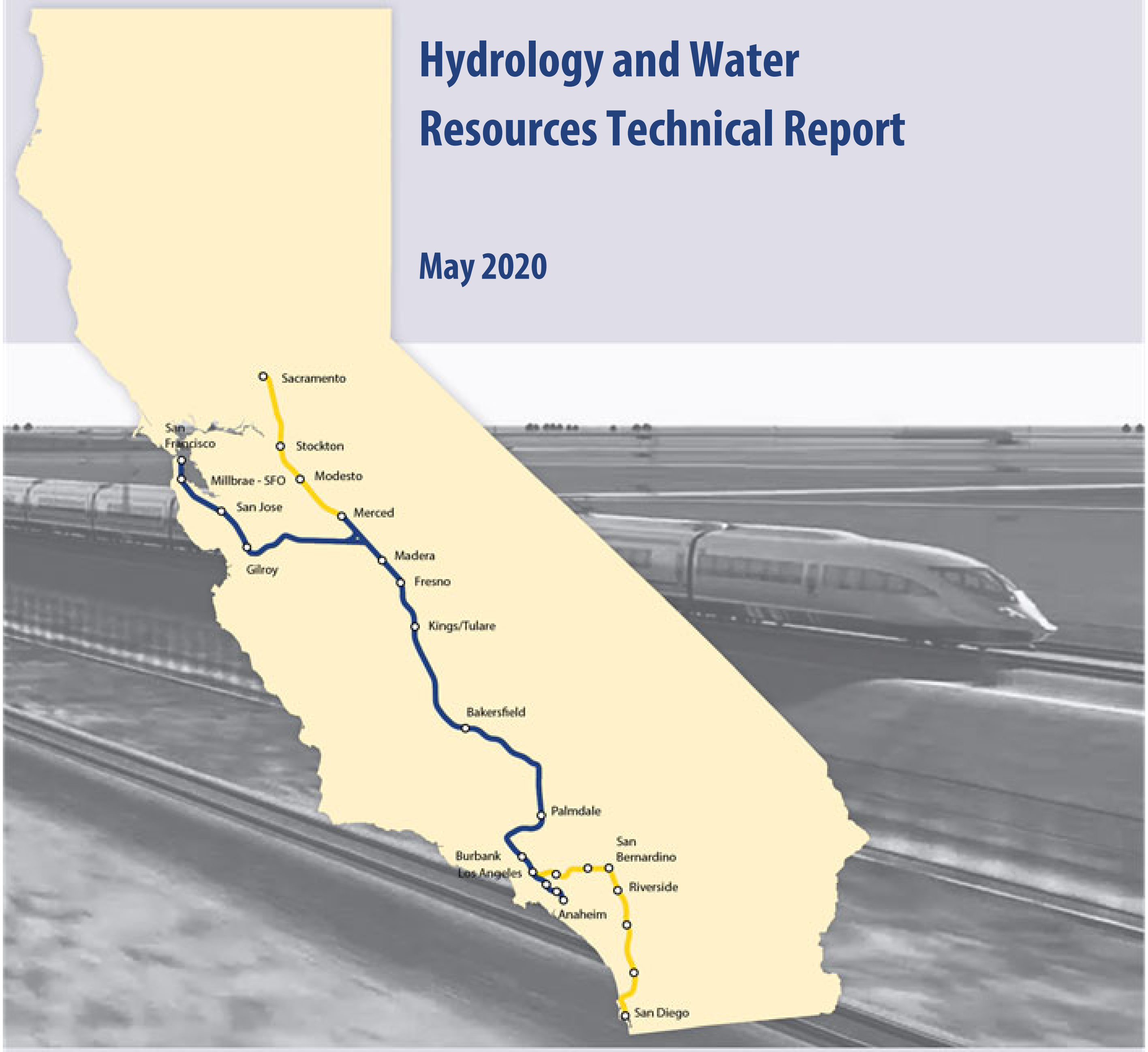
California High-Speed Rail Authority

Burbank to Los Angeles Project Section



Hydrology and Water Resources Technical Report

May 2020

CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
Amtrak	National Railroad Passenger Corporation
Authority	California High-Speed Rail Authority
bgs	below ground surface
BMP	best management practice
BOD	Biological Oxygen Demand
Caltrans	California Department of Transportation
Cal. Code Regs.	California Code of Regulations
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CMF	Metrolink Central Maintenance Facility
CPSWQ	Certified Professional in Storm Water Quality
CWA	Clean Water Act
DOT	U.S. Department of Transportation
DWR	Department of Water Resources
EIR	environmental impact report
EIS	environmental impact statement
Fed. Reg.	Federal Register
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FRA	Federal Railroad Administration
GIS	geographic information systems
GSP	Groundwater Sustainability Plan
HA	Hydrological Area
HMF	heavy maintenance facility
HSA	Hydrologic Subarea
HSR	high-speed rail
HU	Hydrologic Unit
I-	Interstate
K	soil erodibility factor
LACFCD	Los Angeles County Flood Control District
LAUS	Los Angeles Union Station
LID	low-impact development
LMF	light maintenance facility
LinkUS	Link Union Station (Metro project)

MBAS	Methylene Blue Activated Substances
Metro	Los Angeles County Metropolitan Transportation Authority
mg/L	milligram(s) per liter
ml	milliliter(s)
MOIF	maintenance of infrastructure facility
MOIS	maintenance of infrastructure siding facility
MS4	Municipal Separate Storm Sewer System
NEPA	National Environmental Policy Act
ng/L	nanograms per liter
NPDES	National Pollutant Discharge Elimination System
OAL	Office of Administrative Law
OCS	overhead catenary system
NTU	Nephelometric Turbidity Units
PCB	polychlorinated biphenyls
PCE	perchloroethylene
pg/L	picograms per liter
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
PTC	positive train control
PUC	Public Utilities Commission
QSD/QSP	Qualified SWPPP Developer/Practitioner
RSA	resource study area
RWQCB	Regional Water Quality Control Board
SAA	Supplemental Alternatives Analysis
SCRRA	Southern California Regional Rail Authority
SQMP	Stormwater Quality Management Plan
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TCE	trichloroethylene
TDS	total dissolved solids
TMDL	total maximum daily load
TPSS	traction power substation
UPRR	Union Pacific Railroad
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers

USACE manual	*USACE Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual*
USEPA	U.S. Environmental Protection Agency
USEO	U.S. Presidential Executive Order
USGS	U.S. Geological Survey

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EXECUTIVE SUMMARY

This Hydrology and Water Resources Technical Report for the Burbank to Los Angeles Project Section of the California High Speed Rail (HSR) System serves to provide an evaluation of effects to water resources that would result from implementation of the Burbank to Los Angeles Project Section of the HSR system.

The California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) have prepared program-wide, Tier 1 environmental documents for the HSR system under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Specifically, the Authority and FRA prepared the Statewide Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (Authority and FRA 2005) to evaluate the ability of the HSR system to meet existing and future demands on the capacity of California's intercity transportation system.

The Authority is now undertaking second-tier, project environmental evaluations for several sections of the statewide system. This technical report is for the Burbank to Los Angeles Project Section.

The Burbank to Los Angeles Project Section of the California HSR System is approximately 14 miles long and would cross the cities of Burbank, Glendale, and Los Angeles on an existing railroad corridor. The HSR Build Alternative would be located within a narrow and constrained urban environment, crossing major streets and highways, and in portions adjacent to the Los Angeles River. Along the existing rail corridor, the Los Angeles County Metropolitan Transportation Authority (Metro) owns the railroad right-of-way, the Southern California Regional Rail Authority owns the track and operates the Metrolink commuter rail service, the National Railroad Passenger Corporation (Amtrak) provides intercity passenger service, and the Union Pacific Railroad holds track access rights and operates freight trains.

This technical report evaluates the physical setting of the Burbank to Los Angeles Project Section of the California HSR System and the existing water quality; specifies the regulatory framework with respect to water quality; and assesses potential effects to surface water hydrology, water quality, floodplains, and groundwater associated with the HSR Build Alternative.

ES 1 Methodology

The methods used to evaluate hydrology and water resources include:

- Quantitative and qualitative review of available hydrology and water resources information for the resource study area (RSA)
- Evaluation of surface water hydrology, surface water quality, floodplains, and groundwater resources in the RSA

The RSA is the area in which the environmental investigations specific to hydrology and water resources are conducted to determine the resource characteristics and potential effects of the project. The indirect RSA includes the regional study area, including the following elements:

- **Surface Water:** Watersheds and receiving waters of project runoff
- **Groundwater:** Aquifer(s) underlying the project footprint
- **Floodplain:** Federal Emergency Management Agency (FEMA) designated flood-hazard areas within the receiving waters

The direct RSA used for calculating effects to hydrology and water resources includes the HSR Build Alternative footprint with a 250-foot buffer (e.g., stations, track, and temporary construction areas).

ES 2 Findings

The Burbank to Los Angeles Project Section is located within the Los Angeles River Watershed. The HSR Build Alternative includes a set of electrified tracks for the HSR system that would be useable by passenger rail, as well as a set of non-electrified tracks, which would be used by freight and passenger rail. The two sets of tracks would cross FEMA-designated 100-year floodplains, a total of four surface waters (i.e., the Burbank Western Channel, the Lockheed Channel, the Verdugo Wash, and the Los Angeles River), the San Fernando Valley Groundwater Basin, and the Coastal Plain of Los Angeles Groundwater Basin.

ES 2.1 Floodplains

Construction activities within FEMA-designated floodplains could temporarily impede or redirect flood flows which has the potential to increase flood elevations, redefine flood hazard areas, and cause flooding in areas previously not at risk from the 100-year flood. However, the footprint of structures would be minimized within the floodplain to the maximum extent practicable, and all floodplains temporarily disturbed during construction activities would be restored to their pre-existing conditions. In addition, construction activities would comply with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit. A Stormwater Pollution Prevention Plan (SWPPP) would be prepared and Construction best management practices (BMPs) would be implemented, to minimize effects to floodplains. Further, the construction site superintendent would monitor weather conditions for heavy storms (and potential flood flows) and would halt construction, notify construction workers to vacate the 100-year flood hazard area, and relocate construction equipment outside the floodplain if a heavy storm or flood event is identified.

Table ES-1 summarizes the floodplains that construction of the Burbank to Los Angeles Project Section would take place in, over, or under, including the Lockheed Channel, the Burbank Western Channel, the Verdugo Wash, and the Los Angeles River floodplain in three locations.

Table ES-1 Floodplains Crossed by the High-Speed Rail Build Alternative

Surface Water Crossing Location	HSR Build Alternative Component
Lockheed Channel	Surface and Below Grade
Burbank Western Channel	Surface
Verdugo Wash Bridge	Electrified and Non-Electrified Tracks
Los Angeles River at Downey Bridge	Electrified Tracks
Los Angeles River at Main Street Grade Separation	Roadway Bridge
Los Angeles River at Mission Tower Bridge	Non-Electrified Tracks

Note: The Burbank Western Channel, the Lockheed Channel, and the Los Angeles River are mapped as 100-year floodplains by FEMA. No floodplains for the Verdugo Wash are mapped by FEMA.
FEMA = Federal Emergency Management Agency
HSR = High-Speed Rail

The Build Alternative would place structures within the Lockheed Channel and Burbank Western Channel 100-year floodplain. The effects associated with the Lockheed Channel and Burbank Western Channel crossings on the 100-year floodplain are discussed below. The electrified and relocated non-electrified tracks would cross the Verdugo Wash, which has not been mapped by FEMA. The proposed bridge across the Verdugo Wash would be a clear-span bridge and would not require modifications to the channel.

The HSR Build Alternative would cross the Los Angeles River 100-year floodplain three times, as follows:

1. The proposed electrified tracks that would cross the Los Angeles River 100-year floodplain via the existing Los Angeles River Downey Bridge north of SR 110 would not require modifications to the Los Angeles River floodplain.
2. A proposed roadway overpass (Main Street grade separation) that would be constructed over the Los Angeles River 100-year floodplain would place three support columns within the Los Angeles River floodplain.

3. The proposed non-electrified tracks that would cross the Los Angeles River 100-year floodplain on the existing Mission Tower Bridge would not require modifications to the Los Angeles River floodplain.

The effects associated with the Los Angeles River crossing that would encroach on the Los Angeles River floodplain (at the Main Street grade separation) are discussed below.

ES 2.1.1 Lockheed Channel

The Lockheed Channel would be realigned in two locations due to implementation of the HSR Build Alternative; however, the proposed realignments would either maintain or slightly lower the hydraulic grade line of all inlets to the Lockheed Channel; therefore, the channel would be designed to accommodate flows within the channel, and the realignments would not affect the 100-year floodplain elevations. The existing non-electrified tracks would be modified to accommodate the additional electrified tracks; the trackwork would place structures within the 100-year floodplain. Additionally, the existing Burbank Boulevard overcrossing would be reconstructed to cross over the electrified and non-electrified tracks, and the roadway on the west side would be raised in elevation on retained fill. Work proposed on Burbank Boulevard would be located within and adjacent to the 100-year floodplain associated with the Lockheed Channel. The design of the HSR Build Alternative would be required to comply with the requirements set forth in United States (U.S.) Presidential Executive Order (USEO) 11988, Floodplain Management, which requires compliance with the National Flood Insurance Program to reduce the effect of flooding on this structure. The National Flood Insurance Program is managed by FEMA, which is the agency that regulates development within floodplains. FEMA regulations require a floodplain analysis to prevent projects from increasing the base flood elevation by greater than 1 foot in floodplains or substantially changing the floodplain limits. The improvements associated with the Lockheed Channel would be designed and engineered to comply with these requirements and regulations.

ES 2.1.2 Burbank Western Channel

The HSR Build Alternative would cross the Burbank Western Channel at the Burbank Western Channel and Lockheed Channel confluence. The proposed channel crossing would include extending the existing capped channel by a short additional length, which would place structures within the 100 year floodplain; however, because the Lockheed Channel would be realigned to join with the Burbank Western Channel at the same angle as under the existing condition, the watercourse’s ability to convey peak flows would not be reduced. The design of the floodplain crossing would be required to comply with the requirements set forth in USEO 11988 and the FEMA regulations, as described above.

ES 2.1.3 Los Angeles River at Main Street Grade Separation

A grade separation would be required at Main Street across the Los Angeles River, as the current historic bridge is at the same grade as the existing tracks. The grade separation would include a new bridge structure parallel to and north of the existing historic Main Street Bridge. The new Main Street bridge would place three support columns within the Los Angeles River 100-year floodplain that would be parallel to the existing piers of the historic bridge. The columns would take up less area than the current bulky piers associated with the historic bridge. The design of the floodplain crossing would be required to comply with the requirements set forth in USEO 11988 and the FEMA regulations, as described above.

ES 2.2 Surface Water Hydrology and Surface Water Quality

During construction, soil would be exposed, increasing the potential for soil erosion compared to the existing condition. Construction activities would compact soil, thereby resulting in a decrease in infiltration and increase in the volume and rate of stormwater runoff during storm events. In addition, chemicals, liquid products, petroleum products (such as paints, solvents, and fuels) and concrete-related waste may be spilled or leaked and have the potential to be transported via storm runoff into receiving waters.

Construction General Permit

Discharges of stormwater from construction sites disturbing more than 1 acre of soil must comply with the conditions of the State Water Resources Control Board's statewide Construction General Permit. For projects disturbing more than 1 acre of soil, a construction Stormwater Pollution Prevention Plan is required that specifies site management activities to be implemented during site development. These management activities include construction stormwater best management practices, erosion and sedimentation controls, dewatering (nuisance water removal), runoff controls, and construction equipment maintenance.

Project construction would comply with the requirements of the Construction General Permit. A SWPPP would be prepared and implemented during construction. The construction SWPPP would identify specific BMPs to be implemented during construction so as not to cause or contribute to an exceedance of any applicable water quality standards included in the Los Angeles Regional Water Quality Control Board (RWQCB) Basin Plan. These BMPs would be designed to meet all requirements stipulated in the Construction General Permit. In-water work during construction of the bridge piers would be restricted to the dry season. If the channel has year-round flows, the contractor would develop a water diversion plan prior to construction. A water diversion plan includes the installation of cofferdams or sandbag barriers around the work areas (such as in locations where piers or abutments would be constructed) to keep water out and to reduce sediment pollution from construction work in and under water. During the Lockheed Channel realignment, temporary water diversion would be required within the Lockheed Channel and Burbank Western Channel. Once construction is complete, the temporary water diversion would be removed and the channel would be restored to its pre-construction condition.

The depth to groundwater varies along the project footprint. Shallow groundwater (less than 50 feet below ground surface [bgs]) occurs within the project footprint, especially in locations where the footprint is adjacent to the Los Angeles River. Pier construction for the Main Street crossing would extend to approximately 50–120 feet bgs and could encounter groundwater. The HSR Build Alternative would include below grade sections between the Burbank Airport Station and near Beachwood Drive in the city of Burbank. Groundwater could be encountered during construction of the below grade sections. Groundwater encountered during construction would be removed and disposed of according to the requirements of the Los Angeles RWQCB's Groundwater Dewatering Permit. Adherence to the requirements of the Groundwater Dewatering Permit would ensure that water discharged to surface water or land would not degrade the existing water quality or substantially affect the hydraulics of the surface water channel.

Pollutants generated during operation of the HSR project would be similar to existing conditions because the HSR Build Alternative would be within an existing rail corridor. All of the receiving waters are listed on the 2014/2016 California 303(d) List of Water Quality Limited Segments for a variety of impairments. Operation of the HSR Build Alternative has the potential to contribute to existing heavy metal, nutrient, sediment, organic compound, trash and debris, and oil and grease water quality impairments. In addition, development of the HSR project would result in a permanent increase in impervious surface area. An increase in impervious area would increase the volume of runoff during a storm, which would more effectively transport pollutants to receiving waters.

The HSR project would be required to comply with the requirements of the Phase II Municipal Separate Storm Sewer System (MS4) Permit during operation. The proposed drainage system would collect, convey, and discharge surface water runoff from the track right-of-way to the existing storm drain system, while maintaining the existing drainage pattern, in compliance with the Phase II MS4 Permit. Additionally, through compliance with the Phase II MS4 Permit, the HSR Build Alternative would implement post-construction BMPs designed to reduce the discharge of and target pollutants of concern. Furthermore, low-impact development techniques would be incorporated into the HSR Build Alternative to retain runoff on-site and to reduce the volume and rate of off-site runoff, in compliance with the Phase II MS4 Permit. The types of structural and nonstructural BMPs will be determined during final design based on which BMPs would be the most effective and efficient for the particular site.

ES 2.3 Groundwater

Construction of the HSR Build Alternative would increase impervious surface area, which can decrease infiltration and decrease the amount of water that is able to recharge the aquifer/ groundwater basin. However, this increase in impervious surface area would not be substantial due to the size of the groundwater basins and the provision of drainage improvements and post-construction BMPs that would promote infiltration, potentially increasing groundwater recharge.

Infiltration of contaminated stormwater could have the potential to affect groundwater quality in areas of shallow groundwater. There is not a direct path for pollutants to reach groundwater, and pollutants are generally removed by soil through absorption before they reach groundwater. Contaminated soil would be removed and disposed of prior to construction of the proposed improvements, which would reduce the potential for stormwater infiltration to carry pollutants to groundwater. In addition, construction BMPs would be implemented to reduce the risk of leaks or spills during construction.

Shallow groundwater may be encountered during construction activities associated with the bridges and grade separations, which would require groundwater dewatering. The volume of groundwater that would be removed during construction of the bridges and grade separations would be relatively minor due to the size of the groundwater basins and is not anticipated to substantially affect groundwater levels or supplies.

The below grade sections are anticipated to be above the groundwater table. However, not enough groundwater information is available at this time to rule out the potential for groundwater to be encountered during construction of the below grade sections. Consequently, it was conservatively assumed that construction of the below grade sections could encounter groundwater. If encountered, groundwater inflows into the excavations for the below grade sections are anticipated, which would require groundwater dewatering to draw down the groundwater level to prevent groundwater inflow into the excavation. Groundwater dewatering would lower the groundwater table in the vicinity of construction of the below grade sections, which would pose a risk of ground settlement and mobilization of contaminant plumes from nearby groundwater cleanup sites. If groundwater dewatering is deemed not feasible during final design, measures such as chemical or jet grouting or permeation grouting may be required to prevent groundwater flow into the areas of construction of the below grade sections. In addition, secant pile cut-off walls may be required for support of excavation in place of soldier piles and lagging as an alternative to groundwater dewatering, chemical or jet grouting, or permeation grouting. Groundwater inflow into the below grade sections during operations would not occur because the below grade sections would be waterproofed.

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1 INTRODUCTION

1.1 California High-Speed Rail System Background

The California High-Speed Rail Authority (Authority) is responsible for planning, designing, building, and operating the first high-speed passenger rail service in the nation. The California High-Speed Rail (HSR) System will connect the mega-regions of the state, contribute to economic development and a cleaner environment, create jobs, and preserve agricultural and protected lands. When it is completed, it will run from San Francisco to the Los Angeles basin in under three hours at speeds capable of exceeding 200 miles per hour. The system will eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations, as shown on Figure 1-1.[1] In addition, the Authority is working with regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the state's 21st century transportation needs.

The California HSR System is planned to be implemented in two phases. Phase 1 would connect San Francisco to Los Angeles and Anaheim via the Pacheco Pass and the Central Valley.[2] Phase 2 would connect the Central Valley to Sacramento, and another extension is planned from Los Angeles to San Diego. The California HSR System would meet the requirements of Proposition 1A,[3] including the requirement for a maximum nonstop service travel time between San Francisco and Los Angeles of two hours and 40 minutes.

1.2 Burbank to Los Angeles Project Section Background

The Burbank to Los Angeles Project Section would be a critical link in Phase 1 of the California HSR System connecting the San Francisco Bay Area to the Los Angeles Basin. The Authority and the Federal Railroad Administration (FRA) selected the existing railroad right-of-way as the corridor for the preferred alternative between Sylmar and Los Angeles Union Station (LAUS) in the 2005 *Statewide Program Environmental Impact Report/Environmental Impact Statement* (EIR/EIS) (Authority and FRA 2005). The Sylmar to Los Angeles railroad corridor includes Burbank, which is southeast of Sylmar. Therefore, the Project EIR/EIS for the Burbank to Los Angeles Project Section focuses on alignment alternatives along the existing Sylmar to Los Angeles railroad corridor.

The Burbank to Los Angeles Project Section was initially considered as part of the Palmdale to Los Angeles Project Section. The Authority and FRA announced their intention to prepare a joint EIR/EIS for the Palmdale to Los Angeles Project Section in March 2007. On March 12, 2007, the Authority released a Notice of Preparation, and the FRA published a Notice of Intent on March 15, 2007. Over the next several years, the Authority and FRA conducted scoping and prepared alternatives analysis documents for that section. The 2010 Palmdale to Los Angeles Preliminary Alternatives Analysis recommended alignment alternatives and station options for the Palmdale to Los Angeles Project Section based on the program-level corridor selected in 2005. The 2011 Palmdale to Los Angeles Supplemental Alternatives Analysis (SAA) focused specifically on the subsections from the community of Sylmar to LAUS, and reevaluated the alternatives and station options. In June 2014, the Authority published a Palmdale to Los Angeles SAA Report, which introduced the concept of splitting the Palmdale to Los Angeles Project Section into two sections. On July 24, 2014, the Authority released a Notice of Preparation and the FRA published a Notice of Intent to prepare EIR/EIS documents for the Palmdale to Burbank and Burbank to Los Angeles project sections.

[1] The alignments on Figure 1-1 are based on Authority/FRA decisions made in the 2005, 2008, and 2012 Programmatic EIR/EIS documents.

[2] Phase 1 may be constructed in smaller operational segments, depending on available funds.

[3] http://www.catc.ca.gov/programs/hsptbp.htm.

Source: California High-Speed Rail Authority and Federal Railroad Administration (2017)

Figure 1-1 California High-Speed Rail System

One of the main reasons for the project section split was the Initial Operating Section[4] concept and its interim terminus in the San Fernando Valley, which was discussed in the Authority's 2012 and 2014 Business Plans. Additionally, the Authority and FRA determined that separate environmental documents would be more beneficial to address environmental impacts and conduct stakeholder outreach. The key environmental resources likely to be impacted were different between the two sections, and separate environmental documents better supported project phasing and sequencing.

In April 2016, the Authority released the Burbank to Los Angeles SAA, which refined the previously studied alignments. Additionally, the Authority released the 2016 Palmdale to Burbank SAA, which refined the concepts at the Burbank Airport Station and the alignments from south of the Burbank Airport Station to Alameda Avenue in the City of Burbank. The 2016 Burbank to Los Angeles SAA Report proposed to evaluate one build alternative south of Alameda Avenue to LAUS. The subsection between the Burbank Airport Station and Alameda Avenue was studied in the 2016 Palmdale to Burbank SAA, which proposed two station options and two alignment options. Table 1-1 summarizes the conclusions of the two SAA reports.

Table 1-1 2016 Supplemental Alternatives Analysis Recommendations for the Burbank to Los Angeles Project Section

Alternative	Alignment/ Station	Area/Station	Alignment/Station Type
No Project Alternative			
HSR Build Alternative	Alignments	Burbank Airport Station to Alameda Avenue	Alignment Option A (Surface) Alignment Option B (Below-Grade and Surface)
		Alameda Avenue to LAUS	Surface Alignment
	Stations	Burbank Airport Station	Station Option A (Surface) Station Option B (Below-Grade)
		LAUS	Surface Station Option

Sources: California High-Speed Rail Authority and Federal Railroad Administration (2016). "Palmdale to Burbank Supplemental Alternatives Analysis"; "Burbank to Los Angeles Supplemental Alternatives Analysis."
HSR = High-Speed Rail
LAUS = Los Angeles Union Station

Since the release of the two SAA documents in 2016, the design has undergone further refinements. The surface options from Burbank Airport to Alameda Avenue (Alignment Option A and Station Option A) have been eliminated from consideration. The below-grade options (Alignment Option B and Station Option B) have been refined in order to minimize potential environmental effects and reduce cost. Therefore, this environmental document evaluates one build alternative for the project section.

FRA requires logical termini for project level analysis. The Authority has determined that logical termini are defined by stations, with Burbank Airport Station as the northern terminus and LAUS as the southern terminus for the Burbank to Los Angeles Project Section. These two stations are also termini for the Palmdale to Burbank and Los Angeles to Anaheim Project Sections. The analysis for the Burbank Airport Station is consistent with what is included in the Palmdale to Burbank EIR/EIS. Similarly, the analysis for LAUS is consistent with what is included in the Los Angeles to Anaheim EIR/EIS.

[4] The Initial Operating Section was the first segment planned for construction and operations, as outlined in the 2014 Business Plan. The segment permitted operation of HSR service from Merced to the San Fernando Valley. The 2016 Business Plan revised the initial segment termini to the Central Valley and Silicon Valley.

1.3 Project Description Purpose

This project description describes the project for use during environmental impact analyses to complete technical reports to inform the Burbank to Los Angeles Project Section EIR/EIS. The basis of this project description is the HSR Build Alternative as defined in the *Burbank to Los Angeles Project Section Draft Preliminary Engineering for Project Definition* document. This project description describes the physical design elements of the project and does not define all operating plans and scenarios, construction plans, or capital and operating costs. This project description will serve as the basis for Chapter 2, Alternatives, of the project EIR/EIS. Chapter 2 of the EIR/EIS will include additional detail beyond the content of this report.

This report documents the detailed environmental resource analysis conducted for the Burbank to Los Angeles Project Section of the California HSR System and includes the following:

- A brief description of the project and the alternatives under study
- A discussion of pertinent statutes and regulations
- A description of the existing environmental resource conditions in the study area
- A description of the analytical methodologies and assumptions used for this study
- The results of these analyses, including effects or benefits resulting from the project

2 PROJECT DESCRIPTION

The Burbank to Los Angeles Project Section of the California HSR System is approximately 14 miles long, crossing the cities of Burbank, Glendale, and Los Angeles on an existing railroad corridor. HSR for this project section would be within a narrow and constrained urban environment, crossing major streets and highways and, in some portions, adjacent to the Los Angeles River. The Los Angeles County Metropolitan Transportation Authority (Metro) owns the railroad right-of-way, the Southern California Regional Rail Authority owns the track and operates the Metrolink commuter rail service, the National Railroad Passenger Corporation (Amtrak) provides intercity passenger service, and the Union Pacific Railroad (UPRR) holds track access rights and operates freight trains.

This section describes the No Project Alternative and the HSR Build Alternative to be evaluated in the Burbank to Los Angeles Project EIR/EIS.

2.1 No Project Alternative

Under the No Project Alternative, the California HSR System would not be built. The No Project Alternative represents the condition of the Burbank to Los Angeles Project Section as it existed in 2015, and as it would exist without the HSR System at the horizon year (2040).

The No Project Alternative assumes that all currently known programmed and funded improvements to the intercity transportation system (highway, transit, and rail) and reasonably foreseeable local land development projects (with funding sources identified) would be developed by 2040. The No Project Alternative is based on a review of the following: regional transportation plans for all modes of travel; the State Transportation Improvement Program; the Federal Transportation Improvement Program; Southern California Regional Rail Authority strategic plans, transportation plans and programs for Los Angeles County; airport master plans; and city and county general plans.

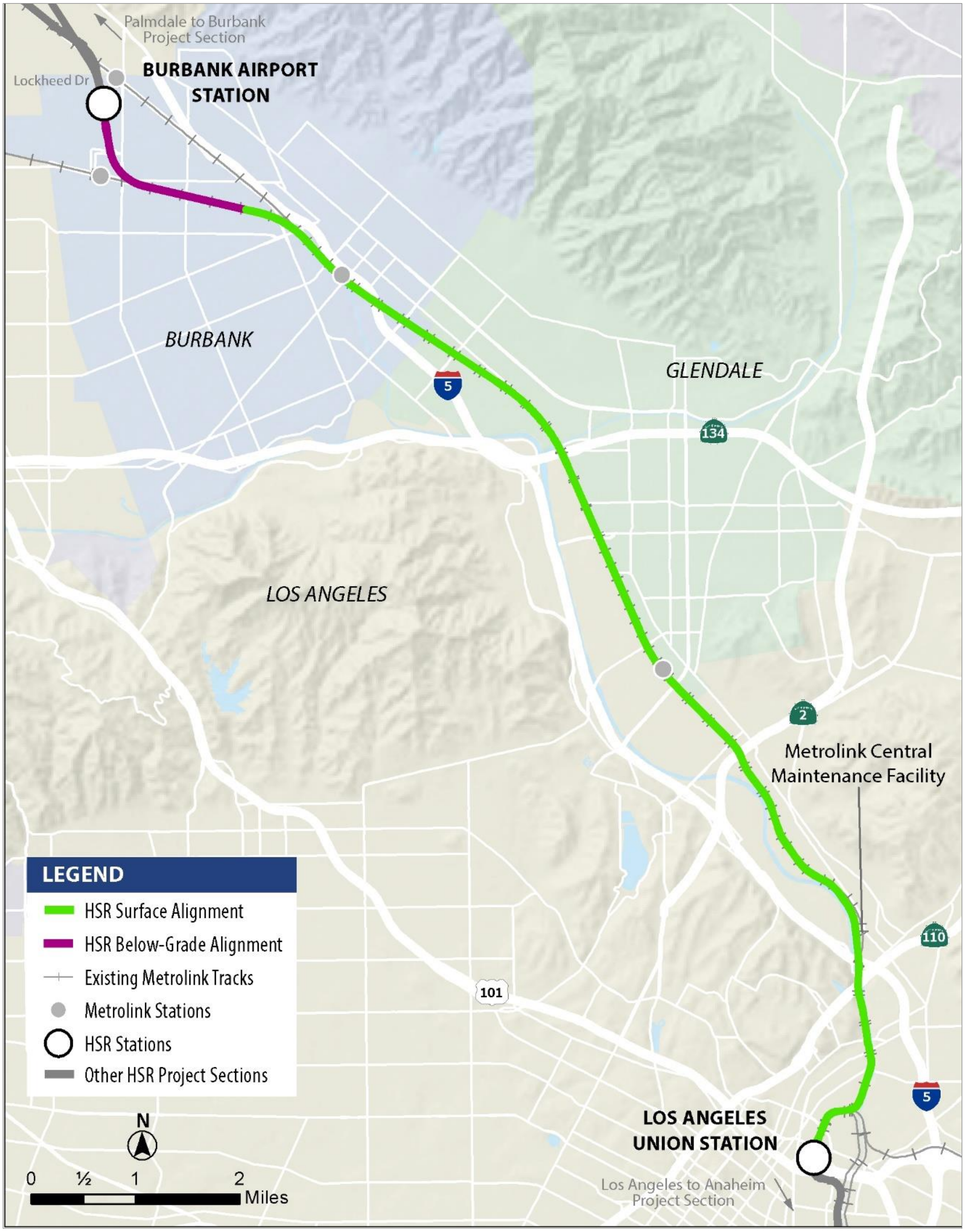
2.2 High-Speed Rail Build Alternative

The HSR Build Alternative includes new and upgraded track, maintenance facilities, grade separations, drainage improvements, communications towers, security fencing, passenger train stations, and other necessary facilities to introduce HSR service into the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Corridor from near Hollywood Burbank Airport to LAUS. In portions of the alignment, new and upgraded tracks would allow other passenger trains to share tracks with the HSR system. HSR stations would be located near Hollywood Burbank Airport and at LAUS. The alignment would be entirely grade-separated at crossings, meaning that roads, railroads, and other transport facilities would be located at different heights so the HSR system would not interrupt or interface with other modes of transport, including vehicle, bicycle, and pedestrian.

For most of the project section, the HSR alignment would be within the existing railroad right-of-way, which is typically 70 to 100 feet wide. The HSR alignment includes northbound and southbound electrified tracks for high-speed trains. The right-of-way would be fenced to prohibit pedestrian and public or unauthorized vehicle access.

The project footprint (the area required to build, operate, and maintain HSR service) is based on the following elements of design: station areas, hydrology, track, roadway, structures, systems, and utilities.

Figure 2-1 shows an overview of the Burbank to Los Angeles Project Section.



Source: California High-Speed Rail Authority (2019)

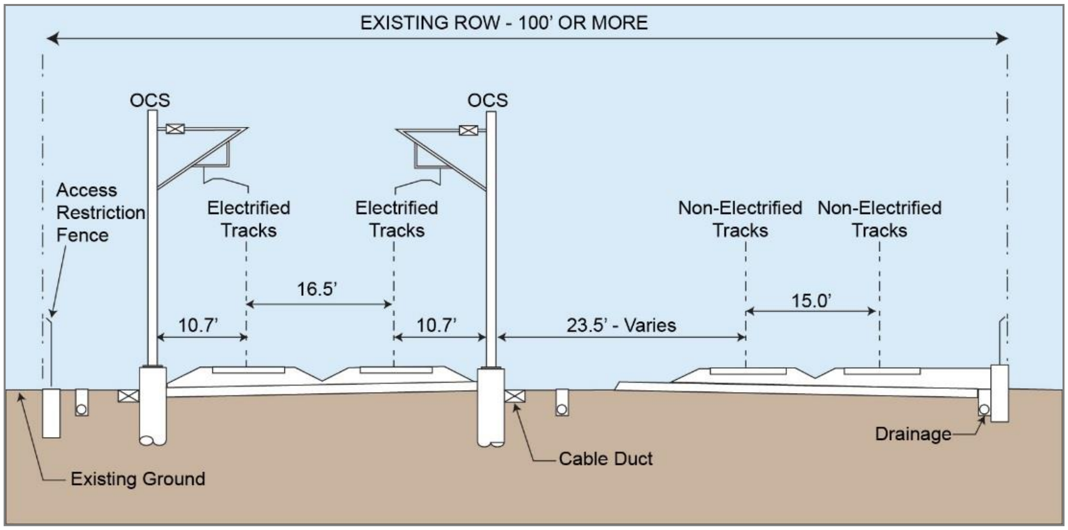
Figure 2-1 Overview of Burbank to Los Angeles Project Section

The Burbank to Los Angeles Project Section includes a combination of at-grade, below-grade, and retained-fill track, depending on corridor and design constraints. The at-grade and retained-fill portions of the alignment would be designed with structural flexibility to accommodate shared operations with other passenger rail operators. Throughout most of the project section (between Alameda Avenue and State Route [SR] 110), two new electrified tracks would be placed along the west side of the existing railroad right-of-way and would be useable for HSR and other passenger rail operators. The existing non-electrified tracks would be realigned closer to the east side of the existing right-of-way, for a total of four tracks; these realigned, non-electrified tracks would be usable for freight and other passenger rail operators, but not for HSR. Figure 2-2 illustrates the placement of the new electrified tracks and realigned, non-electrified tracks relative to the existing tracks.

Source: California High-Speed Rail Authority (2019)

Figure 2-2 New Electrified and Non-Electrified Tracks Within Existing Right-of-Way

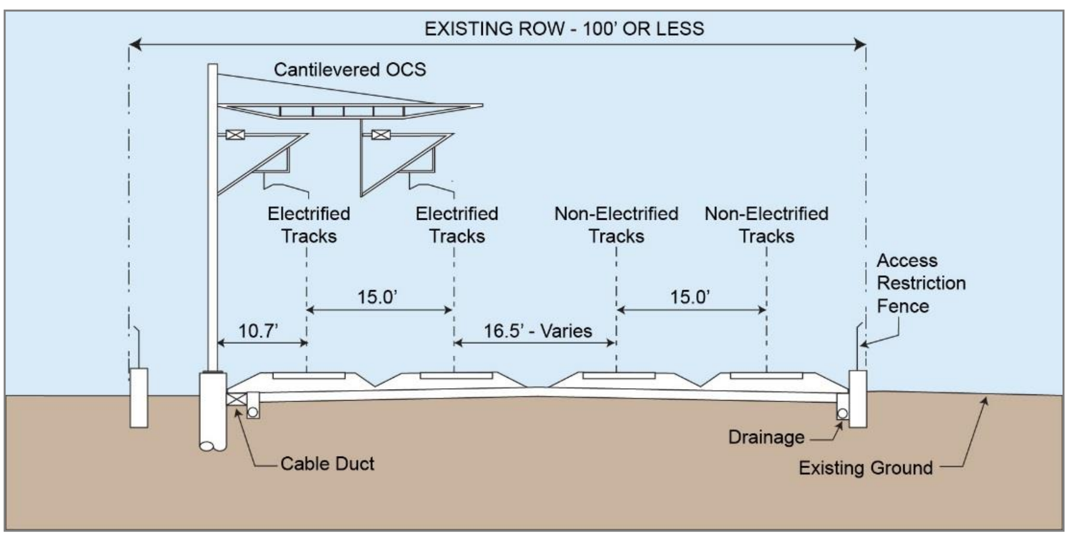
Throughout most of the Burbank to Los Angeles Project Section, the electrified track centerline and the non-electrified track centerline would have a minimum separation of 23.5 feet, and the northbound and southbound electrified tracks would have a separation of 16.5 feet, following the Authority's *Technical Memorandum 1.1.21 Typical Cross Sections for 15% Design*. These standard separations are illustrated on Figure 2-3.



Source: California High-Speed Rail Authority (2019)
This illustration shows the standard separations between the electrified and non-electrified tracks in areas where the railroad right-of-way is at least 100 feet wide. (Figure not to scale.)

Figure 2-3 Standard Track Separations within Non-Constrained Right-of-Way

However, in several areas of the corridor, the right-of-way is less than 100 feet wide, a threshold that constrains the design. As a result, reduced track separations were used in these constrained areas in order to stay within the existing right-of-way to the greatest extent possible and thus minimize property impacts. The reduced separations between the electrified and non-electrified track centerlines would be a minimum of 16.5 feet, and between the two electrified track centerlines would be 15 feet. The narrower cross-section separations are illustrated on Figure 2-4.



Source: California High-Speed Rail Authority (2019)
This illustration shows the narrow separations between the electrified and non-electrified tracks, which would minimize property impacts in areas where right-of-way is constrained. The reduced separations are applied in areas where the railroad right-of-way is less than 100 feet wide. (Figure not to scale.)

Figure 2-4 Reduced Track Separations within Constrained Right-of-Way

2.2.1 HSR Build Alternative Description

The following section describes the HSR Build Alternative in greater detail. Figure 2-5 (Sheets 1 to 3) shows the HSR Build Alternative, including the HSR alignment, new/modified non-electrified tracks, and roadway crossings.

The HSR alignment would begin at the underground Burbank Airport Station and would consist of two new electrified tracks. After exiting the underground station, the alignment would travel southeast beneath the Hollywood Burbank Airport runway in a tunnel, which would be constructed using the sequential excavation method without any disruptions to airport operations. The alignment from south of the airport to where it would join the Metrolink Ventura Subdivision would be constructed as cut-and-cover, and the alignment would then transition to a trench within the Metrolink Ventura Subdivision. The existing Metrolink Ventura Subdivision tracks would be realigned north within the existing right-of-way, and an existing UPRR siding track between Buena Vista Street and Beachwood Drive would be realigned north of the relocated Metrolink Subdivision tracks within the existing right-of-way. These non-electrified tracks would remain at-grade. The trench, which would be south of and parallel to the relocated non-electrified tracks, would be dedicated for HSR tracks only. Figure 2-6, Figure 2-7, and Figure 2-8 depict the typical cross-sections of the below-grade portion of the alignment. During construction of the below-grade alignment, shoofly tracks would be provided to support Metrolink operations. The proposed shoofly tracks would be aligned between Hollywood Way and Buena Vista Street outside the existing right-of-way and would result in temporary roadway impacts to Vanowen Street.

The HSR tracks would transition from the trench and emerge to at-grade within the existing railroad right-of-way near Beachwood Drive in the City of Burbank Near Beachwood Drive, the HSR tracks would curve south out of the existing railroad right-of-way and cross Victory Place on a new railroad bridge, which would be directly south of the existing Victory Place bridge. South of Burbank Boulevard, the HSR tracks would re-enter the railroad right-of-way and run parallel to the Metrolink Antelope Valley Subdivision tracks. Between Burbank Boulevard and Magnolia Boulevard, several UPRR industry tracks west of the right-of-way would be removed.

Continuing south, the HSR alignment would pass the Downtown Burbank Metrolink Station, which would be modified. HSR tracks would be placed within the existing parking lot west of the southbound platforms, and new pedestrian connections and relocated parking would be provided. Section 2.6.1 provides more details on design modifications for the Downtown Burbank Metrolink station.

