear-span pedestrian bridge would allow the bridge to span the 100-year floodplain without requiring construction of structures within the 100-year flood zone. Alternatively, a pedestrian bridge design including support piles would require placement of structures within the 100-year flood zone. It should be noted that the proposed sewer line may be hung underneath the pedestrian bridge, at an elevation above the 100-year water surface elevation. Should support piles be necessary for the pedestrian bridge, construction of the proposed bridge would require a Section 404 permit from the USACE, a Section 401 Certification from the CVRWQCB, and a Streambed Alteration Agreement from the California Department of Fish and Wildlife (CDFW). The Streambed Alteration Agreement, California Water Quality Certification, and the Section 404 Permit would include conditions involving the avoidance and minimization of impacts, and possible conservation or replacement of habitat on the project site or elsewhere. Compliance with the aforementioned permits, agreements, and certifications would ensure that the proposed project complied with the USACE's "no-net-loss" policy. Potential conditions of the foregoing permitting and certifications could include measures such as installation of silt fences, implementation of storm drain inlet protections, installation of fiber rolls, establishment of stabilized construction exists, installation and maintenance of silt curtains and/or turbidity barriers, proper maintenance of material stockpiles, and performance of water quality monitoring. Such permitting conditions would be anticipated to protect water quality, but would not have the potential to affect flood hazards.

Considering the above, the construction of the vehicle bridges and water line would not involve the construction of structures within the 100-year floodplain that could redirect the flow of flood waters. However, the design of the pedestrian bridge and sewer line is currently unknown and could involve supports or piers within the 100-year flood zone of Sand Creek. Should such structures be placed within the 100-year flood zone, flood waters could be redirected, which would have the potential to result in a change to the FEMA flood hazard zones for the project area. Potential changes to the 100-year flood zone caused by construction of the pedestrian bridge or sewer line could lead to areas identified for residential development or areas designated for use as stormwater treatment, which are currently outside of the 100-year flood zone, being redesignated as within a 100-year flood zone. Therefore, implementation of the proposed project could result in the placement of structures, residences, or infrastructure within a 100-year floodplain, which could redirect flood flows, and both development scenarios would result in a ***significant*** impact.

Mitigation Measure(s)

Implementation of the following mitigation measure would reduce the above impact to a *less-than-significant* level.

Multi-Generational Plan and Traditional Plan

4.8-5 Prior to the approval of tentative maps for the project, if design plans for the pedestrian bridge and utility connections across Sand Creek do not feature piers or other forms of support within the 100-year floodplain of Sand Creek, further mitigation is not necessary. If design plans for the pedestrian bridge or utility connections across Sand Creek indicate that piers or other forms of support would be constructed within the 100-year floodplain of Sand Creek, the project applicant shall obtain the necessary permits for work within Sand Creek. In addition, prior to the issuance of the first building permit, a hydraulic study shall be conducted to assess the current streambed flow of Sand Creek and how the new infrastructure would affect the streambed and/or the 100-year floodplain. If the hydraulic study identifies improvements needed to the Sand Creek channel, the applicant shall implement the improvements and obtain the necessary permits for work within Sand Creek. Furthermore, if the hydraulic study shows that the new infrastructure would affect the 100-year floodplain in a manner that would alter the FEMA flood hazard zone boundaries, the project applicant shall submit a map showing the updated flood hazard zone boundaries to FEMA for flood insurance purposes under the National Flood Insurance Program.

Although alteration of the on-site flood hazard zone boundaries may occur, improvements that would result in an increase in floodwater surface elevations shall not occur off the project site. In the case that any proposed structures or stormwater basin berms on the project site would be located within the updated flood hazard zone boundaries, the project applicant shall obtain a Conditional Letter of Map Revision Based on Fill from FEMA that demonstrates that all proposed structures would be set above the base flood elevation.

The hydraulic study, as well as confirmation that all necessary permits for work within Sand Creek have been obtained, shall be submitted to the City Engineer and Community Development Department for review and approval prior to issuance of the first building permit for the construction of the pedestrian bridge and utility crossings.

4.8-6 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. Based on the analysis below, the impact is *less than significant*.

Multi-Generational Plan and Traditional Plan

According to the City's General Plan EIR, the City of Antioch is located below the Contra Loma Dam and Reservoir. The Bureau of Reclamation Division of Dam Safety determined that "safe performance of the dam can be expected under all anticipated

loading conditions, including the maximum credible earthquake and probable maximum flood events." The overall safety classification of the dam is registered as satisfactory. The General Plan EIR concludes that with implementation of the City's Policy 11.8.2-f, which requires regular review and clarification of emergency evacuation plans in the event of dam failure, any potential impacts related to dam failure would be reduced to a less-than-significant level. Therefore, consistent with the General Plan EIR, people or structures at the proposed project site would not be exposed to a significant risk or loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, and impacts would be ***less than significant***.