Source: California High-Speed Rail Authority (2019)

Figure 2-5 HSR Build Alternative Overview

(Sheet 1 of 3)

Source: California High-Speed Rail Authority (2019)

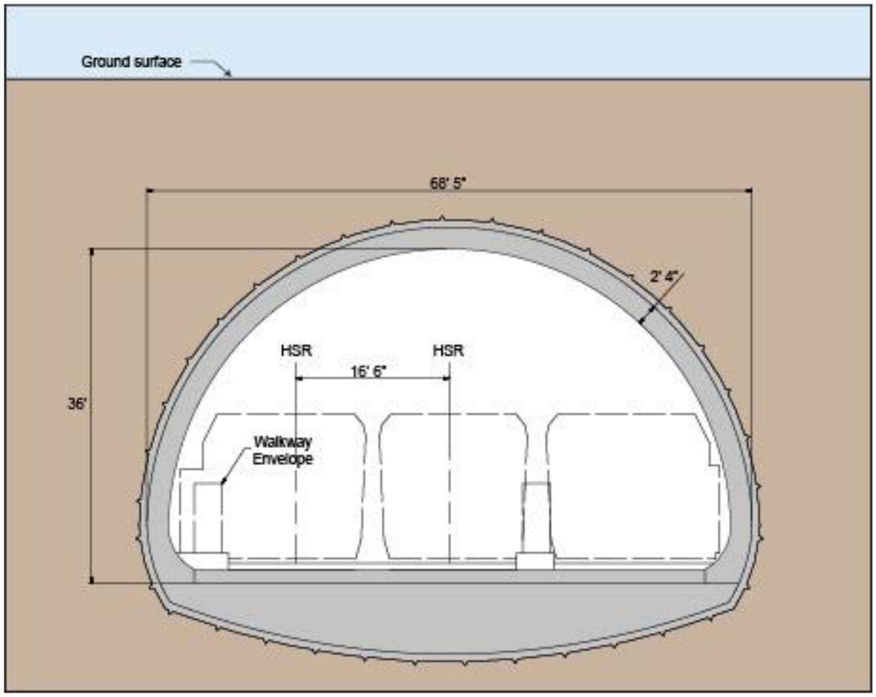
Figure 2-5 HSR Build Alternative Overview

(Sheet 2 of 3)

Source: California High-Speed Rail Authority (2019)

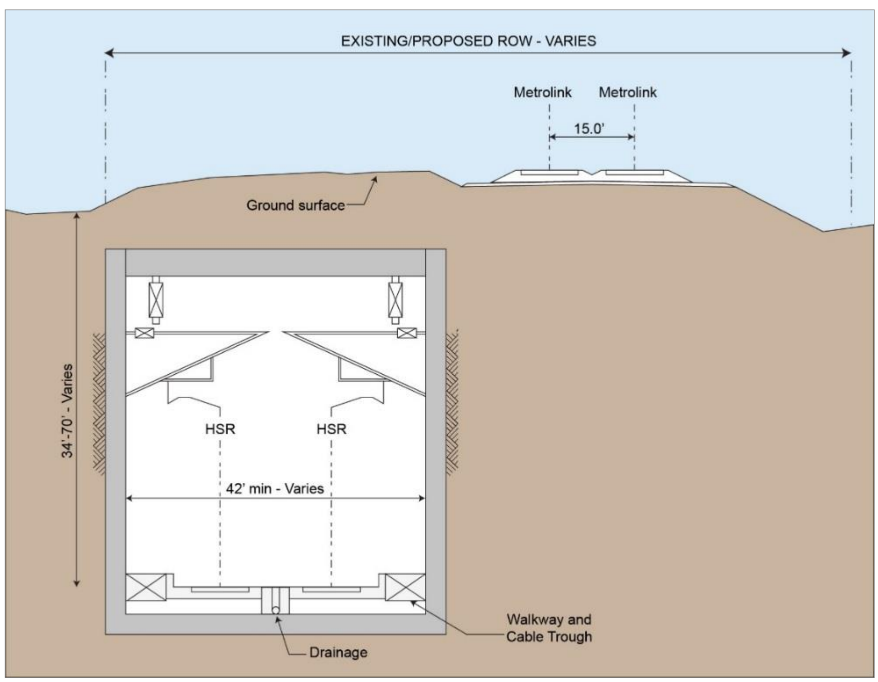
Figure 2-5 HSR Build Alternative Overview

(Sheet 3 of 3)



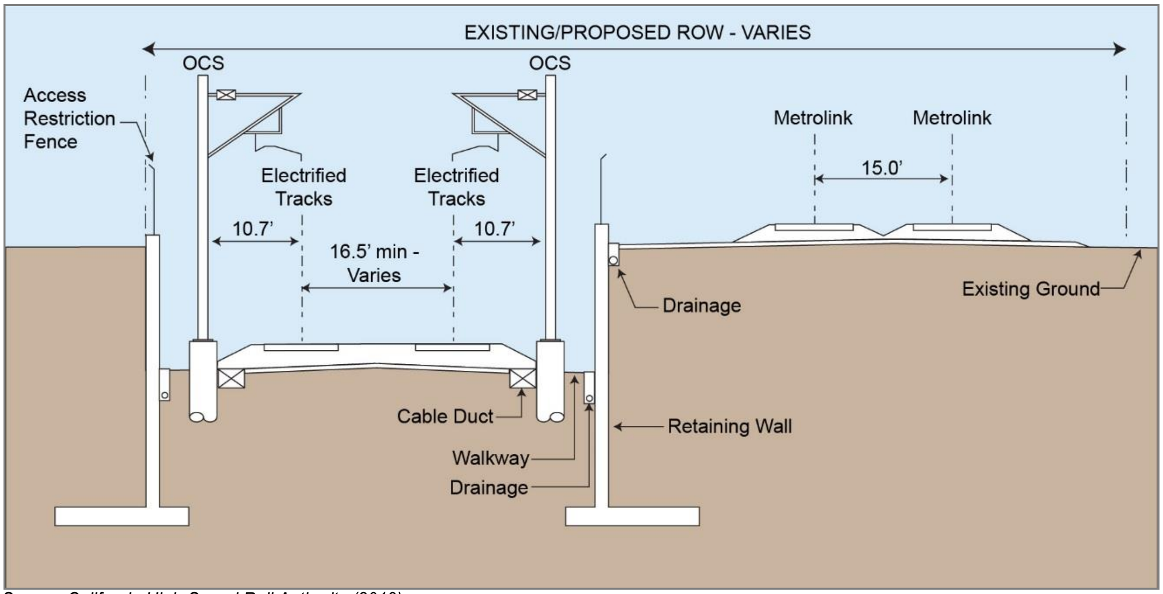
Source: California High-Speed Rail Authority (2019)

Figure 2-6 Typical Tunnel Cross-Section



Source: California High-Speed Rail Authority (2019)

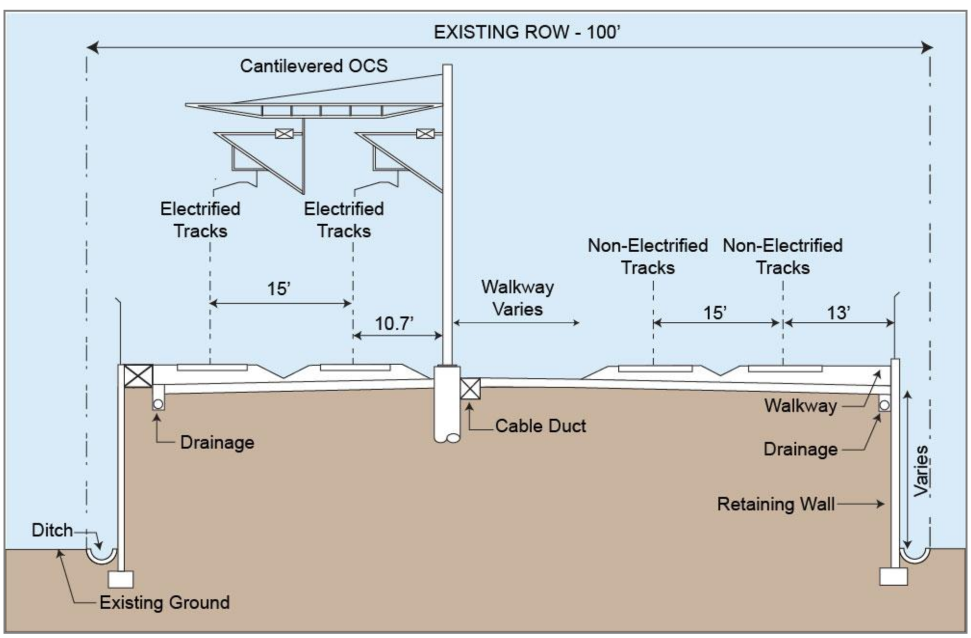
Figure 2-7 Typical Cut-and-Cover Tunnel Cross-Section



Source: California High-Speed Rail Authority (2019)

Figure 2-8 Typical Trench Cross-Section

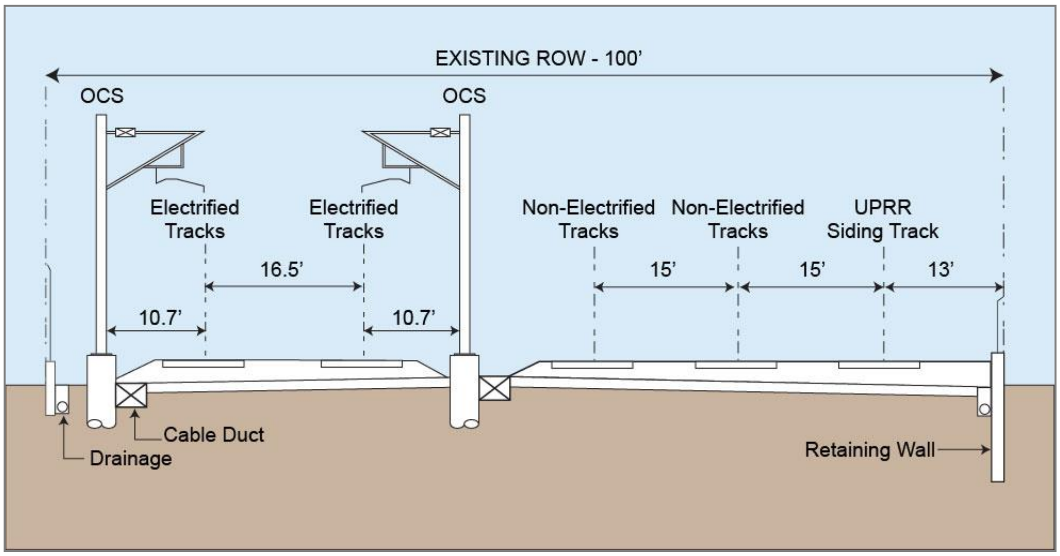
Between Olive Avenue to the north end of the Metrolink Central Maintenance Facility (CMF), the existing non-electrified tracks would be shifted east within the right-of-way to accommodate the addition of the electrified tracks within the right-of-way. Throughout this area, both sets of tracks would be at-grade, with a retained fill segment between Western Avenue and SR 134. Figure 2-9 shows a typical cross-section of the alignment on retained fill.



Source: California High-Speed Rail Authority (2019)

Figure 2-9 Typical Retained-Fill Cross-Section

The alignment would cross Verdugo Wash, where an existing railroad bridge would be rebuilt as a new clear-span structure, to accommodate the additional set of electrified tracks. The alignment would continue south within the existing railroad right-of-way, which follows the Glendale and Los Angeles city borders. Between SR 134 and Chevy Chase Drive, a UPRR siding track would be realigned to the east of the non-electrified tracks, for a total of five tracks within the right-of-way through this area. This siding track is currently located at the Metrolink Central Maintenance CMF but would need to be relocated to accommodate HSR at the CMF. Figure 2-10 shows the typical cross-section for this area.

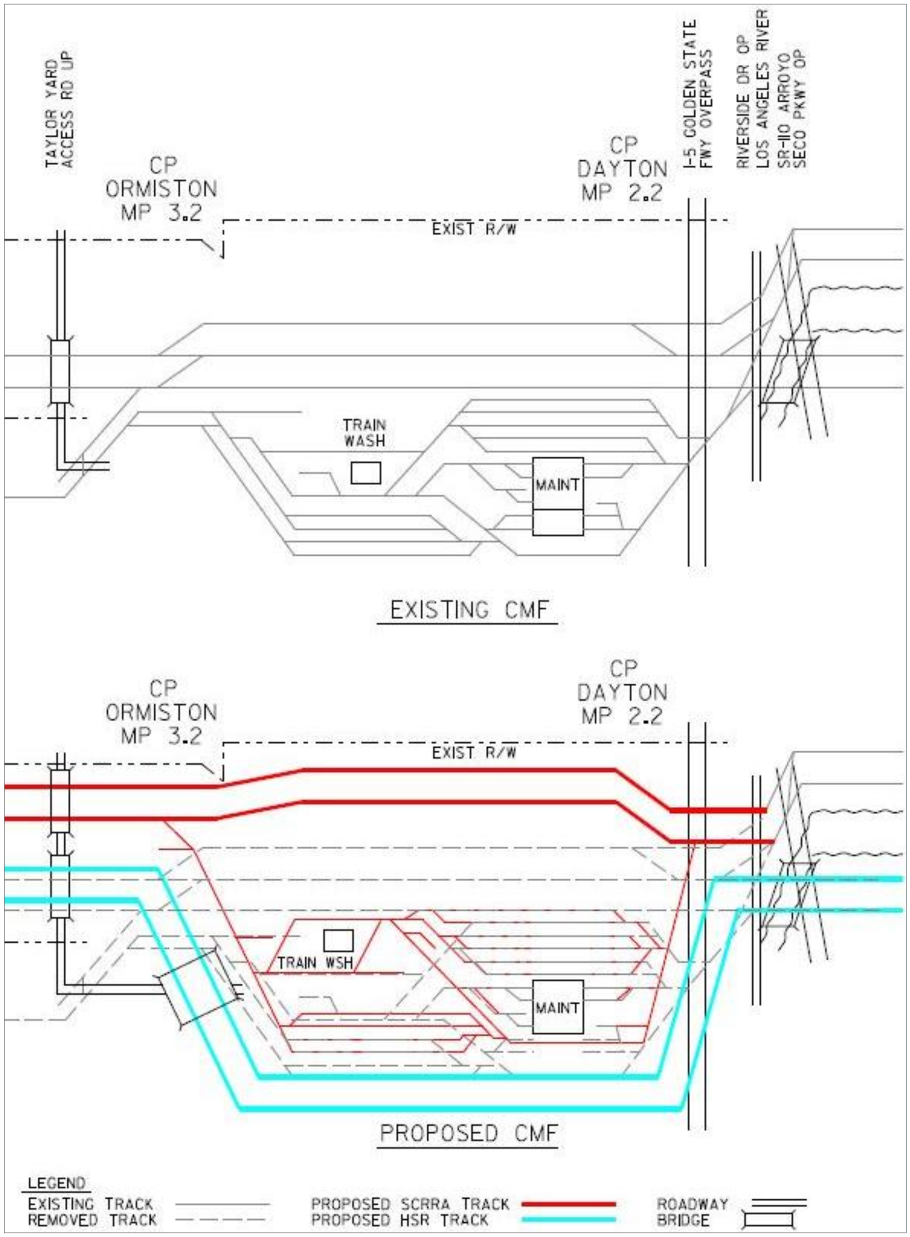


Source: California High-Speed Rail Authority (2019)

Figure 2-10 Typical Cross-Section Between State Route 134 and Chevy Chase Drive

The alignment would pass by the Glendale Metrolink Station (originally known as the Southern Pacific Railroad Depot), a known historical resource listed on the National Register of Historic Places and located north of Glendale Boulevard. No modifications would be needed for the Glendale Metrolink Station. At Tyburn Street, the alignment would enter the City of Los Angeles. Continuing south, the two sets of tracks would diverge at the north end of the Metrolink CMF. The electrified tracks would travel along the west side of the CMF, and the non-electrified, mainline tracks would travel along the east side of the facility.

The CMF is Metrolink's major daily servicing location and maintenance facility in the region. The Burbank to Los Angeles Project Section proposes reconfiguring the various yard and maintenance facilities within the CMF to accommodate HSR, while maintaining as many of the existing yard operations as possible. Figure 2-11 displays a schematic diagram of the existing CMF and the proposed changes, which include new mainline-to-yard track connections, partial demolition of the existing maintenance shop, a revised roadway network with reconfigured parking areas, track relocation shifts, and construction to provide additional storage capacity. Additionally, several facilities would need to be relocated or reconstructed within the CMF, including a train washing/reclamation building, a yard pump house, and two service and inspection tracks. Utilities would also need to be relocated with the CMF, including domestic and fire water, underdrains and reconstructed catch basins, power facilities, fueling facilities and storage tanks, and sanitary sewer systems. The proposed design would not be able to accommodate wheel truing operations or progressive maintenance bays; these would relocate to another Metrolink facility. All other facilities and infrastructure would remain in place. The construction work at the CMF would be phased to minimize the disruption to the existing operations and to maintain the key operational facilities.



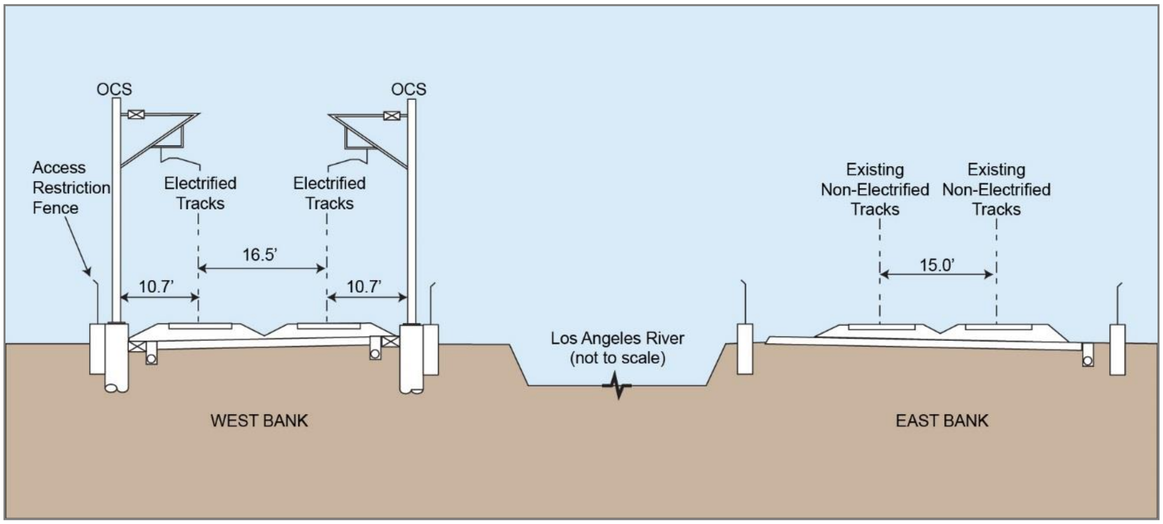
Source: Burbank to Los Angeles Draft Preliminary Engineering for Project Description Design Submittal (2019)

Figure 2-11 Diagram of Existing and Proposed Metrolink Central Maintenance Facility

At the south end of the CMF, the two electrified and two non-electrified tracks would converge briefly within the right-of-way and then diverge again south of Figueroa Street. The electrified tracks would cross over to the west bank of the Los Angeles River on the existing Metrolink Downey Bridge. The existing tracks on the Downey Bridge would be electrified, which would allow for both HSR and passenger rail operations. The non-electrified tracks would remain on the east bank of the Los Angeles River and cross the Arroyo Seco on an existing railroad bridge, which would not require modifications. These non-electrified tracks would connect with the existing tracks on the east bank, which currently serve UPRR and nonrevenue trains. An illustrative cross-section for this area is shown on Figure 2-12.

South of Main Street, on the east bank of the river, the existing tracks would be modified at Mission Junction to be used by freight and passenger rail. They would cross the Los Angeles River on the existing Mission Tower bridge to join the electrified tracks within the railroad right-of-way. The existing Mission Tower bridge has two tracks, but currently only one track is functional and used by Metrolink. The HSR Build Alternative would replace the trackwork to conform to the most current design standards and specifications, which may require a retrofit to the bridge.

The two sets of tracks would continue south to terminate at LAUS. The electrified tracks and HSR station platforms would be located on the west side of the station, while the non-electrified tracks would merge with the Metrolink and Amtrak tracks. The configuration at LAUS is described in further detail in Section 2.3.2.



Source: California High-Speed Rail Authority (2019)
The electrified tracks would cross the Los Angeles River just north of State Route 110 and run along the west bank of the river. The non-electrified tracks would run along the east bank of the river. (Figure not to scale.)

Figure 2-12 Typical Cross-Section from State Route 110 to Mission Junction

2.2.2 Roadway Crossings

The HSR Build Alternative would cross a total of 34 roadways, 15 of which would require modifications. Figure 2-5 shows the crossings throughout the project section, and Table 2-1 lists their configurations before and after the introduction of the HSR Build Alternative.

Modifications to existing crossings

- Victory Place: a new bridge for the HSR tracks would be constructed directly south of the existing railroad bridge over Victory Place, and the roadway would be lowered to cross under the new bridge.
- Burbank Boulevard: the roadway bridge would be reconstructed to cross over the tracks, and Burbank Boulevard would be raised in elevation on the west side.
- Alameda Avenue: the railroad bridge would be reconstructed to be wider.
- Colorado Street: the railroad bridge would be reconstructed to be wider.
- Los Felix Boulevard: the railroad bridge would be reconstructed to be wider, and the roadway would be lowered slightly
- Glendale Boulevard: the railroad bridge would be reconstructed to be wider, and the roadway would be lowered slightly

- Kerr Road: the railroad bridge would be reconstructed to be wider, and the roadway would be lowered slightly

New grade separations

- Buena Vista Street: the crossing would be modified and remain at-grade for Metrolink and UPRR tracks, but a new undercrossing would be constructed to grade-separate the HSR tracks only from the roadway.
- Sonora Avenue: a new roadway undercrossing would be constructed, with the tracks slightly raised on retained fill and the roadway slightly lowered (see Section 2.6).
- Grandview Avenue: a new roadway undercrossing would be constructed, with the tracks slightly raised on retained fill and the roadway slightly lowered (see Section 2.6).
- Flower Street: a new roadway undercrossing would be constructed, with the tracks slightly raised on retained fill and the roadway slightly lowered (see Section 2.6).
- Goodwin Avenue: the road currently does not cross the railroad right-of-way, but the project would grade-separate it as a new roadway undercrossing (see Section 2.6).
- Main Street: a new roadway bridge would be constructed north of the existing Main street bridge, which would cross the railroad right-of-way and the Los Angeles River (see Section 2.6).

Closures

- Chevy Chase Drive: the roadway would be closed, and a new pedestrian undercrossing would be provided (see Section 2.6).
- Private driveway: a driveway that currently provides access to a Los Angeles Department of Water and Power facility parking lot would be closed, and the Los Angeles Department of Water and Power parking would be relocated to a new facility on Main Street.

Table 2-1 Roadway Crossings within the Burbank to Los Angeles Project Section

Roadway	Current Crossing Configuration	Proposed Crossing Configuration[1]
Buena Vista Street	At-Grade*	**At-Grade* (modified)** **Undercrossing** (new)**
Victory Place	Undercrossing"	Undercrossing* **Undercrossing (new)**
Burbank Boulevard	Overcrossing	**Overcrossing (modified)**
Magnolia Boulevard	Overcrossing	Overcrossing
Olive Avenue	Overcrossing	Overcrossing
Interstate 5	Overcrossing	Overcrossing
Alameda Avenue	Undercrossing	**Undercrossing (modified)**
Western Avenue	Overcrossing	Overcrossing
Sonora Avenue	At-Grade	**Undercrossing (new)**
Grandview Avenue	At-Grade	**Undercrossing (new)**
Flower Street	At-Grade	**Undercrossing (new)**
Fairmont Avenue	Overcrossing	Overcrossing
SR 134	Overcrossing	Overcrossing
Salem/Sperry St[2]	No Crossing	Overcrossing (Metro project)
Colorado Street	Undercrossing	**Undercrossing (modified)**

Roadway	Current Crossing Configuration	Proposed Crossing Configuration[1]
Goodwin Avenue	No Crossing	**Undercrossing (new)**
Chevy Chase Drive	At-Grade	**Closed**
Los Feliz Boulevard	Undercrossing	**Undercrossing (modified)**
Glendale Boulevard	Undercrossing	**Undercrossing (modified)**
Fletcher Drive	Undercrossing	Undercrossing
SR 2	Overcrossing	Overcrossing
Kerr Road	Undercrossing	**Undercrossing (modified)**
Interstate 5	Overcrossing	Overcrossing
Figueroa Street	Overcrossing	Overcrossing
SR 110	Overcrossing	Overcrossing
Metro Gold Line	Overcrossing	Overcrossing
Broadway	Overcrossing	Overcrossing
Spring Street	Overcrossing	Overcrossing
Main Street	At-Grade	**Overcrossing (new)**
Private LADWP road	At-Grade	**Closed**
Vignes Street	Undercrossing	Undercrossing
Cesar Chavez Avenue	Undercrossing	Undercrossing

Source: California High-Speed Rail Authority (2019)
[1] All proposed grade crossing configurations are pending Public Utilities Commission approval.
[2] Salem/Sperry Street would be grade-separated as a part of the Metro Doran Street and Broadway/Brazil Grade Separation Project. The project also proposes closing the existing at-grade railroad crossings at Doran Street and Broadway/Brazil Street. As the Metro project would be completed before the introduction of HSR service, the crossing configurations are considered part of the existing conditions for the HSR project.
**Crossings apply to Metrolink and/or UPRR tracks only*
***Crossing applies to HSR tracks only*
***Bold** denotes change from existing condition under the HSR Build Alternative.*
Overcrossing = Road over train tracks Undercrossing = Road under train tracks
HSR = High-Speed Rail SR = State Route
Source: California High-Speed Rail Authority and Federal Railroad Administration (2019)

2.3 Station Sites

The HSR stations for the Burbank to Los Angeles Project Section would be in the vicinity of Hollywood Burbank Airport and at LAUS. Stations would be designed to optimize access to the California HSR System, particularly to allow for intercity travel and connections to local transit, airports, highways, and the bicycle and pedestrian network. Both stations would include the following elements:

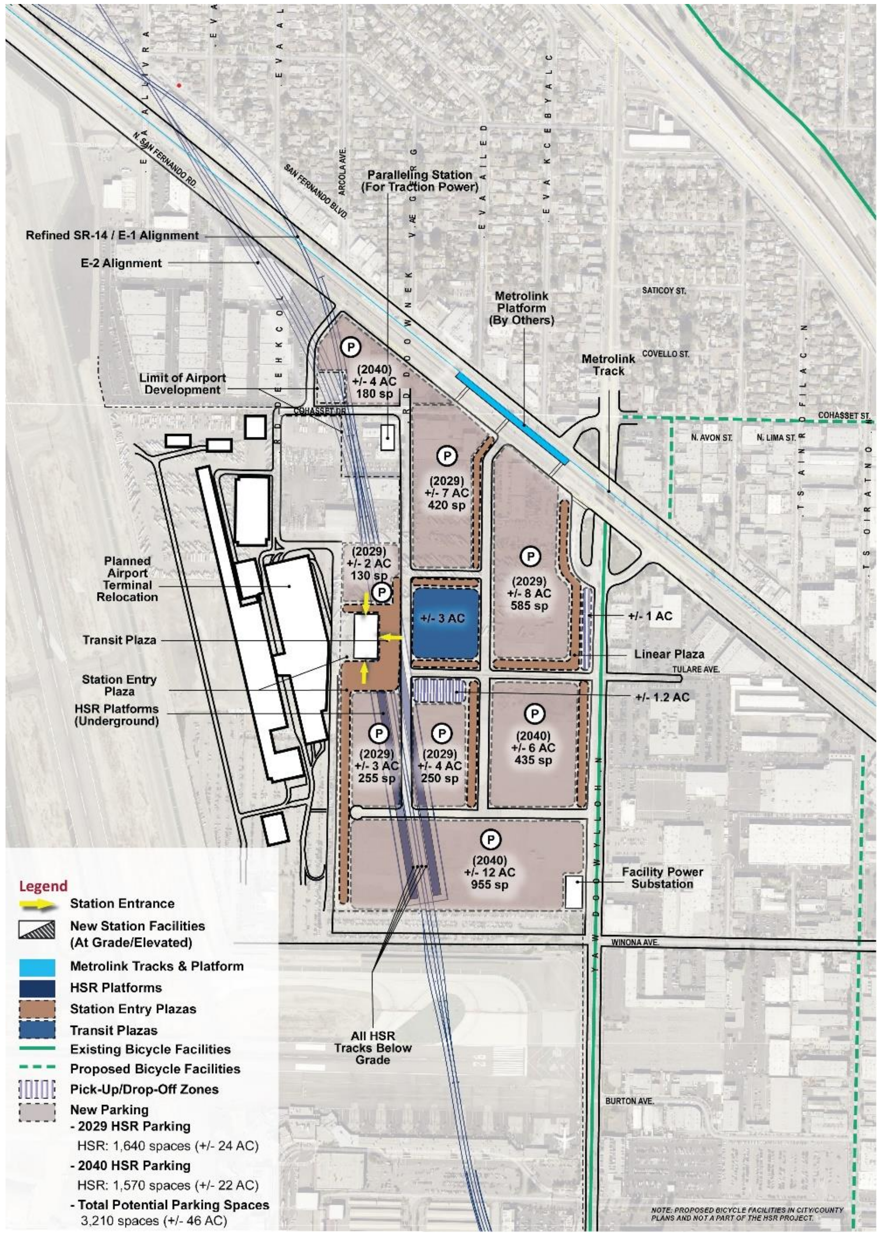
- Passenger boarding and alighting platforms
- Station head house with ticketing, waiting areas, passenger amenities, vertical circulation, administration and employee areas, and baggage and freight-handling service
- Vehicle parking (short-term and long-term)
- Pick-up and drop-off areas
- Motorcycle/scooter parking
- Bicycle parking
- Waiting areas and queuing space for taxis and shuttle buses
- Pedestrian walkway connections

2.3.1 Burbank Airport Station

The Burbank Airport Station site would be located west of Hollywood Way and east of Hollywood Burbank Airport. The airport and ancillary properties occupy much of the land south of the Burbank Airport Station site, while industrial and light industrial land uses are located to the east and residential land uses are found north of the Burbank Airport Station site. Interstate 5 runs parallel to the station site, approximately 0.25 mile north of the proposed Metrolink platform.

The Burbank Airport Station would have both underground and aboveground facilities that would span approximately 70 acres. Station facilities would include train boarding platforms, a station building (that would house ticketing areas, passenger waiting areas, restrooms, and related facilities), pick-up/drop-off facilities for private autos, a transit center for buses and shuttles, and surface parking areas. Underground portions of the station would be beneath Cohasset Street, along which runs the boundary between the City of Los Angeles to the north and the City of Burbank to the south. There would be two HSR tracks at the station.

The Burbank Airport Station would have up to 3,200 surface parking spaces. About 2,980 spaces would be located between the proposed Replacement Terminal and N Hollywood Way. An additional 220 spaces would be located in surface lots in the area bounded by Lockheed Drive to the west, Cohasset Street to the south, and N San Fernando Boulevard to the north and east. The preliminary station layout concept plan is shown on Figure 2-13. The Burbank to Los Angeles Project Section EIR/EIS analyzes the Burbank Airport Station project footprint displayed on Figure 2-13 as permanently impacted because no additional temporary construction easements are identified beyond the permanent area required to construct, operate, and maintain the station. This is the assumption based on the current level of design.



Source: California High-Speed Rail Authority (2019)

Figure 2-13 Preliminary Station Concept Layout Plan, Burbank Airport Station

2.3.2 Los Angeles Union Station

The existing LAUS campus and surrounding tracks are being reconfigured as a part of the Metro Link Union Station (Link US) [5] Project. The Metro Link US Project would reconfigure the station entry tracks from north of Mission Junction and construct an elevated structure through the station arrival and boarding area, which would extend south over U.S. Route 101 and come back to grade near First Street. Reconfiguration would occur over two construction phases. The first phase would include an elevated structure for non-HSR passenger rail operators between Vignes Street and First Street. The second phase would add additional tracks to the structure for use by HSR. The Metro Link US EIR/EIS, on which the Authority is a cooperating agency, would evaluate these changes, along with an expanded passenger concourse area and changes to the Metro Gold Line. These changes would be completed prior to the introduction of HSR service.

While Metro would environmentally clear and construct the trackwork and new passenger concourse, the HSR project would require additional modifications within the Link US area. HSR improvements include raising the platform heights and installing an overhead contact system. The Burbank to Los Angeles Project EIR/EIS evaluates these modifications, as well as potential increases in traffic associated with the introduction of HSR service.

The proposed HSR station at LAUS would include up to four HSR tracks and two 870-foot platforms (with the possibility of extending to 1,000 feet). The HSR system would share passenger facilities, such as parking and pick-up/drop-off, with other operators. HSR would require 1,180 parking spaces in 2029 and 2,010 spaces in 2040. This new demand may be met by existing underutilized parking supply within 0.5 mile of LAUS. This parking would be shared with other LAUS service providers and businesses.

[5] Link US will transform LAUS from a “stub-end” station to a “run-through” station by extending tracks south over U.S. Route 101. The project will add a new passenger concourse that will provide improved operational flexibility for rail service. The Draft FIR is available at: https://www.metro.net/projects/link-us/final-ei-report/.

Sources: California High-Speed Rail Authority (2019); Los Angeles Metropolitan Transportation Authority (2018)

Figure 2-14 Preliminary Station Elements Plan, Los Angeles Union Station

2.4 Maintenance of Infrastructure

The California HSR System includes four types of maintenance facilities: maintenance of infrastructure facilities (MOIF), Maintenance of infrastructure siding facilities (MOIS), heavy maintenance facilities, and light maintenance facilities (LMF).[6] The California HSR System would require one heavy maintenance facility for the system, located in the Central Valley. The design and spacing of maintenance facilities along the HSR system do not require the Burbank to Los Angeles Project Section to include any of the maintenance facilities within the limits of the project section.

For purposes of environmental analysis, the Authority has defined each project section to have the capability to operate as a stand-alone project in the event that other project sections of the

[6] Maintenance facilities are described in the Authority's *Summary of Requirements for O&M Facilities* (2013).

HSR system are not constructed. Because this project section does not provide a heavy maintenance facility or MOIF, an independent contractor would need to be retained to handle all maintenance functions for vehicles and infrastructure if this project section were built as a stand-alone project for purposes of independent utility. Independent utility is discussed further in Section 2.9.

2.4.1 Maintenance of Infrastructure Facilities

The HSR system infrastructure will be maintained from regional MOIFs located at approximately 150-mile intervals. Each MOIF is estimated to be approximately 28 acres in size and would provide a location for regional maintenance machinery servicing storage, materials storage, and maintenance and administration. The MOIFs could be co-located with the MOIS within each 75-mile segment. The MOIFs would be located outside of the Burbank to Los Angeles Project Section.

2.4.2 Maintenance of Infrastructure Sidings

The MOISs would be centrally located within the 75-mile maintenance sections on either side of each MOIF. Each MOIS would support MOIF activities by providing a location for the layover of maintenance of infrastructure equipment and temporary storage for materials. The MOIS is estimated to be about 4 acres in size. The MOISs would be located outside of the Burbank to Los Angeles Project Section.

2.4.3 Heavy Maintenance Facility

Only one heavy maintenance facility is required for the HSR system, and it would be within either the Merced to Fresno Project Section or the Fresno to Bakersfield Project Section. The heavy maintenance facility would include all activities associated with train fleet assembly, disassembly, and complete rehabilitation; all on-board components of the trainsets; and overnight layover accommodations and servicing facilities. The site would include a maintenance shop, a yard Operations Control Center building, one traction power substation (TPSS), other support facilities, and a train interior cleaning platform.

2.4.4 Light Maintenance Facility

An LMF would be used for all activities associated with fleet storage, cleaning, repair, overnight layover accommodations, and servicing facilities. The LMF closest to the Burbank to Los Angeles Project Section would be sited in proximity to LAUS but within the Los Angeles to Anaheim Project Section, and would likely support the following functions:

- **Train Storage:** Some trains would be stored at the LMF prior to start of revenue service.
- **Examinations in Service:** Examinations would include inspections, tests, verifications, and quick replacement of certain train components on the train.
- **Inspection:** Periodic inspections would be part of the planned preventive maintenance program requiring specialized equipment and facilities.

The LMF site will be sized to support the level of daily revenue service dispatched by the nearby terminal at the start of each revenue service day. The Authority defines three levels of maintenance that can be performed at an LMF:

- **Level I:** Daily inspections, pre-departure cleaning, and testing
- **Level II:** Monthly inspections
- **Level III:** Quarterly inspections, including wheel-truing

A Level I LMF is proposed on the west bank of the Los Angeles River at the existing Amtrak Railroad Yard. The facility would be where the current BNSF Railway storage tracks are located and would require their relocation.

2.5 Ancillary and Support Facilities

2.5.1 Electrification

Trains on the California HSR System would draw power from California's existing electricity grid distributed via an overhead contact system. The Burbank to Los Angeles Project Section would not include the construction of a separate power source, although it would include the extension of power lines from potential TPSSs to a series of independently owned power substations positioned along the HSR corridor if necessary. The transformation and distribution of electricity would occur in three types of stations:

- TPSSs transform high-voltage electricity supplied by public utilities to the train operating voltage. TPSSs would be adjacent to existing utility transmission lines and the right-of-way, and would be located approximately every 30 miles along the HSR system route.
- Switching stations connect and balance the electrical load between tracks, and switch overhead contact system power on or off to tracks in the event of a power outage or emergency. Switching stations would be midway between, and approximately 15 miles from, the nearest TPSSs. Each switching station would be 120x80 feet and be adjacent to the HSR right-of-way.
- Paralleling stations, or autotransformer stations, provide voltage stabilization and equalize current flow. Paralleling stations would be located approximately every 5 miles between the TPSSs and the switching stations. Each paralleling station would approximately be 100x80 feet and located adjacent to the right-of-way.

Table 2-2 lists the proposed switching station and paralleling station sites within the Burbank to Los Angeles Project Section. A TPSS is not required for the Burbank to Los Angeles Project Section because of the HSR system's facilities spacing requirements. The Burbank to Los Angeles Project Section would be able to use the TPSSs within the Palmdale to Burbank Project Section and/or Los Angeles to Anaheim Project Section. In the event the other project sections of the HSR system are not constructed, a standalone TPSS would be required within the Burbank to Los Angeles Project Section for purposes of independent utility. Independent utility is discussed further in Section 2.8.

Table 2-2 Traction Power Facility Locations for the Burbank to Los Angeles Project Section

Type of Facility	Location
Paralleling Station	Los Angeles, south of Main Street between railroad right-of-way and Los Angeles River
Switching Station	Los Angeles, south of Verdant Street and west of railroad right-of-way

Source: California High-Speed Rail Authority and Federal Railroad Administration (2019)

2.5.2 Signaling and Train-Control Elements

To reduce the safety risks associated with freight and passenger trains, the National Transportation Safety Board, FRA, and other agencies have mandated Positive Train Control (PTC). PTC is a train safety system designed to automatically implement safety protocols and provide communication with other trains to reduce the risk of a potential collision. The U.S. Rail Safety Improvement Act of 2008 requires the implementation of PTC technology across most railroad systems; in October 2015, Congress extended the deadline for implementation to December 31, 2018. The FRA published the Final Rule regarding PTC regulations on January 15, 2010.

Communication towers and ancillary facilities are included in the Burbank to Los Angeles Project Section to implement the FRA PTC requirements. PTC infrastructure consists of integrated command, control, communications, and information systems for controlling train movements that improve railroad safety by significantly reducing the probability of collisions between trains, casualties to roadway workers and equipment, and over-speed accidents. PTC is especially important in "blended"[7] corridors, such as in the Burbank to Los Angeles Project Section, where passenger and freight trains need to share the same tracks safely.

PTC for the HSR project would use a radio-based communications network that would include a fiber-optic backbone and communications towers approximately every 2 to 3 miles, depending on the terrain and selected radio frequency. The towers would be located in the fenced HSR corridor in a fenced area of approximately 20x15 feet, including a 10x8-foot communications shelter and a 6- to 8-foot-diameter, 100-foot-tall communications pole. These communications facilities could be co-located within the TPSSs. Where communications towers cannot be located with TPSSs or other HSR facilities, the communications facilities would be located near the HSR corridor in a fenced area of approximately 20 feet by 15 feet.

2.6 Early Action Projects

As described in the 2016 Business Plan, the Authority has made a commitment to invest in regionally significant connectivity projects in order to provide early benefits to transit riders and local communities while laying a solid foundation for the HSR system. These early actions will be made in collaboration with local and regional agencies. These types of projects include grade separations and improvements at regional passenger rail stations, which increase capacity, improve safety, and provide immediate benefits to freight and passenger rail operations. Local and regional agencies may take the lead on coordinating the construction of these early action projects. Therefore, they are described in further detail below and are analyzed within the Burbank to Los Angeles Project Section EIR/EIS to allow the agencies, as Responsible Agencies under CEQA, to adopt the findings and mitigation measures as needed to construct these projects.

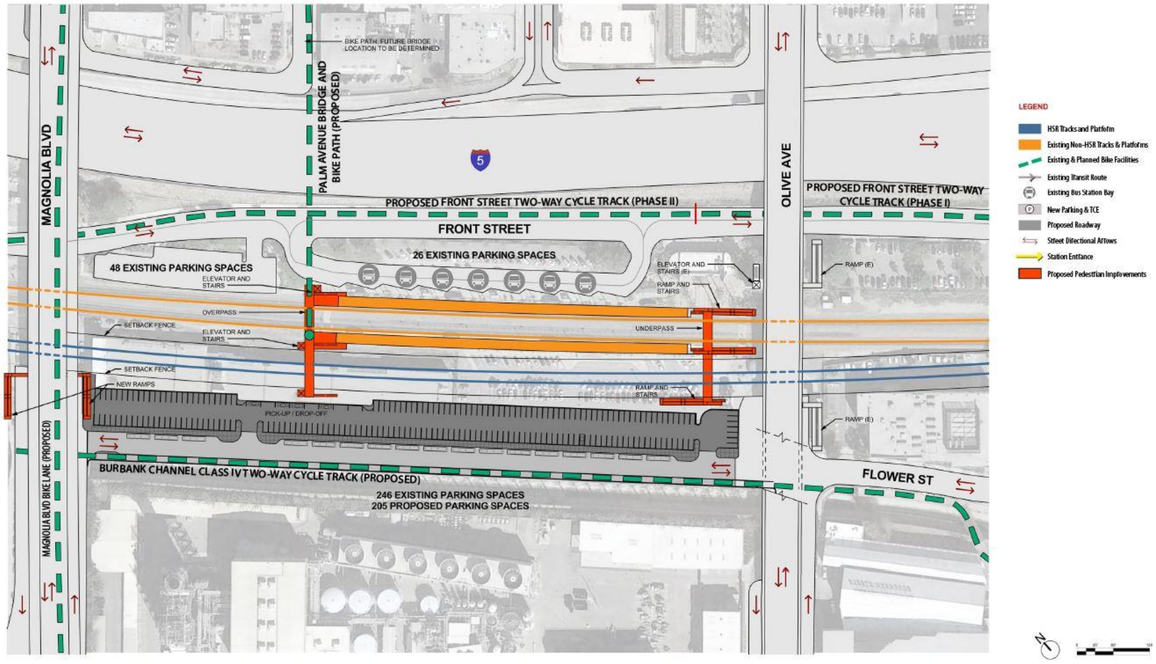
2.6.1 Downtown Burbank Metrolink Station

Although the HSR system will not serve the Downtown Burbank Metrolink Station, modifications at the station would be required to ensure continued operations of existing operators. The HSR tracks would be located within the existing parking lot west of the southbound platforms; the platforms and existing Metrolink tracks would not change. The parking would be relocated to between Magnolia Boulevard and Olive Avenue, and Flower Street would be extended from where it currently ends at the south side of the Metrolink Station. Pedestrian bridges would be provided for passengers to cross over the HSR tracks to access the Metrolink platforms. Other accessibility improvements would include additional vehicle parking, bus parking, and bicycle pathways. Figure 2-15 shows the proposed site plan for the Downtown Burbank Metrolink Station.