Mitigation Measure(s)
None required.

4.8-7 Inundation by seiche, tsunami, or mudflow. Based on the analysis below, the project would have *no impact*.

Multi-Generational Plan and Traditional Plan

Tsunamis typically affect coastlines and areas up to one quarter of a mile inland. The proposed project is located over 50 miles from the Pacific Ocean. Due to the project's distance from the coast, potential flooding effects related to a tsunami would be minimal. The nearest enclosed body of water to the project site is the Contra Loma Reservoir, which is located over 4.2 miles northwest of the project site. Due to the project site's distance from the nearest enclosed body of water and regional topography, the project site would not be susceptible to flooding resulting from a seiche. The majority of the project site is relatively flat and the slopes existing in the southwestern portion of the site are relatively gradual. The slopes in the southwestern portion of the project site are not considered steep enough to pose risks related to mudflows; thus, mudflows would not pose a threat to the proposed project. Overall, the proposed project would result in ***no impact*** related to inundation by seiche, tsunami, or mudflow.

Mitigation Measure(s)
None required.

Cumulative Impacts and Mitigation Measures

The following discussion of impacts is based on the implementation of the proposed project in combination with other proposed and pending projects in the region. Other proposed and pending projects in the region under the cumulative context would include buildout of the City of Antioch General Plan, as well as development of the most recent planned land uses within the vicinity of the project area.

4.8-8 Cumulative impacts to hydrology and water quality. Based on the analysis below and with implementation of mitigation, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

Cumulative development within the City could result in changes to hydrology and water quality within the City.

Stormwater and Water Quality

Buildout of the proposed project in conjunction with the City's General Plan, including development of other planned and reasonably foreseeable projects within the City, would result in an overall increase in impervious surfaces in the area. The increase in impervious surfaces, if not adequately controlled, could result in degradation of the water quality and hydromodification of local streams, waterways, and downstream water bodies. In order to address such potential impacts from cumulative development, a number of regulations and development standards have been established to protect and enhance the water quality of watercourses, including the CWA, NPDES program, and the County Watershed Program and EC3MSP, including Provision C.3.

The aforementioned regulations are set forth with the intention to protect waterways from potential degradation from increased runoff and pollutants associated with cumulative development by requiring source control, site design measures, and stormwater treatment measures. Regulations such as the Provision C.3 requirements would reduce hydrology and water quality effects associated with cumulative development by eliminating or controlling stormwater discharges and associated pollutants to local stormwater systems or waterways. Specifically, Provision C.3 requires that new development and redevelopment projects include stormwater control measures sufficient to ensure that post-development flows do not exceed pre-development flows.

All development within the City of Antioch would be required to comply with all applicable regulatory stormwater documents, standards, and requirements (including EC3MSP and Provision C.3). Because each future project would be required to implement measures sufficient to avoid hydromodification, address water quality, and ensure that runoff volumes and rates do not exceed pre-development conditions, each project, similar to the proposed project, would be expected to result in less-than-significant project-level impacts related to hydrology and water quality.

Groundwater Recharge

Soils underlying the project site are characterized as having relatively low permeability rates, which reduces the amount of groundwater recharge occurring on the project site. Therefore, the project site is not considered a significant source of groundwater recharge within the City. Cumulative development within the City may occur on areas with relatively more permeable soils, which would cumulatively reduce the rate of groundwater recharge. However, future development within the City would be required

to incorporate stormwater control measures, which could allow for continued stormwater infiltration and groundwater recharge. In addition, Sand Creek and other drainage areas throughout the City contribute to cumulative groundwater recharge. Similar to the proposed project, cumulative development throughout the City would be required to protect natural drainage ways, which would allow for continued stormwater infiltration and groundwater recharge. Because stormwater infiltration and groundwater recharge would continue to occur throughout the City, cumulative development within the City would be anticipated to result in a less-than-cumulatively-considerable impact.

Flood Elevations

Although City policies would ensure the protection of natural drainage ways, such as Sand Creek, individual development projects may include limited development or improvements within flood zones. Such development could result in changes to flood elevations on a project and cumulative level. The proposed project may result in improvements within Sand Creek that could lead to a change in flood elevations. However, Mitigation Measure 4.8-5 ensures that any changes to flood elevations would be limited to the project site and would not result in off-site or cumulative impacts. Therefore, following the implementation of mitigation, the proposed project would result in a less-than-cumulatively-considerable impact to flood elevations.

Conclusion

Considering the above discussions, the proposed project would not have the potential to result in cumulatively considerable impacts to stormwater and water quality, or groundwater recharge. However, the proposed project may include improvements within Sand Creek, which could result in a ***cumulatively considerable*** impact to flood elevations.

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

Multi-Generational Plan and Traditional Plan

4.8-8 Implement Mitigation Measure 4.8-5.