2.6.2 Sonora Avenue Grade Separation

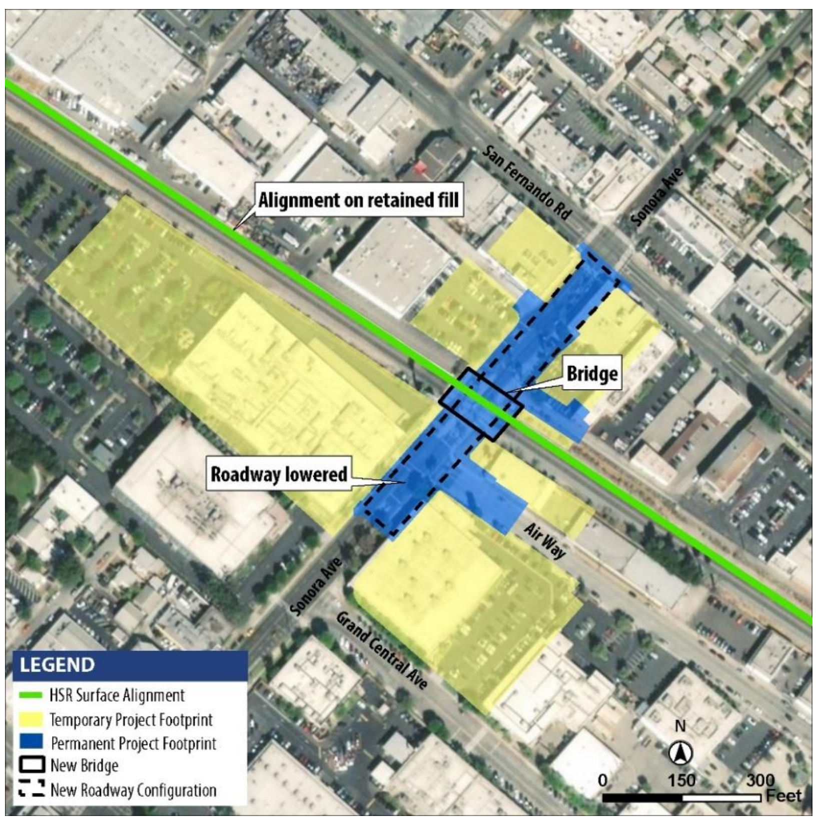
Sonora Avenue is an existing at-grade crossing. The existing roadway configuration consists of two traffic lanes in both the eastbound and westbound directions. The Burbank to Los Angeles Project Section proposes a "hybrid" grade separation, with Sonora Avenue slightly depressed and the HSR alignment and non-electrified tracks raised on a retained-fill structure. A 10-foot-wide median would be added and the lanes would be narrowed, so the overall width of Sonora Avenue would not change. Sonora Avenue would be lowered in elevation between Air Way and San Fernando Road, and the lowest point of the undercrossing would be approximately 10 feet below the original grade. The height of the new retained-fill structure would be approximately 28 feet. Figure 2-16 shows the temporary and permanent project footprint areas.

[7] California HSR Project Business Plans (http://www.hsr.ca.gov/About/Business_Plans/) suggest blended railroad systems and operations. These terms refer to integrating the HSR system with existing intercity, and commuter and regional rail systems through coordinated infrastructure (blended systems) and scheduling, ticketing, and other means (blended operations).



Source: California High-Speed Rail Authority (2019)

Figure 2-15 Downtown Burbank Metrolink Station Site Plan



Source: California High-Speed Rail Authority (2019)

Figure 2-16 Sonora Avenue Grade Separation Footprint

2.6.3 Grandview Avenue Grade Separation

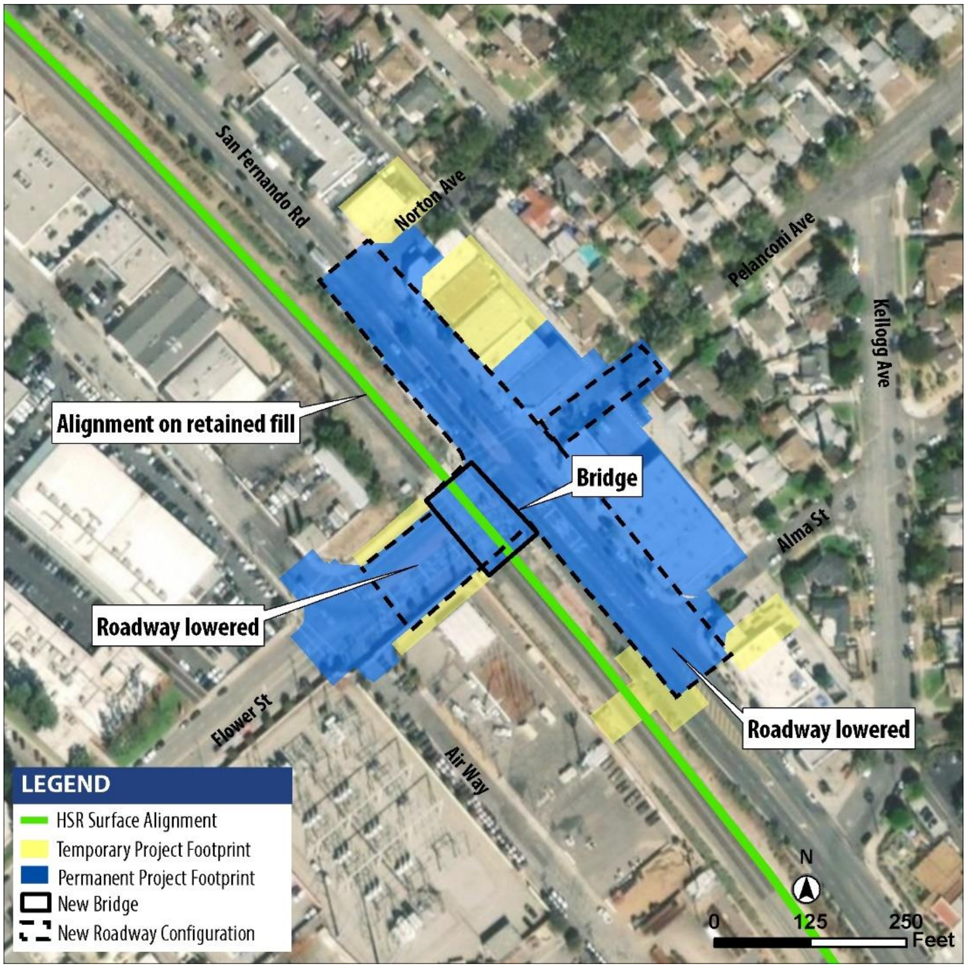
Grandview Avenue is an existing at-grade crossing. The existing roadway configuration consists of three traffic lanes in both the eastbound and westbound directions. The Burbank to Los Angeles Project Section proposes a "hybrid" grade separation, with Grandview Avenue slightly depressed and the HSR alignment and non-electrified tracks raised on retained fill. Grandview Avenue would be lowered in elevation between Air Way and San Fernando Road, and the lowest point of the undercrossing would be approximately 3 feet below original grade. The lanes and overall width of Grandview Avenue would not change. The height of the new retained-fill structure would be approximately 30 feet. Figure 2-17 shows the temporary and permanent project footprint areas.

Source: California High-Speed Rail Authority (2019)

Figure 2-17 Grandview Avenue Grade Separation Footprint

2.6.4 Flower Street Grade Separation

Flower Street is an existing at-grade crossing, with Flower Street ending in a T-shaped intersection with San Fernando Road, which runs parallel on the east side of the railroad right-of-way. Existing Flower Street consists of two traffic lanes in both the westbound and eastbound directions, with a right-turn-only lane in the westbound direction. The Burbank to Los Angeles Project Section proposes a "hybrid" grade separation, with Flower Street and San Fernando Road slightly depressed, and the HSR alignment and non-electrified tracks raised on a retained-fill structure. Flower Street would be lowered in elevation between Air Way and San Fernando Road, and the lowest point of the undercrossing would be approximately 10 feet below original grade. The existing median would be modified on Flower Street, and the overall width of Flower Street would remain the same. San Fernando Road would be lowered in grade between Norton Avenue and Alma Street, and Pelanconi Avenue would be extended to connect to San Fernando Road. The height of the new retained-fill structure would be approximately 28 feet. Figure 2-18 shows the temporary and permanent project footprint areas.



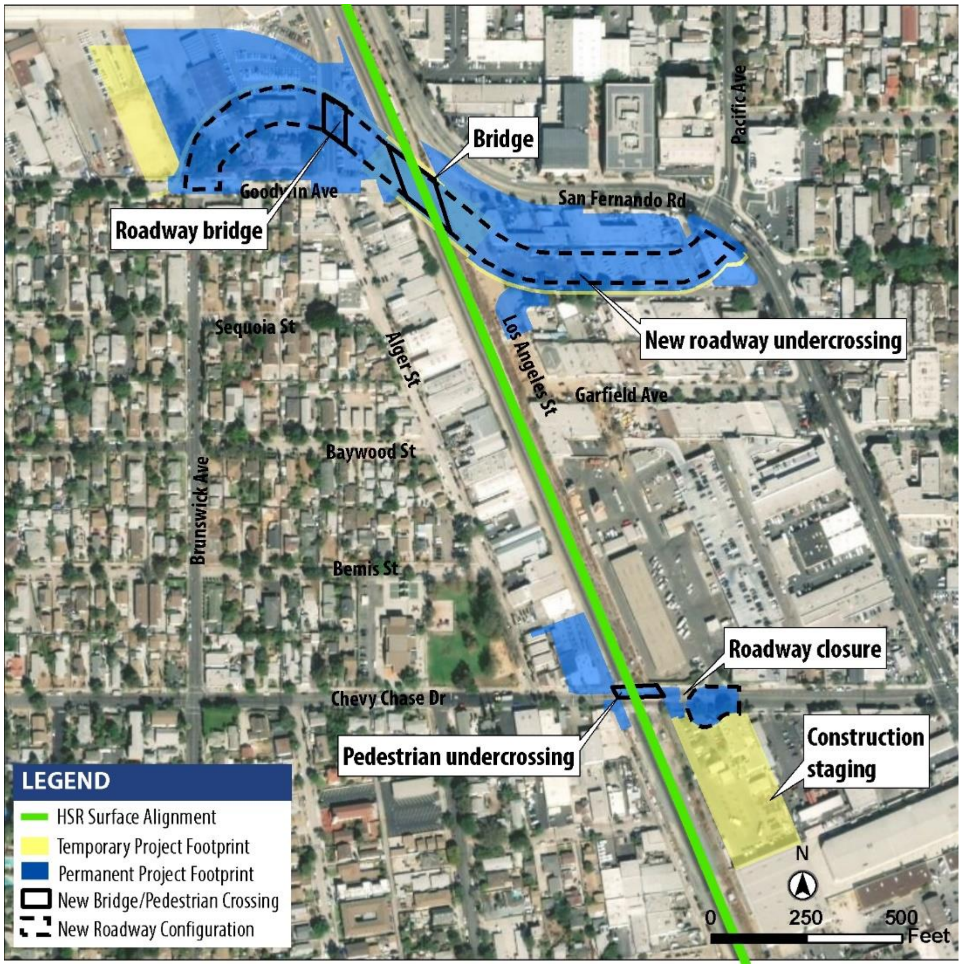
Source: California High-Speed Rail Authority (2019)

Figure 2-18 Flower Street Grade Separation Footprint

2.6.5 Goodwin Avenue/Chevy Chase Drive Grade Separation

There is currently no crossing at Goodwin Avenue, which ends in a cul-de-sac on the west side of the railroad right-of-way. The Burbank to Los Angeles Project Section proposes a grade separation, with Goodwin Avenue realigned and depressed to cross under a new railroad bridge supporting the HSR and non-electrified tracks. A new roadway bridge would also be required to carry Alger Street over the depressed Goodwin Avenue, connecting to W San Fernando Road. The new depressed roadway would curve north from Brunswick Avenue, cross under the new roadway and railroad bridges, and connect with Pacific Avenue on the east side of the railroad right-of-way. The lowest point of the undercrossing would be approximately 28 feet below original grade.

Chevy Chase Drive is an at-grade crossing. With the construction of a new grade separation at Goodwin Avenue, Chevy Chase Drive would be closed on either side of the rail crossing and a pedestrian undercrossing would be provided. Figure 2-19 shows the temporary and permanent project footprint areas for Goodwin Avenue and Chevy Chase Drive.



Source: California High-Speed Rail Authority (2019)

Figure 2-19 Goodwin Avenue Grade Separation

2.6.6 Main Street Grade Separation

Main Street is an existing at-grade crossing. It crosses the existing tracks at-grade on the west bank of the Los Angeles River, crosses over the river on a bridge, and then crosses the existing tracks at-grade on the east bank of the river. The existing bridge carries two traffic lanes in both directions. The Burbank to Los Angeles Project Section proposes a grade separation, with a new Main Street bridge spanning the tracks on the west bank, the Los Angeles River, and the tracks on the east bank. The new Main Street bridge would be 86 feet wide and 75 feet high at its highest point over the Los Angeles River and would place three columns within the river channel. Main Street would be raised in elevation, starting from just east of Sotello Street on the west side of the Los Angeles River. The new bridge would come down to grade at Clover Street on the east side of the Los Angeles River. Several roadways on the east side of the Los Angeles River would be reconfigured, including Albion Street, Lamar Street, Avenue 17, and Clover Street. The existing Main Street bridge would not be modified, but it would be closed to public access. Figure 2-20 shows the temporary and permanent project footprint areas.

Source: California High-Speed Rail Authority (2019)

Figure 2-20 Main Street Grade Separation Footprint

2.7 Project Construction

For the Burbank to Los Angeles Project Section of the California HSR System, specific construction elements would include at-grade and underground track, grade-separated roadway crossings, retaining walls, and installation of a PTC system. Surface track sections would be built using conventional railroad construction techniques. A typical construction sequence includes clearing, grubbing, grading, and compacting the railbed; applying crushed rock ballast; laying track; and installing electrical and communications systems. The at-grade track would be laid on an earthen railbed topped with rock ballast approximately 3 feet off the ground. Fill and ballast for the railbed would be obtained from permitted borrow sites and quarries.

Retaining walls are used when it is necessary to transition between an at-grade and elevated profile. In this project section, retained fill would be used between Western Avenue and SR 134. The tracks would be raised in elevation on a retained-fill platform made of reinforced walls, much like a freeway ramp. Short retaining walls would have a similar effect and would protect the adjacent properties from a slope extending beyond the proposed rail right-of-way.

The preferred construction method for the tunnel alignment underneath the Burbank Airport runway is the Sequential Excavation Methods. The tunnel alignment south of the airport would be constructed using cut-and-cover.

Pre-construction activities would be conducted during final design and would include geotechnical investigations, interpretation of anticipated ground behavior and ground support requirements, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures. Additional studies and investigations to develop construction requirements and worksite traffic control plans would be conducted as needed.

Major construction activities for the Burbank to Los Angeles Project Section would include earthwork and excavation support, systems construction, bridge and aerial structure construction, and railway systems construction (including trackwork, traction electrification, signaling, and communications).

During peak construction periods, work is envisioned to be underway at several locations along the route simultaneously, with overlapping construction of various project elements. Working hours and the number of workers present at any time would vary depending on the activities being performed but could be expected to extend to 24 hours per day, seven days per week.

2.8 Independent Utility of the Burbank to Los Angeles Project Section

The Burbank to Los Angeles Project Section would have independent utility if it is able to operate as a standalone project in the event the other project sections of the HSR system are not constructed. As none of the four types of maintenance facilities would be located within the limits of the Burbank to Los Angeles Project Section, all maintenance functions for vehicles and infrastructure would be handled through an independent contractor to achieve independent utility. For power, one potential location for a TPSS has been preliminarily identified within the project section. Because the addition of a TPSS would alter the spacing of the other systems facilities, further design and environmental study would be required to environmentally clear the TPSS site and the alteration of the other systems facilities in the absence of the Palmdale to Burbank and Los Angeles to Anaheim project sections being built and operated.

Any electrical interconnections between a potential future TPSS site and existing utility providers would also have to be environmentally evaluated and cleared in subsequent documentation.

2.9 Operations of the Burbank to Los Angeles Project Section

The conceptual HSR service plan for Phase 1, starting in 2029, begins with service between Los Angeles/Anaheim running through the Central Valley from Bakersfield to Merced, and traveling northwest into the Bay Area. Subsequent sections in Phase 2 of the HSR system include a southern extension from Los Angeles to San Diego and an extension from Merced to north of Sacramento. These extensions do not have an anticipated implementation date.

Currently, the Metrolink Ventura and Antelope Valley Lines, Amtrak Pacific Surfliner and Coast Starlight, and UPRR freight trains operate within the Burbank to Los Angeles Project Section. As the proposed HSR Build Alternative is within the active LOSSAN passenger and freight rail corridor, all existing operators would have to change their operation patterns and frequency. New and realigned tracks would change the tracks on which the various users operate, with passenger rail and freight trains shifted closer to the east side of the right-of-way. With the introduction of HSR service, the proposed general operational characteristics are shown in Table 2-3.

Table 2-3 Existing and Future Trains per Day in the Los Angeles–San Diego–San Luis Obispo Rail Corridor Within the Burbank and Los Angeles Project Section

Operator	2016 Existing Conditions	2029 Opening Day	2040 Horizon Year
California High-Speed Rail Authority[1]	N/A	196	196
Metrolink[2]	61	99	99
Amtrak[3]	12	16	18
UPRR[4]	11	18	23

[1] 2029 Opening Day and 2040 Horizon Year projections are from the California High-Speed Rail Authority's "Year 2029 and Year 2040 Concept Timetable for EIR/EIS Analysis."
[2] Existing Conditions data are from the 2016 Metrolink Schedule (effective October 3, 2016); 2029 Opening Day projections are extrapolated from the 2016 Metrolink 10-Year Strategic Plan, "Growth Scenario 2: Overlay of Additional Service Patterns."
[3] Existing Conditions data are from the 2016 LOSSAN Corridor Schedule; 2029 Opening Day projections are extrapolated from 2012 LOSSAN Corridorwide Strategic Implementation Plan "Long-Term Operations Analysis" (increase of approximately one train every four years for the Amtrak Pacific Surfliner and no growth for the Amtrak Coast Starlight between Hollywood Burbank Airport and LAUS).
[4] Existing Conditions data are from the 2012 LOSSAN Corridorwide Strategic Implementation Plan "Long-Term Operations Analysis"; 2029 Opening Day projections are extrapolated from the 2012 LOSSAN Corridorwide Strategic Implementation Plan "Long-Term Operations Analysis" (increase of approximately one train every two years for UPRR between Hollywood Burbank Airport and LAUS).
Amtrak = National Railroad Passenger Corporation
LAUS = Los Angeles Union Station
N/A = not applicable
UPRR = Union Pacific Railroad

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3 LAWS, REGULATIONS, AND ORDERS

Federal, state, and local laws, regulations, orders, or plans relevant to hydrology and water resources in the geographic area that are affected by the HSR Build Alternative are presented below.

3.1 Federal

3.1.1 Federal Railroad Administration, Procedures for Considering Environmental Impacts (64 Fed. Reg. 28545)

On May 26, 1999, the FRA released *Procedures for Considering Environmental Impacts* (FRA 1999). These FRA procedures supplement the Council on Environmental Quality Regulations (40 Code of Federal Regulations [C.F.R.] Part 1500 et seq.) and describe FRA's process for assessing the environmental impacts of actions and legislation proposed by the agency and for the preparation of associated documents (42 United States Code 4321 et seq.). The FRA *Procedures for Considering Environmental Impacts* states that "the EIS should identify any significant changes likely to occur in the natural environment and in the developed environment. The EIS should also discuss the consideration given to design quality, art, and architecture in project planning and development as required by U.S. Department of Transportation Order 5610.4." These FRA procedures state that an EIS should consider possible impacts on water quality and flood hazards and floodplains.

3.1.2 Clean Water Act (33 U.S.C. § 1251 et seq.)

The Clean Water Act (CWA) is the primary federal law protecting the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. The CWA prohibits any discharge of pollutants into the nation's waters unless specifically authorized by a permit. The applicable sections of the CWA are further discussed below.

- Section 102 requires the planning agency of each state to prepare a basin plan to set forth regulatory requirements for protection of surface water quality, which include designated beneficial uses for surface water bodies, as well as specified water quality objectives to protect those uses. Analysis of the degree to which discharges of runoff from the Project may or may not adversely affect Project receiving water beneficial uses and attainment by the receiving water of assigned water quality objectives indicates the degree to which the Project may affect water quality of existing surface waters.
- Section 303(d) requires each state to provide a list of impaired surface waters that do not meet or are expected not to meet state water quality standards as defined by that section. It also requires each state to develop total maximum daily loads (TMDLs) of pollutants for impaired waterbodies. The TMDL must account for the pollution sources causing the water to be listed.
- Under Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a dredged or fill material into waters of the U.S. must obtain certification that the discharge of fill will not violate water quality standards, including water quality objectives and beneficial uses. The certification is issued by the state in which the discharge would originate or from the interstate water pollution control agency with jurisdiction over affected waters. In California, the Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board (SWRCB) issue Section 401 certifications.
- Under Section 402, all point-source discharges, including, but not limited to, construction-related runoff discharges to surface waters and some post-development, are regulated through the National Pollutant Discharge Elimination System (NPDES) program. Project sponsors must obtain an NPDES permit from the SWRCB.
- Under Section 404, the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA) regulate the discharge of dredged and fill materials into the

waters of the U.S. Project sponsors must obtain a permit from USACE for discharges of dredged or fill materials into proposed jurisdictional waters over which USACE determines that it will exert jurisdiction. The HSR Build Alternative is anticipated to be permitted through multiple Nationwide Permits (one for each water crossing), rather than an individual Section 404 permit.

3.1.3 Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)

The Rivers and Harbors Act is a primary federal law regulating activities that may affect navigation on the nation's waterways, including:

- Section 14 of the Rivers and Harbors Act requires USACE permission for the use, including modifications or alterations, of any flood control facility work built by the U.S. to ensure that the usefulness of the federal facility is not impaired.
- Section 408 provides that USACE may grant permission for another party to alter a USACE flood control facility upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the facility.

3.1.4 Floodplain Management (USEO 11988) and U.S. Department of Transportation Order 5650.2 (Floodplain Management and Protection)

U.S. Presidential Executive Order (USEO) 11988 requires that federal agency construction, permitting, or funding of a project must avoid incompatible floodplain development, be consistent with the standards and criteria of the National Flood Insurance Program, and restore and preserve natural and beneficial floodplain values. U.S. DOT Order 5650.2 contains policies and procedures for the transportation agencies to implement USEO 11988 on transportation projects. Furthermore, USEO 11988 stipulates that if the proposed action involves a significant encroachment on a base floodplain, the EIS shall contain a finding that there is no other practicable alternative that avoids significant encroachment on a base floodplain. This finding is required to be supported by a description of why the proposed action must be located in the floodplain (including the alternatives considered and why they were not practicable) and accompanied by a statement that the action conforms to applicable state and local floodplain protection standards.

3.1.5 National Flood insurance Act (42 U.S.C. § 4001 et seq.) and Flood Disaster Protection Act (42 U.S.C. §§ 4001 to 4128)

The purpose of the National Flood Insurance Act is to identify flood-prone areas and provide insurance. The act requires purchase of insurance for buildings in special flood-hazard areas. The act is applicable to any federally assisted acquisition or construction projects in an area identified as having special flood hazards. Projects should avoid construction in, or develop a design to be consistent with Federal Emergency Management Agency (FEMA) identified flood hazard areas.

The Flood Disaster Protection Act requires the purchase of insurance for buildings in special flood-hazard areas identified and mapped by FEMA.

3.1.6 Safe Drinking Water Act of 1974 (42 U.S.C. § 300 et seq.)

The Safe Drinking Water Act was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The Act authorizes USEPA to set national health-based standards for drinking water to protect against both naturally occurring and human-produced contaminants that may be found in drinking water. The Act applies to every public water system in the U.S.

The Sole Source Aquifer Protection Program is authorized by Section 1424(e) of the Act. The Sole Source Aquifer designation is a tool to protect drinking water supplies in areas where there are few or no alternative sources to the groundwater resource and where, if contamination occurred, using an alternative source would be extremely expensive. All proposed projects receiving federal funds are subject to USEPA review to ensure that they do not endanger the water source.

3.2 State

3.2.1 Porter-Cologne Water Quality Act (Cal. Water Code, § 13000 et seq.)

The Porter-Cologne Water Quality Control Act requires the regulation of all pollutant discharges, including wastes in Project runoff that could affect the quality of the state's water. Any entity proposing to discharge a waste must file a Report of Waste Discharge with the appropriate RWQCB or SWRCB. The RWQCBs are responsible for implementing CWA Sections 401, 402, and 303(d). Because the HSR project is a project of statewide importance, any Reports of Waste Discharge will be filed with the SWRCB. The act also provides for the development and periodic reviews of basin plans that designate beneficial uses of California's major rivers and groundwater basins and establish water quality objectives for those waters.

3.2.2 Construction Activities, National Pollutant Discharge Elimination System General Construction Permit

Under the federal CWA, discharges of stormwater from construction sites must comply with the conditions of an NDPES permit. The SWRCB is the permitting authority in California and has adopted the statewide General Permit for Stormwater Discharges Associated with Construction Activity that applies to projects resulting in one or more acres of soil disturbance. For projects disturbing more than 1 acre of soil, a construction SWPPP is required that specifies site management activities to be implemented during site development. These management activities include construction stormwater best management practices (BMP), erosion and sedimentation controls, dewatering (nuisance water removal), runoff controls, and construction equipment maintenance.

3.2.2.1 National Pollutant Discharge Elimination System General Industrial Permit

Another required permit is the statewide General Permit for Discharges of Stormwater Associated with Industrial Activities (SWRCB Water Quality Order No. 2014-0057-DWQ, NPDES No. CAS000001). Qualifying industrial sites are required to prepare SWPPPs describing BMPs that will be employed to protect water quality. Industrial facilities are required to use best conventional pollutant control technology for control of conventional pollutants and best available technology economically achievable for toxic and non-conventional pollutants. Monitoring runoff leaving the site is also required. For transportation facilities, this permit applies only to vehicle maintenance shops and equipment-cleaning operations. The permit established number action levels that reflect Cal. EPA benchmark values for selected parameters, minimum BMP requirements, a revised monitoring protocol, and exceedance response actions if a numeric action level is exceeded.

3.2.2.2 California Department of Transportation National Pollutant Discharge Elimination System Statewide Stormwater Permit

The California Department of Transportation (Caltrans) operates under a permit (Order No. 2012-0011-DWQ, NPDES No. CAS000003) that regulates stormwater discharge from Caltrans properties, facilities, and activities and requires that the Caltrans construction program comply with the adopted General Permit for Stormwater Discharges Associated with Construction Activities (described above). The permit requires Caltrans to implement a year-round program in all parts of the state to effectively control stormwater and non-stormwater discharges (SWRCB 2012). The Caltrans permit is applicable to portions of the HSR project that involve modifications to state highways.

3.2.3 California High-Speed Rail Authority National Pollutant Discharge Elimination System Permit

On August 24, 2014, the SWRCB designated the Authority as a nontraditional permittee under the Phase II Municipal Separate Storm Sewer System (MS4) permit (Order No. 2013-0001-DWQ). This order is the only MS4 permit for which the Authority has obtained coverage as a nontraditional permittee. The Authority must follow the discharge, program, and monitoring requirements described in Section F of the Phase II MS4 permit within its right-of-way in Los Angeles County (Los Angeles RWQCB jurisdiction) and Orange County (Santa Ana RWQCB jurisdiction). The Authority's MS4 permit replaces county-/city-specific MS4 permits that would otherwise be applicable to the project. If runoff enters another agency's MS4 (i.e., Caltrans) or if the project extends into local rights-of-way (i.e., county or city), the jurisdictional agency's MS4 permit applies. Low-impact development design standards and a post-construction stormwater management program are required under the MS4 permit.

3.2.4 Cobey-Alquist Floodplain Management Act (California Water Code § 8400 et seq.)

The Cobey-Alquist Flood Plain Management Act encourages local governments to adopt and enforce land use regulations to accomplish floodplain management. It also provides state assistance and guidance for flood control.

3.2.5 Streambed Alteration Agreement (California Fish and Game Code Sections 1601 to 1603)

The California Fish and Game Code requires the Authority to notify the California Department of Fish and Wildlife prior to implementing any HSR project that would divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream (including intermittent streams), or lake.

3.2.6 Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act of 2014 (SGMA) is a comprehensive three-bill package that was signed into California state law by Governor Jerry Brown in September 2014. The SGMA that provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention only if necessary to protect the resource. The plan is intended to ensure a reliable groundwater water supply for California for years to come.

3.3 Regional and Local

This section discusses local and regional regulations and permitting requirements. Cities and counties within the resource study area (RSA), as well as regional agencies, have developed ordinances, policies, and other regulatory mechanisms to minimize negative effects during a project's construction and operation. The following regional and local plans and policies are applicable to this project section.

3.3.1 Regional Water Quality Control Board

The RWQCBs were established in the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The Burbank to Los Angeles Project Section is within the jurisdiction of the Los Angeles RWQCB. The RWQCBs make water quality decisions for their regions. Responsibilities include setting water quality standards for surface waters and groundwater, implementing the NPDES program, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions. In addition, the RWQCBs develop and implement basin plans that consider regional beneficial uses, water quality characteristics, and water quality problems.

3.3.1.1 Basin Plans and Water Quality Objectives

CWA Section 102 requires the planning agency of each state (in California, the SWRCB) to prepare a basin plan to set forth regulatory requirements for the protection of surface water quality, including designated beneficial uses for surface waterbodies, as well as specified water quality objectives to protect those uses. The *Water Quality Control Plan for the Los Angeles Region* (Los Angeles Basin Plan) (RWQCB 2014) is the applicable basin plan for the RSA. The basin plan designates beneficial uses for specific surface water and groundwater resources, establishes water quality objectives to protect those uses, and sets forth policies to guide the implementation of programs to attain the objectives.

3.3.1.2 Groundwater Dewatering Permit

The Los Angeles RWQCB has a general permit for the discharge of treated or untreated groundwater from construction and project dewatering to surface waters. This permit is Order No. R4-2013-0095, NPDES No. CAG994004, *Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters* (RWQCB 2013). Its provisions cover discharges of treated and untreated groundwater generated from permanent, temporary dewatering operations or other applicable wastewater discharges not specifically covered in other general or individual NPDES permits in the Los Angeles and Ventura Counties. This Groundwater Dewatering Permit specifies the discharge prohibitions, receiving water limitations, monitoring and reporting program requirements, and general compliance determination criteria for groundwater dewatering discharges. Permittees are required to monitor their discharges from groundwater extraction waste from construction and dewatering activities to ensure that proposed effluent limitations for constituents are not exceeded.

3.3.2 Stormwater Management Programs

Stormwater discharges are permitted under the NPDES program. Section 402(p) of the CWA requires that Stormwater Management Programs be developed and implemented for municipalities to meet the requirements for stormwater discharges from Municipal Separate Storm Sewer System (MS4) permits. Stormwater Management Programs limit to the maximum extent practicable the discharge of pollutants from storm sewer systems. A single state agency or a coalition, often consisting of more than one municipality (such as cities and counties) may implement these programs. Each program includes BMPs intended to reduce the quantity and improve the quality of stormwater discharged to the stormwater system. Discharges to storm sewer systems must comply with the Stormwater Management Program's requirements.

In compliance with this requirement to develop a Stormwater Management Program, the County of Los Angeles and the cities therein developed a Stormwater Quality Management Plan (SQMP), which is discussed in more detail below.

3.3.2.1 County or Metropolitan Area Stormwater Management Plans

As previously discussed, the Authority is a nontraditional permittee of the Phase II Small MS4 permit (Order No. 2013-0001-DWQ). The permit became effective on August 22, 2014. This order is the only MS4 permit for which the Authority has obtained coverage as a nontraditional permittee. The Authority's MS4 permit replaces county-/city-specific MS4 permits that would otherwise be applicable to the project. If runoff enters another agency's MS4 (e.g., Caltrans) or if the project extends into local rights-of-way (i.e., county or city), the jurisdictional agency's MS4 permit applies. These county-/city-specific MS4 permits are described further below. Low-impact development (LID) design standards and a post-construction stormwater management program are required under the MS4 permit.

Los Angeles County MS4 Permit

The Los Angeles RWQCB adopted Order No. R4-2012-0175, as amended by SWRCB Order WQ 2015-0075 and Order No. R4-2012-0175-A01, NPDES Permit No. CAS004001, *Waste Discharge Requirements for MS4 Discharges within the Coastal Watershed of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4* (referred to herein as the Los Angeles County MS4 Permit). The Los Angeles County MS4 Permit identifies programs and objectives associated with municipal discharges of stormwater and nonstormwater by the Los Angeles County Flood Control District (LACFCD), the County of Los Angeles, and 84 incorporated cities within the county, with the exception of the City of Long Beach. The Los

Angeles County MS4 Permit identifies programs that must be tailored and implemented by the permittees, some of which are applicable to the HSR program, including, but not limited to, the construction program and the new development/redevelopment program. The Los Angeles County MS4 Permit requires the co-permittees to prepare an SQMP specifying the BMPs that the co-permittee will implement to reduce the discharge of pollutants in stormwater to the maximum extent practicable. The emphasis of the SQMP is pollution prevention through education, public outreach, planning, and implementation of source control BMPs first, followed by structural and treatment control BMPs.

The SQMP also requires that new development implement BMPs designed to control pollutants in stormwater runoff, specifies sizing criteria for BMPs, and specifies flow control requirements. The BMPs include structural, source control, treatment, and site design BMPs to address water quality.

The permittees have developed ordinances and policies as a result of the Los Angeles County MS4 Permit requirements. Those that are relevant to the project vicinity are described below in Section 3.3.1.1 and 3.3.1.2.

3.3.3 General Plan Policies and Ordinances

The State of California requires all cities and counties to adopt general plans and municipal codes that provide objectives, policies, goals, and ordinances addressing public health and safety, including protection of water resources and protection against flood events. The local general plan objectives, policies, and goals and municipal code ordinances below were identified and considered in the preparation of this analysis.

3.3.3.1 County

Table 3-1 provides a list of the plans, policies, and ordinances adopted by the County of Los Angeles.

Table 3-1 Los Angeles County Plans, Policies, and Ordinances

Policy Title	Summary
Los Angeles County General Plan (2015)	Provides goals, objectives, and policies to protect hydrology and water resources. • Conservation and Natural Resource Element: – Policies C/NR 5.1, 5.2, 5.3, 5.6, 5.7, 6.1, 6.2, and 6.3 conserve water supply and protect water quality and public safety. • Public Services and Facilities Element: – Policy PS/F 4.4 elevates stormwater treatment. • Water and Waste Management Element – Policies 18, 19, 20 protect groundwater and surface water
Los Angeles County Municipal Code (2019)	Provides requirements and regulations to protect stormwater and implement low-impact development standards. • Title 12, Environmental Protection: – Chapter 12.80, Stormwater and Runoff Pollution Control, protects the health and safety of the county and enhances water quality. – Chapter 12.84, Low Impact Development Standards, identifies low-impact development standards. • Title 26, Building Code: – Appendix J, Grading, regulates grading on private property, sets forth rules and regulations to control grading, establishes procedures for the issuance of permits, and provides for approval of grading plans. • Flood Control District Code: – Chapter 21, Stormwater and Runoff Pollution Control, regulates stormwater and non-stormwater charges to LACFCD facilities.

Policy Title	Summary
Los Angeles County Green Street Policy (2011)	Los Angeles County prepared a Green Street Policy in response to the requirements set forth in the most recent MS4 permit. The Green Street Policy for Los Angeles County states that street improvements within transportation corridors should provide source control for stormwater, limit the transport of pollutant loads, restore predevelopment hydrology if possible, and incorporate LID strategies, including permanent BMPs. This Green Street Policy references the Green Infrastructure Guidelines as a source of information for projects that are developing or redeveloping streets and transportation corridors. Green street projects are required to develop a LID Plan, similar to that specified in the LID ordinance.

BMPs = best management practices
LACFCD = Los Angeles County Flood Control District
LID = low-impact development
MS4 = Municipal Separate Storm Sewer System

3.3.3.2 City

Table 3-2 provides a list of the plans, policies, and ordinances adopted by the cities of Burbank, Glendale, and Los Angeles.

Table 3-2 City Plans, Policies, and Ordinances

Policy Title	Summary
City of Burbank	
City of Burbank General Plan (2013)	• Open Space and Conservation Element – Policy 9.5 requires on-site drainage improvements using native vegetation. • Safety Element: – Policy 6.1 informs applicants of flood risks and associated development requirements. – Policy 6.7 employs design to reduce impervious surfaces in development projects. • Plan Realization: – Program OSC-7: Development Review requires project applicants to comply with the Stormwater Master Plan and demonstrate LID. – Program OSC-9: Regional Water Consultation maintains groundwater recharge areas to protect water quality.
City of Burbank Municipal Code (2019)	• Title 7, Public Ways and Property: – Chapter 1, Article 1, Grading, Fills and Excavations, governs grading on public property, exclusive of state and federally owned or operated parcels; offers design standards for grading; and outlines procedures for the issuance of permits. – Chapter 3, Article 1, General Provisions, requires natural stormwater filtration mechanisms in new or reconstructed streets that are eligible for Green Streets designation. • Title 8, Utilities: – Article 10, Storm Water and Runoff Pollution Control, protects the quality of water by prescribing BMPs that prohibit pollution and discharges into the stormwater system from industrial activities. • Title 9, Building Regulations:

Policy Title	Summary
	– Chapter 3, Article 4, Standard Urban Storm Water and Urban Runoff Management Programs, outlines the BMPs required for construction projects. – Appendix J, Fees, Bonds, Insurance – Excavation and Grading, lays out fee, bond, and insurance requirements to ensure work that includes grading does not present a hazard if left incomplete.
City of Glendale	
City of Glendale General Plan (2014)	• Open Space and Conservation Element: – Open Space and Conservation Planning Overview Goals 2 and 6 and Objectives 1, 2, 4, and 5 protect watersheds from development effects, encourage groundwater recharge, and monitor groundwater pollution. • Safety Element : – Chapter 3.1, Flooding Hazards, discusses flooding hazards in the city and discourages construction or reconstruction of critical facilities in inundation zones.
City of Glendale Municipal Code (2019)	• Title 8 Health and Safety: – Chapter 8.20, Floodplain Management, minimizes losses due to flood hazards. • Title 13, Public Services: – Chapter 13.42, Stormwater and Urban Runoff Pollution Prevention Control, protects water quality through regulations and stormwater BMPs for construction projects. – Chapter 13.43, Low Impact Development Standards, provides standards for improving water quality through LID.
City of Los Angeles	
City of Los Angeles General Plan (1995)	• General Plan Framework: – Chapter 6, Open Space and Conservation, Policy 6.3.1, cites the importance of open space to improve water quality and reduce flood hazards. – Chapter 9, Infrastructure and Public Services, Policy 9.6.3, reduces flood risk and improves water quality through reducing runoff and improving stormwater management. • Safety Element: – Policy 1.1.5 mitigates flood hazard through risk reduction. • Conservation Element: – Section 8, Policy 2, protect watersheds from the effects of erosion.
City of Los Angeles Municipal Code (2019)	• Chapter VI, Public Works and Property: – Article 4.2, Stormwater Pollution Abatement Charge, protects water quality by establishing fines for stormwater pollution. – Article 4.4, Stormwater and Urban Runoff Pollution Control, enhances water quality through development and enforcement of a Standard Urban Stormwater Mitigation Plan. • Chapter IX, Building Regulations: – Article 1, Division 70, provides regulations and permitting procedures governing grading and excavation.
City of Los Angeles Community Plan (2016)	• Central City Community Plan: – Street/Hierarchy Standards, Policy 3, modifies street standards to permit stormwater infiltration.
City of Los Angeles Specific Plans (2013, 2001)	• Cornfield/Arroyo Seco Specific Plan: – Chapter 2.4, Open Space, lists contributing to the health of the city's watershed as one of its primary objectives.

Policy Title	Summary
	– Chapter 3.1, Streets, describes different ways to incorporate stormwater BMPs. • Alameda District Specific Plan: – Appendix F provides effect thresholds for grading and surface water runoff for new projects in the district. – Appendix G outlines the measures required to mitigate effects on stormwater runoff, hydrology, and potential groundwater contamination in the district.
Los Angeles River Revitalization Master Plan (2007)	The Los Angeles River Revitalization Master Plan provides a framework for revitalizing the Los Angeles River to: • Enhance Flood Storage • Enhance Water Quality • Enable Safe Public Access • Restore a Functional Ecosystem.
United States Army Corps of Engineers and City of Los Angeles	
Los Angeles River Ecosystem Restoration Project (2015)	The Los Angeles River Ecosystem Restoration Project would restore approximately 11 miles of the Los Angeles River from Griffith Park to downtown Los Angeles. The Project would reestablish riparian strand, freshwater marsh, and aquatic habitat communities and reconnect the river to major tributaries, its historic floodplain, and the regional habitat zones of the Santa Monica, San Gabriel, and Verdugo Mountains while maintaining existing levels of flood risk management. The goals of the Project are to restore valley foothill riparian strand and freshwater marsh habitat, increase habitat connectivity and increase passive recreation.

BMPs = best management practices
LID = low-impact development
MS4 = Municipal Separate Storm Sewer System
NPDES = National Pollutant Discharge Elimination System

3.3.4 Grading Codes

The County and City grading codes are summarized below.

3.3.4.1 County

The Los Angeles County Grading Code is included as Appendix J of the Los Angeles County Building Code (Title 26, of the Los Angeles County Code). The Grading Code regulates grading on private property, sets forth rules and regulations to control grading, establishes procedures for the issuance of permits, and provides for approval of grading plans.

3.3.4.2 City

Table 3-3 summarizes the grading codes of the cities of Burbank, Glendale, and Los Angeles.

Table 3-3 City Grading Codes

Policy Title	Summary
City of Burbank Grading Code (2019)	Building Code provisions on grading are contained in Appendix J of the California Building Code and are adopted by the City of Burbank in Title 9, Building Regulations, of the City Municipal Code.
City of Glendale Grading Code (2019)	Ordinance 5714 adopted the 2010 California Building Code, including Appendix J, Grading, as the 2011 the Building and Safety Code of the City of Glendale.
City of Los Angeles Grading Code (2019)	The City of Los Angeles Chapter IX, Building Regulations, Article 1, Division 70, provides regulations and permitting procedures governing grading and excavation. The Los Angeles Building Code and the Los Angeles Residential Code adopt by

Policy Title	Summary
	reference portions of the 2013 California Building Code and the 2013 California Residential Code.

4 METHODS FOR EVALUATING EFFECTS

4.1 Definition of Resource Study Area

The resource study area (RSA) is the area in which all environmental investigations specific to each resource are conducted to determine the resource characteristics and potential impacts of the project. The direct RSA for effects on hydrology and water resources includes the project footprint of the Burbank to Los Angeles Project Section with a 250-foot buffer (e.g., stations, track, and temporary construction areas).

The indirect RSA includes the direct RSA and the following additional elements:

- **Surface Water:** Watersheds, including receiving waters of project runoff
- **Groundwater:** Aquifer(s) underlying the project footprint
- **Floodplain:** FEMA-designated flood-hazard areas within receiving waters

The indirect RSA also includes adjoining, adjacent, or downstream water resources that could receive runoff and sediment from the potential area of disturbance. Indirect RSA boundaries vary for surface water, groundwater, and floodplains because they include different resources, as shown on Figure 4-1.

4.2 Methodology for NEPA and CEQA Effect Analysis

The following information sources (and associated geographic information systems [GIS] data) were used to describe the affected environment:

- **Climate, Precipitation, and Topography:** Sources of information for these elements included the Statewide Program EIR/EIS, the Western Regional Climate Center (WRCC; 2016a, 2016b), and United States (U.S.) Geological Survey (USGS) topographic maps.
- **Regional and Local Hydrology and Water Resources:** The existing hydrology and water resources features in the regional and local project vicinity are surface water features that include rivers and canals; and groundwater aquifers. Information regarding these features and their conditions originates in the following sources: the Statewide Program EIR/EIS (Authority and FRA 2005), USGS topographic maps, aerial imagery, the Los Angeles Basin Plan (RWQCB 2014), and the CWA Section 303(d) list of water quality-impaired reaches on the 2014/2016 Integrated Report (SWRCB 2018).
- **Existing Floodplain Conditions:** The existing conditions with respect to floodplains are based on available data, reports, studies, and topographic and floodplain mapping. The FEMA-designated 100-year floodplain areas were identified and mapped using GIS and are based on FEMA's Flood Insurance Rate Maps (FIRM) for Los Angeles County (September 26, 2008). The special flood-hazard area designations and base flood elevation information were obtained from the FIRMs.

To evaluate potential effects on hydrology and water resources, both quantitative and qualitative analyses were performed.

- Conceptual-level plans and profiles (15 percent design) were reviewed and compared with information on floodplains, surface water features, and groundwater basins.
- Station locations and footprints were reviewed and compared with information on floodplains, surface water features, and groundwater basins.
- Federal and state statutes regulating water resources were reviewed as part of the analysis of potential flooding, hydrology, and water quality effects. The applicable statutes establish water quality standards; regulate discharges and pollution sources; and protect drinking water systems, aquifers, and floodplain values. County and city general plans and ordinances were also reviewed for applicable policies and regulations to determine whether implementation of the HSR Build Alternative would result in potential effects.

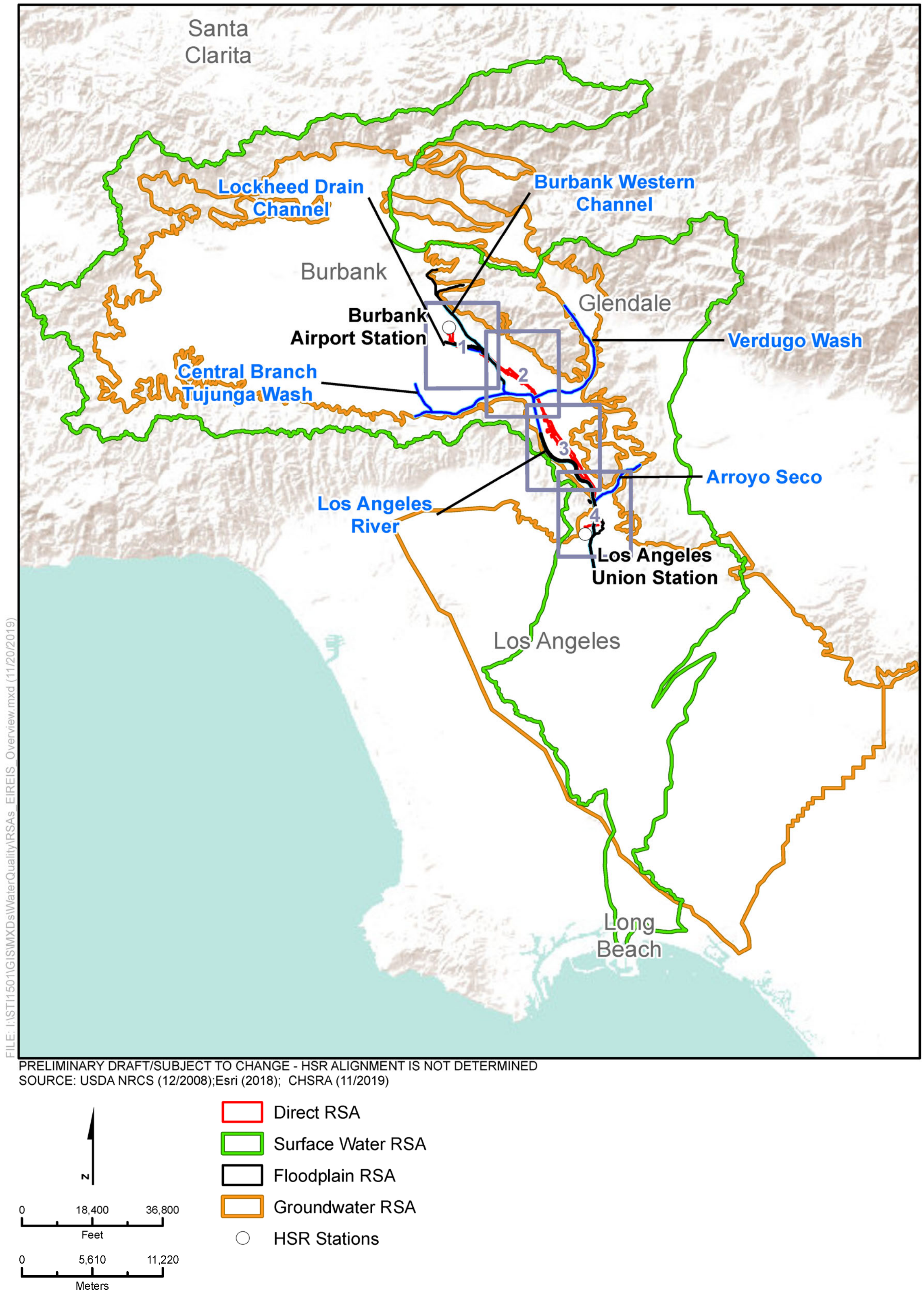


Figure 4-1 Direct and Indirect Resource Study Area
(Overview)

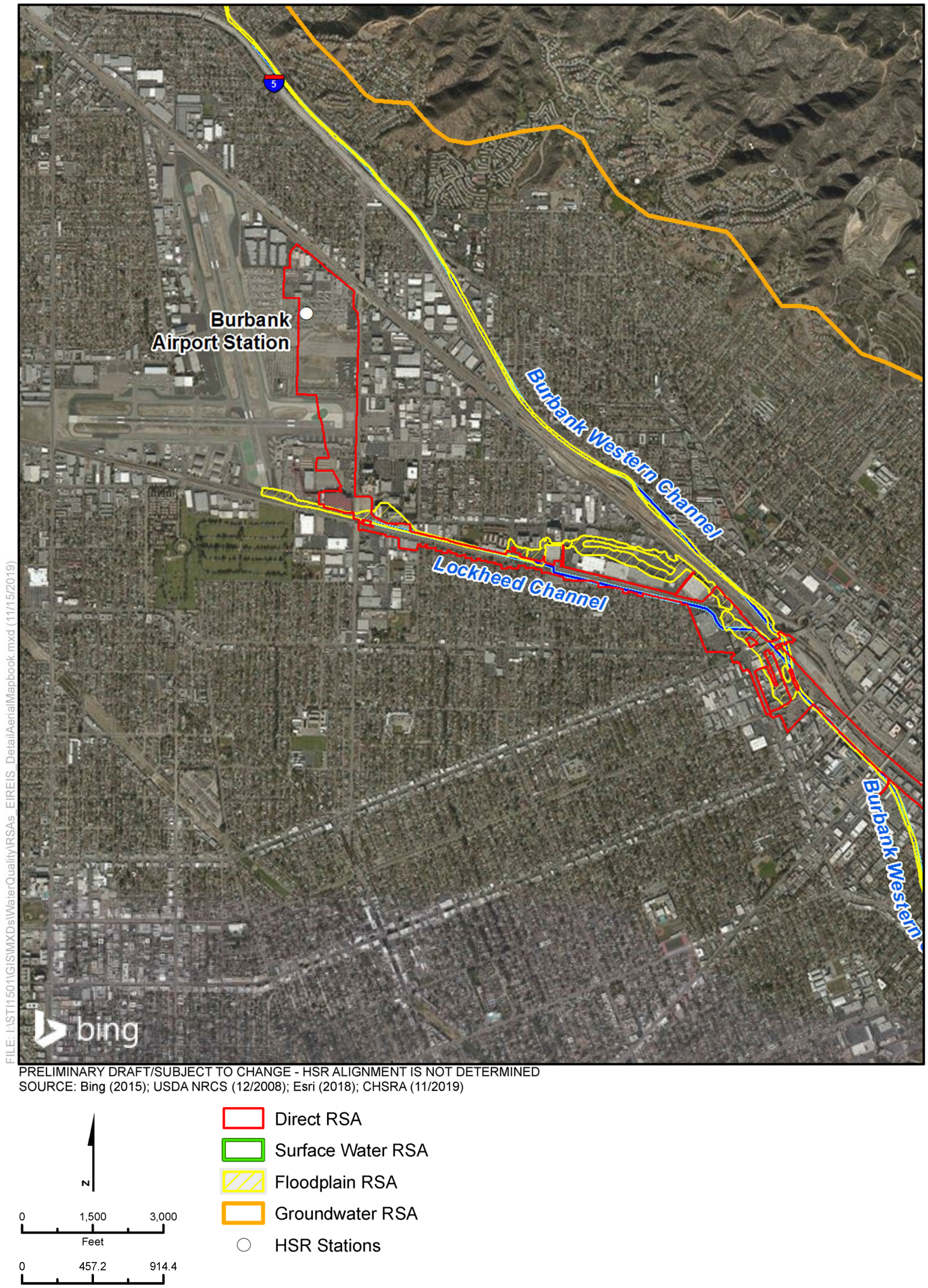
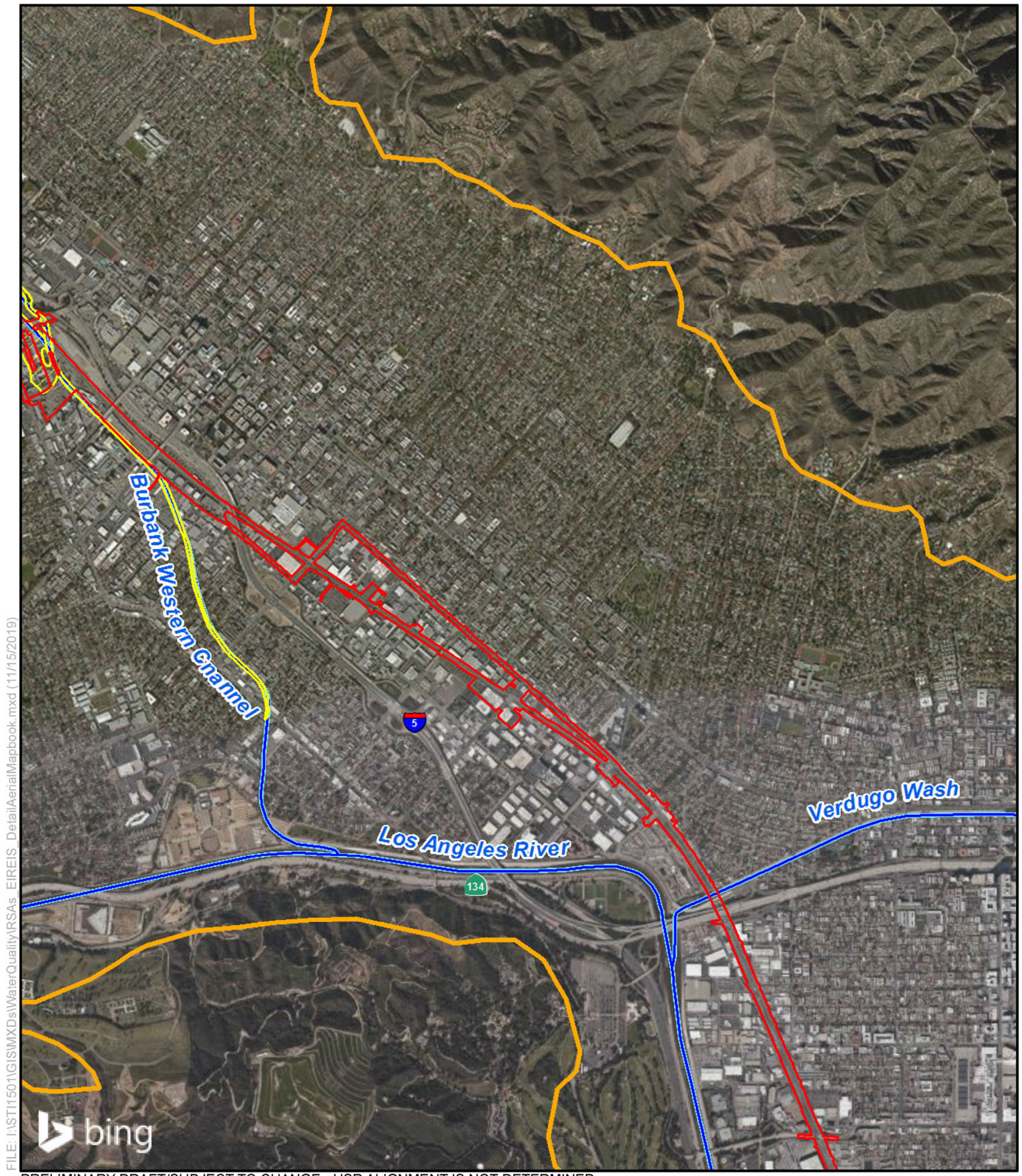


Figure 4-1 Direct and Indirect Resource Study Area

(Sheet 1 of 4)



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: Bing (2015); USDA NRCS (12/2008); Esri (2018); CHSRA (11/2019)

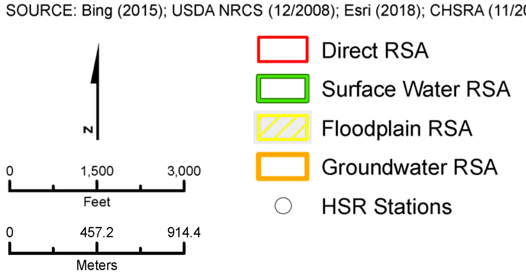


Figure 4-1 Direct and Indirect Resource Study Area
(Sheet 2 of 4)

PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: Bing (2015); USDA NRCS (12/2008); Esri (2018); CHSRA (11/2019)

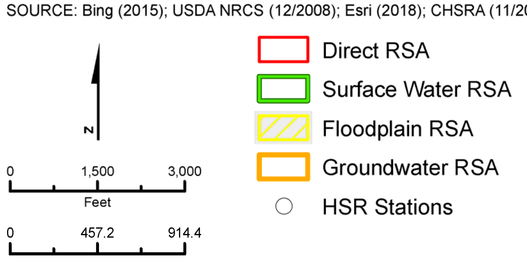
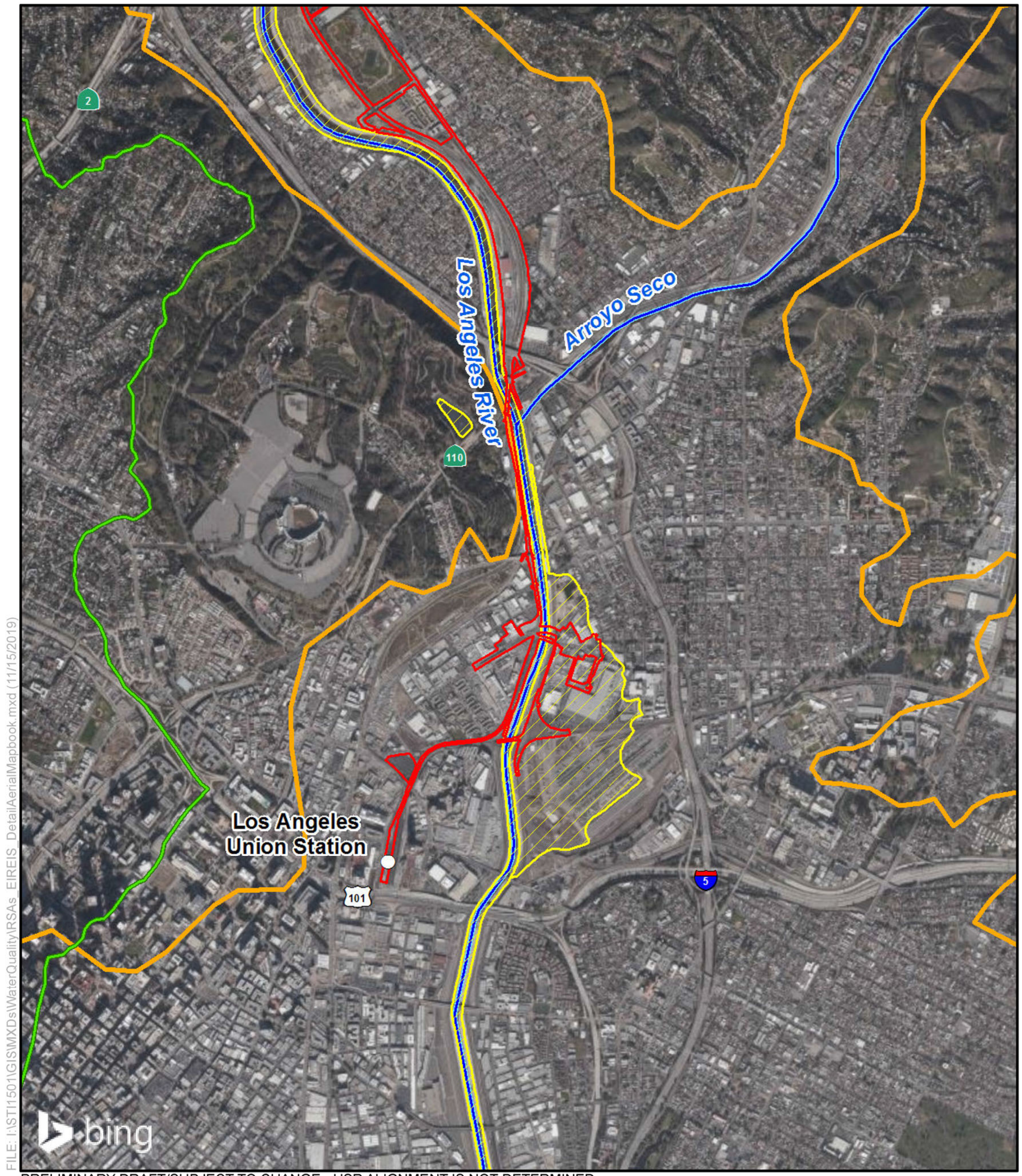


Figure 4-1 Direct and Indirect Resource Study Area

(Sheet 3 of 4)



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: Bing (2015); USDA NRCS (12/2008); Esri (2018); CHSRA (11/2019)

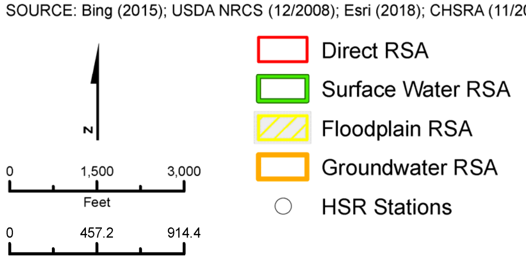


Figure 4-1 Direct and Indirect Resource Study Area
(Sheet 4 of 4)

- A review of available documents from various agencies, including USGS, FEMA, SWRCB, and Los Angeles RWQCB, were used to determine whether water quality and/or water resources would be affected by the HSR Build Alternative.
- A review of supporting documents prepared for the Preliminary Engineering for Project Design, including the following:
  - *Burbank to Los Angeles Project Section: Stormwater Management Plan* (Authority 2019d)
  - *Burbank to Los Angeles Project Section: Floodplain, Hydrology & Hydraulics Report* (Authority 2019c)
  - *Burbank to Los Angeles Project Section: Water Crossings Technical Report* (Authority 2019e)
- A review of the supporting documents prepared for the Palmdale to Burbank Project Section, including the following:
  - *Palmdale to Burbank Project Section: Preliminary Draft Hydrology and Water Resources Technical Report* (Authority 2017)
  - *Draft PEPD Palmdale Subsection: Palmdale to Burbank Project Section FEMA Flood Hazard Evaluation, City of Palmdale* (Authority 2016b)

Topic-specific evaluation methods are discussed below.

4.2.1 Floodplains

Conceptual-level plans (15 percent design) for the HSR Build Alternative were reviewed and compared with information on existing floodplains. The HSR Build Alternative would cross designated floodplains on bridges and elevated structures. Although a detailed analysis would be required to evaluate the effects of the potential encroachment, the type of crossing and the estimated amount of floodplain that may be affected by the HSR Build Alternative provide a preliminary indication of the potential magnitude of the encroachment.

The evaluation of potential effects of the HSR Build Alternative being located on a floodplain includes the following analyses:

- The length of the floodplains (defined as special flood-hazard areas) crossed by the alignment was estimated by comparing GIS layers for the alignment onto GIS layers for floodplains.
- Evaluation of changes to floodplains was based on hydraulic model results included in the *Burbank to Los Angeles Project Section: Floodplain, Hydrology, and Hydraulics Technical Report* (Authority 2019c). In addition, the Hydrologic Engineering Center's River Analysis System model, which was available from the USACE for both the Verdugo Wash and the Los Angeles River system, was used to determine the existing water surface elevation.
- Review of HSR Build Alternative facilities located within a designated floodplain which could expose the HSR Build Alternative to risks related to flooding, as well as subjecting other areas to effects resulting from changes in the location and or direction of flood flows.
- The potential for the HSR Build Alternative to increase flood height and/or divert flood flows was evaluated using flood information from the FEMA flood insurance studies and available topographic data.
- The potential for the HSR Build Alternative to result in incompatible floodplain development and affect floodplain values was addressed using flood information from the FEMA flood insurance studies.
- Consideration of construction activities within a designated floodplain which could redirect flows and pose a risk to construction workers and equipment.

Crossing locations have been identified based on the Flood Insurance Study for Los Angeles County, California and Unincorporated Areas revised by FEMA in 2016. GIS software was used to overlay the proposed project footprint with the most currently available FIRMs. Locations where the proposed project footprint intersects the base flood zones as outlined in the FIRMs are identified in Section 5.

4.2.2 Surface Water Hydrology

An evaluation of potential effects on surface waters from the proposed HSR Build Alternative includes the following:

- Analysts compared GIS layers for the project footprint with the GIS layers for surface waters and flood-prone areas, USGS topographic maps, and aerial photography from web-mapping services to identify the potential effects on surface waters. Analysts then used these GIS layers to identify footprint crossings of surface water.
- The length of the surface waters crossed by the project footprint was estimated using GIS.
- The amount of existing impervious surface area in the permanent project footprint was calculated using land use data from the Southern California Association of Governments and the impervious surface area percentages for each land use type from the Los Angeles County Department of Public Works.
- The amount of impervious area that would be created by the footprint was estimated by using GIS to first identify the permanent features in the project footprint; secondly by making assumptions on the percentage of imperviousness for the permanent features based on existing conditions; and thirdly by multiplying the assumed imperviousness percentage with the area of permanent feature type in the project footprint to calculate the total amount of proposed impervious surface area created by the project. The amount of proposed impervious area includes permanent features such as access roads, bridge access, graded areas, roadways, stations, tracks, radio sites, interlocking site, passenger rail relocation site, and permanent access areas. Increases in impervious surfaces would lead to increases in the timing and volume of water runoff.
- The changes to drainage patterns in the direct RSA during construction and operation were evaluated based on the hydraulic model results included in the *Burbank to Los Angeles Project Section: Floodplain, Hydrology, and Hydraulics Technical Report* (Authority 2019c) and the *Burbank to Los Angeles Project Section: Water Crossings Technical Report* (Authority 2019e).

4.2.3 Surface Water Quality

An evaluation of potential effects on surface water quality from the HSR Build Alternative includes the following:

- Consideration of the location of water segments with impaired water quality in relation to the direct RSA.
- Evaluation of the potential for construction activities to affect surface water quality as a result of uncontrolled runoff and discharges. These activities include accidental releases of construction-related hazardous materials, ground disturbance and associated erosion and sedimentation, stormwater discharges, and dewatering discharges, particularly in locations within or close to a surface waterbody.
- Consideration of in-water construction work to directly contaminate surface water quality and redirect flows.
- Review of the potential for operation and maintenance activities related to the HSR Build Alternative to introduce pollutants into the environment.
- Evaluation of the HSR Build Alternative to create significant new sources of pollutants (e.g., construction equipment and parking lots), leading to new sources of contaminated runoff in the direct RSA.

4.2.4 Groundwater

Potential effects on groundwater resources were evaluated using documents available from the California Department of Water Resources (DWR), Los Angeles RWQCB, counties, and other agencies. In general, depth to groundwater within the direct RSA is typically less than 50 feet bgs; therefore, there is a potential for groundwater to be encountered.

The evaluation of potential effects on groundwater from the HSR Build Alternative includes the following analyses:

- Analysts compared GIS layers for the project footprint with GIS layers for groundwater basins to identify the potential effects to groundwater basins. The length and acreage of groundwater basins beneath the project footprint were estimated using GIS.
- The depth to groundwater within the direct RSA was estimated on the basis of available documentation from DWR.
- For construction-related effects, the following were evaluated:
  - Excavation activities that could result in intrusions below the groundwater table could be a direct mechanism for contaminants to enter groundwater.
  - Dewatering activities that could potentially deplete localized groundwater supplies.
  - Potential for contaminated site runoff to percolate to the groundwater aquifer.
- For operational effects, the following were evaluated:
  - Increases in impervious surfaces as a result of the HSR Build Alternative that could reduce groundwater recharge.
  - Potential for contaminated site runoff to percolate to the groundwater aquifer from operation and maintenance activities

4.2.5 Method for Determining Significance under CEQA

A significant impact on hydrology and water resources would occur pursuant to CEQA if the project would:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality
- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would:
  - Result in substantial erosion or siltation on- or off-site;
  - Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
  - 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; or
  - Impede or redirect flood flows
- In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation
- Conflict with or obstruct implementation of a water quality control or sustainable groundwater management plan

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5 AFFECTED ENVIRONMENT

This section describes the affected environment and setting for the Burbank to Los Angeles Project Section.

5.1 Resource Study Area Watersheds

The direct RSA is located within the Los Angeles River Watershed (Figure 5-1). The Los Angeles River Watershed covers a land area of approximately 834 square miles and is one of the largest watersheds in the region. The western portion reaches from the Santa Monica Mountains to the Simi Hills and in the east from the Santa Susana Mountains to the San Gabriel Mountains. The watershed encompasses and is shaped by the path of the Los Angeles River, which flows from its headwaters in the mountains eastward to the northern corner of Griffith Park. Here the channel turns southward through the Glendale Narrows before it flows across the coastal plain and into San Pedro Bay near Long Beach. The Los Angeles River has evolved from an uncontrolled, meandering river that provided a valuable source of water for early inhabitants to a major flood protection waterway (Los Angeles County Department of Public Works 2016a).

The direct RSA is within the jurisdiction of the Los Angeles RWQCB. The Los Angeles RWQCB has jurisdiction over all coastal drainages flowing to the Pacific Ocean between Rincon Point and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente).

For regulatory purposes, the Los Angeles RWQCB uses the watershed classification system developed by the DWR, which divides watersheds into Hydrologic Units (HU) that are further divided into Hydrological Areas (HA) and Hydrologic Subareas (HSA). As designated by the Los Angeles RWQCB, the direct RSA is located within the Los Angeles-San Gabriel HU. The southern portion of the direct RSA (approximately one-quarter of the direct RSA) is within the Coastal Plain HA, Central HSA Split. The northern portion of the direct RSA (approximately three-quarters of the direct RSA) is within the San Fernando HA, Bull Canyon HSA (Table 5-1). The Los Angeles-San Gabriel HU covers approximately 1,608 square miles within Los Angeles County and small areas in Ventura County (RWQCB 2014).

Table 5-1 Los Angeles Regional Water Quality Control Board Hydrologic Units, Areas, and Subareas Crossed by the Burbank to Los Angeles Project Section

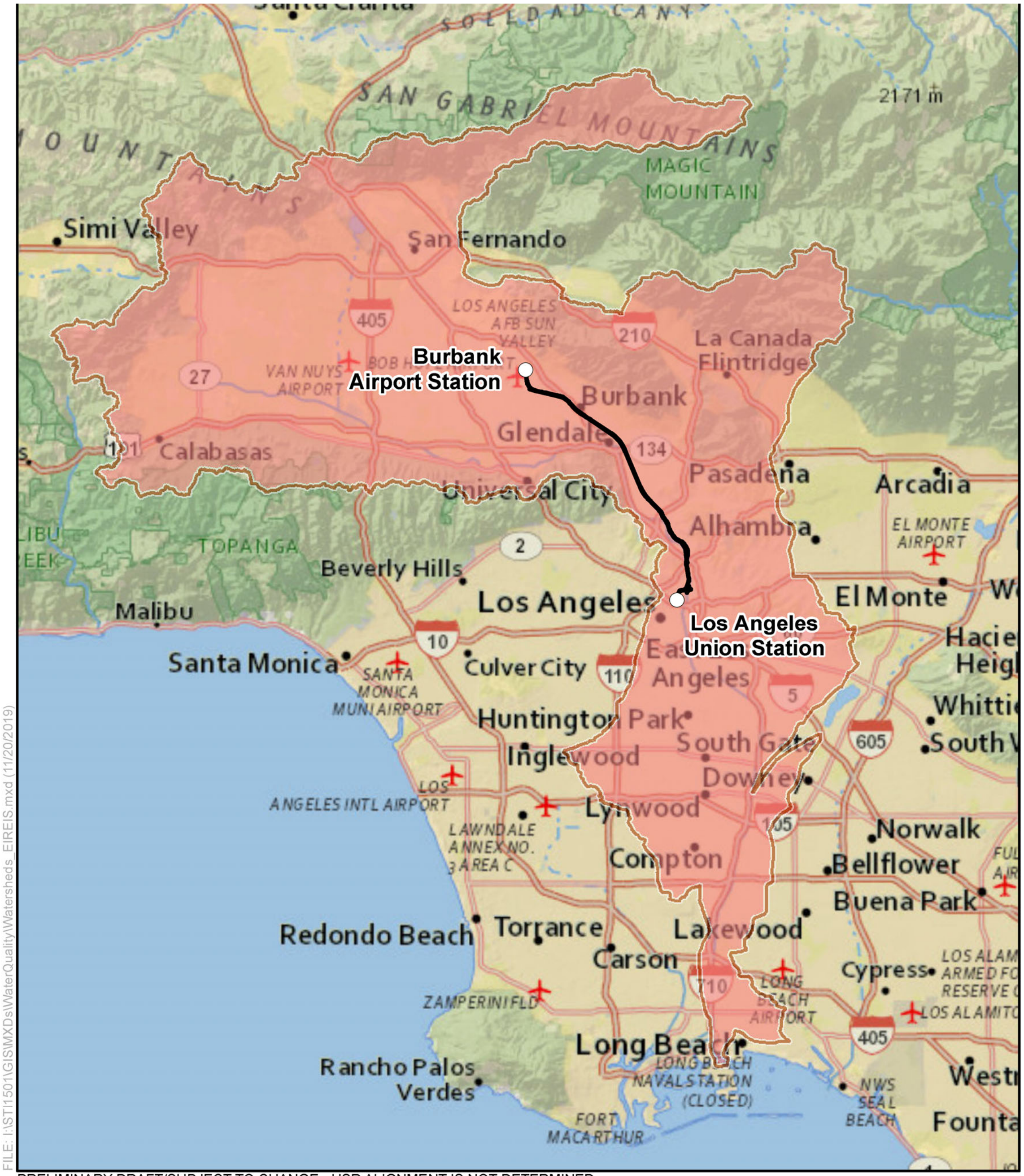
Hydrologic Unit (HU)	Hydrologic Area (HA)	Hydrologic Subarea (HSA)
Los Angeles-San Gabriel HU	Coastal Plain HA	Central HSA Split
	San Fernando HA	Bull Canyon HSA

Source: Los Angeles Regional Water Quality Control Board, 2014

5.2 Climate, Precipitation, and Topography

The climate in the region is classified as Mediterranean (i.e., semi-arid climate with hot and dry summers and moderately mild and wet winters). Monthly mean, maximum, and minimum temperature data and average monthly precipitation for Burbank and Los Angeles are based on long-term weather station records (Table 5-2). The Burbank and Los Angeles stations are the closest open climate stations to the RSA with current and available climate data. Other stations in the RSA are closed and, therefore, do not contain up-to-date climate data. Overall, the climate of the area is relatively mild (temperatures typically range between 40 and 90 degrees Fahrenheit [°F]). Summer daytime high temperatures average in the 80s°F with overnight lows in the 60s°F. Winter daytime high temperatures average in the 60s°F with overnight lows in the 40s°F.

Rain is common in this area during the winter. Precipitation in the region generally occurs as rainfall, with an annual average of 15 to 16 inches. Although the rainy season is defined as October 1 through May 1, most of the precipitation and storms occur from November to March (Western Regional Climate Center 2016).



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PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: USDA NRCS (12/2008); National Geographic/Esri (2018); CHSRA (11/2019)

N

0 18,400 36,800
Feet

0 5,610 11,220
Meters

- Upper and Lower Los Angeles River Watershed
- HSR Build Alternative
- HSR Stations

Figure 5-1 Watersheds

Table 5-2 Climate Data Summary

Temperature (°F)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Burbank, California (1966–2016)													
Average Mean Temperature	54.6	56.1	58.1	61.3	65.0	69.3	74.7	75.2	73.2	67.1	59.8	54.8	64.1
Average Max Temperature	67.5	68.7	70.4	73.7	76.6	81.4	88.3	89.0	87.2	80.9	73.7	67.9	77.1
Average Min Temperature	41.7	43.5	45.7	48.9	53.5	57.3	61.2	61.4	59.2	53.3	46.0	41.6	51.1
Average Total Precipitation	3.35	3.84	2.84	1.17	0.27	0.07	0.01	0.10	0.20	0.60	1.51	2.34	16.29
Los Angeles, California (1877–2016)													
Average Mean Temperature	57.3	58.4	60.0	62.2	64.7	68.3	72.7	73.4	72.3	68.1	63.0	58.2	64.9
Average Max Temperature	66.4	67.3	68.8	71.0	72.9	76.9	82.3	83.1	81.9	77.6	72.8	67.4	74.0
Average Min Temperature	48.3	49.5	51.1	53.5	56.5	59.7	63.2	63.8	62.6	58.7	53.3	49.1	55.8
Average Total Precipitation	3.20	3.38	2.40	1.01	0.25	0.06	0.01	0.05	0.27	0.48	1.25	2.41	14.77

Source: Western Regional Climate Center, 2016
ºF = degree(s) Fahrenheit
Min = minimum
Max = Maximum

According to the *Geology, Soils, and Seismicity Technical Report* (Authority 2019a), the HSR alignment would be located in a portion of the San Fernando Valley that ranges in elevation from approximately 1,200 feet above mean sea level near the Burbank Airport Station to 400 feet above mean sea level where the alignment crosses SR 2 and 300 feet above mean sea level at LAUS. Ground surface generally slopes to the south and southwest because of a merger of alluvial fan surfaces, except at the far southern end, where slopes adjacent to the Santa Monica Mountains are to the north and northeast.

5.3 Geology, Soils, and Erosion

5.3.1 Geology

As discussed in the *Draft Paleontological Resources Technical Report* (Authority 2019b), the direct RSA is located in the transition zone between the south-central part of the Transverse Ranges Geomorphic Province and the northern end of the Peninsular Ranges Geomorphic Province.

The Transverse Ranges Geomorphic Province is characterized by steep mountains and valleys that trend in an east-west direction at an oblique angle to the northwest-southeast trend of the California coast (hence the name “Transverse”). This type of trend is extremely rare elsewhere in the U.S. Compression along the San Andreas fault is squeezing and rotating the Transverse Ranges, making this area one of the most rapidly rising regions on earth. Tectonic activity in this province has also folded and faulted thick sequences of Cenozoic, organic-rich sedimentary rocks, making the area an important source for oil.

The Peninsular Ranges Geomorphic Province is a 900-mile-long northwest-southeast-trending structural block that extends from the Transverse Ranges in the north to the tip of Baja California in the south and includes the Los Angeles Basin. This province is characterized by mountains and valleys that trend in a northwest-southeast direction, roughly parallel to the San Andreas fault. The total width of the province is approximately 225 miles, extending from the Colorado Desert in the east, across the continental shelf, to the southern Channel Islands (i.e., Santa Barbara, San Nicolas, Santa Catalina, and San Clemente). It contains extensive pre-Cretaceous (more than 145 million years ago) and Cretaceous (145 to 66 million years ago) igneous and metamorphic rock covered by limited exposures of post-Cretaceous (less than 66 million years ago) sedimentary deposits.

5.3.2 Soils

According to the *Geology, Soils, and Seismicity Technical Report* (Authority 2019a), soil units present within the direct RSA include artificial fill, alluvial fan deposits (Holocene), young alluvial deposits (Holocene and late Pleistocene), young/old alluvial fan deposits (Holocene-Late Pleistocene), and Puente Formation (Late Miocene to early Pliocene). Most soils within the direct RSA have been modified and disturbed by grading and earthmoving associated with development, which includes the placement of artificial fill. Therefore, it is unlikely that large areas of undisturbed native soils are present along the surface within the direct RSA. Alluvial material within the direct RSA is predominantly sand and silty sand with some gravel. Smaller amounts of clay are also known to occur, along with cobbles and boulders.

Surface and near-surface soils along heavily used roadways in the RSA have the potential to contain elevated concentrations of lead. Aerially deposited lead is generally found within 30 feet from the edge of the road pavement. Contaminants common in railway corridors include wood preservatives (e.g., creosote and arsenic) and heavy metals in ballast rock. Asbestos-containing materials might also occur in ballast rock and soils associated with railroad tracks. In addition, soils in and adjacent to these corridors might contain herbicide residues as a result of historical and ongoing weed-abatement practices.

5.3.3 Erosion

Soil type is one criterion used to evaluate the potential effects of development, as well as effects of the HSR Build Alternative on the environment. Depending on type, some soils are susceptible to erosion and/or expansive behavior, while others are more suitable for construction. Erosion is a major contributing factor to the degradation of surface water quality in areas with a combination of erosive soil types and steep slopes. Certain soil types demonstrate a higher potential for erosion by rainfall and runoff than other soil types. This is expressed in the Revised Universal Soil Loss Equation by a factor designated as “K,” the soil erodibility factor. Figure 5-2 illustrates relative soil erodibility factors throughout the direct and indirect RSAs. K is defined as a function of texture, organic matter content and cover, structure size class, and subsoil-saturated hydraulic conductivity. Fine-textured soils, which are high in clay, express low erodibility (K values between 0.02 and 0.2) because the strong adherence between individual particles reduces their ability to detach. Coarse-textured soils also have low erodibility because their ability to rapidly infiltrate water reduces surface runoff rates. Medium-textured soils, such as silt loams, have a moderate potential for erosion (K values between 0.25 and 0.40) because they are susceptible to detachment and produce moderate runoff. Soils with a high silt content have the highest potential for erosion (K values greater than 0.4) because they easily detach, tend to crust, and produce large amounts and rates of runoff.

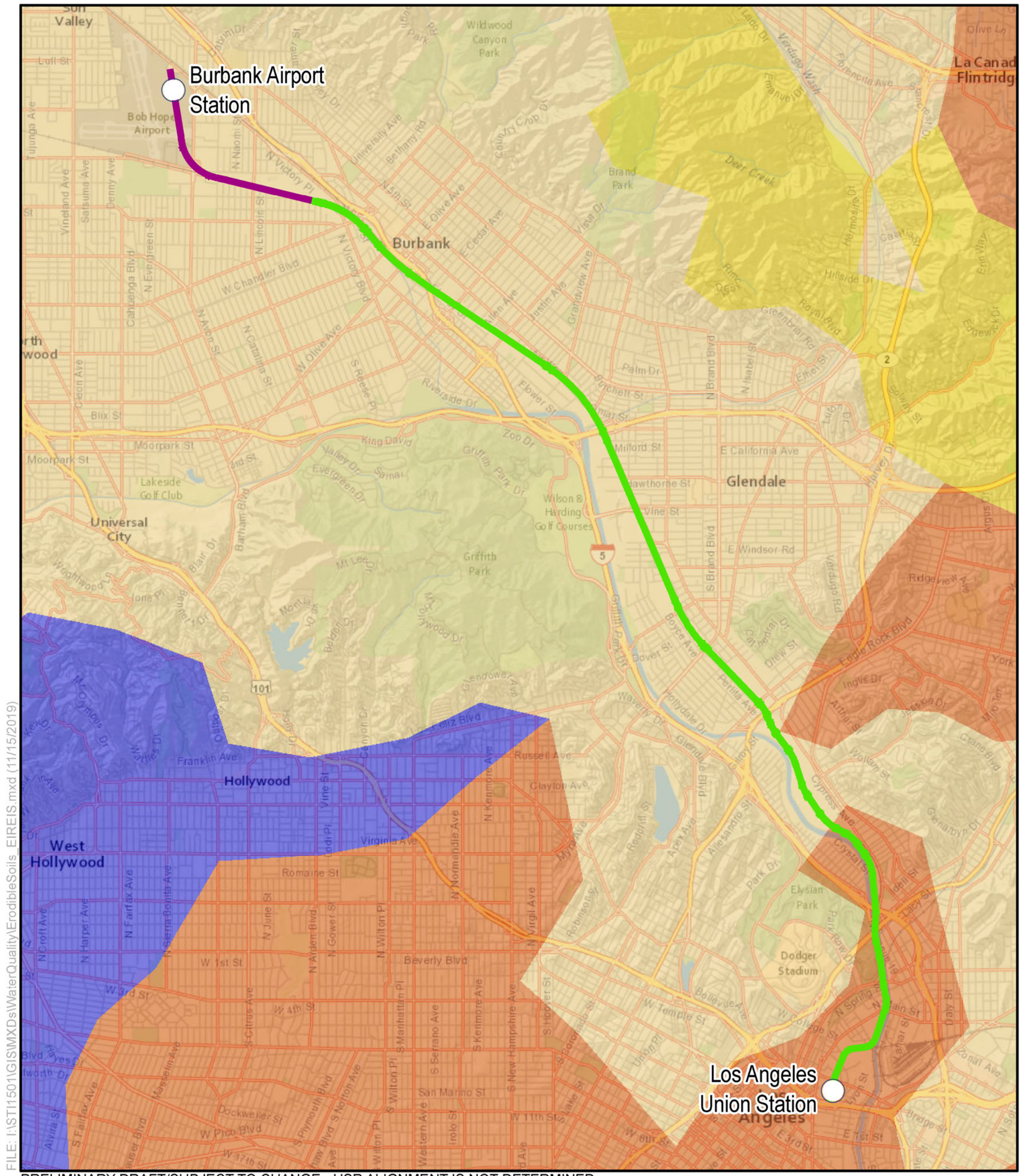
Most of the direct RSA is located in areas with a moderate susceptibility to erosion (Figure 5-2). Additional information regarding geology, soil type, and erosion can be found in the *Geology, Soils, and Seismicity Technical Report* for the Burbank to Los Angeles Project Section (Authority 2019a).

5.4 Surface Water Hydrology

5.4.1 Surface Water Features

Surface waters in the vicinity of the direct RSA are shown on Figure 5-3 and discussed in more detail below. The length of the surface waters within the direct RSA is included in Table 5-3.

At the northern end of the direct RSA, the HSR Build Alternative crosses the Burbank Western Channel and the Lockheed Channel near I-5. The HSR Build Alternative then crosses the Verdugo Wash (Reach 1) at SR 134. In addition, the HSR Build Alternative runs adjacent to Arroyo Seco at SR 110. The majority of the HSR Build Alternative runs parallel to the Los Angeles River (Reaches 2 and 3). The HSR Build Alternative includes three crossings over the Los Angeles River: north of SR 110, at the existing Downey Bridge; at Main Street; and at the Mission Tower bridge (Figure 5-3).



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SOURCE: National Geographic (2018); US Department of Agriculture and State Water Resources Control Board (2013); CHSRA (11/2019)

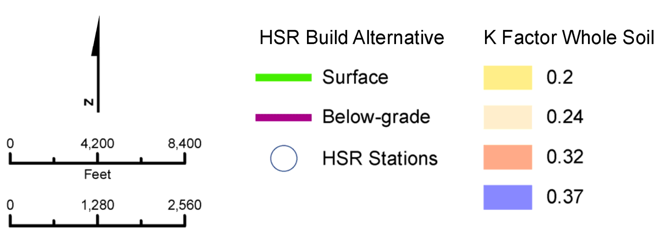


Figure 5-2 Erodible Soils

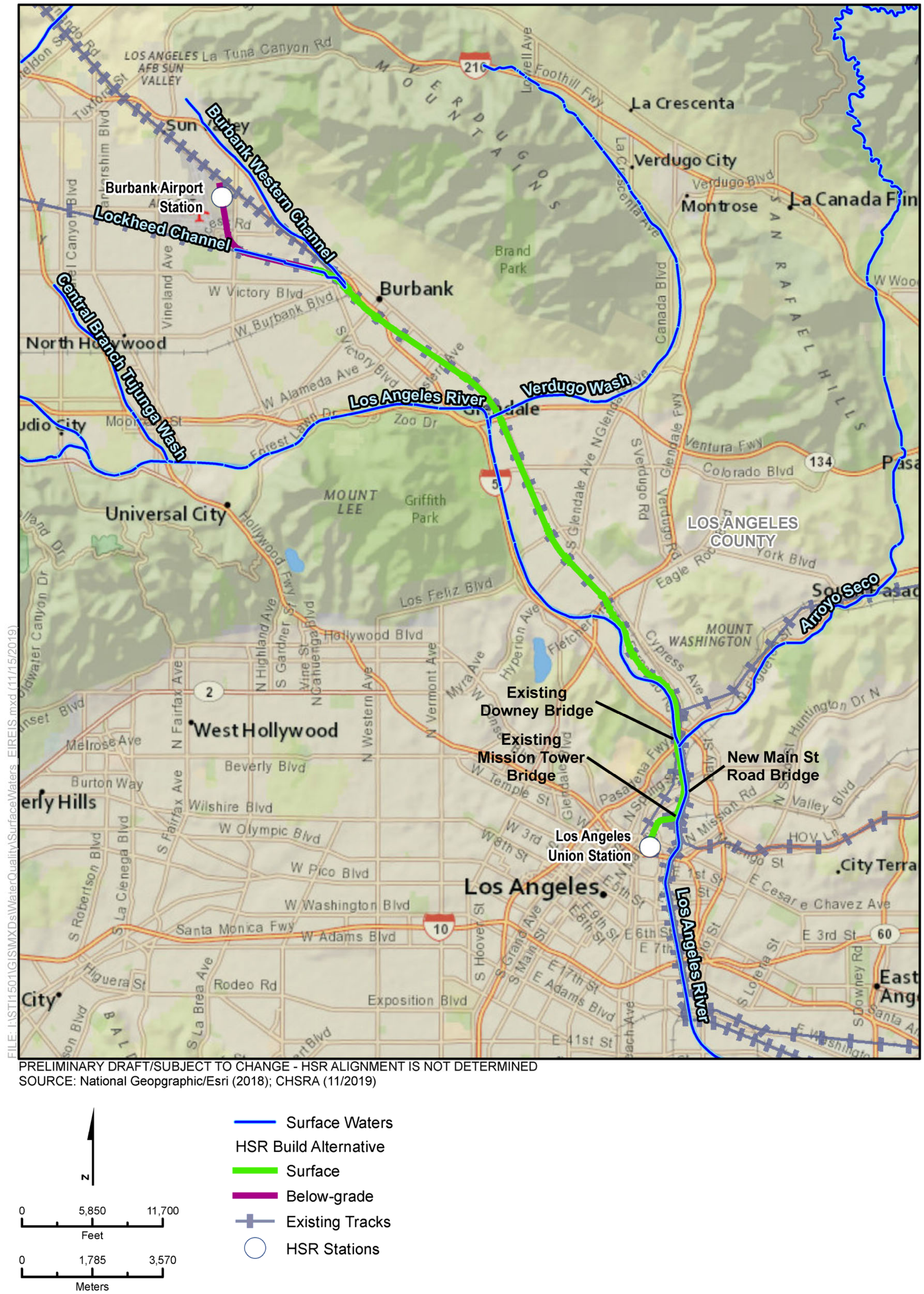
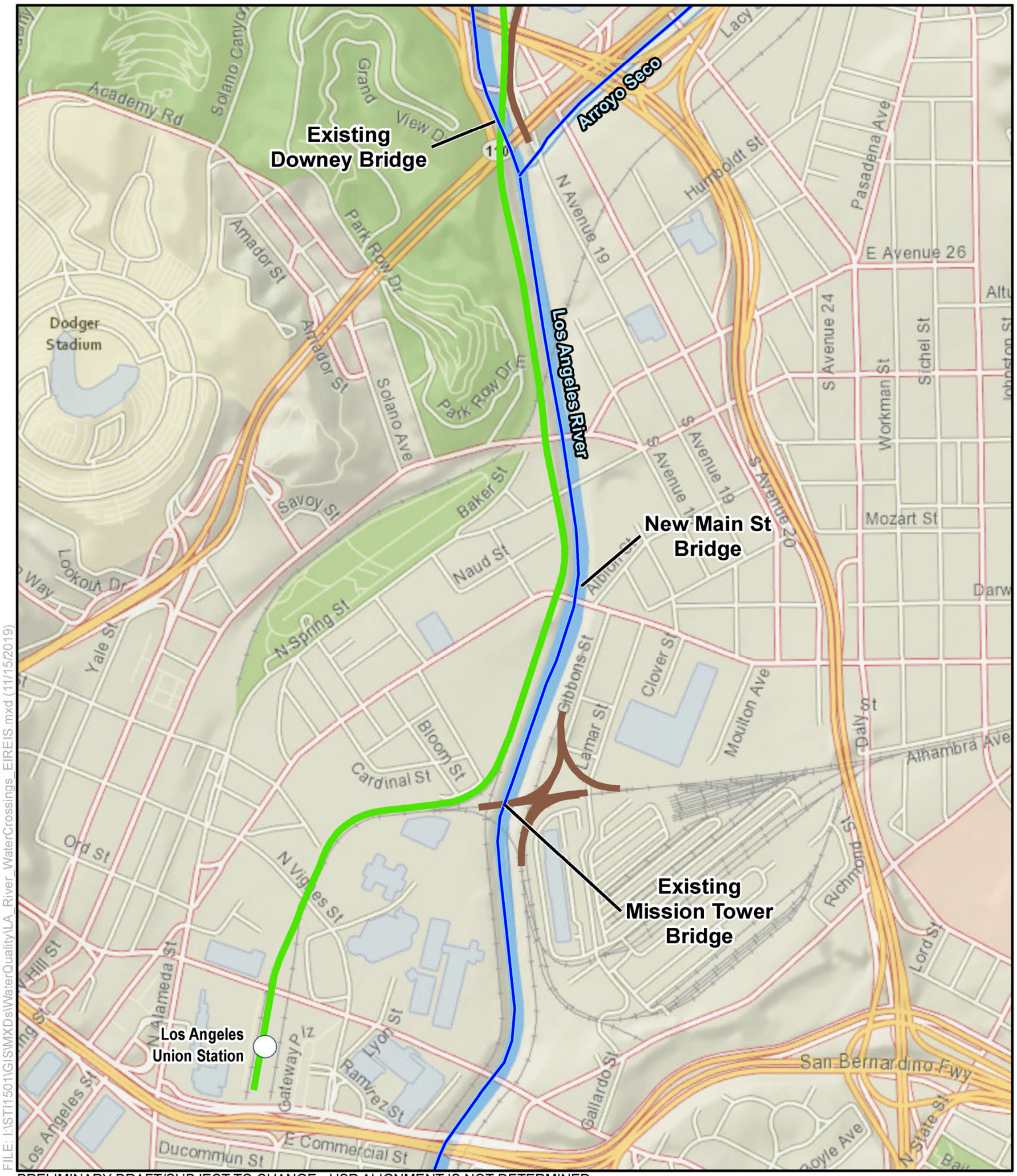


Figure 5-3 Surface Waters



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: National Geographic/Esri (2018); CHSRA (11/2019)

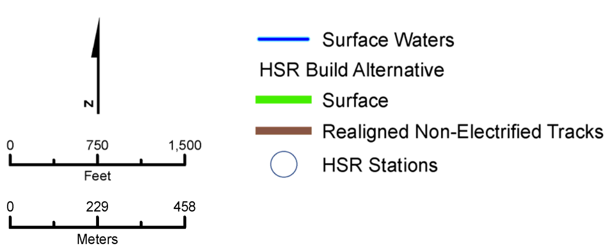


Figure 5-4 Los Angeles River Crossings

Table 5-3 Length of Surface Waters Within the Direct Resource Study Area

Surface Water	Length (feet)
Lockheed Channel	12,771
Burbank Western Channel	4,357
Los Angeles River	490
Verdugo Wash	185
Arroyo Seco	550

5.4.2 Slough

A slough is a wetland, usually a swamp or shallow lake and often a backwater to a larger body of water. Water tends to be stagnant or may flow slowly on a seasonal basis. Some sloughs are channelized for the purposes of flood protection or water distribution. The direct RSA does not cross any sloughs.

5.4.3 Cut

A cut is a human-made canal for water conveyance that may be used as a transportation route. The direct RSA does not cross any cuts.

5.4.4 River

The rivers discussed below are within the direct RSA.

5.4.4.1 Los Angeles River

The approximately 50-mile-long Los Angeles River originates in the community of Canoga Park in the city of Los Angeles and flows to the Pacific Ocean along the city of Long Beach. The Los Angeles River within the direct RSA is a 370-foot-wide, concrete-lined trapezoidal channel with an earthen bottom and riparian vegetation. The flow in the Los Angeles River varies greatly over the course of the year. During the dry season, most of the water in the river is from wastewater effluent. Discharge from the three wastewater treatment plants, the Tillman, Burbank, and Glendale Wastewater Treatment Plants, constitutes most of the volume flowing in the river during the dry period (Boroon and Coo 2015). During the wet season, the river contains runoff from large storms. In addition to variability in seasonal flow, the flow in the channel increases greatly as the river flows toward its mouth on the Pacific Ocean.

Reach 2 of the Los Angeles River extends from Carson Street to Figueroa Street. Reach 3 of the Los Angeles River extends from Figueroa Street to Riverside Drive. The design flow rate for the Los Angeles River is 104,000 cubic feet per second (cfs) where the HSR Build Alternative crosses the river.

5.4.4.2 Arroyo Seco

The Arroyo Seco is a 22-mile-long river that originates in the San Gabriel Mountains, flows between La Cañada Flintridge on the west and Altadena on the east, continues along the western boundary of South Pasadena, and then flows along SR 110 into northeast Los Angeles, where it drains into the Los Angeles River near the I-5/SR 110 interchange. The Arroyo Seco within the direct RSA is a 35-foot trapezoidal concrete flood control channel.

Reach 1 of the Arroyo Seco extends from the Los Angeles River to W Holly Street in the city of Pasadena. The design flow rate for the Arroyo Seco is 25,700 cfs.

5.4.4.3 Verdugo Wash

The Verdugo Wash is a 9.4-mile-long 86-foot-wide rectangular concrete flood control channel within the city of Glendale. The Verdugo Wash originates just south of I-210 in the Crescenta Valley, flows southeast along the eastern edge of the Verdugo Mountains, and then flows south through a pass between the Verdugo Mountains and the San Rafael Hills, ultimately discharging into the Los Angeles River just northeast of Griffith Park.

Reach 1 of the Verdugo Wash extends from the Los Angeles River (Reach 3) to Verdugo Road/ Towne Street. The design flow rate for the Verdugo Wash is approximately 42,900 cfs.

5.4.4.4 Burbank Western Channel

Burbank Western Channel is a 6.3-mile-long, 30-foot-wide reinforced concrete box culvert that drains to the Los Angeles River in the eastern San Fernando Valley of Los Angeles County, California.

The Burbank Western Channel begins at the confluence of Hansen Heights Channel and La Tuna Canyon Lateral in Sun Valley. It runs adjacent to I-5 for most of its length and is entirely encased in a concrete flood control channel. The stream travels southeast through downtown Burbank and the Riverside Rancho area of Glendale, ultimately joining the Los Angeles River by the edge of the Los Angeles Equestrian Center. Tributaries to the Burbank Western Channel include the Lockheed Channel, the Hansen Heights Channel, and several unnamed streams originating from the nearby Verdugo Mountains.

5.4.4.5 Lockheed Channel

The Lockheed Channel is a concrete-lined canal that is a tributary to the Burbank Western Channel. The source of water for this waterbody includes surface runoff from Hollywood Burbank Airport and the surrounding area.

5.4.5 Creek

A creek is a stream, brook, or minor tributary of a river. The direct RSA does not cross any creeks.

5.4.6 Gulch

A gulch is a deep V-shaped valley formed by erosion. It may contain a small stream or dry creek bed and is usually larger in size than a gully. The direct RSA does not cross any gulches.

5.5 Surface Water Quality

5.5.1 Existing Surface Water Quality

As previously stated, the surface waters in the direct RSA are within the Los Angeles River Watershed. Pollutants from dense clusters of residential, industrial, and other urban activities have impaired water quality in the middle and lower watersheds. Added to this complex mixture of pollutant sources (in particular, pollutants associated with urban and stormwater runoff) is the high number of point-source discharges. Excessive nutrients, coliform, and metals are widespread problems in the watershed. Major issues of concern in the Los Angeles River Watershed include protection and enhancement of fish and wildlife habitat, removal of exotic vegetation, enhancement of recreational areas, attaining a balance between water reclamation and minimum flows to support habitat, management of stormwater quality, assessment of other nonpoint sources (e.g., horse stables, golf courses, and septic systems), pollution from contaminated groundwater, groundwater recharge with reclaimed water, contamination of groundwater by volatile organic compounds (VOC), leakage of methyl tertiary butyl ether from underground storage tanks, groundwater contamination with heavy metals (particularly hexavalent chromium), and contaminated sediments within the Los Angeles River estuary (RWQCB 2007).

5.5.2 Surface Water Beneficial Uses

Beneficial uses of inland surface waters form the cornerstone of water quality protection under the Los Angeles RWQCB Basin Plan. They are defined in the Basin Plan as those necessary for the survival or well-being of humans, plants, and wildlife. Examples of beneficial uses include swimming, fishing, drinking water supplies, industrial water supply, and the support of freshwater and marine habitats and their organisms.

The existing, potential, and intermittent beneficial uses for the Los Angeles River, the Arroyo Seco, the Verdugo Wash, and the Burbank Western Channel, as identified in the Los Angeles RWQCB Basin Plan, are identified in Table 5-4. No existing, potential, or intermittent beneficial uses are identified in the Basin Plan for the Lockheed Channel.

Table 5-4 Receiving Waters Beneficial Uses

Beneficial Use	Los Angeles River		Arroyo Seco	Verdugo Wash	Burbank Western Channel
	Reach 2	Reach 3	Reach 1	Reach 1	
Municipal and Domestic Supply (MUN)	P*	P*	P*	P*	P*
Industrial Service Supply (IND)	P	P			
Groundwater Recharge (GWR)	E	E		I	
Water Contact Recreation (REC-1)	Es	Es	I	Pm	Pm
Non-Contact Water Recreation (REC-2)	E	E	I	I	I
Warm Freshwater Habitat (WARM)	E	E	P	P	P
Wildlife Habitat (WILD)	P	E	P	P	P
Wetland Habitat (WET)		E			
High Flow Suspension	Yav	Yav		Yav	Yav

Source: Los Angeles Regional Water Quality Control Board, 2014
* MUN designations are designated under SWRCB Resolution No. 88-63 and RWQCB Resolution No. 89-03.
av = High Flow Suspension only applies to water contact recreational activities associated with the swimmable goal as expressed in the federal CWA, Section 101(a)(2), and regulated under the REC-1 use, noncontact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal CWA, Section 101(a)(2), and regulated under the REC-1 use and (2) other REC-2 uses (e.g., uses involving the aesthetic aspects of water) shall remain in effect at all times for waters where the "(av)" footnote appears.
CWA = Clean Water Act
E = existing beneficial uses
I = intermittent beneficial uses
m = Access prohibited by Los Angeles County Department of Public Works in the concrete-channelized areas
P = potential beneficial uses
s = Access prohibited by Los Angeles County Department of Public Works
Y = currently dry and no plans for restoration

5.5.3 Surface Water Quality Objectives

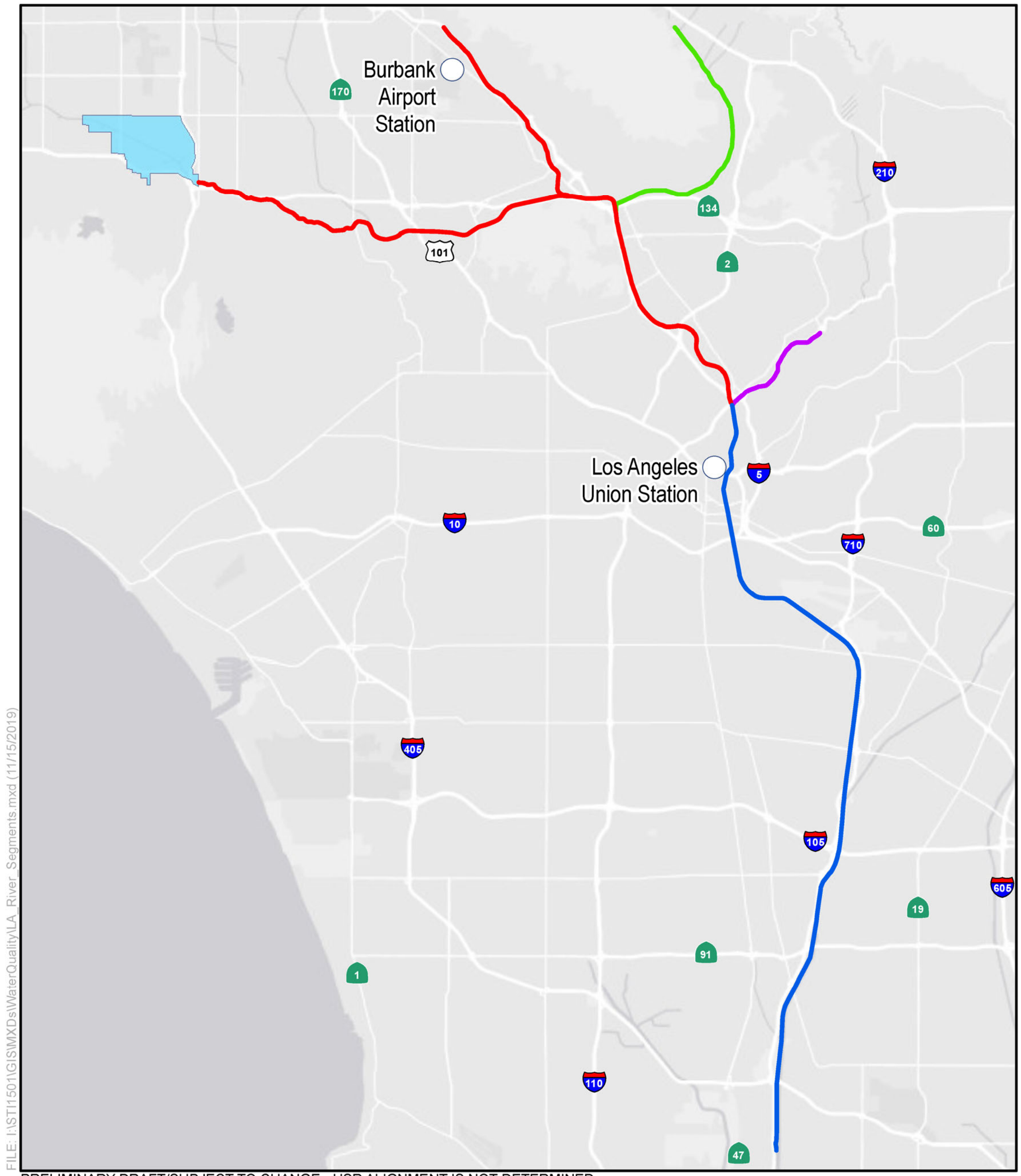
Surface water quality objectives for all inland waters in the Los Angeles region, as documented in the Los Angeles RWQCB Basin Plan, are listed in Table 5-5. The site-specific water quality objectives were identified for segments of the Los Angeles River and other tributaries (Figure 5-5).

Table 5-5 Surface Water Quality Objectives for Inland Surface Waters

Constituent	Basin Plan Objectives
Ammonia	Shall not be present at levels that when oxidized to nitrate, pose a threat to groundwater. Numerical ammonia concentrations for inland surface waters are contained in Tables 3-1 through 3-4 of the Los Angeles RWQCB Basin Plan.
Bacterial, Coliform	• **REC-1 (fresh waters):** E. coli density geometric mean shall not exceed 126/100 ml. E. coli density in a single sample shall not exceed 235/100 ml. • **REC-1:** Fecal coliform concentration shall not exceed a log mean of 200/100 ml (based on a minimum of not less than four samples for any 30-day period), nor shall more than 10 percent of samples collected during any 30-day period exceed 400/100 ml. • **REC-2 (and not designated REC-1):** Fecal coliform concentration shall not exceed a log mean of 2,000/100 ml (based on a minimum of not less than four samples for any 30-day period), nor shall more than 10 percent of samples collected during any 30-day period exceed 4,000/100 ml.
Bioaccumulation	Toxic pollutants shall not be present at levels that will bioaccumulate in aquatic life to levels that are harmful to aquatic life or human health.
BOD	Waters shall be free of substances that result in increases in the BOD, which adversely affect beneficial uses.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses.
Chemical Constituents	Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Waters designated MUN shall not contain concentrations of chemical constituents in excess of the limits specified in Cal. Code Regs. Title 22 and incorporated by reference into Tables 3-8 and 3-9 of the Los Angeles RWQCB Basin Plan.
Chlorine, Total Residual	Chlorine residual shall not be present in surface water discharges at concentrations that exceed 0.1 mg/L and shall not persist in receiving waters at any concentration that causes impairment of beneficial uses.
Color	Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.
Exotic Vegetation	Exotic vegetation shall not be introduced around stream courses to the extent that such growth causes nuisance or adversely affects beneficial uses.
Floating Material	Waters shall not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
MBAS	Waters shall not have MBAS concentrations greater than 0.5 mg/L in waters designated MUN.
Mineral Quality	Numerical mineral quality objectives for individual inland surface waters are contained in Table 3-10 of the Los Angeles RWQCB Basin Plan.
Nitrogen (Nitrate, Nitrite)	Waters shall not exceed 10 mg/L nitrogen as nitrate-nitrogen plus nitrite-nitrogen, 45 mg/L as nitrate, 10 mg/L as nitrate-nitrogen, or 1 mg/L as nitrite-nitrogen or as otherwise designated in Table 3-10 of the Los Angeles RWQCB Basin Plan.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water that cause nuisance or adversely affect beneficial uses.
Oxygen, Dissolved	The mean annual dissolved oxygen concentration of all waters shall be greater than 7 mg/L, and no single determination shall be less than 5 mg/L, except when natural conditions cause lesser concentrations. The dissolved oxygen content of all surface waters designated WARM shall not be depressed below 5 mg/L.

Constituent	Basin Plan Objectives
Pesticides	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life. Waters designated MUN shall not contain concentration of pesticides in excess of the limiting concentrations specified in Table 64444-A of Cal. Code Regs. Title 22, Section 64444, which is incorporated by reference into the Los Angeles RWQCB Basin Plan.
pH	Inland water shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 unit from natural conditions as a result of waste discharge.
PCBs	Pass-through or uncontrollable discharges to waters, or at locations where the waste can subsequently reach waters, are limited to 70 pg/L (30-day average) for protection of human health and 14 ng/L (daily average) to protect aquatic life in inland fresh waters.
Radioactive Substances	Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. Waters designated MUN shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Cal. Code Regs. Title 22, Section 64443, which is incorporated by reference into Table 3-9 of the Los Angeles RWQCB Basin Plan.
Solid, Suspended, or Settleable Materials	Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses.
Tastes and Odors	Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible aquatic resources, cause nuisance, or adversely affect beneficial uses.
Temperature	The natural receiving water temperature of all waters shall not be altered unless it can be demonstrated that such alteration in temperature does not adversely affect beneficial uses. For waters designated WARM, water temperature shall not be altered by more than 5°F above the natural temperature, and shall not exceed 80°F as a result of waste discharges.
Toxicity	All waters shall be free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in, human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in natural turbidity attributable to controllable water quality factors shall not exceed the following limits: • Where natural turbidity is between 0 and 50 NTU, increases shall not exceed 20%. • Where natural turbidity is greater than 50 NTU, increases shall not exceed 10%.

BOD = Biochemical Oxygen Demand
Cal. Code Regs. = California Code of Regulations
°F = degrees Fahrenheit
MBAS = Methylene Blue Activated Substances
ml = milliliters
MUN = municipal and domestic supply
mg/L = milligrams per liter
ng/L = nanograms per liter
NTU = National Turbidity Units
PCBs = polychlorinated biphenyls
pg/L = picograms per liter
RWQCB = Regional Water Quality Control Board
WARM = warm freshwater habitat



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: Esri (2018); NHD (2003); CHSRA (11/2019)

Figure 5-5 Site-Specific Water Quality Objectives

The Los Angeles River between the Sepulveda Flood Control Basin and Figueroa Street (including the Burbank Western Channel) has the following site-specific water quality objectives:

- **Total Dissolved Solids (TDS):** 950 milligrams per liter (mg/L)
- **Sulfate:** 300 mg/L
- **Chloride:** 190 mg/L
- **Nitrogen:** 8 mg/L

The Los Angeles River between Figueroa Street and the Los Angeles River Estuary (at Willow Street) has the following site-specific water quality objectives:

- **TDS:** 1,500 mg/L
- **Sulfate:** 350 mg/L
- **Chloride:** 190 mg/L
- **Nitrogen:** 8 mg/L

Other tributaries to the Los Angeles River between the Sepulveda Flood Control Basin and Figueroa Street (including the Verdugo Wash) have the following site-specific water quality objectives:

- **TDS:** 950 mg/L
- **Sulfate:** 300 mg/L
- **Chloride:** 150 mg/L
- **Nitrogen:** 8 mg/L

Other tributaries to Los Angeles River between Figueroa Street and the Los Angeles River Estuary (including Arroyo Seco) have the following site-specific water quality objectives:

- **TDS:** 1,500 mg/L
- **Sulfate:** 350 mg/L
- **Chloride:** 150 mg/L
- **Nitrogen:** 8 mg/L

5.5.4 Water Quality Impairments

The SWRCB developed a list of waterbodies (known as 303[d] water quality-limited waterbodies) that do not meet water quality objectives. The SWRCB approved the 2014/2016 Integrated Report (CWA Section 303(d) List) on October 3, 2017. On April 6, 2018, the USEPA approved the 2014/2016 California 303(d) List of Water Quality Limited Segments.

The Los Angeles River (Reach 2) is listed on the 303(d) List as impaired for ammonia, indicator bacteria, copper, lead, nutrients (algae), oil, and trash. The Los Angeles River (Reach 3) is listed as impaired for ammonia, copper, nutrients (algae), indicator bacteria, toxicity, and trash. The Arroyo Seco (Reach 1) is listed as impaired for indicator bacteria and trash. The Verdugo Wash (Reach 1) is listed as impaired for indicator bacteria, copper, and trash. The Burbank Western Channel is listed as impaired for copper, cyanide, indicator bacteria, lead, selenium, and trash.

A TMDL is developed by states, territories, or authorized tribes for constituents on the CWA Section 303(d) List to restore the quality of the waterbody.

The following TMDLs apply to the Los Angeles River and its tributaries, including Arroyo Seco and the Verdugo Wash.

5.5.4.1 Trash Total Maximum Daily Load

A trash TMDL per Resolution No. 2001-013 became effective August 28, 2002, and was approved by the Los Angeles RWQCB, the SWRCB, the Office of Administrative Law (OAL), and the USEPA. The City and County of Los Angeles filed petitions and complaints challenging the trash TMDL. In addition, 22 other cities sued the Los Angeles RWQCB and the SWRCB to set aside the TMDL. On June 8, 2006, the Los Angeles RWQCB set aside the trash TMDL per Resolution No. 2006-013. On August 9, 2007 the Los Angeles RWQCB adopted Resolution No

R07-0012, an amendment to the Basin Plan establishing a trash TMDL for the Los Angeles River Watershed. The trash TMDL was subsequently approved by the SWRCB, OAL, and USEPA and became effective on September 23, 2008. Stormwater discharge from nonpoint sources (e.g., direct deposition of trash by people or wind) is the major source of trash in the watershed. A numeric target of zero trash in all waterbodies was established by the trash TMDL.

The Los Angeles RWQCB approved a revision to this TMDL on June 11, 2015, through Resolution No. R15-006. Resolution No. R15-006 has subsequently been approved by the SWRCB and OAL and is awaiting approval by the USEPA. Revisions include changes to ensure consistency between the Los Angeles River and Ballona Creek Trash TMDLs, to provide clarity regarding compliance demonstration, and to improve compliance monitoring and ensure receiving water monitoring.

5.5.4.2 Metals Total Maximum Daily Load

The Los Angeles River and tributaries metals TMDL became effective on January 11, 2006. Targeted pollutants are total copper, lead, zinc, cadmium, and selenium. On September 6, 2007, the RWQCB readopted the TMDL by Resolution No. 2007-014 in compliance with a writ of mandate issued by the Los Angeles County Superior Court. The readopted TMDL became effective on October 29, 2008, and replaced the previous implementation deadlines with specific dates. On November 3, 2011, an amendment to revise the TMDL to adjust the numeric target for certain reaches and the corresponding waste load allocations for the publically owned treatment works based on the 2008 water-effect ration study per Resolution No. 2010-003 became effective. Resolution No. R15-004 was approved by the RWQCB on April 9, 2015. This resolution is awaiting approval by the SWRCB, OAL, and USEPA and is therefore not yet effective. The amendment will review the water quality objectives for copper and recalculate the lead acute and chronic water quality objectives.

The water quality targets are expressed in terms of total recoverable metals and are separated for dry and wet weather because hardness values and flow conditions in the Los Angeles River and tributaries differ between dry and wet weather. The regulatory mechanisms used to implement the TMDL would include the Los Angeles MS4 Permit, the City of Long Beach MS4 Permit, the Caltrans stormwater permit, major NPDES permits, minor NPDES permits, general NPDES permits, general industrial stormwater NPDES permits, and general construction stormwater NPDES permits.

5.5.4.3 Nutrients Total Maximum Daily Load

The Los Angeles River Nitrogen Compounds and Related Effects TMDL became effective March 23, 2004, per Resolution No. 2003-009. A revision to the amendment to revise interim ammonia effluent limits contained within a TMDL for nitrogen compounds per Resolution No. 2003-016 became effective on September 27, 2004. On December 6, 2012, the Los Angeles RWQCB adopted Resolution No. R12-010, an amendment to the Basin Plan, to revise the TMDL for Nitrogen Compounds and Related Effects in the Los Angeles River Watershed. The Los Angeles RWQCB's goal in amending the TMDL to incorporate site-specific objectives for select reaches and tributaries of the Los Angeles River Watershed was to take into account site-specific conditions in the Los Angeles River that affect the toxicity of ammonia to aquatic life while maintaining protection. The SWRCB approved the amendment on June 4, 2013; OAL approved the amendment on June 9, 2014; and the USEPA approved the amendment August 7, 2014.

Numeric targets to address narrative objectives required to protect warm freshwater and wildlife habitats are intended to implement the narrative objectives and may be revised based on the results of monitoring and studies conducted pursuant to the Implementation Plan. The Implementation Plan includes upgrades to the water reclamation plants discharging to the Los Angeles River for removal of ammonia, nitrate, and nitrite. The Implementation Plan also includes additional studies to evaluate the effectiveness of nitrogen reductions on related effects such as algae growth, odors, and scum. Ammonia and nitrate reductions would be regulated through the effluent limits prescribed in NPDES permits.

5.5.4.4 Indicator Bacteria Total Maximum Daily Load

On July 9, 2010, the Los Angeles RWQCB adopted Resolution No. R10-007 amending the Basin Plan to incorporate a TMDL for indicator bacteria in the Los Angeles River Watershed. The TMDL for indicator bacteria became effective on March 23, 2012. The TMDL has a multipart numeric target based on the bacteriological water quality objectives for freshwater to protect the water contact recreation use. The Basin Plan objectives and these targets are based on an acceptable health risk for fresh recreational waters of eight illnesses per 1,000 exposed individuals as recommended by the USEPA. The regulatory mechanisms used to implement the TMDL would include general NPDES permits, individual NPDES permits, MS4 Permits covering jurisdictions within the Los Angeles River Watershed, the Statewide Industrial Stormwater General Permit, the Statewide Construction Activity Stormwater General Permit, the Statewide Stormwater Permit for Caltrans Activities, and the authority contained in Sections 13263 and 13267 of the California Water Code. For each discharger assigned a waste load allocation, the appropriate RWQCB order shall be reopened or amended when the order is reissued, in accordance with applicable laws, to incorporate the applicable waste load allocation as a permit requirement.

5.6 Groundwater

The majority of the direct RSA is within the San Fernando Valley Groundwater Basin. A small portion of the southern end of the direct RSA is within the Central Subbasin of the Coastal Plain of Los Angeles Groundwater Basin. The groundwater basins are shown on Figure 5-6. Table 5-6 includes the groundwater basin area, storage capacity, typical well depth, and whether the basins are designated as sole-source aquifers.

Table 5-6 Groundwater Basins in the Vicinity of the Burbank to Los Angeles Project Section of the California High-Speed Rail Project

Groundwater Basin Name (Basin Number)[1]	Total Groundwater Basin Area (acres)[1]	Groundwater Storage (acre/feet)[1]	Typical Well Depths (feet)[1]	Designated Sole-Source Aquifer[2]
San Fernando Valley Groundwater Basin (4-12)	145,000	3,670,000	1,220 to 3,240	No
Central Subbasin of Coastal Plain of Los Angeles Groundwater Basin (4-11.04)	177,000	13,800,000	N/A	No

Sources: DWR, 2004c, 2004b; USEPA, 2016

[1] Basin areas, storage, and well depths are from Bulletin 118 (DWR 2004b and DWR 2004c).

[2] The USEPA defines a sole- or principal-source aquifer as an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas may have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend on the aquifer for drinking water. For convenience, all designated sole- or principal-source aquifers are referred to as "sole-source aquifers" (USEPA 2016).

DWR = California Department of Water Resources
N/A = information not available in *California's Groundwater: Bulletin 118*
USEPA = U.S. Environmental Protection Agency

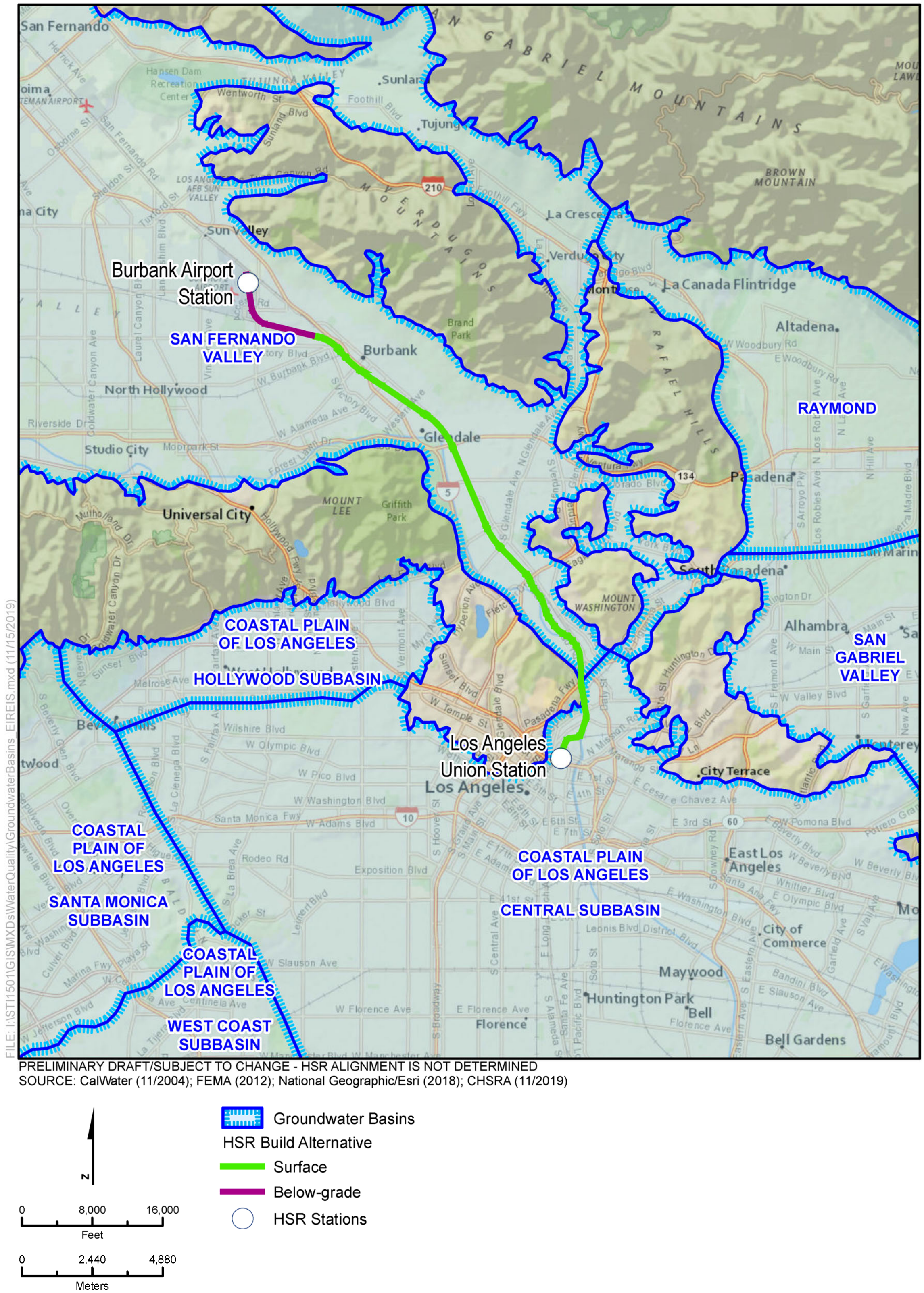


Figure 5-6 Groundwater Basins

5.6.1 San Fernando Valley Groundwater Basin

The San Fernando Valley Groundwater Basin includes water-bearing sediments beneath the San Fernando Valley, the Tujunga Valley, Browns Canyon, and the alluvial areas surrounding the Verdugo Hills near La Crescenta and Eagle Rock. The basin is bounded on the north and northwest by the Santa Susana Mountains, on the north and northeast by the San Gabriel Mountains, on the east by the San Rafael Hills, on the south by the Santa Monica Mountains and Chalk Hills, and on the west by the Simi Hills. The valley is drained by the Los Angeles River and its tributaries (DWR 2004a).

Groundwater generally flows from the edges of the basin toward the middle of the basin, then beneath the Los Angeles River Narrows into the Central Coastal Plain of Los Angeles Groundwater Basin. In the northeastern part of the basin, groundwater moves from the La Crescenta area southward beneath the surface of Verdugo Canyon toward the Los Angeles River near Glendale. Groundwater in the Tujunga area flows west following the Tujunga Wash around the Verdugo Mountains to join groundwater flowing from the west along the course of the Los Angeles River near Glendale. Flow velocity ranges from about 5 feet per year in the western part of the basin to 1,300 feet per year beneath the Los Angeles River Narrows (DWR 2004a). Recharge of the San Fernando Valley Groundwater Basin is from a variety of sources including from infiltration in spreading grounds maintained by the Los Angeles County Department of Public Works, infiltration of runoff from natural streamflow from the surrounding mountains, precipitation falling on impervious areas, reclaimed wastewater discharge, and industrial discharges. In addition, water flowing in surface washes infiltrates to the groundwater basin, particularly in the eastern portion of the basin (DWR 2004a).

The San Fernando Valley Groundwater Basin was adjudicated in 1979 and is managed by the Upper Los Angeles River Area Watermaster (Upper Los Angeles Area Watermaster 2016). The Sustainable Groundwater Management Act requires the formation of local Groundwater Sustainability Agencies, which are required to adopt Groundwater Sustainability Plans (GSP) to manage the sustainability of groundwater basins. The adoption of a GSP is required for all high- and medium-priority basins as identified by DWR. The San Fernando Valley Groundwater Basin is identified by the DWR as a very low-priority basin, so the development of a GSP is not required (DWR 2019).

5.6.2 Coastal Plain of Los Angeles Groundwater Basin—Central Subbasin

The Central Subbasin occupies a large portion of the southern part of the Coastal Plain of the Los Angeles Basin. This subbasin is commonly referred to as the Central Basin. The Central Basin is bounded on the north by a surface divide called the La Brea high, and on the northeast and east by emergent, less permeable Tertiary rocks of the Elysian, Repetto, Merced, and Puente Hills. The southeast boundary between the Central Basin and the Orange County Groundwater Basin roughly follows Coyote Creek, which is a regional drainage province boundary. The southwest boundary is formed by the Newport-Inglewood Fault System and the associated folded rocks of the Newport-Inglewood uplift. The Los Angeles and San Gabriel Rivers drain inland basins and pass across the surface of the Central Basin on their way to the Pacific Ocean (DWR 2004a).

Historically, groundwater flow in the Central Basin has been from recharge areas in the northeast part of the subbasin, toward the Pacific Ocean on the southwest. However, pumping has lowered the water level in the Central Basin and water levels in some aquifers are about equal on both sides of the Newport-Inglewood uplift, decreasing subsurface outflow to the West Coast Subbasin to the west. Groundwater enters the Central Basin through surface and subsurface flow and by direct percolation of precipitation, stream flow, and applied water, and replenishes the aquifers dominantly in the forebay areas where permeable sediments are exposed at ground surface. Natural replenishment of the subbasin's groundwater supply is largely from surface inflow, and from some underflow, through the Whittier Narrows from the San Gabriel Valley. Percolation into the Los Angeles Forebay Area is restricted due to paving and development of the surface of the forebay. Imported water purchased from Metropolitan Water District and recycled water from Whittier and San Jose Treatment Plants are used for artificial recharge in the Montebello Forebay at the Rio Hondo and San Gabriel River spreading grounds.

The Central Basin was adjudicated in 1965 and has been managed by the Central Basin Watermaster since June 30, 2014, when the DWR retired as the Watermaster (Central Basin Watermaster 2016). The DWR identifies the Central Basin as a very low-priority basin, so the development of a GSP is not required (DWR 2019).

5.6.3 Groundwater Recharge

Groundwater recharge areas are those areas that replenish groundwater that is stored in a groundwater basin and/or aquifer. Natural groundwater recharge areas occur without human interference or assistance. Artificial, intentional, or managed groundwater recharge areas can take place where natural recharge occurs or within structures (i.e., recharge basins, spreading basins, or replenishment basins or areas) built for increasing recharge by increasing the rate of infiltration or percolation of surface water into the subsurface (DWR 2013). The Los Angeles County Department of Public Works maintains spreading grounds throughout the County to percolate water into groundwater basins for later pumping. These spreading grounds are located adjacent to river channels and in soft-bottom (i.e., not concrete) channels where underlying soils are permeable and in hydraulic connection with the underlying aquifer. The HSR alignment is located upstream of the Headworks Spreading Grounds and is hydrologically connected via the Burbank Western Channel.

5.6.4 Existing Groundwater Quality

TDS in the Central Basin ranges from 200 to 2,500 mg/L and averages 453 mg/L according to data from 293 public supply wells (DWR 2004a). Groundwater in the Central Basin is degraded by both organic and inorganic pollutants from a variety of sources, such as leaking tanks, leaking sewer lines, and illegal discharges. The quality of the deeper groundwater is threatened by migration of pollutants from the upper aquifers (RWQCB 2014).

In the western part of the San Fernando Valley Groundwater Basin, calcium sulfate-bicarbonate character is dominant, and calcium bicarbonate character dominates the eastern part of the basin (DWR 2004a). Volatile organic compounds from industry and nitrates from subsurface sewage disposal and past agricultural activities are the primary pollutants in much of the groundwater through the basin (RWQCB 2014). A number of investigations have determined contamination of volatile organic compounds such as trichloroethylene (TCE), perchloroethylene (PCE), petroleum compounds, chloroform, nitrate, sulfate, and heavy metals. TCE, PCE, and nitrate contamination occurs in the eastern part of the basin and elevated sulfate concentration occurs in the western part of the basin. TDS range from 326 mg/L to 615 mg/L and average 499 mg/L according to data from 125 public supply wells (DWR 2004a).

5.6.5 Existing Groundwater Levels

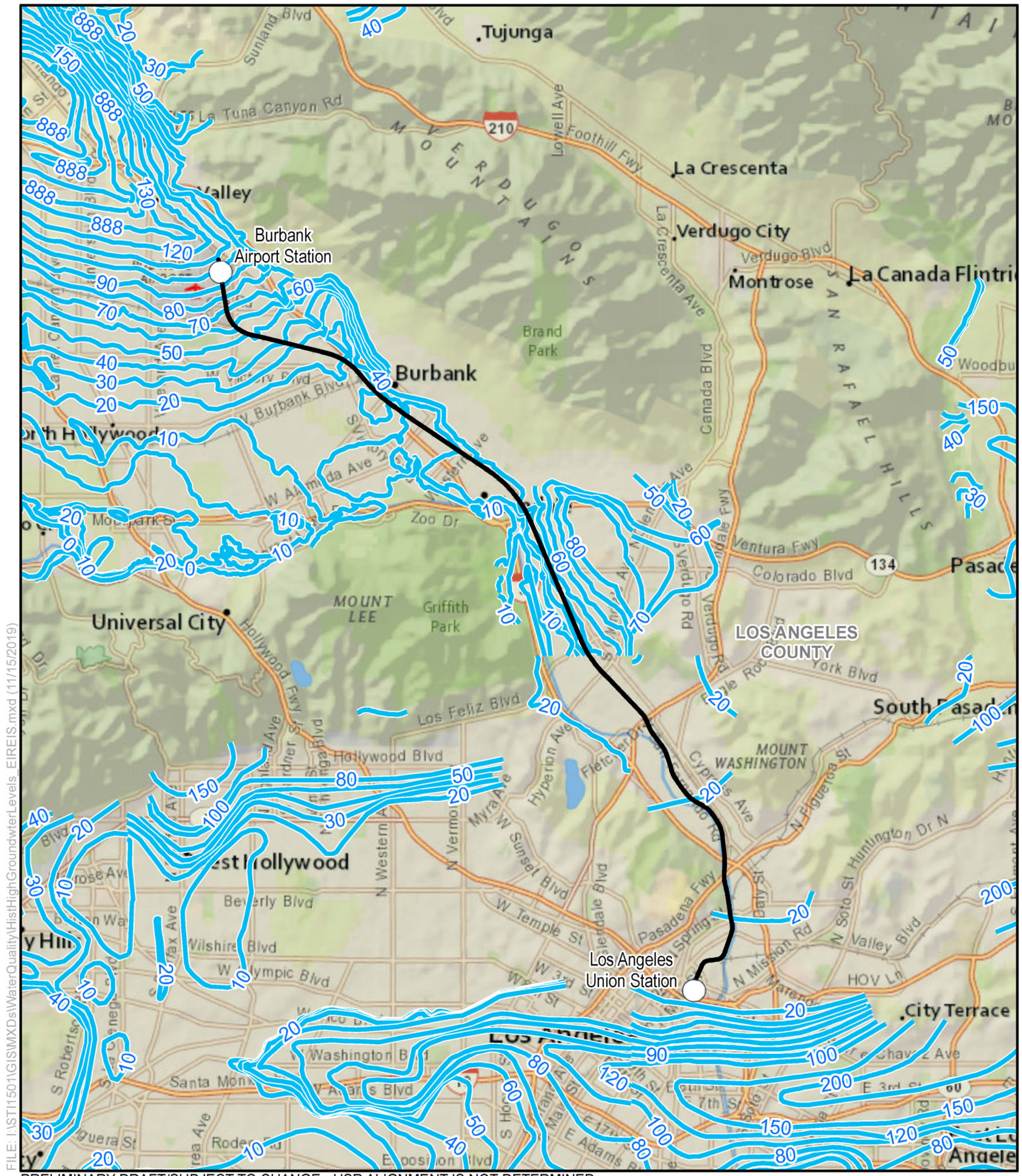
The elevation of groundwater varies with the amount of withdrawal and the amount of recharge to the groundwater basin. Water levels in the Central Basin varied approximately 25 feet between 1961 and 1977 and have varied approximately 5 to 10 feet since 1996 (DWR 2004a). Water levels in the San Fernando Valley Groundwater Basin have been fairly stable over about the past 35 years. Hydrographs show variations in water levels of 5 to 40 feet in the western part of the basin, approximately 40 feet in the southern and northern parts of the basin, and approximately 80 feet in the eastern part of the basin (DWR 2004a). Refer to Table 5-7 for a summary of groundwater depths from active wells in the vicinity of the direct RSA.

Table 5-7 Approximate Depth to Groundwater in the Vicinity of the Burbank to Los Angeles Section of the California High-Speed Rail Project

Los Angeles County Well ID	City	Date of Record	Minimum Depth to Groundwater (feet bgs)	Maximum Depth to Groundwater (feet bgs)	Last Measurement (feet bgs)
4969B	Burbank	7/2/1973 to 12/9/2015	168	227	225
3904A	Glendale	7/24/1956 to 1/5/2010	7	461	36
3914T	Glendale	6/29/1960 to 12/10/2009	15	221	26
3914H	Glendale	6/19/956 to 1/5/2010	8	201	16
3924R	Glendale	6/1/1959 to 4/21/2011	39	224	65
3924N	Glendale	2/27/1956 to 4/21/2011	40	219	90
3928	Los Angeles	5/21/1964 to 1/5/2010	17	251	21
3949A	Los Angeles	4/29/1959 to 1/4/2010	23	155	45
3949B	Los Angeles	4/29/1959 to 1/4/2010	26	156	45
3959D	Los Angeles	4/21/1958 to 1/4/2010	16	99	23
2760	Los Angeles	3/5/1935 to 1/4/2010	3	39	23
2760C	Los Angeles	1/29/1969 to 1/4/2010	15	24	17
2772E	Los Angeles	4/9/1958 to 1/4/2010	25	53	33

Source: Los Angeles County Department of Public Works, 2017
bgs = below ground surface

As discussed in the *Geology, Soils, and Seismicity Technical Report* (Authority 2019a), groundwater levels are shallow throughout the city of Burbank at or near the project footprint where it is near the Los Angeles River and become deeper as the alignment shifts further from the Los Angeles River in the city of Glendale. Groundwater levels become shallow again as the project footprint nears the Los Angeles River in the city of Los Angeles. As also discussed in the *Geology, Soils, and Seismicity Technical Report* (Authority 2019a), California Geologic Survey and earlier Caltrans borings (not project-related) identified groundwater near elevation approximately 635 feet above mean sea level, approximately 25 bgs at the southern end of the direct RSA. Borings at the northern end of the direct RSA in the city of Burbank did not encounter groundwater. Historically, groundwater has been as shallow as 20 feet bgs at the southern end of the direct RSA near the Los Angeles River. According to the California Geologic Survey historical high groundwater maps, there is shallow groundwater (less than 50 feet bgs) within the direct RSA. Figure 5-7 depicts historically high groundwater levels adjacent to the direct RSA.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: National Geographic/Esri (2018); USDA (2016); CHSRA (11/2019)

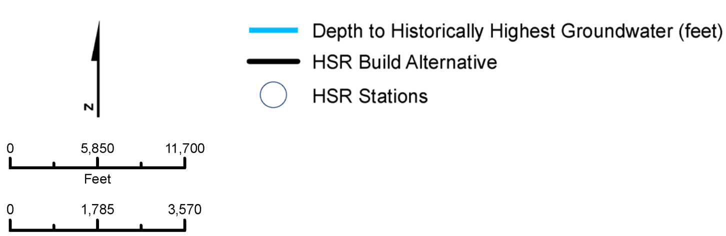


Figure 5-7 Historically High Groundwater Levels

5.6.6 Groundwater Beneficial Uses

The existing beneficial uses for the Coastal Plain of Los Angeles Groundwater Basin, the Central Basin, and the San Fernando Valley Groundwater Basin as identified in the Basin Plan are identified in Table 5-8.

Table 5-8 Groundwater Beneficial Uses

Beneficial Use	Coastal Plain of Los Angeles Groundwater Basin	Central Basin	San Fernando Valley Groundwater Basin
MUN—Waters used for community, military, or individual water supply systems	X	X	X
AGR—Waters used for farming, horticulture, or ranching	X	X	X
IND—Industrial activities that do not depend primarily on water quality (mining)	X	X	X
PROC—Industrial activities that depend primarily on water quality	X	X	X

Source: Los Angeles Regional Water Quality Control Board, 2014

5.6.7 Groundwater Quality Objectives

The groundwater quality objectives for all groundwater basins in the Los Angeles Region, as designated in the Los Angeles RWQCB Basin Plan, are provided in Table 5-9.

Table 5-9 Groundwater Quality Objectives

Constituent	Basin Plan Objectives
Bacteria	In groundwaters used for domestic or municipal supply (MUN) the concentration of coliform organisms over any seven-day period shall be less than 1.1/100 ml.
Chemical Constituents and Radioactivity	Groundwaters designated MUN shall not contain concentrations of chemical constituents and radionuclides in excess of the limits specified in Cal. Code Regs. Title 22 and incorporated by reference into the Los Angeles RWQCB Basin Plan. Groundwaters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use.
Nitrogen (Nitrate, Nitrite)	Groundwaters shall not exceed 10 mg/L nitrogen as nitrate-nitrogen plus nitrite-nitrogen, 45 mg/L as nitrate, 10 mg/L as nitrate-nitrogen, or 1 mg/L as nitrite-nitrogen.
Taste and Odor	Groundwaters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

Source: Los Angeles Regional Water Quality Control Board, 2014
Cal. Code Regs. = California Code of Regulations
mg/L = milligrams per liter
ml = milliliters
MUN = municipal and domestic water supply
RWQCB = Regional Water Quality Control Board

The site-specific groundwater quality objectives for the groundwater basins in the direct RSA are listed below:

- **Central Basin:**
  - **TDS:** 700 mg/L
  - **Sulfate:** 250 mg/L
  - **Chloride:** 150 mg/L
  - **Boron:** 1 mg/L

- **San Fernando Valley Basin (east of I-405):**
  - **TDS:** 700 mg/L
  - **Sulfate:** 300 mg/L
  - **Chloride:** 100 mg/L
  - **Boron:** 1.5 mg/L
- **San Fernando Valley Basin (area encompassing RT-Tujunga-Erwin-North Hollywood-Whithall-LA/Verdugo-Crystal Springs-Headworks-Glendale/Burbank well fields)**
  - **TDS:** 600 mg/L
  - **Sulfate:** 250 mg/L
  - **Chloride:** 100 mg/L
  - **Boron:** 1.5 mg/L
- **San Fernando Valley Basin (narrow area below confluence of the Verdugo Wash with Los Angeles River)**
  - **TDS:** 900 mg/L
  - **Sulfate:** 300 mg/L
  - **Chloride:** 150 mg/L
  - **Boron:** 1.5 mg/L

5.7 Floodplains

5.7.1 Existing Federal Emergency Management Agency Designated Flood Zones

FEMA identified special flood-hazard areas on FIRMs for all communities that participate in the National Flood Insurance Program, including Los Angeles County. State and local governments use these FIRMs for administering floodplain management programs, enforcing building codes, and mitigating flooding losses. The 100-year floodplain corresponds to FEMA's special flood-hazard areas. The special flood-hazard areas consist of the land areas covered by the base flood to which the FEMA floodplain management regulations apply. Special flood-hazard areas in the direct RSA include Flood Zones A and AE of the Los Angeles River. Zone A areas have a 1 percent annual chance of flooding (100-year flood) with no base flood elevations determined. Zone AE areas have a one percent annual chance of flooding (100-year flood) with base flood elevations determined.

Figure 5-8 depicts the special flood-hazard areas where the direct RSA crosses floodplains. Table 5-10 lists the floodplain name or source, city, flood zone, design flow rate, existing water surface elevation, and FEMA FIRM map panel number for the special flood-hazard areas in the RSA. Below is a description of the existing floodplains in the RSA.

5.7.1.1 Lockheed Channel

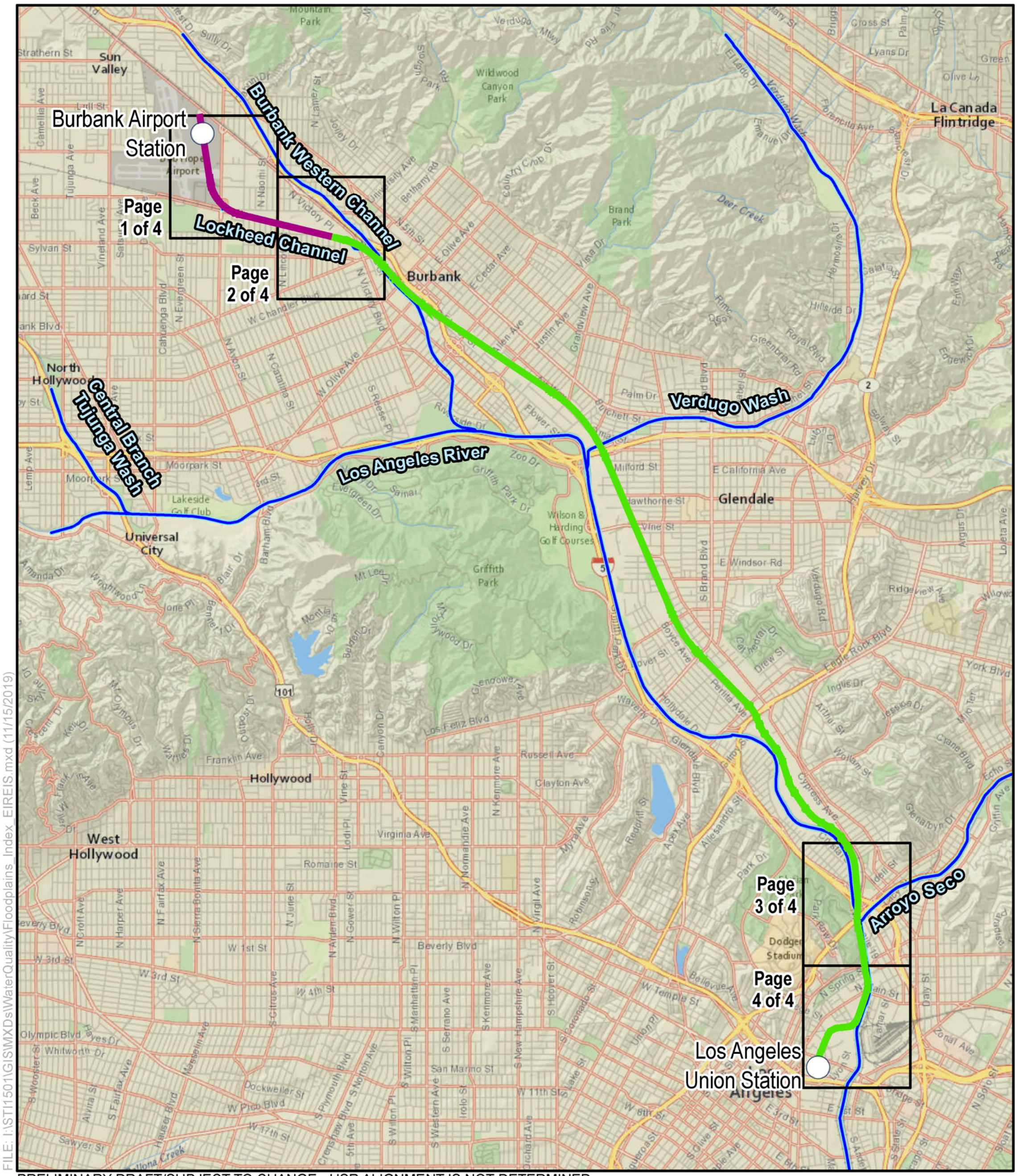
The Lockheed Channel Floodplain is designated as Zone AO and Zone AE flood hazard areas. As shown in Table 5-10, the current design flow rate is 2,910 cfs and the existing water surface elevation is approximately 579 feet.

5.7.1.2 Burbank Western Channel

The Burbank Western Channel Floodplain is designated as a Zone A flood hazard area. As shown in Table 5-10, the current design flow rate is 15,000 cfs and the existing water surface elevation ranges from 543 to 596 feet.

5.7.1.3 Verdugo Wash

The Verdugo Wash is an approximately 86-foot-wide, rectangular, and concrete-lined channel. The current FEMA FIRM does not include any information for the area within the city of Glendale; therefore, no floodplains are mapped for the Verdugo Wash. As shown in Table 5-10, the current design flow rate is 42,900 cfs and the existing water surface elevation adjacent to the direct RSA is 449 feet.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: National Geographic/Esri (2018); USGS NHD (2015); CHSRA (11/2019)

Waterway / Channel
HSR Build Alternative
Surface
Below-grade
HSR Stations

0 4,500 9,000 Feet

0 1,370 2,740 Meters

Figure 5-8 Floodplains
(Index Map)

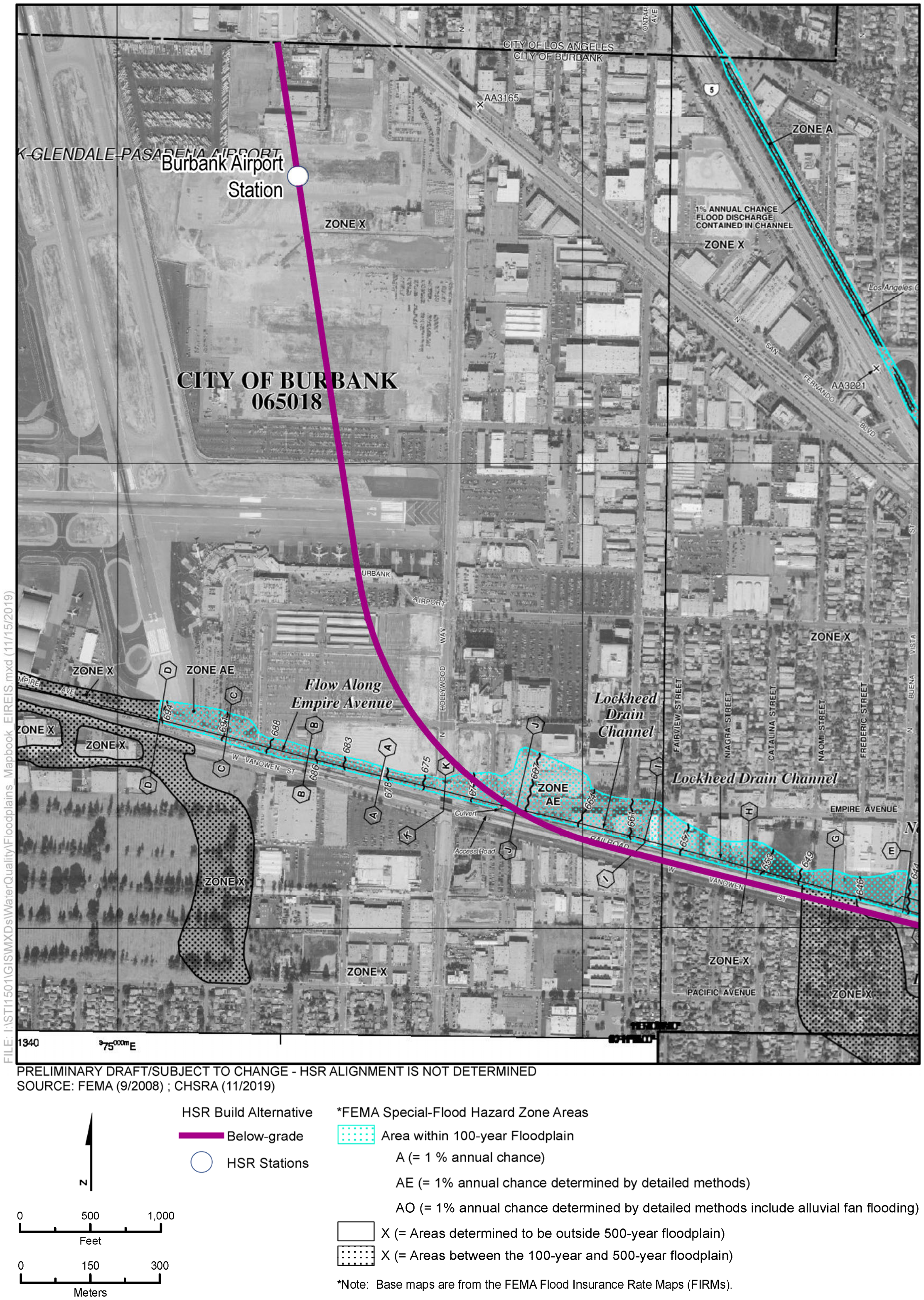
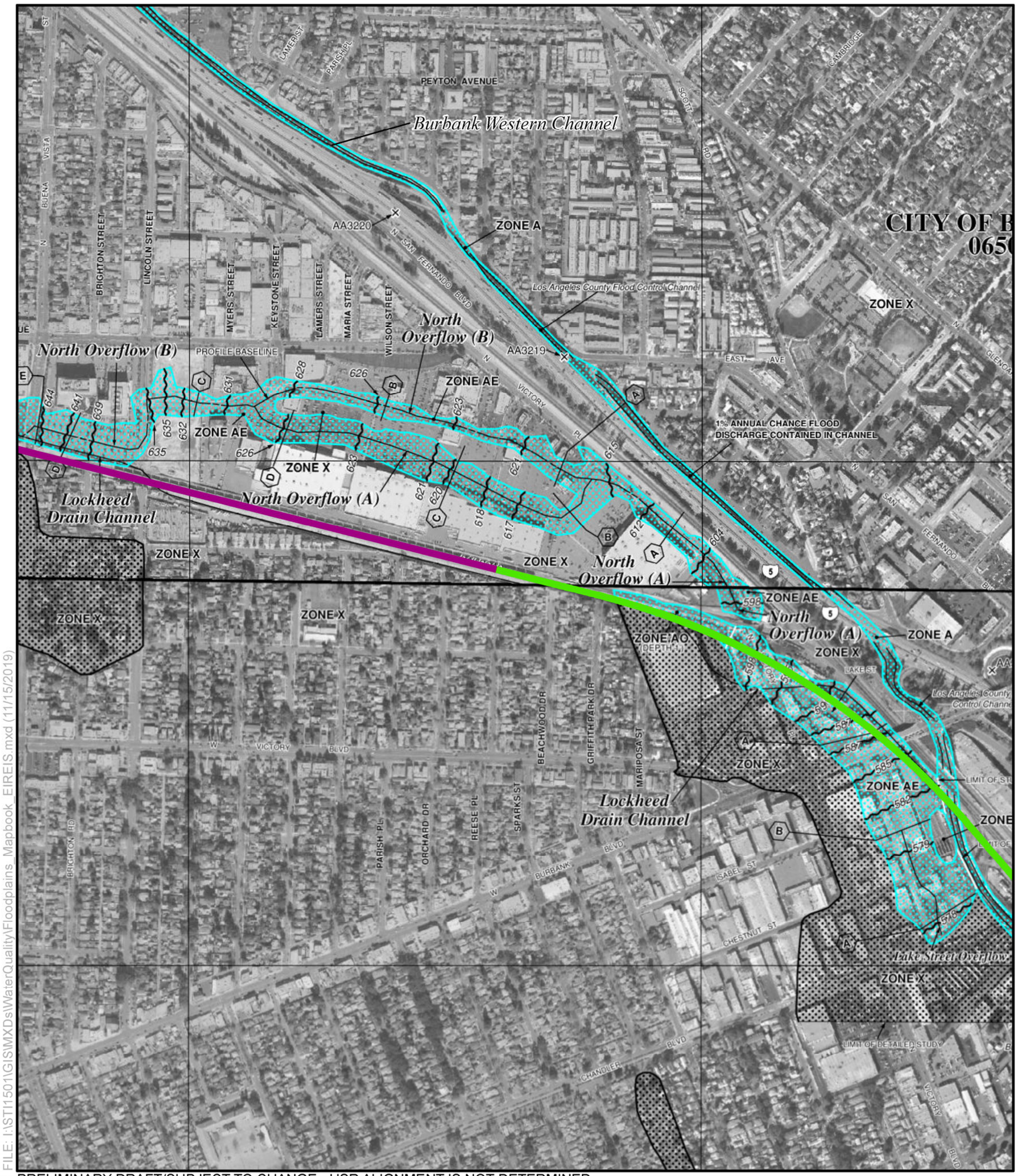


Figure 5-8 Floodplains

(Sheet 1 of 4)



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: FEMA (9/2008) ; CHSRA (11/2019)

HSR Build Alternative
- Surface
- Below-grade

*FEMA Special-Flood Hazard Zone Areas
- Area within 100-year Floodplain
  - A (= 1 % annual chance)
  - AE (= 1% annual chance determined by detailed methods)
  - AO (= 1% annual chance determined by detailed methods include alluvial fan flooding)
- X (= Areas determined to be outside 500-year floodplain)
- X (= Areas between the 100-year and 500-year floodplain)

*Note: Base maps are from the FEMA Flood Insurance Rate Maps (FIRMs).

N

0 500 1,000 Feet

0 150 300 Meters

FILE: I:\STI1501\GIS\MXDs\WaterQuality\Floodplains_Mapbook_EIREIS.mxd (11/15/2019)

Figure 5-8 Floodplains
(Sheet 2 of 4)

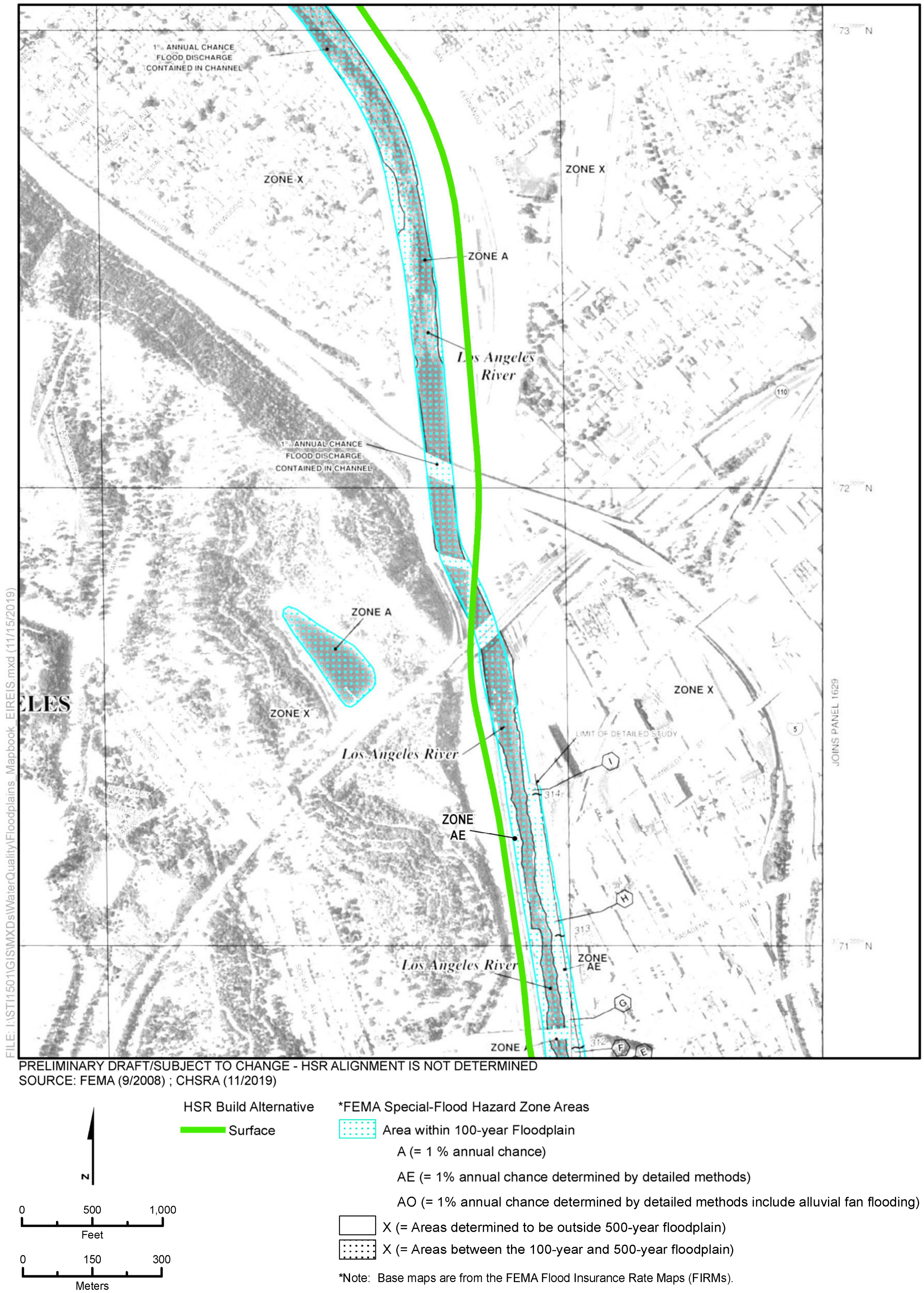
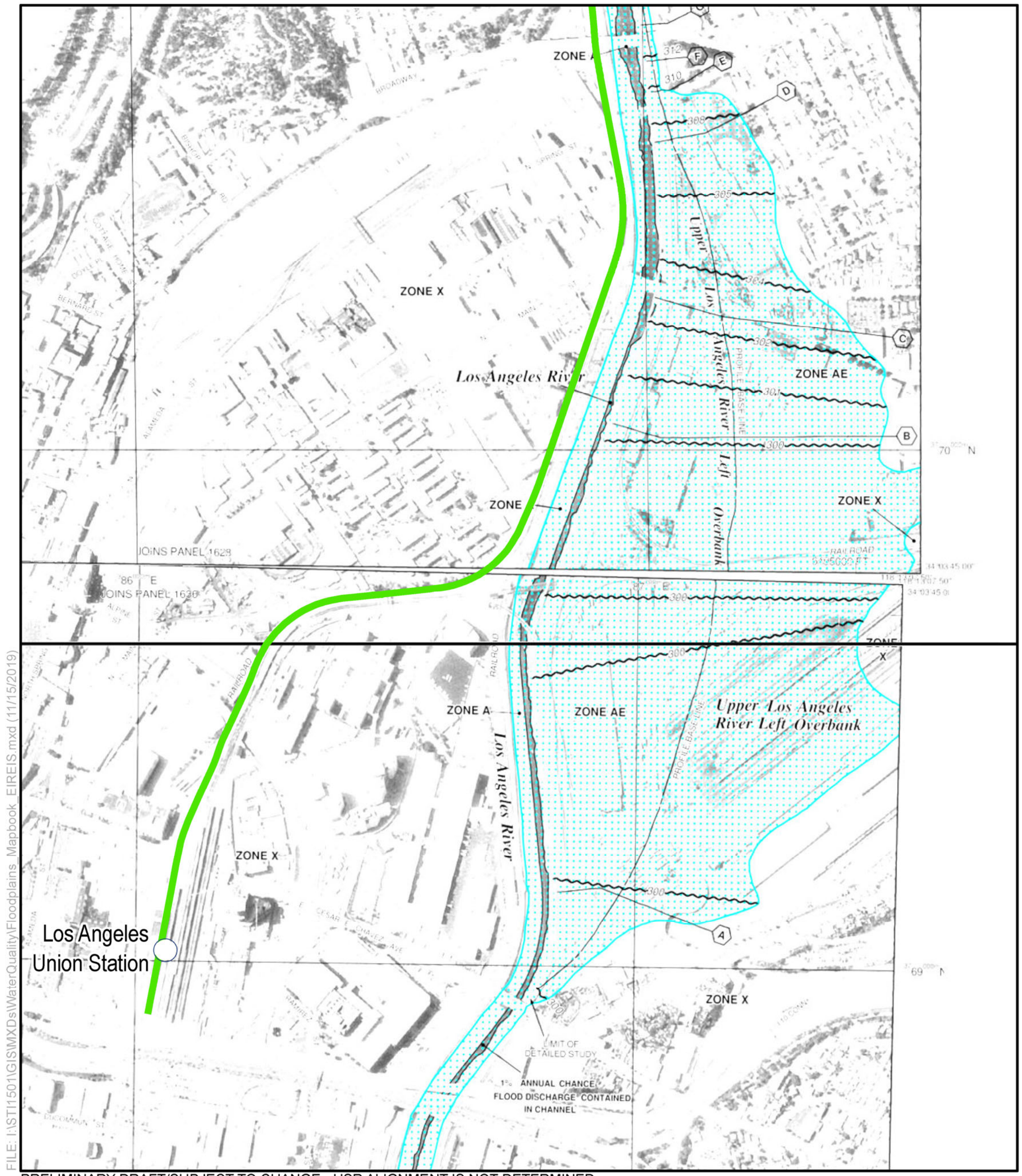
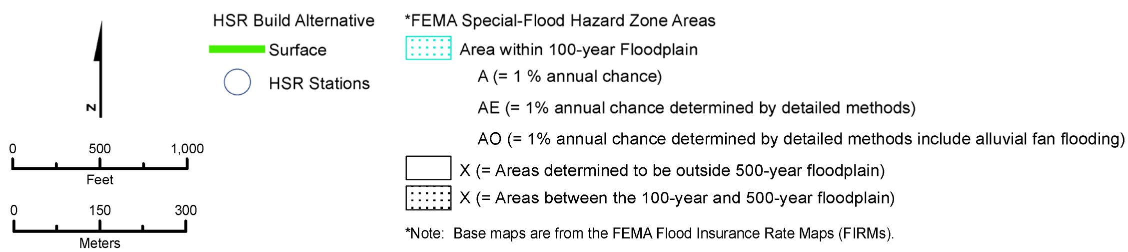


Figure 5-8 Floodplains

(Sheet 3 of 4)



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: FEMA (9/2008) ; CHSRA (11/2019)



*Note: Base maps are from the FEMA Flood Insurance Rate Maps (FIRMs).

Figure 5-8 Floodplains

(Sheet 4 of 4)

Table 5-10 Floodplains in the Vicinity of the Burbank to Los Angeles Project Section of the California High-Speed Rail Project

Floodplain Name or Floodplain Source	City	FEMA Special Flood Hazard Area[1]	Design Flow Rate (cfs)	Existing Water Surface Elevation[4] (feet)	FEMA FIRM Panel
Lockheed Channel	Burbank	Zone AO Zone AE	2,910	579	06037C1337F 06037C1328F 06037C1329F
Burbank Western Channel	Burbank	Zone A	15,000	543–596[5]	06037C1329F 06037C1337F 06037C1345F
Verdugo Wash Bridge	Glendale	N/A[2]	42,900	449	06037C1345F
Arroyo Seco	Los Angeles	N/A[2]	25,700	305	06037C1628F
Los Angeles River	Los Angeles	Zone AE	104,000[3]	303–313[6]	06037C1628F 06037C1636F

Source: California High-Speed Rail Authority, 2019c, 2019e

[1] Special flood hazard areas (i.e., 100-year flood areas) designated by FEMA. In the RSA, these include Zone AE (the floodway is the channel of the stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1 percent annual chance flood can be carried without substantial increases in flood heights) and Zone A (areas with 1 percent annual chance of flooding [100-year flood] with no base flood elevations determined).
[2] No floodplains for the Verdugo Wash or Arroyo Seco are mapped by FEMA.
[3] Design flow rate for the Los Angeles River is the design flow rate with the RSA.
[4] Water surface elevation is for the 100-year storm event.
[5] Existing water surface elevation is a range from several station locations in the Burbank Western Channel.
[6] Existing water surface elevation is a range from several station locations in the Los Angeles River from Figueroa Street to the SR 110 Bridge.
cfs = cubic feet per second
FEMA = Federal Emergency Management Agency
FIRM = Flood Insurance Rate Map
N/A = not available
RSA = resource study area
SR = State Route

5.7.1.4 Arroyo Seco

The current FEMA FIRM does not map the Arroyo Seco floodplain as a 100-year floodplain. As shown in Table 5-10, the current design flow rate is 25,700 cfs and the existing water surface elevation adjacent to the direct RSA is 305 feet.

5.7.1.5 Los Angeles River

The Los Angeles River Floodplain is designed as a Zone AE flood hazard area. The floodplain extends from Main Street to Cesar E. Chavez Avenue. The base flood elevation ranges from approximately 299.8 feet near Cesar E. Chavez Avenue to 314.6 feet near Arroyo Seco. As shown in Table 5-10, the current design flow rate is 104,000 cfs and the existing water surface elevation ranges from 303 to 313 feet.

5.7.2 Awareness Flood Zone Areas

The DWR also publishes Awareness Floodplain Maps, which identify all pertinent flood-hazard areas for areas not mapped under the FEMA National Flood Insurance Program. The intent of the Awareness Floodplain Maps is to provide the community and residents an additional tool in understanding potential flood hazards currently not mapped as regulated floodplains. The DWR has only mapped awareness floodplains in the Burbank area; however, the HSR alignment does not cross any DWR awareness floodplains.

5.8 Stakeholder Issues and Concerns

The following issues and concerns related to hydrology and water resources were raised in comment letters during the scoping process in 2014:

- The following agencies and organizations requested that the project not conflict with ecological restoration efforts, especially along the Los Angeles River:
  - City of Los Angeles Department of Public Works
  - Natural Resources Defense Council
  - Glendale Rancho Neighborhood Association
- The SWRCB and the City of Los Angeles Department of Public Works expressed concern about possible conflicts with stormwater facilities and flood protections.
- The SWRCB, the Natural Resources Defense Council, and an unaffiliated stakeholder named Byron Betts expressed concern for water quality and hydrology.

6 EFFECT ANALYSIS

6.1 Introduction

This section presents the analysis of effects relating to hydrology and water resources for the Burbank to Los Angeles Project Section.

Construction of the HSR Build Alternative would occur in or above several surface waters, including the Lockheed Channel, the Burbank Western Channel, the Los Angeles River and the Verdugo Wash. The proposed HSR track would be on elevated structures/bridges, at-grade on cut or fill slopes, and on retained fill or through below grade sections. The exact track elevations and types of support would depend on railroad grade during final design.

The effects of the HSR Build Alternative and No Project Alternative are evaluated below. Additionally, because the electric power utility improvements are included in the project footprint; these improvements are included in the calculations and analysis for the HSR Build Alternative. The HSR Build Alternative has the potential to affect existing floodplains, surface waters, and groundwater basins.

6.1.1 No Project Alternative

As described under Section 2.1, this project section of the California HSR System would not be built under the No Project Alternative. Under the No Project Alternative, recent development trends within the Burbank to Los Angeles Project Section are anticipated to continue, leading to ongoing hydrology and water resources impacts. Effects on hydrologic and water resources, including floodplains, surface waters, and groundwater, could result from transportation improvements and land development projects under the No Project Alternative.

Transportation improvement projects may cross FEMA-designated 100-year floodplains and land development projects, such as residential and commercial developments, may affect flood flow volume or rates due to increases in impervious area. However, all projects under the No Project Alternative would be required to comply with FEMA regulations and the requirements set forth in USEO 11988, similar to the HSR Build Alternative described below.

In addition, due to other approved transportation improvement projects and land development projects, there would be an overall increase in impervious surface area as a result of the No Project Alternative. Increases in impervious surfaces could lead to increased volumes and velocities of stormwater runoff and pollutants of concern reaching receiving waters. Short-term water quality effects would occur as a result of construction activities associated with the No Project Alternative. Long-term water quality effects would occur from continued operation of existing highways, airports, and railways and from operational activities associated with the new projects under the No Project Alternative. It is reasonable to assume that planned developments would comply with existing laws and regulations that protect surface water hydrology, including various CWA Section 402 NPDES permits.

The demand for domestic water supply would increase as a result of the anticipated increased population, and aquifers could continue to experience drawdown effects if groundwater withdrawals exceed recharge rates. Further, increases in impervious surfaces could further decrease the amount of runoff that is able to infiltrate and recharge the aquifer or groundwater basin. Overall, effects associated with the No Project Alternative would be similar to effects associated with the HSR Build Alternative. Planned development would comply with existing laws, regulations, and agencies that protect groundwater resources.

6.1.2 High-Speed Rail Build Alternative

The following summarizes potential hydrology and water resources effects as a result of implementation of the HSR Build Alternative.

6.1.2.1 Construction Impacts

Impact HWR#1: Effects to Floodplains

Temporary Construction Effects

Construction of the HSR Build Alternative would occur in or over FEMA-designated floodplains summarized in Table 6-1. As shown in Table 6-1, the HSR Build Alternative would cross the floodplain associated with the Lockheed Channel, the Burbank Western Channel, and the Los Angeles River. The HSR Build Alternative would cross the Los Angeles River 100-year floodplain at the following three locations:

- An existing rail bridge north of SR 110 (Los Angeles River Downey Bridge)
- A new vehicular bridge for the proposed Main Street grade separation adjacent to the existing Main Street bridge
- An existing rail bridge southeast of Bolero Lane (Mission Tower Bridge)

The effects of these floodplain crossings are discussed further below. The Verdugo Wash, has not been mapped as a 100-year floodplain by FEMA and is therefore not discussed further.

Construction activities associated with the HSR Build Alternative in these FEMA-designated floodplains would include grading and excavation; construction of bridges, culverts, embankments, and/or retaining walls; placement of fill, and street demolition/reconstruction. During construction, construction equipment, materials, and temporary staging areas near the Lockheed/Burbank Western Channel confluence and at the Main Street crossing over the Los Angeles River would be present in floodplains. These construction activities could temporarily impede or redirect flood flows which has the potential to increase flood elevations, redefine flood hazard areas, and cause flooding in areas previously not at risk from the 100-year flood. In addition, construction workers would be exposed to potential risk associated with floods. Construction of the HSR Build Alternative in this subsection would require temporary fill and structures inside of 100-year floodplains regulated by FEMA, which could result in temporary effects on the vertical profile and horizontal extent of existing 100-year floodplains. Construction in a floodplain could also temporarily impede or redirect flood flows because of the presence of construction equipment and materials in the floodplain, depending on the activity occurring within a specific area.

As specified in HYD-IAMF#2, the footprint of structures would be minimized within the floodplain to the maximum extent practicable, and all floodplains temporarily disturbed during construction activities would be restored to their pre-existing conditions. In addition, as specified in HYD-IAMF#3, construction of the HSR Build Alternative would comply with the requirements of the Construction General Permit, which includes preparation of a SWPPP and implementation of Construction BMPs. Construction BMPs would include, but not be limited to: Erosion Control and Sediment Control BMPs designed to minimize erosion and retain sediment on-site and Good Housekeeping BMPs designed to prevent and contain spills and leaks, and prevent discharge of construction debris and waste into receiving waters and floodplains. In addition, construction activities would be short-term and equipment and materials would be required to be stored outside of the floodplain to minimize the potential flood risk. The construction site superintendent would monitor weather conditions for heavy storms (and potential flood flows). In the event that a heavy storm or flood event is identified, construction activities would be halted until the storm or flood event passes. In addition, construction workers would be notified and vacated from the 100-year flood hazard area to avoid potential harm associated with a flood, and construction equipment within flood control channels (i.e., the Lockheed Channel, the Burbank Western Channel, and the Los Angeles River) would be relocated outside of the flood control channel. Therefore, the HSR Build Alternative would store construction equipment and materials outside of the floodplain and monitor weather conditions to minimize effects to floodplains during construction.

Table 6-1 Floodplains Crossed by the High-Speed Rail Build Alternative

Surface Water Crossing	FEMA FIRM Panel	FEMA Special Flood Hazard Area[1] and Estimated Floodplain Level	Approximate Length of Floodplain Crossed (miles)[2]	Cubic Feet of Structure Within Floodplain	Area of Impact (acres)	HSR Build Alternative Component	Crossing Type
Lockheed Channel (near Hollywood Way)	06037C1525F	Zone AE	0.09[4]	0	0	Below Grade Alignments	Below Grade
Lockheed Channel	06037C1328F 06037C1329F 06037C1337F	Zone AE (Min: 171.3 feet; Max: 193.0 feet)	0.38[4]	0	1.05 (realigned)	Surface and Below Grade Alignments	Surface/Below Grade
Burbank Western Channel	06037C1337F 06037C1329F 06037C1345F	Zone AE (Min: 168.4 feet; Max: 175.5 feet)	0.02	13,500	0.51 (covered)	Surface Alignment	Surface
Verdugo Wash Bridge	06037C1345F	N/A[3]	0.017	0	0	Electrified and Non-Electrified Tracks	Replacement Bridge
Los Angeles River at Downey Bridge	06037C1628F	Zone AE (Min: 88.6 feet; Max: 92.9 feet)	0.071	0	0	Electrified Tracks	Existing Bridge
Los Angeles River at Main Street Grade Separation	06037C1636F	Zone AE (Min: 80.3 feet; Max: 93.6 feet)	1.38	12,096	0.005(fill)	Roadway Bridge	New Bridge
Los Angeles River at Mission Tower Bridge	06037C1636F	Zone AE (Min: 82.3 feet; Max: 92.8 feet)	0.05	0	0	Non-Electrified Tracks	Existing Bridge

Source: California High-Speed Rail Authority 2019c

1 Special flood-hazard areas (i.e., 100-year flood areas) designated by FEMA. Flood-hazard areas impacted by the HSR Build Alternative include Zone AE (the floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1 percent annual chance flood can be carried without substantial increases in flood heights). The HSR Build Alternative would not encroach on Zone A of the Los Angeles River.

2 Crossing lengths estimated using GIS based on FEMA FIRMs and the HSR Build Alternative centerline, unless otherwise noted.

3 No floodplains for the Verdugo Wash or the Arroyo Seco are mapped by FEMA.

4 Crossing length of the proposed realigned Lockheed Channel.

FEMA = Federal Emergency Management Agency
FIRM = Flood Insurance Rate Map
GIS = geographic information system
HSR = High-Speed Rail
Max. = maximum
Min. = minimum
N/A = not applicable

Permanent Construction Effects

The improvements associated with the HSR Build Alternative would mostly take place outside of the 100-year floodplain. The improvements at each surface water crossing are described in detail below.

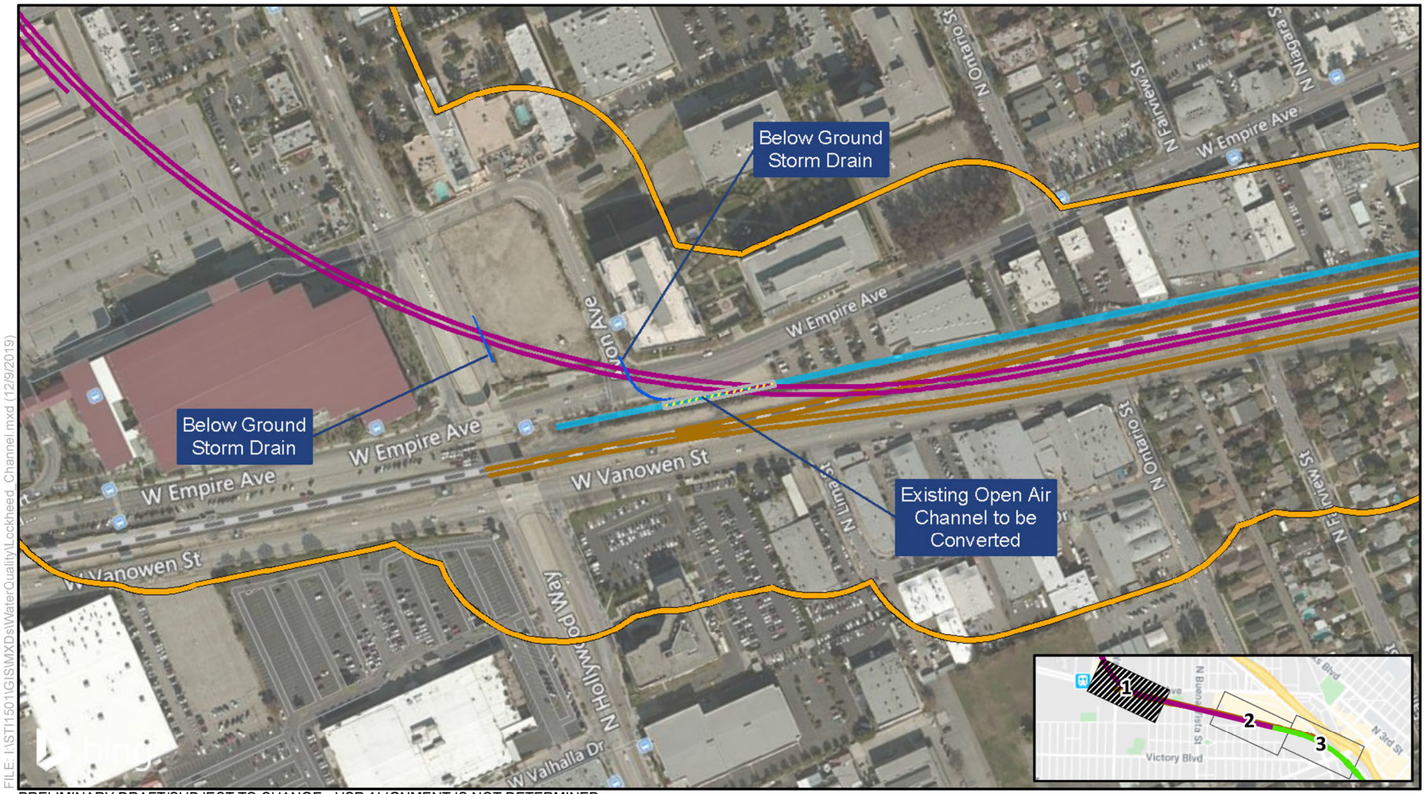
Lockheed Channel

The Lockheed Channel would be realigned in two locations due to implementation of the HSR Build Alternative. The proposed realignment of the Lockheed Channel is depicted on **Error! Reference source not found.**. The upstream realignment would be located between Avon Street and Lima Street. At this location, the HSR tracks would be constructed through the use of cut-and-cover. The alignment of the Lockheed Channel would be in approximately the same location as existing conditions; however, construction of a new box culvert would be required where the HSR tracks cross the Lockheed Channel.

The downstream realignment would take place between Lincoln Street and the channel's confluence with the Burbank Western Channel. In the existing condition, the Lockheed Channel crosses under the Metrolink and UPRR tracks just east of Lincoln Street. The HSR tracks would parallel the Metrolink and UPRR tracks at this location, but the elevation would be below the existing tracks by approximately 30 feet and would conflict with the existing channel. Therefore, the Lockheed Channel crossing would be relocated to the east, where the proposed HSR tracks would be constructed above ground level.

The realignments of Lockheed Channel would be required to comply with the requirements of the Los Angeles County Flood Control District Hydraulic Design Manual, which requires the design of the drainage facilities to maintain the existing hydraulic grade when joining a new or realigned facility to the existing facility. For the upstream realignment of the Lockheed Channel, the capacity of the new portion of the channel would be increased to maintain/improve the hydraulic grade within the existing Lockheed Channel. Therefore, the proposed Lockheed Channel realignments would either maintain or slightly lower the hydraulic grade line of all inlets to the Lockheed Channel. The channel would be designed to accommodate flows within the channel, and the realignments would not affect the 100-year floodplain elevations as the hydraulic grade line (water surface of open flow) of all inlets to the Lockheed Channel would be the same or lower than the existing water surface elevation for the Lockheed Channel. Therefore, the hydraulics of the adjoining storm drain system would be minimally improved over the existing condition. Although flooding currently occurs in this location due to the overtopping of the Lockheed Channel and would continue to occur under the proposed condition, this flooding would be minimally reduced due to the lower hydraulic grade line of the inlets to the Lockheed Channel.

The existing non-electrified tracks along Vanowen Street would be modified to accommodate the additional electrified tracks within the existing rail corridor. The trackwork proposed along Vanowen Street would be adjacent to the 100-year floodplain associated with the Lockheed Channel and may involve the placement of fill within land designated as part of the Lockheed Channel 100-year floodplain. As mentioned above, flooding currently occurs in this location during 100-year storm events.



FILE: I:\STI1501\GIS\MXDs\WaterQuality\Lockheed_Channel.mxd (12/9/2019)

PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
SOURCE: Bing (2018); CHSRA (11/2019)

N

0 175 350 Feet

0 55 110 Meters

- Resource Study Area
- Existing Structure
- Proposed Structure
- Storm Drains

HSR Build Alternative

- Surface
- Below-Grade
- Realigned, Non-electrified Tracks

Potential Non-Wetland Waters of the U.S.

- Riverine

Project Design Features related to Lockheed Channel

- Temporary Impacts to Existing Channel (0.63 acre total)
- Proposed Channel Realignment (2.02 acres total)
- Existing Open Air Alignment to be Converted (1.65 acres total)

Figure 6-1 Lockheed Channel Realignment

(Sheet 1 of 3)

Figure 6-1 Lockheed Channel Realignment

(Sheet 2 of 3)

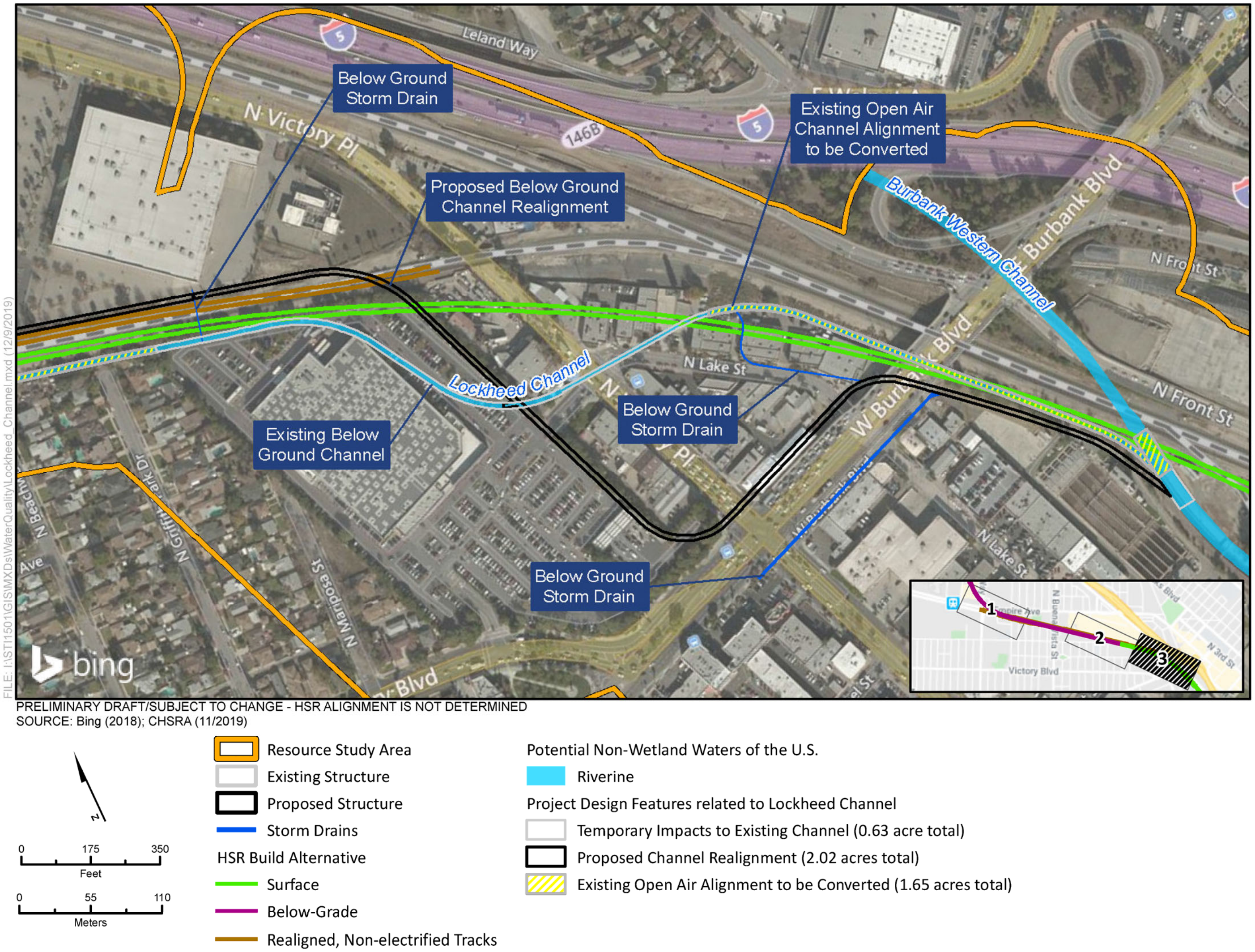


Figure 6-1 Lockheed Channel Realignment

(Sheet 3 of 3)

The placement of new structures associated with the Victory Place railroad bridge within the limits of the Lockheed Channel floodplain could result in additional flooding in a narrow strip along the north side of the Lockheed Channel, extending from N Buena Vista Street to Victory Place. However, the additional flooding would occur in an area that is already flooded during 100-year storm events in the existing condition. The changes in flood elevations would be limited to areas already affected by flooding, and additional flooding would not occur in areas not already flooded during 100-year storm events. Additionally, the new railroad bridge at Victory Place and development of HSR tracks would result in the demolition of several buildings within the limits of existing flooding and would not increase flooding at any buildings that would remain within the flood zone. Therefore, no buildings would be affected by any change in water surface elevation. Further, as described above, the proposed Lockheed Channel realignments would either maintain or slightly lower the hydraulic grade line of all inlets to the Lockheed Channel. Although the HSR Build Alternative would place structures within the floodplain (i.e., support structures for the tracks and a new railroad bridge), buildings would be removed and the capacity of the Lockheed Channel would be maintained.

The existing Burbank Boulevard overcrossing would be reconstructed to cross over the electrified and non-electrified tracks and the roadway on the west side would be raised in elevation on retained fill. Work proposed on Burbank Boulevard would be within and adjacent to the 100-year floodplain associated with the Lockheed Channel. However, the placement of structures and fill associated with reconstruction of the overcrossing would be similar to the existing condition and would not result in an increase in water surface elevation. Additionally, as described above, the proposed Lockheed Channel realignments would either maintain or slightly lower the hydraulic grade line of all inlets to the Lockheed Channel.

Because portions of the proposed HSR Build Alternative would be located in FEMA-designated floodplains, the requirements set forth in USEO 11988, Floodplain Management, would apply. USEO 11988 requires compliance with the National Flood Insurance Program, which aims to reduce the effect of flooding on private and public structures. FEMA regulations require a floodplain analysis to demonstrate that projects are prevented from increasing the base flood elevation by greater than 1 foot in floodplains or substantially changing the floodplain limits, as specified in HYD-IAMF#2. Although the HSR Build Alternative would place structures within the floodplain, the realignments would maintain or slightly lower the hydraulic grade line of the channel. Thus, the channel would be designed to accommodate flows within the channel, which is in compliance with the requirements set forth in USEO 11988 and the FEMA regulations (HYD-IAMF#2). In addition, the tracks and roadway would be elevated above the floodplain and would, therefore, not expose passengers or motorists to flooding risks above the existing condition as flooding would be contained with the limits of the Lockheed Channel (except for the area already affected by flooding discussed above).

Burbank Western Channel

The HSR Build Alternative would cross the Burbank Western Channel just south of Burbank Boulevard, near I-5, at the Burbank Western Channel and Lockheed Channel confluence. At the proposed water crossing of the Burbank Western Channel, the channel is capped and changes from a 30-foot-wide reinforced concrete box culvert to a 50-foot-wide, open, concrete-lined channel. The Burbank Western Channel was designed to convey a 13,200 cfs flow upstream of the channel transition and a 15,000 cfs flow downstream of the channel transition. In the existing condition, the 100-year flood is contained within the Burbank Western Channel downstream of Magnolia Boulevard, south of the proposed HSR crossing. However, during the 100-year storm, the Burbank Western Channel overflows upstream of Magnolia Boulevard and existing storm drains may cause localized flooding. The proposed channel crossing would include extending the existing capped channel by a short additional length. In addition, the Lockheed Channel would be realigned to join with the Burbank Western Channel downstream of the existing condition at the same angle as under the existing condition. The extension of the capped channel would place structures within the 100-year floodplain; however, because the realigned Lockheed Channel would join the Burbank Western Channel at the same angle, the watercourse's ability to convey peak flows would not be reduced.

The 1999 *USACE Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual* (USACE manual) includes design flow rate information, typical cross-sections, and required freeboard for major drainage facilities built by USACE in Los Angeles County. The Burbank Western Channel was built by USACE, and the required freeboard established by the USACE manual is 1.5 feet in the covered channel portion and 2 feet in the open channel portion. Under the existing condition, the design storm is contained within the channel with a freeboard of approximately 5.43 feet, which is greater than the required freeboard of 2 feet. As shown in Table 6-2, the maximum change in water surface elevation from construction of the Burbank Western Channel crossing would be approximately 0.18 foot. Although the HSR Build Alternative would increase water surface elevation within the channel, the design storm would continue to be contained in the channel with a freeboard of approximately 5.25 feet in the vicinity of the Burbank Western Channel crossing. The freeboard under the proposed condition would continue to be greater than the USACE-required freeboard of 2 feet for open channel portions.

Table 6-2 Floodplain Crossings Water Surface Elevation Comparison

Surface Water Crossing Location	Maximum Change in Water Surface Elevation (feet)	Distance from Crossing (feet)[1]	Length of Impact (feet)[2]
Lockheed Channel	No change in water surface elevation; the channel realignment would either maintain or slightly lower the hydraulic grade line of the channel and all inlets to the channel under the proposed condition.		
Burbank Western Channel	0.18	625	0
Verdugo Wash Bridge	No change in water surface elevation; the channel would be spanned under proposed conditions, as it is under existing conditions.		
Los Angeles River at Downey Bridge	No change in water surface elevation; the existing bridge structure would not be modified under proposed conditions.		
Los Angeles River at Main Street Grade Separation	0.17	223	713
Los Angeles River at Mission Tower Bridge	No change in water surface elevation; the existing bridge structure would not be modified under proposed conditions.		

Source: California High-Speed Rail Authority, 2019c, 2019e
[1] Distance from the HSR crossing where the maximum change in water surface elevation occurs.
[2] Length along the centerline of the channel for which the water surface elevation is greater than 0.1 foot above existing conditions.
HSR = high-speed rail

In addition, the water surface elevation at the Burbank Western Channel and Lockheed Channel confluence would decrease by approximately 3 feet due to realignment of the Lockheed Channel. The realignment would move the Lockheed Channel and Burbank Western Channel confluence downstream, which would change the hydraulics at that location and decrease the water surface elevation. The HSR Build Alternative would include flood protection measures that would minimize effects on the vertical profile, horizontal extent, flow patterns, and peak flows of 100-year floodplains. Project features include the development and implementation of a Flood Protection Plan that would include specific measures to minimize development within floodplains and prevent increases in 100-year water surface elevations by more than 1 foot (as required by HYD-IAMF#2). Additionally, the Authority would design the shape and alignment of the piers to minimize adverse hydraulic effects. The HSR Build Alternative would also comply with the requirements set forth in USEO 11988, Floodplain Management, and FEMA regulations.

USEO 11988 requires compliance with the National Flood Insurance Program, which aims to reduce the effect of flooding on private and public structures. FEMA regulations require a floodplain analysis to demonstrate that projects are prevented from increasing the base flood elevation by greater than 1 foot in floodplains or substantially changing the floodplain limits. Additionally, a Conditional Letter of Map Revision/Letter of Map Revision would be obtained from FEMA. The Conditional Letter of Map Revision would serve as FEMA's acknowledgement that the HSR Build Alternative would affect the base flood elevation or modify the boundaries of a floodplain. The Letter of Map Revision would officially revise the FIRM to reflect the change in the floodplain. Modifying the FIRM ensures that future development can account for the change in the conditions of the floodplain to reduce the risk of flooding to future development proposed in the area. Therefore, compliance with HYD-IAMF#2, the requirements set forth in USEO 11988, and FEMA requirements would minimize permanent effects from construction within the Burbank Western Channel floodplain.

Verdugo Wash Bridge (Electrified and Non-Electrified Tracks)
The proposed electrified and relocated non-electrified tracks would cross the Verdugo Wash just east and upstream of its confluence with the Los Angeles River. At the proposed water crossing of the Verdugo Wash, the channel is approximately 86 feet wide, rectangular, and concrete lined. The channel is concrete lined to reduce potential erosion or siltation from high-velocity stormwater flows. The current FEMA FIRM does not include any information for the area within the city of Glendale; therefore, no floodplains are mapped for the Verdugo Wash. Development of the HSR Build Alternative would reconstruct the existing spanning bridge in order to accommodate the new electrified tracks along with the relocated existing non-electrified tracks to the east. The proposed bridge would span the Verdugo Wash and would not require modifications to the Verdugo Wash. The Los Angeles County 50-year design storm event of 42,900 cfs would continue to be contained in the channel with a minimum freeboard[8] of 2.9 feet that exceeds the County requirement of 2.5 feet of freeboard for this channel. Therefore, because the replacement bridge (similar to the existing bridge) would not impede the channel, no effects to existing floodplain values or uses of the Verdugo Wash would occur during operations.

Los Angeles River at Downey Bridge (Electrified Tracks)
The HSR Build Alternative would cross the Los Angeles River at the existing Downey Bridge (currently used by passenger rail operators) north of SR 110 and west of the I-5/SR 110 interchange. The existing bridge would be electrified to support HSR trains, but the structure would not otherwise be modified and, therefore, would not require any modifications to the existing Los Angeles River floodplain crossing at Downey Bridge. The existing floodplain would remain the same as it is under existing conditions and the current capacity of the channel would not be reduced due to the improvements to the existing bridge. During operations of the HSR Build Alternative, the design storm would continue to be contained in the channel with a minimum freeboard of just less than 7 feet in the vicinity of the Downey Bridge. The improvements to the existing bridge would not result in any effects to the existing Los Angeles River floodplain values or uses during operations of the HSR Build Alternative at Downey Bridge.

Los Angeles River at Main Street (Roadway Bridge)
A new grade separation would be required at Main Street and at the existing railroad tracks on both sides of the Los Angeles River, as the current historic bridge is at the same grade as the existing tracks. As the existing railroad tracks are on the west and east banks of the Los Angeles River, the grade separation would include a new bridge structure parallel to the existing historic Main Street Bridge. This early action project is described in more detail in Section 2.6. At the location of the proposed new bridge, the Los Angeles River channel is approximately 280 feet wide and is trapezoidal with concrete lining. In addition, a trapezoidal low-flow channel runs in the center of the channel. Main Street would be elevated on an aerial structure and would cross the Los Angeles River at a different location compared to the existing condition. The existing historic Main Street bridge would remain. The new Main Street bridge over the Los Angeles River would place three support columns within the Los Angeles River channel, within the 100-year floodplain. The columns could reduce the watercourse's ability to convey peak flows by reducing the floodplain's capacity to convey flows, resulting in potential effects to floodplains. Therefore, the proposed Main Street grade separation would encroach into the Los Angeles River floodplain.

The 1999 USACE manual includes design flow rate information, typical cross-sections, and required freeboard for major drainage facilities built by USACE in Los Angeles County. The Los Angeles River channel was built by USACE, and the required freeboard established by the

[8] Freeboard is the distance between the maximum calculated flood elevation and the top of a channel or bottom of a bridge structure. Freeboard is a factor of safety that compensates for the unknown factors that contribute to flood heights greater than the height calculated for a selected size flood (FEMA 2016).

USACE manual is 2.5 feet. Under the existing condition, the design storm is contained within the channel with a freeboard of approximately 8.77 feet, which is greater than the required freeboard of 2.5 feet. As shown in Table 6-2, the maximum change in water surface elevation from construction of the proposed new Main Street bridge would be approximately 0.17 foot. Although the HSR Build Alternative would increase water surface elevation within the channel, the design storm would continue to be contained in the channel with a freeboard of approximately 8.6 feet in the vicinity of the Main Street roadway bridge; the freeboard under the proposed condition would continue to be greater than the USACE-required freeboard of 2.5 feet.

The HSR Build Alternative would include flood protection measures that would minimize effects on the vertical profile, horizontal extent, flow patterns, and peak flows of 100-year floodplains. Project features include the development and implementation of a Flood Protection Plan that would include specific measures to minimize development within floodplains and prevent increases in 100-year water surface elevations by more than 1 foot and optimize bridge designs to minimize backwater (as required by HYD-IAMF#2). Additionally, the Authority would design the shape and alignment of the piers to minimize adverse hydraulic effects. The HSR Build Alternative would also comply with the requirements set forth in USEO 11988, Floodplain Management and FEMA regulations. USEO 11988 requires compliance with the National Flood Insurance Program, which aims to reduce the effect of flooding on private and public structures. FEMA regulations require a floodplain analysis to demonstrate that projects are prevented from increasing the base flood elevation by greater than 1 foot in floodplains or substantially changing the floodplain limits. Additionally, a Conditional Letter of Map Revision/Letter of Map Revision would be obtained from FEMA. The Conditional Letter of Map Revision would serve as FEMA's acknowledgement that the HSR Build Alternative would affect the base flood elevation or modify the boundaries of a floodplain. The Letter of Map Revision would officially revise the FIRM to reflect the change in the floodplain. Modifying the FIRM ensures that future development can account for the change in the conditions of the floodplain to reduce the risk of flooding to future development proposed in the area. Therefore, through compliance with HYD-IAMF#2, the requirements set forth in USEO 11988, and FEMA requirements, permanent effects from construction within the Los Angeles River floodplain would be minimized.

The project would require review from USACE under Section 408 where the subsection would include modifications or alterations of any federal flood control facility built to ensure that its usefulness is not impaired. The Los Angeles River is a USACE facility under Section 14 of the Rivers and Harbors Act of 1899, as amended and codified in 33 U.S. Code 408 (Section 408). Therefore, during the design phase, the Authority would be required to coordinate with the Los Angeles County Flood Control District and USACE to obtain Section 408 review for the Los Angeles River new bridge crossing. Section 408 provides that USACE may grant permission for another party to alter a USACE flood control facility upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the facility.

Los Angeles River at Mission Tower Bridge (Non-Electrified Tracks)

The existing non-electrified tracks would cross the Los Angeles River floodplain on the existing Mission Tower Bridge southeast of Bolero Lane. No proposed modifications to the Mission Tower Bridge would occur, other than to reinstall a set of non-electrified tracks on the existing bridge. Therefore, because the existing Mission Tower Bridge would not be modified, the Los Angeles River floodplain crossing at Mission Tower Bridge would not be modified. The existing floodplain would remain the same as it is under existing conditions and the current capacity of the channel would not be reduced due to the restoration of tracks at the existing bridge. The non-electrified tracks would not result in any effects to the existing Los Angeles River floodplain values or uses during operations of the HSR Build Alternative at Mission Tower Bridge.

Impact HWR#2: Effects to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Temporary Construction Effects

Construction activities such as grading and excavation associated with the HSR Build Alternative could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events. However, construction of the HSR Build Alternative would be subject to the requirements of the Construction General Permit. Compliance with the Construction General Permit requires the preparation of a SWPPP to identify project-specific construction BMPs to be implemented as part of the HSR Build Alternative at all construction sites and in adjacent areas during construction. Construction BMPs include both structural and nonstructural (institutional) BMPs. Structural BMPs include temporary silt fences, fiber rolls, sand bag barriers, diversion berms and drainage swales, and check dams. Nonstructural BMPs are incorporated into the operation of the construction site and include preserving existing vegetation, hydroseeding, dust control, and street/parking lot sweeping. Construction BMPs, such as check dams and preserving existing vegetation, would reduce the volume and rate of stormwater runoff during construction activities. The SWPPP would also describe temporary drainage patterns within the construction sites and indicate stormwater discharge locations from the construction sites to the existing drainage system. Further, hydromodification management controls would be implemented during construction to maintain pre-project hydrology by emphasizing on-site retention of stormwater runoff. These procedures are specified in Impact Avoidance and Minimization Feature (IAMF) HYD-IAMF#3.

In-water work during construction of the bridge piers in the Los Angeles River associated with the Main Street crossing would be restricted to the dry season. Additionally, fill would be required to be placed within or adjacent to the Lockheed Channel and the Burbank Western Channel in the city of Burbank. If the channel has year-round flows, the contractor would develop a water diversion plan prior to construction. A water diversion plan includes the installation of cofferdams or sandbag barriers around the work areas (such as in locations where piers or abutments would be constructed) to keep water out and to reduce sediment pollution from construction work in and under water. Once construction is complete, the temporary water diversion would be removed, and the channel would be restored to its pre-construction condition. The HSR Build Alternative would also be required to comply with any additional conditions of the Section 404 Nationwide Permit 14 authorized by the USACE and the Section 401 Permit from the SWRCB to reduce hydrologic and drainage effects to these surface waters.

The depth to groundwater varies along the project footprint. Groundwater is generally deep (i.e., more than 100 feet) near the northern terminus of the HSR Build Alternative. Historically, groundwater in the vicinity of the below grade sections of the HSR Build Alternative was as high as 40 to 64 feet bgs. The below grade sections are anticipated to be above the groundwater table. However, not enough groundwater information is available at this time to rule out the potential for groundwater to be encountered during construction of the below-grade sections (tunnel beneath Hollywood Burbank Airport, cut-and-cover from south of the airport to the Metrolink Ventura Subdivision, and the trench within the Metrolink Ventura Subdivision to near Beachwood Drive in the city of Burbank). Consequently, it was conservatively assumed that construction of the below grade sections could encounter groundwater. Shallow groundwater (less than 50 feet bgs) also occurs within the direct RSA, especially in locations adjacent to the Los Angeles River. Pier construction for the Main Street crossing would extend to approximately 50–120 feet bgs and could encounter groundwater (Jacobs 2016). Additionally, there is potential to encounter groundwater during the Flower Street and Goodwin Avenue/Chevy Chase Drive grade separations, which are early action projects described in more detail in Section 2.6. Groundwater encountered during construction would be removed and disposed of according to the requirements of the Los Angeles RWQCB's Dewatering Permit, described in Section 3.3.1.2, Groundwater Dewatering Permit. The Los Angeles RWQCB Dewatering Permit covers discharges of treated or untreated groundwater from dewatering operations to surface waters. Water produced during dewatering activities that is discharged to surface waters could affect the hydraulics of the surface water channel by increasing the volume of stormwater runoff flowing within the channel. However, the discharge of dewatered groundwater to surface waters would be temporary and would cease once pier construction and directional boring are complete.

Permanent Construction Effects

Stormwater and Drainage

Implementation of the HSR Build Alternative would result in alteration of the existing drainage patterns and related hydromodification[9] effects due to development of the HSR Build Alternative's project elements. The existing impervious surface area in the project footprint is approximately 266 acres (69 percent of the 388-acre permanent project footprint). Development of the HSR Build Alternative would increase impervious surface area by approximately 19 acres, resulting in a proposed impervious surface area of approximately 285 acres (74 percent of the project footprint). Increasing the amount of impervious surface area has the potential to increase the rate and volume of stormwater runoff reaching receiving waters and alter the existing drainage pattern. Because the HSR Build Alternative would create and/or replace more than 5,000 square feet (0.11 acre) of impervious surface, the California HSR project would be considered a "Regulated Project" under the Phase II MS4 Permit and would be required to implement measures for runoff reduction and hydromodification management.

The HSR Build Alternative would add new tracks, shift the existing tracks within the existing railroad corridor, and would widen the right-of-way in some locations. The surface along the track alignment would consist of gravel, which would be considered pervious; however, gravel included in the subballast would be considered impervious. Extending and/or widening the track ballast may affect the drainage patterns in the vicinity of the direct RSA; however, track drainage would be a very small component of the overall drainage area and would not substantially affect the rates and volumes of stormwater runoff in the area. In addition, the area within the existing right-of-way is highly compacted and primarily impervious; therefore, the net change in rate and volume of stormwater runoff would be similar to existing conditions. Additionally, post-construction hydromodification BMPs would be implemented to reduce the rate and volume of stormwater runoff associated with the project. Overall, the proposed drainage system would collect, convey, and discharge surface water runoff from the HSR Build Alternative track right-of-way to the existing storm drain system while maintaining the existing drainage pattern to the maximum extent practicable, in compliance with the requirements of the Phase II MS4 Permit.

Below is a more detailed description of the proposed drainage system and drainage pattern that may occur as a result of the HSR Build Alternative based on the type of structure proposed (i.e., aerial or at-grade structures). These drainage systems are a design feature included in HYD-IAMF#1.

Aerial structure decks would be impervious. The proposed aerial structures (i.e., bridges) would involve the installation of piers to support the bridges. The bridges would not result in a substantial increase in impervious surface area as they would be in an impervious urban area. Overall, increases in impervious surface area would be small compared to the size of the watershed in which they are located. Two methods of track construction are being considered for aerial structures. One method, known as direct fixation or slab track, would attach the track directly to the structural concrete. The other method, known as traditional ballast track, would attach the rails to crossties situated on stone ballast. Slab track would likely drain to the center, between the tracks, and be piped parallel to the track until it can be conveyed to a post-construction BMP prior to discharge to the local storm drain system at column locations. Ballast track would drain away from the centerline of the rails and be collected by a piped system, then routed to post-construction BMPs prior to discharge to the local storm drain system.

For at-grade sections of the track, stormwater runoff would either be discharged to storm drain piping downgrade of the ballast or infiltrate back into the ground adjacent to the tracks in the open drainage condition.

Tracks placed on retained fill with retaining walls would feature drainage ditches near the base of the wall to prevent the buildup of stormwater. Drainage from the track bed would be collected through piped drainage systems. Periodic storm drains may also be incorporated behind the top

[9] Hydromodification is the alteration of the natural hydrology associated with changes in land use and cover that results in negative impacts to watershed health and functions.

of the retaining walls to accommodate peak events. Although the location of infiltration would be slightly altered, runoff would drain to the pervious ground surface or unlined drainage ditches and basins.

In addition, the HSR Build Alternative would cross nine roadways, five of which would require modifications. Additionally, four at-grade crossings (Sonora Avenue, Grandview Avenue, Flower Street, and Main Street) are proposed to be grade separated. One grade separation (Buena Vista Street) would remain at grade for Metrolink and UPRR tracks, but a new undercrossing would be constructed to grade separate the HSR tracks from the roadway. One new undercrossing (Goodwin Avenue) is proposed. Six existing undercrossings (Victory Place, Alameda Avenue, Colorado Street, Los Feliz Boulevard, Glendale Boulevard, and Kerr Road) are proposed to be modified. Two existing at-grade crossings (Chevy Chase Drive and LADWP private road) are proposed to be closed. Finally, one new pedestrian undercrossing at Chevy Chase Drive would be provided. Undercrossings change the hydrology and drainage in the area by depressing a large area below the existing ground level. For undercrossings, stormwater runoff would drain to the sump and then be pumped to a nearby drainage system. Overcrossings can alter the hydrology and drainage in the area by increasing impervious surface area. Only one new overcrossing over a waterbody would be constructed as part of the HSR Build Alternative at Main Street. Several of the new grade separations would require new access roads to connect to the existing roadway network. On-site stormwater runoff would flow into roadside ditches and infiltrate. Off-site stormwater runoff would flow to an existing storm drain system. Additional catch basins and/or storm drains would be installed as required to meet the applicable jurisdictions' hydrologic criteria to capture, infiltrate, or treat stormwater runoff from the 85th percentile storm event.[10]

There are 28 minor cross-drainage locations (where the proposed track drainage system would tie into the existing storm drain system) along the direct RSA. Storm drain hydraulics would be reviewed to identify if the existing drainage systems are sufficient to support the changes in drainage proposed as part of the HSR Build Alternative, as specified in HYD-IAMF#1. *Technical Memorandum 2.6.5: Hydraulics and Hydrology Design Guidelines* (Authority and FRA 2010) requires that drainage facilities adjacent to the HSR tracks be designed for the peak 50-year storm event in urban areas within the right-of-way; however, this is substantially greater than the current design capacity of the cross-drainage systems. Stormwater flows associated with the 50-year storm event would likely not be able to be accommodated by systems designed for smaller events. Therefore, it is unlikely that the drainage systems for the HSR Build Alternative would connect to local systems because these local systems are sized to accommodate runoff from storm events that are smaller than a 50-year storm.

Drainage alternatives will be evaluated as more information becomes available. Drainage facilities would be designed in compliance with the applicable jurisdiction requirements (City of Burbank, City of Glendale, Los Angeles County Flood Control District, or the USACE) and would comply with the design standards in the in the latest version of Authority Technical Memorandum *2.6.5 Hydraulics and Hydrology Guidelines* to ensure that capacity of downstream drainage systems are not exceeded. Storage facilities, such as basins or subsurface systems, may be required for flow attenuation. If it is determined that the subdrainage system within the direct RSA would support infiltration to reduce the velocity and volume of runoff, then infiltration devices would be incorporated and would connect to the existing drainage system. Another alternative would be to provide storage systems that would control the discharge of stormwater runoff from the HSR Build Alternative to maintain the current design capacity. Stormwater runoff could also be conveyed to proposed grade separations, where the pump would control discharge rates. Lastly, existing drainage patterns during large storm events that exceed the drainage system design capacity would be further evaluated during the design/build phase as more information becomes available to identify drainage improvements that would provide adequate capacity in compliance with the design standards of the applicable jurisdictions and the latest version of

[10] The 85th percentile storm event is an event where the precipitation total is greater than or equal to 85 percent of all 24-hour storms on an annual basis.

Authority Technical Memorandum *2.6.5 Hydraulics and Hydrology Guidelines* in order to ensure that stormwater runoff is adequately captured and conveyed.

Hydraulics
The HSR Build Alternative would cross Lockheed Channel, Burbank Western Channel, Verdugo Wash, and the Los Angeles River. Table 6-1 lists the surface water crossing locations the HSR Build Alternative crosses, the area of impact, the HSR Build component, and the crossing type. All crossings would be designed to provide flow conveyance and connectivity. The hydraulic design of the crossings would comply with the hydraulic criteria of the applicable jurisdiction, as described above. The bridge crossings would be elevated a minimum of 3 feet above the high-water surface elevation, and piers and/or columns associated with the Main Street grade separation placed within the Los Angeles River channel would be oriented parallel to the expected high-water flow direction, as specified in HYD-IAMF#2. In addition, the placement of fill would be minimized in the flow channel to reduce potential hydraulic effects. The columns required for the Main Street grade separation would be placed within the Los Angeles River flow channel to support the aerial structure/bridge. However, the placement of additional soil or fill would not be required within the Los Angeles River.

However, fill would be required to be placed within or adjacent to the Lockheed Channel and the Burbank Western Channel in the city of Burbank. Therefore, the HSR Build Alternative would be required to comply with Section 404 and Section 401 of the CWA. In addition, all permits and notifications required by the City of Burbank would be completed, and all conditions of approval would be adhered to, unless authorized by the City of Burbank.

In summary, stormwater runoff captured within the direct RSA would be directed to existing facilities, maintaining the existing drainage pattern to the maximum extent practicable. It is anticipated that existing stormwater facilities would have capacity to accommodate the minimal amount of project runoff. However, additional stormwater facilities and LID techniques would be provided as required to capture and reduce project runoff (HYD-IAMF#1). In addition, all surface water crossings would be designed to provide flow conveyance and minimize the placement of structures (i.e., columns and fill) within the flow channel (HYD-IAMF#2).

Impact HWR#3: Effects to Surface Water Quality

Temporary Construction Effects

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants could have a detrimental effect on water quality. During construction activities, excavated soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products (such as paints, solvents, and fuels), and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters and could have a detrimental effect on surface water quality.

The potential effects to water quality during construction of the HSR Build Alternative would occur both on land and within the channels. Construction activities associated with the HSR Build Alternative would disturb approximately 594 acres of soil (both upland and within waterbodies) which includes work within three waterbodies (the Lockheed Channel, the Burbank Western Channel, and the Los Angeles River). [11] During ground-disturbing activities, land and vegetation would be cleared, thereby exposing soil to the potential for erosion. When new structures are installed (e.g., HSR track bed, overcrossings, undercrossings, Burbank Airport Station), concrete and/or asphalt applications could be a source of fine sediment, metals, and chemicals that could affect downstream waterbodies if BMPs are not implemented correctly. Grading and other earthmoving activities during construction could be a source of petroleum products and heavy metals if construction equipment has leaks of petroleum products, such as engine oil, hydraulic

[11] The disturbed surface area calculation includes the footprint of the Burbank to Los Angeles Project Section (e.g., stations, grade separations, existing right-of-way, proposed expansion of right-of-way, and temporary construction areas).

oil, and antifreeze. Furthermore, temporary or portable sanitary facilities provided for construction workers could be a source of sanitary waste if they leak. In addition, construction in the channels associated with water crossings would provide a direct path for construction-related contaminants to reach surface waters. Construction work within all three waterbodies could result in temporary sediment release and increase the risk of spills or leaks into these waterbodies, which could degrade water quality. However, because the Lockheed Channel and the Burbank Western Channel are concrete-lined, less sediment disruption would occur compared to the Los Angeles River, which has an earthen bottom and riparian vegetation within the direct RSA.

However, construction activities would be temporary and compliance with the Construction General Permit requires the preparation of a SWPPP to identify project-specific construction BMPs to be implemented, as described in HYD-IAMF#3. Construction BMPs include, but are not limited to, Erosion and Sediment Control BMPs (e.g., hydromulch, temporary silt fences, and check dams) designed to minimize erosion and retain sediment on site, and Good Housekeeping BMPs (e.g., spill prevention and control, and stockpile management) to prevent spills, leaks, and discharges of construction debris and waste into receiving waters. As described previously under Impact HWR #2, in-water work during construction of the bridge piers would be restricted to the dry season and would require the use of cofferdams or sandbag barriers around the work areas to keep water out and to reduce sediment pollution from construction work in and under water. During the Lockheed Channel realignment, temporary water diversion would be required within the Lockheed Channel and Burbank Western Channel. Once construction is complete, the temporary water diversion would be removed, and the channel would be restored to its pre-construction condition.

Soil contaminated by petroleum hydrocarbons, pesticides, herbicides, asbestos, heavy metals, or other hazardous materials may be present in the direct RSA. Construction activities could disturb contaminated soils and increase the potential for stormwater to carry these pollutants into receiving waters. Before the construction of project facilities is initiated, soils would be tested, and contaminated soils would be remediated (i.e., cleaned up). Any contaminated soils unearthed during construction would be classified as hazardous waste and disposed of at appropriate off-site disposal facilities in accordance with state and federal regulations. Removal and disposal of contaminated soils before construction of the proposed facilities is initiated would reduce the potential for these pollutants to be introduced into receiving waters.

Additionally, because construction of the HSR Build Alternative would take place within the channel of surface waters, within waters of the U.S. and the state, a Nationwide Permit 14 under Section 404 permitting would be required from the USACE and a Section 401 Permit would be required from the RWQCB. Unavoidable effects on waters of the U.S. are within the scope of the USACE Nationwide Permit Program (including all General and Regional Conditions).

As described above, groundwater dewatering would be required during excavation activities associated with the Main Street crossing over the Los Angeles River, and may be required during construction of the below grade sections. Additionally, there is potential for groundwater to be encountered during the Flower Street and Goodwin Avenue/Chevy Chase Drive grade separations, which are early action projects described in more detail in Section 2.6. Dewatering groundwater could affect surface water quality through the discharge of polluted groundwater to surface waterbodies. Water produced during dewatering activities could contain sediments and contaminants that could degrade water quality if the water were to be discharged directly to surface water or land without treatment. Compliance with the Los Angeles RWQCB’s Dewatering Permit would ensure the water discharged to surface water or land would not degrade existing water quality by requiring testing prior to discharge. For any contaminated groundwater, the water may be collected and off-hauled to a local sanitary sewer or a treatment system to reduce the concentration of contaminants and improve water quality prior to discharge.

Permanent Construction Effects

The HSR Build Alternative would increase impervious surface area by approximately 19 acres along the Burbank to Los Angeles Project Section. An increase in impervious surface area would increase the volume of runoff during a storm, thereby increasing the potential for more effectively transporting pollutants to receiving waters and increasing on-site or downstream erosion. However, the Los Angeles River Watershed within the indirect and direct RSAs is already highly urbanized and impervious, and increases in impervious surface area as a result of the HSR Build Alternative would be small compared to the size of the Los Angeles River Watershed (i.e., the HSR Build Alternative would increase impervious surface area by approximately 19 acres in a 533,760-acre [834-square-mile] watershed).

New and replaced impervious surfaces collect pollutants, including sediment, oil and grease, hydrocarbons (e.g., fuels, solvents), heavy metals, organic fertilizers and pesticides, pathogens, nutrients, and debris. Runoff mobilizes these pollutants during storm events and conveyed into a surface water either directly or through drainage systems. Stormwater discharges associated with the operation of the HSR Build Alternative would comply with the Phase II MS4 Permit to minimize effects on water quality.

As specified in HYD-IAMF#1, a stormwater management and treatment plan would be prepared. In compliance with this plan, post-construction BMPs would be implemented to reduce effects to water quality, as required by the Phase II MS4 Permit. BMPs would reduce surface water quality effects by reducing stormwater flow and removing pollutants prior to discharge to the existing storm drain system. Post-construction BMPs include structural and nonstructural BMPs. The types of structural and nonstructural BMPs will be determined during final design based on which BMPs would be the most effective and efficient for the particular site. Potential structural BMPs could include surface infiltration basins, subsurface infiltration systems, seasonal dry detention ponds, sand and media filters, and infiltration trenches. Nonstructural BMPs are incorporated into the design of the HSR Build Alternative and mostly consist of preventative measures such as conserving natural areas, protecting slopes and channels, storm drain stenciling and signage, and vehicle/equipment cleaning.

Implementation of post-construction BMPs would reduce the potential for pollutants to be discharged to surface waters. Construction activities would not permanently adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e., the Los Angeles Basin Plan). Therefore, the HSR Build Alternative would not conflict with the implementation of the Los Angeles Basin Plan.

Impact HWR#4: Effects to Groundwater Volume, Quality, and Recharge

Temporary Construction Effects

Grading and construction activities along the entire length of the Burbank to Los Angeles Project Section would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary, and as shown in Table 6-3, the reduction in infiltration would not be substantial due to the size of the groundwater basins underlying the indirect and direct RSAs. (The area of the San Fernando Valley Groundwater Basin crossed by the HSR Build Alternative is approximately 711 acres compared to the total 145,000-acre basin, and the area of the Coastal Plain of Los Angeles Groundwater Basin—Central Basin crossed the HSR Build Alternative would cross is approximately 65 acres compared to the total 177,000-acre basin.)

Table 6-3 Groundwater Basins Crossed by the High-Speed Rail Build Alternative

Groundwater Basin Name (basin number)	Total Groundwater Basin Area (acres)	Groundwater Storage (acres/feet)	Length of Groundwater Basin Crossed (miles)	Area of Groundwater Basin Crossed (acres)	Percent of Total Groundwater Basin Area Crossed
San Fernando Valley Groundwater Basin	145,000	3,670,000	22.83	711	0.5%
Coastal Plain of Los Angeles Groundwater Basin—Central Basin	177,000	13,800,000	3.68	65	0.04%

Source: California Department of Water Resources, 2004a.

Infiltration of contaminated stormwater could have the potential to affect groundwater quality in areas of shallow groundwater. Pollutants are generally removed by soil through absorption; therefore, in areas of deep groundwater, there is more absorption potential and, as a result, less potential for pollutants to reach groundwater. As discussed previously, contaminated soil that is currently present in the direct RSA would be removed and disposed of prior to construction of the proposed facilities, which would reduce the potential for stormwater infiltration to carry pollutants to groundwater. In addition, if pollutants were leaked or spilled during construction, there is a potential for them to infiltrate the groundwater. It is not expected that construction activities would affect groundwater quality because there is not a direct path for pollutants to reach groundwater. In addition, implementation of construction BMPs (e.g., Good Housekeeping BMPs) at the construction site, in compliance with the Construction General Permit (HYD-IAMF#3). Construction BMPs would minimize pollutants from stormwater runoff that could infiltrate the groundwater basin. Through compliance with the Construction General Permit, construction of the HSR Build Alternative would not substantially reduce groundwater recharge or affect groundwater quality in the groundwater basins.

As discussed previously, the Sustainable Groundwater Management Act requires GSPs to be developed in medium- and high-priority basins to manage the sustainability of groundwater basins. The DWR identifies both the San Fernando Valley Groundwater Basin and Central Basin as very low-priority basins. Therefore, development of GSPs for the San Fernando Valley Groundwater Basin and Central Basin is not required. Because there is not an adopted GSP applicable to the groundwater basins within the project alignment, construction activities would not conflict with or obstruct the implementation of a sustainable groundwater management plan.

Shallow groundwater (less than 50 feet bgs) occurs within the direct RSA, especially in locations where the direct RSA is adjacent to the Los Angeles River. Groundwater was detected approximately 25 feet bgs at the southern end of the direct RSA near the Los Angeles River. Historically, groundwater has been as shallow as 20 feet bgs. Therefore, shallow groundwater may be encountered during construction activities associated with the Main Street crossing over the Los Angeles River. Additionally, there is a potential for groundwater to be encountered during the Flower Street and Goodwin Avenue/Chevy Chase Drive grade separations, which are early action projects described in more detail in Section 2.6. Pier construction would extend to approximately 50–120 feet bgs (Jacobs 2016). Therefore, it is likely that groundwater would be encountered during construction activities of the bridges and grade separations. Dewatering groundwater during construction activities could reduce the amount of groundwater available in the groundwater basin. In the event that groundwater is encountered during construction, it would be removed and disposed of according to the requirements of the Los Angeles RWQCB's Dewatering Permit, as mentioned previously. Any contaminated groundwater may be collected and off-hauled to a local sanitary sewer, or a treatment system may be required to treat the water prior to discharge. The volume of groundwater that would be removed would be relatively minor due to the size of the groundwater basins (Table 6-3). Other than groundwater dewatering being required during construction activities as mentioned above, it is not anticipated that groundwater extraction would be required. Therefore, dewatering activities are not anticipated to substantially affect groundwater levels or supplies.

At the northern end of the direct RSA, groundwater is generally deep (i.e., deeper than 100 feet bgs). Historically, groundwater in the vicinity of the below grade sections of the HSR Build Alternative was as high as 40 to 64 feet bgs. The below grade sections are anticipated to be above the groundwater table. However, not enough groundwater information is available at this time to rule out the potential for groundwater to be encountered during construction of the below grade sections. Consequently, it was conservatively assumed for purposes of this analysis that the construction of the below grade sections could encounter groundwater. If encountered, groundwater inflows into the excavations during construction of the below grade sections are anticipated. Because a relatively dry excavation is required during construction, groundwater dewatering would be required to draw down the groundwater level to 5 feet below the structure invert of the below grade sections to prevent groundwater inflow into the below grade sections. Construction of groundwater wells may be required to pump groundwater to achieve the required drawdown. Groundwater dewatering would lower the groundwater table in the vicinity of the construction of the below grade sections, which would pose a risk of ground settlement and mobilization of contaminant plumes from nearby groundwater cleanup sites. If groundwater dewatering is deemed not feasible during final design, measures such as chemical or jet grouting or permeation grouting may be required to prevent groundwater flow into the areas of construction of the below grade sections. In addition, secant pile cut-off walls may be required for support of excavation in place of soldier piles and lagging as an alternative to groundwater dewatering, chemical or jet grouting, or permeation grouting.

Permanent Construction Effects

Much of the area proposed for development is within areas of existing development, within urban areas of the cities of Burbank, Glendale, and Los Angeles. The Los Angeles County Department of Public Works maintains spreading grounds within Los Angeles County for groundwater recharge. Although the HSR Build Alternative would not cross Los Angeles County spreading grounds, increases in impervious surface area would have the potential to interfere with groundwater recharge. Implementation of the HSR Build Alternative would result in an increase in impervious surface area (approximately 19 acres) along the Burbank to Los Angeles Project Section. An increase in impervious surface area decreases infiltration, which can decrease the amount of water that is able to recharge the aquifer/groundwater basin. However, this reduction in infiltration would be small in comparison to the size of the groundwater basins (the San Fernando Valley Groundwater Basin is approximately 145,000 acres and the Central Basin is approximately 177,000 acres in total area). Additionally, native materials with high infiltration potential at the ground surface would be used and retained in areas that are critical to infiltration for groundwater recharge (i.e., areas in proximity to the Los Angeles River, including at the Flower Street, Goodwin Avenue/Chevy Chase Drive, and Main Street grade separations).

Infiltration of stormwater could have the potential to affect groundwater quality in areas of shallow groundwater. Pollutants are generally removed by soil through absorption. Therefore, in areas of deep groundwater, there is more absorption potential and, as a result, less potential for pollutants to reach groundwater. It is not expected that stormwater infiltration would affect groundwater quality because there is not a direct path for pollutants to reach groundwater. In addition, the HSR Build Alternative would be required to implement post-construction BMPs to promote infiltration and recharge of the groundwater aquifer and to treat stormwater prior to infiltration, as described in HYD-IAMF#1. The small increase in the total new impervious surfaces would not affect existing groundwater recharge capabilities, would not interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table, and would not affect groundwater quality with the addition of the proposed BMPs to promote infiltration.

Because there is not an adopted GSP applicable to the groundwater basins within the project alignment, construction activities would not result in permanent impacts related to conflict with or obstruction of the implementation of a sustainable groundwater management plan.

6.1.2.2 Operation

Impact HWR#1: Effects to Floodplains

Operational activities of the HSR Build Alternative would include passenger access to and from stations, use of parking structures or lots, maintenance activities along the HSR Build Alternative trackway, and facility security patrols. Routine maintenance activities would take place periodically around the Burbank Airport Station and LAUS as well as along the trackway. These activities would be similar to maintenance activities that take place for other major transportation infrastructure facilities in the area, such as freeways, the Metrolink rail line, and local major arterial streets. No operations or maintenance activities are anticipated to be required within floodplains. Additionally, the tracks and stations would be elevated above the floodplain and would therefore not expose passengers to flooding risks during storm events. Therefore, operations and maintenance activities would not be anticipated to affect floodplains.

Impact HWR#2: Effects to Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Operational activities of the HSR Build Alternative would include passenger access to and from stations, use of parking structures or lots, maintenance activities along the HSR Build Alternative trackway, and facility security patrols. Routine maintenance activities would take place periodically around the Burbank Airport Station and LAUS as well as along the trackway, and include inspection and maintenance along the track and railroad right-of-way, as well as on the structures, fencing, power system, train control, electric interconnection facilities, and communications. These activities would be similar to maintenance activities that take place for other major transportation infrastructure facilities in the area, such as freeways, the Metrolink rail line, and local major arterial streets. Operation and maintenance activities associated with the HSR system would be similar to what exists today for the existing rail corridor that does not alter drainage patterns, stormwater runoff, and hydraulic capacity. As a result, none of the operational and routine maintenance activities would be anticipated to involve activities that would alter drainage patterns, stormwater runoff, and hydraulic capacity.

Impact HWR#3: Effects to Surface Water Quality

Because there are existing railways within the Burbank to Los Angeles Project Section, the HSR Build Alternative would not introduce new types of pollutants to the indirect and direct RSAs. However, the presence of the HSR Build Alternative could increase the amount of the pollutants associated with railroads (pollutants that may already exist in the watershed) because of increased rail service and maintenance. During operation and maintenance activities, anticipated pollutants associated with a railway facility include heavy metals, dissolved metals, nutrients, sediments, particulate matter, organic compounds, trash and debris, and oil and grease. As discussed further below, stormwater discharges associated with the operation of the HSR Build Alternative would comply with the Phase II MS4 Permit, which includes implementation of post-construction BMPs to reduce pollutants of concern in stormwater runoff and minimize effects on water quality.

The HSR system would be electrically powered and would not emit petroleum hydrocarbons or byproducts of internal combustion engines. In addition, the technology proposed for the HSR Build Alternative does not require large amounts of lubricants or hazardous materials for operation. Greases may be used to lubricate switching equipment along the trackway. Routine vegetation removal along the tracks and associated infrastructure may require land disturbance resulting in increased susceptibility to erosion and sedimentation along slopes. Additionally, herbicides and/or pesticides may be used along the right-of-way to control weeds and vermin as required by state and federal regulations. Appropriate laws and regulations pertaining to the use of pesticides and herbicides and safety standards for employees and the public (including the Federal Insecticide, Fungicide and Rodenticide Act [7 U.S.C. § 136 and 40 C.F.R. Parts 152.1–171], federal Occupational Safety and Health Act of 1970, California Health and Safety Code, and California Occupational Safety and Health Act) would be followed to minimize adverse effects on the environment. The Authority would implement hazardous materials monitoring plans to limit the potential for spills, limit the amount of hazardous substances used for HSR operations, and have specific cleanup protocols and trained personnel to prevent accidental spills of hazardous materials and other pollutants from reaching surface waterbodies during project operation.

Because there are existing railways within the Burbank to Los Angeles Project Section, the HSR Build Alternative would not introduce new types of pollutants to the indirect and direct RSAs. However, the operation of the HSR Build Alternative could increase the amount of the pollutants associated with rail operations because of increased rail service. Specifically, dust generated by braking would be continuously generated and released by trains. Brake dust consists of particulate metals (primarily iron) but may also include copper, silicon, calcium, manganese, chromium, and barium. Although brake dust consists primarily of particulate metals, some of these metals could become dissolved in rainwater. Although brake dust would be released into the environment during operations, the electric trains would use regenerative braking technology, resulting in reduced physical braking and associated wear compared to conventional petroleum-fueled trains. Brake dust would not be generated in equal amount throughout the HSR alignment. The primary locations where brake dust would be generated are areas where the trains must reduce their travel speed, such as approaches to stations, turns, and elevation changes (primarily descents). Long stretches of flat terrain with a straight rail alignment would generate less brake dust than other areas. In addition, brake dust is generally anticipated to be retained in track ballast. Parking lots associated with the stations would also be a primary source of pollutants, including heavy metals, organic compounds, trash and debris, oil and grease, nutrients, pesticides, and sediments.

In consideration of the potential for brake-pad particles and parking lot runoff to be conveyed to surface waters, the Authority would prepare a stormwater management and treatment plan that complies with the Phase II MS4 permit requirements (HYD-IAMF#1). The plan would include post-construction BMPs and LID techniques to reduce the quantity and improve the quality of stormwater runoff before runoff is discharged into a surface waterbody. Potential BMPs include, but are not limited to, surface infiltration basins, subsurface infiltration systems, seasonal dry detention ponds, sand and media filters, and infiltration trenches. Of these potential treatment BMPs, all are capable of reducing particulate and dissolved metal concentrations in runoff (Caltrans 2017). Post-construction BMPs would minimize potential continuous impacts from brake dust deposited on impervious surfaces by capturing runoff and improving the quality of runoff prior to discharge into waterbodies. Along at-grade and retained-fill portions of the HSR alignment, brake dust is generally anticipated to be retained in track ballast. Accordingly, post-construction BMPs would minimize potential continuous impacts from brake dust deposited on impervious surfaces by capturing and improving the quality of runoff prior to discharge into waterbodies.

Although not quantifiable at this time, the amount of brake dust that could be discharged into surface waterbodies is not anticipated to be sufficient to alter water quality substantially because the electric trains would use regenerative braking technology to reduce brake pad wear and the amount of potential metal particles deposited within the track right-of-way. Even though certain heavy metals have the potential to bioaccumulate within the aquatic environment or stimulate the growth of microbes (e.g., algae), resulting in adverse effects on aquatic life, the discharge of metals into surface waterbodies is not likely to cause a violation of the water quality objectives for bioaccumulation and biostimulatory substances. Considering that the HSR project would implement treatment BMPs to reduce the quantity and improve the quality of runoff generated on all new and replaced impervious surfaces, the project would minimize potential water quality impacts from brake dust to the maximum extent practicable using the best available technology.

The Los Angeles River, the Verdugo Wash, the Arroyo Seco, and the Burbank Western Chanel are all listed for various impairments on the 303(d) List. The Los Angeles River (Reach 2) is listed as impaired for ammonia, indicator bacteria, copper, lead, nutrients (algae), oil*, and trash. The Los Angeles River (Reach 3) is listed as impaired for ammonia, copper, nutrients (algae), indicator bacteria, and trash. Arroyo Seco (Reach 1) is listed as impaired for indicator bacteria and trash. The Verdugo Wash (Reach 1) is listed as impaired for indicator bacteria, copper, and trash. The Burbank Western Channel is listed as impaired for copper, cyanide*, indicator bacteria, lead, selenium, and trash (RWQCB 2016).[12]

Operation of the HSR Build Alternative has the potential to contribute to heavy metal, nutrient, sediment, organic compound, trash and debris, and oil and grease existing water quality impairments. However, as stated above, post-construction BMPs and LID techniques would be implemented to reduce effects to water quality by reducing pollutants of concern in stormwater runoff, as required by the Phase II MS4 Permit, prior to discharge to the existing storm drain system (HYD-IAMF#1). Post-construction BMPs include structural and nonstructural BMPs. The types of structural and nonstructural BMPs will be determined during final design based on which BMPs would be the most effective and efficient for the particular site. As stated above, potential structural BMPs could include surface infiltration basins, subsurface infiltration systems, seasonal dry detention ponds, sand and media filters, and infiltration trenches. Nonstructural BMPs are incorporated into the design of the HSR Build Alternative and mostly consist of preventative

[12] Constituents for which a TMDL has not been developed are marked with an asterisk (*).

measures such as conserving natural areas, protecting slopes and channels, storm drain stenciling and signage, and vehicle/equipment cleaning.

Implementation of post-construction BMPs in compliance with Phase II MS4 permit requirements would reduce the potential for pollutants to be discharged to surface waters. Operations of the HSR Build Alternative would not permanently adversely affect beneficial uses of surface waters or attainment of water quality objectives established in the water quality control plans applicable to the RSA (i.e., the Los Angeles Basin Plan). Therefore, the HSR Build Alternative would not conflict with the implementation of the Los Angeles Basin Plan.

Although there are several floodplains within the RSA, the HSR tracks and stations would not be within a floodplain and would not be anticipated to be inundated during a flood event. Therefore, there is no risk of release of pollutants due to inundation from flooding during a storm event. Flooding as a result of seismic seiche or tsunami is unlikely to occur within the direct RSA due to the distance to any large waterbodies (i.e., reservoirs or the Pacific Ocean). For these reasons, the HSR Build Alternative would not increase the risk release of pollutants during inundation.

Impact HWR#4: Effects to Groundwater Volume, Quality, and Recharge

The below-grade sections of the HSR Build Alternative would be waterproofed to prevent groundwater seepage into the below-grade sections (tunnel beneath Hollywood Burbank Airport, cut-and-cover from south of the airport to the Metrolink Ventura Subdivision, and the trench within the Metrolink Ventura Subdivision to near Beachwood Drive in the city of Burbank). The lining would be inspected regularly to monitor for potential leaks. Should leaks be found, the lining would be repaired immediately and assessed for future integrity. Any groundwater seepage into the below-grade sections would be minimal due to the lining and would drain toward a low point in the below-grade sections and then be conveyed to a sump. The water would then be treated and pumped out to local storm drain facilities.

Operation of the HSR Build Alternative would not involve direct extraction of groundwater. However, operation of the proposed stations would increase the need for municipal water in the cities of Burbank and Los Angeles for the use of toilets, sinks, landscaping, and other improvements. The only water usage associated with the HSR Build Alternative alignment would be in the city of Burbank at below-grade sections and portals during operations for cleaning of the below-grade sections, fire and life safety, domestic needs, and general maintenance operations. Municipal water in the cities of Burbank and Los Angeles is partly supplied by groundwater. Water use within the cities of Burbank and Los Angeles is managed by Burbank Water and Power and the Los Angeles Department of Water and Power through implementation of Urban Water Management Plans. These agencies are responsible for ensuring adequate water supplies are available for existing and proposed development so that groundwater overdraft does not occur. Water use at the Burbank Airport Station during operation of the HSR Build Alternative would be 165 acre feet/year, which is approximately 15 percent less than existing water demand in the Burbank area of the project footprint (192 acre-feet/year). Water use at LAUS would be 168 acre-feet/year, which is an increase of 243 percent due to the additional passengers and employees at the facility compared to the existing water demand in the LAUS area of the project footprint (69 acre-feet/year). However, anticipated water demand for the Burbank Airport Station would be 0.6 percent of Burbank Water and Power's total water supply by the year 2040. Anticipated water demand for LAUS would be 0.02 percent of the Los Angeles Department of Water and Power's total water supply by the year 2040. The HSR Build Alternative would not adversely affect groundwater volumes in the city of Burbank because the anticipated demand for water to serve the Burbank Airport station would be less than the existing uses on the same areas. The HSR Build Alternative would not adversely affect groundwater volumes in the city of Los Angeles, because the increase in demand to serve LAUS represents a small fraction of the total supplies available.

Pollutants from operational and maintenance activities would not substantially affect groundwater quality because (1) post-construction BMPs would reduce pollutants from stormwater runoff prior to infiltration to the groundwater basin (HYD-IAMF#1), and (2) there is not a direct pathway for stormwater pollutants to reach groundwater (soil would filter out pollutants before they would reach groundwater). Additionally, because there is not an adopted GSP applicable to the groundwater basins within the project alignment, operation of the HSR Build Alternative would not conflict with or obstruct the implementation of a sustainable groundwater management plan.

6.2 Station Sites

Effects associated with the Burbank Airport Station and LAUS are discussed below. In some cases, effects associated with the stations are similar and are therefore discussed together. However, in cases where the effects associated with the stations vary, the stations are discussed separately.

6.2.1 Construction Impacts

6.2.1.1 Impact HWR #1: Effects to Floodplains

Burbank Airport Station

The Burbank Airport Station is not within a FEMA-designated 100-year floodplain. Therefore, construction of the station would not affect any 100-year floodplains.

Los Angeles Union Station

Construction activities associated with LAUS include the establishment of a staging area, raising the passenger platforms to accommodate HSR, and installing the OCS (refer to Section 2, Project Description for more details on proposed work at LAUS). Construction activities would occur within a portion of the Los Angeles River Floodplain Zone AE flood hazard area. As previously discussed in Impact HWR #1 in Section 6.1.2.1, construction equipment and materials would be required to be stored outside of the floodplain to minimize the potential flood risk. In addition, construction workers would monitor weather conditions for heavy storms (and potential flood flows). In the event that a heavy storm or flood event is identified, construction activities would be halted until the storm or flood event passes. Therefore, construction equipment and materials would be stored outside the floodplain, and construction workers would monitor weather conditions to minimize effects to floodplains during construction activities associated with LAUS.

6.2.1.2 Impact HWR #2: Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Burbank Airport Station

Construction activities associated with the Burbank Airport Station would include grading, hauling, excavating, and constructing facilities. Construction activities such as grading and excavation could alter existing drainage patterns and redirect stormwater runoff. During ground-disturbing activities, soil would be compacted, thereby resulting in a decrease in infiltration and an increase in the volume and rate of stormwater runoff during storm events.

Construction activities would be subject to the requirements of the Construction General Permit. Compliance with the Construction General Permit requires the preparation of a SWPPP to identify project-specific Construction BMPs to be implemented as part of the project. The SWPPP would be prepared prior to construction. It would describe temporary drainage patterns within the construction sites and indicate stormwater discharge locations from construction sites to the existing drainage system.

Groundwater is generally deep (i.e., more than 100 feet) in the vicinity of the Burbank Airport Station (at the northern end of the alignment) and is not anticipated to be encountered during construction of the station. Thus, groundwater dewatering is not anticipated during construction of the Burbank Airport Station. However, based on historical groundwater levels, it is conservatively assumed that the below grade sections in the vicinity of the Burbank Airport Station would encounter groundwater in the area. Water produced during dewatering activities that is discharged to surface waters could affect the hydraulics of the surface water channel by increasing the volume of water flowing within the channel. However, the discharge of dewatered groundwater to surface waters would be temporary and would cease once construction boring is complete.

Los Angeles Union Station

The construction of the proposed HSR station at LAUS would include raising the passenger platforms to accommodate HSR and installing the OCS. Grading and excavation activities would not be required at LAUS. However, all construction activities would be short-term and would be subject to the requirements of the Construction General Permit. Compliance with the Construction General Permit requires the preparation of a SWPPP to identify project-specific Construction BMPs to be implemented as part of the project. The SWPPP would be prepared prior to construction. It would describe temporary drainage patterns within the construction sites and indicate stormwater discharge locations from construction sites to the existing drainage system.

6.2.1.3 Impact HWR #3: Effects to Surface Water Quality

Burbank Airport Station and Los Angeles Union Station

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants could have a detrimental effect on water quality. During construction activities, excavated soil would be exposed, and there would be an increased potential for soil erosion compared to existing conditions. In addition, chemicals, liquid products, petroleum products (e.g., paints, solvents, and fuels), and concrete-related waste may be spilled or leaked during construction. Any of these pollutants have the potential to be transported via storm runoff into receiving waters.

Construction activities associated with the stations would be subject to the requirements of the Construction General Permit. Compliance with the Construction General Permit requires the preparation of a SWPPP to identify project-specific Construction BMPs to be implemented as part of the project. Construction BMPs include, but are not limited to, Erosion and Sediment Control BMPs designed to minimize erosion and retain sediment on-site and Good Housekeeping BMPs to prevent spills, leaks, and discharges of construction debris and waste into receiving waters.

Groundwater levels near the Burbank Airport Station are approximately 100 feet bgs, and groundwater is not anticipated to be encountered during construction of the station. However, construction of the below grade sections in the vicinity of the Burbank Airport Station could encounter groundwater in the area. Shallow groundwater (less than 50 feet bgs) is located adjacent to LAUS; however, because the HSR improvements at the LAUS would not require grading and excavation, groundwater would not be encountered. In the event that groundwater is encountered during construction activities associated with the Burbank Airport Station, it would be removed and disposed of according to the requirements of the Los Angeles RWQCB's Dewatering Permit. Water produced during dewatering activities could contain sediments and contaminants that could degrade water quality if the water were to be discharged directly to surface water or land without treatment. Therefore, adherence to the requirements of the Los Angeles RWQCB's Dewatering Permit would ensure the water discharged to surface water or land would not degrade existing water quality by requiring testing prior to discharge. For any contaminated groundwater, the water may be collected and off-hauled to a local sanitary sewer or an active treatment system that may be required to treat the water prior to discharge.

6.2.1.4 Impact HWR #4: Effects to Groundwater Volume, Quality, and Recharge

Burbank Airport Station

Grading and construction activities would compact soil, which can decrease infiltration during construction. However, construction activities would be temporary, and the reduction in infiltration would not be substantial due to the size of the groundwater basins underlying the station site (Table 6-3). In addition, construction of the station would be located in urbanized areas; thus, there is little existing potential for groundwater recharge.

Construction activities associated with the Burbank Airport Station would not affect groundwater quality due to the depth of groundwater in the area (i.e., approximately 100 feet bgs) and because construction activities would be temporary and would be subject to the requirements of the Construction General Permit. The Construction General Permit requires the preparation of a SWPPP to identify project-specific Construction BMPs to be implemented as part of the project and to target pollutants of concern.

The Burbank Airport Station would have both underground and aboveground facilities and is in the city of Burbank, west of the Burbank Western Channel. Groundwater levels near the Burbank Airport Station are approximately 100 feet bgs, and groundwater is not anticipated to be encountered during construction of the station. However, based on historical groundwater levels, it is conservatively assumed that the below grade sections in the vicinity of the Burbank Airport Station could encounter groundwater in the area. If encountered, groundwater inflows into the excavations for the below grade sections are anticipated. Because a relatively dry excavation is required during construction, groundwater dewatering would be required to draw down the groundwater level to 5 feet below the structure invert of the below grade sections to prevent groundwater inflow into the below grade sections. Construction of groundwater wells may be required to pump groundwater to achieve the required drawdown. Groundwater dewatering would lower the groundwater table in the vicinity of the construction of the below grade sections, which would pose a risk of ground settlement and mobilization of contaminant plumes from nearby groundwater cleanup sites. If groundwater dewatering is deemed not feasible during final design, measures such as chemical or jet grouting or permeation grouting may be required to prevent groundwater flow into the areas of construction of the below grade sections. In addition, secant pile cut-off walls may be required for support of excavation in place of soldier piles and lagging as an alternative to groundwater dewatering, chemical or jet grouting, or permeation grouting.

Los Angeles Union Station

LAUS is an existing station and HSR improvements at the station would not require grading or excavation activities. Thus, groundwater would not be encountered during construction. In addition, the station is located in an urbanized area; thus, there is a little existing potential for groundwater recharge.

Construction activities associated with the LAUS improvements would not affect groundwater quality, as construction activities would be subject to the requirements of the Construction General Permit. The Construction General Permit requires the preparation of a SWPPP to identify project-specific Construction BMPs to be implemented as part of the project and to target pollutants of concern.

6.2.2 Operation

6.2.2.1 Impact HWR #1: Effects to Floodplains

Burbank Airport Station

The Burbank Airport Station is not located within a FEMA-designated 100-year floodplain. Therefore, operation of the station would not affect any 100-year floodplains.

Los Angeles Union Station

The existing LAUS is located within a FEMA-designated 100-year floodplain. The proposed HSR station at LAUS would be a surface station, with up to four HSR tracks and two platforms.[13] Train capacity at LAUS would be maintained after the introduction of HSR service at LAUS; therefore, operation of the LAUS with the associated HSR improvements in the floodplain would be similar to the existing condition. Development within the floodplain would be minimized, as specified in HYD-IAMF #2.

[13] The proposed HSR station at LAUS is discussed further in Metro's Link Union Station Project EIR/EIS.

6.2.2.2 Impact HWR #2: Drainage Patterns, Stormwater Runoff, and Hydraulic Capacity

Burbank Airport Station and Los Angeles Union Station

The stations would consist primarily of impermeable surfaces such as roofs, platforms, ramps, stairs, buildings, parking areas, and other hard structures. Impermeable surfaces could increase the volume and rate of stormwater runoff. The stations would be required to implement stormwater design features and BMPs that would reduce the volume and rate of stormwater runoff draining to the stormwater system. Stormwater design measures to be implemented at the stations may include inlets, grated catch basins, storm drains, flow splitters, detention/infiltration basins, and energy dissipaters. Examples of LID design approaches may include dispersal, infiltration trenches, filter strips, biofiltration swales, and permeable pavement. The types of BMPs will be determined during final design based on which BMPs would be the most effective and efficient for the particular site.

6.2.2.3 Impact HWR #3: Effects to Surface Water Quality

Burbank Airport Station and Los Angeles Union Station

Development of the stations would result in an increase in impervious surface area that would increase the volume of runoff during a storm, thereby increasing the potential for more effectively transporting pollutants to receiving waters. Also, an increase in impervious surface area would also increase the total amount of pollutants in stormwater runoff. The main sources of pollutants from stations would include heavy metals, organic compounds, trash and debris, oil and grease, nutrients, pesticides, and sediments. Project-specific BMPs would treat runoff before it enters the stormwater drainage system.

6.2.2.4 Impact HWR #4: Effects to Groundwater Volume, Quality, and Recharge

Burbank Airport Station and Los Angeles Union Station

The Burbank Airport Station would be a new station within the city of Burbank. LAUS is an existing station within the city of Los Angeles. Both cities are served by municipal water that originates from several sources, including groundwater sources. Operation of the stations would use municipal water for the increased use of toilets, sinks, landscaping, and other improvements. The only water usage associated with the HSR Build Alternative alignment would be in the city of Burbank at below-grade sections and portals during operations for cleaning of the below-grade sections, fire and life safety, domestic needs, and general maintenance operations. Municipal water in the cities of Burbank and Los Angeles is partly supplied by groundwater. Water use within the cities of Burbank and Los Angeles are managed by Burbank Water and Power and the Los Angeles Department of Water and Power through implementation of Urban Water Management Plans. These agencies are responsible for ensuring adequate water supplies are available for existing and proposed development so that groundwater overdraft does not occur. Anticipated water demand for the Burbank Airport Station would be approximately 165 acre-feet/year, which is 0.6 percent of Burbank Water and Power’s total water supply by the year 2040. Anticipated water demand for LAUS would be approximately 168 acre-feet/year, which is 0.02 percent of the Los Angeles Department of Water and Power’s total water supply by the year 2040. Water use at the Burbank Airport Station during operation of the HSR Build Alternative would be 165 acre feet/year, which is approximately 15 percent less than existing water demand in the Burbank area of the project footprint (192 acre-feet/year). Water use at LAUS would increase by 243 percent due to the additional passengers and employees at the facility compared to the existing water demand in the LAUS area of the project footprint (69 acre-feet/year).

Increases in impervious surface area have the potential to interfere with groundwater recharge. Development of the stations would result in an increase in impervious surface area. An increase in impervious surface area decreases infiltration, which can decrease the amount of water that is able to recharge the aquifer/groundwater basin. However, this reduction in infiltration would not be substantial due to the amount of increase in impervious surface area (19 acres) compared to the size of the groundwater basins (the San Fernando Valley Groundwater Basin is approximately

145,000 acres and the Central Basin is approximately 177,000 acres in total area) (Table 6-3). In addition, the stations would be required to implement post-construction BMPs to promote infiltration to the groundwater aquifer.

It is not expected that operational activities would affect groundwater quality because there would not be a direct path for operation-related contaminants to reach groundwater due to the depth of groundwater in the vicinity of the station sites. In addition, implementation of BMPs would target pollutants of concern and prevent pollutants from infiltrating the underlying groundwater basin.

Currently available information on groundwater levels is not sufficient to determine if the below grade sections in the vicinity of the Burbank Airport Station would be below groundwater levels. If the below grade sections would be below groundwater levels, there would be a potential for groundwater seepage into the below grade sections during operation. However, the below grade sections would be waterproofed to prevent groundwater inflow.

In summary, operation of the stations would not substantially deplete groundwater volumes, affect groundwater quality, or reduce groundwater recharge in the groundwater basins.

6.3 Maintenance Facility

As described in Section 2.4.1, no maintenance facilities are proposed to be constructed within the Burbank to Los Angeles Project Section. The Burbank to Los Angeles Project Section would either use the HMF and LMF in other project sections, or maintenance would be handled through an independent contractor. Therefore, no further analysis of maintenance facilities is included in this technical report prepared for the Burbank to Los Angeles Project Section.

6.4 Electric Power Utility Improvements

The project would not include the construction of a separate power source, although it would include the extension of power lines to a series of power substations positioned along the HSR corridor. Because the electric power utility improvements are included in the project footprint, these improvements are included in the calculations and analysis for the HSR Build Alternative in Section 6, Effects Analysis. Refer to Section 3.6, Public Utilities and Energy, of the EIR/EIS for further discussion of utility improvements associated with the project. However, as described in Section 2.5.1, a standalone TPSS could be required within the Burbank to Los Angeles Project Section for purposes of independent utility if the other project sections of the HSR System (i.e., Palmdale to Burbank Project Section and/or Los Angeles to Anaheim Project Section) are not constructed; effect analysis for this potential TPSS would be conducted as designs undergo further refinement.

6.5 Cumulative Effects

6.5.1 High-Speed Rail Build Alternative

This section presents potential cumulative effects based on current knowledge of the Burbank to Los Angeles Project Section. Subsequent to this technical report, the Authority will further refine the cumulative effects described herein and present the information in Section 3.19, Cumulative Impacts, of the EIR/EIS.

Cumulative effects are those resulting from past, present, and reasonably foreseeable future actions, combined with the potential hydrology and water resource effects of the proposed project. The cumulative analysis for hydrology and water resources includes the evaluation of floodplains, surface water, and groundwater, as described below.

6.5.1.1 Floodplains

The RSA for the cumulative floodplain evaluation consists of FEMA-designated 100-year floodplains crossed by the HSR Build Alternative and the land adjacent to these floodplains. As stated in Section 5.7, Floodplains, the direct RSA crosses the Los Angeles River floodplain. The portion of the Los Angeles River within the indirect RSA is owned and maintained by USACE. The floodplain crossings would be on aerial structures and would be designed to prevent increases greater than 1 foot in the base flood elevation in floodplains in accordance with FEMA. Other ongoing and future federal projects would be required to comply with FEMA regulations, which require a floodplain analysis to prevent projects from increasing the base flood elevation greater than 1 foot in floodplains or substantially changing the floodplain limits. Also, county and city general plan policies, programs, and ordinances are intended to offset the potential direct and cumulative flooding problems that may arise from development. All ongoing and reasonably foreseeable future projects are subject to and would be required to comply with these policies, programs, and ordinances.

6.5.1.2 Surface Water Hydrology and Quality

The RSA for the cumulative effect analysis for surface waters includes the entire Los Angeles River Watershed. The Los Angeles River Watershed is described in Section 5.1, Resource Study Area Watersheds. Other present and reasonably foreseeable future projects could have construction schedules that overlap with that of the Burbank to Los Angeles Project Section. Construction in, across, and/or over channels has the potential to degrade water quality, and this degradation of water quality could be exacerbated by concurrent construction schedules for multiple projects. Most present or reasonably foreseeable future projects greater than 1 acre in area (and, therefore, subject to federal, state, and local regulations) would be required to comply with the requirements of the Construction General Permit. The Construction General Permit would require the preparation of a SWPPP and implementation of construction BMPs to target pollutants of concern during construction. Projects affecting areas of less than 1 acre are not expected to increase peak flows substantially and would adhere to local regulations to protect water quality.

The development of present and reasonably foreseeable future projects could result in increased impervious surface area and stormwater runoff volume, and could therefore contribute to pollutant loading in stormwater runoff reaching the storm drain systems receiving waters within the Los Angeles River Watershed. The HSR Build Alternative would result in a minimal increase in impervious surface area. This increase in impervious surface area would be small when compared with the total area of the watershed. New development, including HSR Build Alternative facilities, would comply with stormwater control ordinances and post-construction requirements from waste discharge requirements or NPDES permits, as applicable. MS4 Permit requirements include minimizing impervious surface area and employing LID BMPs to mimic pre-development hydrology through infiltration, evapotranspiration, and rainfall harvesting and use. In addition, the cities and county review all construction projects to ensure that sufficient local and regional drainage capacity is available.

Urban runoff can carry dissolved or suspended residue of both natural and human land uses within the watershed. Stormwater originates as overland flow before entering the storm drain system; therefore, surrounding land uses affect surface water quality. Pollutant sources in urban areas primarily include parking lots and streets, industrial uses, rooftops, exposed earth at construction sites, and landscaped areas. Pollutants in runoff can include sediment, oil and grease, hydrocarbons (e.g., fuels, solvents), heavy metals, organic fertilizers and pesticides, pathogens, nutrients, and debris. The HSR Build Alternative, together with the past, present, and foreseeable projects identified for the RSA, could potentially create new sources of runoff pollution that would contribute to cumulative effects. Potential future uses could increase pollution of stormwater runoff by introducing new activities in the area. However, like the HSR Build Alternative, other projects would be subject to regulations and permits required by the SWRCB and RWQCB to minimize effects on water quality by implementing BMPs to reduce pollutants in stormwater runoff. These regulations are in place to ensure that new developments and infrastructure projects do not result in water-quality standard violations or hydrologic effects.

6.5.1.3 Groundwater

The RSA for cumulative effects to groundwater is the groundwater basins crossed by the HSR Build Alternative: the Central Basin of the Coastal Plain of Los Angeles Groundwater Basin and the San Fernando Valley Groundwater Basin. These groundwater basins are described in Section 5.6, Groundwater. Planned development and roadway widening projects would increase impervious surface area in the groundwater basins, as would the HSR Build Alternative. However, new impervious surface areas associated with the HSR Build Alternative and other foreseeable future projects outside the urban areas would be small compared with the size of the groundwater basins. All of the planned projects would comply with the MS4 Permit requirements, which include minimizing impervious surface area and employing LID BMPs to mimic predevelopment hydrology through infiltration, evapotranspiration, and rainfall harvesting and use. Implementation of LID BMPs would promote infiltration to the groundwater aquifer, which would help to offset cumulative effects to groundwater.

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7 IMPACT AVOIDANCE AND MINIMIZATION FEATURES

The HSR Build Alternative incorporates standardized HSR features to avoid and minimize impacts. These features are referred to as IAMFs. The Authority will implement these measures during project design and construction to avoid or reduce impacts.

The following IAMFs would be implemented to avoid and/or minimize adverse effects on hydrology and water resources.

HYD-IAMF#1: Storm Water Management

Prior to Construction, the Contractor shall prepare a storm water management and treatment plan for review and approval by the Authority. During the detailed design phase, each receiving stormwater system's capacity to accommodate project runoff would be evaluated. As necessary, on-site stormwater management measures, such as detention or selected upgrades to the receiving system, would be designed to provide adequate capacity and to comply with the design standards in the latest version of Authority Technical Memorandum *2.6.5 Hydraulics and Hydrology Guidelines*. On-site stormwater management facilities would be designed and constructed to capture runoff and provide treatment prior to discharge of pollutant-generating surfaces, including station parking areas, access roads, new road over- and underpasses, reconstructed interchanges, and new or relocated roads and highways. Low-impact development techniques would be used to detain runoff on site and to reduce off site runoff such as constructed wetland systems, biofiltration and bioretention systems, wet ponds, organic mulch layers, planting soil beds, and vegetated systems (biofilters), such as vegetated swales and grass filter strips, would be used where appropriate.

HYD-IAMF#2: Flood Protection

Prior to Construction, the Contractor shall prepare a flood protection plan for Authority review and approval. The project would be designed both to remain operational during flood events and to minimize increases in 100-year or 200-year flood elevations, as applicable to locale. Design standards will include the following:

- Establish track elevation to prevent saturation and infiltration of stormwater into the sub-ballast.
- Minimize development within the floodplain, to such an extent that water surface elevation in the floodplain would not increase by more than 1 foot, or as required by state or local agencies, during the 100-year or 200-year flood flow [as applicable to locale]. Avoid placement of facilities in the floodplain or raise the ground with fill above the base-flood elevation.
- Design the floodplain crossings to maintain a 100-year floodwater surface elevation of no greater than 1 foot above current levels, or as required by state or local agencies, and project features within the floodway itself would not increase existing 100-year floodwater surface elevations in Federal Emergency Management Agency-designated floodways, or as otherwise agreed upon with the county floodplains manager.

The following design standards would minimize the effects of pier placement on floodplains and floodways:

- Design site crossings to be as nearly perpendicular to the channel as feasible to minimize bridge length.
- Orient piers to be parallel to the expected high-water flow direction to minimize flow disturbance.
- Elevate bridge crossings at least 3 feet above the high-water surface elevation to provide adequate clearance for floating debris, or as required by local agencies.

- Conduct engineering analyses of channel scour depths at each crossing to evaluate the depth for burying the bridge piers and abutments. Implement scour-control measures to reduce erosion potential.
- Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complimented with native riparian plantings or other natural stabilization alternatives that would restore and maintain a natural riparian corridor.
- Place bedding materials under the stone protection at locations where the underlying soils require stabilization as a result of stream-flow velocity.

HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan

Prior to Construction (any ground disturbing activities), the Contractor shall comply with the State Water Resources Control Board (SWRCB) Construction General Permit requiring preparation and implementation of a SWPPP. The Construction SWPPP would propose BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for affected stream crossings. These BMPs would include measures to incorporate permeable surfaces into facility design plans where feasible, and how treated stormwater would be retained or detained on site. Other BMPs shall include strategies to manage the amount and quality of overall stormwater runoff. The Construction SWPPP would include measures to address, but are not limited to, the following:

- Hydromodification management to verify maintenance of pre-project hydrology by emphasizing on site retention of stormwater runoff using measures such as flow dispersion, infiltration, and evaporation (supplemented by detention where required). Additional flow control measures would be implemented where local regulations or drainage requirements dictate.
- Implementing practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater.
- Limiting fueling and other activities using hazardous materials to areas distant from surface water, providing drip pans under equipment, and daily checks for vehicle condition.
- Implementing practices to reduce erosion of exposed soil, including soil stabilization, regular watering for dust control, perimeter siltation fences, and sediment catchment basins.
- Implementing practices to maintain current water quality, including: siltation fencing, wattle barriers, stabilized construction entrances, grass buffer strips, ponding areas, organic mulch layers, inlet protection, storage tanks and sediment traps to arrest and settle sediment.
- Where feasible, avoiding areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.
- Using diversion ditches to intercept surface runoff from off site.
- Where feasible, limiting construction to dry periods when flows in water bodies are low or absent.
- Implementing practices to capture and provide proper off-site disposal of concrete wash water, including isolation of runoff from fresh concrete during curing to prevent it from reaching the local drainage system, and possible treatments (e.g., dry ice).
- Developing and implementing a spill prevention and emergency response plan to handle potential fuel and/or hazardous material spills.

Implementation of a SWPPP would be performed by the construction contractor's as directed by the contractor's Qualified SWPPP Practitioner or designee. As part of that responsibility, the effectiveness of construction BMPs must be monitored before, during and after storm events. Records of these inspections and monitoring results are submitted to the local regional water quality control board (RWQCB) as part of the annual report required by the Statewide

Construction General Permit. The reports are available to the public online. The SWRCB and RWQCB would have the opportunity to review these documents.

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8.2 Persons or Agencies Consulted

Jacobs. 2016. Personal Communication. September 2016.

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9 PREPARER QUALIFICATIONS

Project Role	Name, Credential	Qualifications
LSA		
Associate/Author	Nicole West, Associate/ Author	19 years of experience in water quality, floodplains, fisheries, aquatic weed control, and transportation planning M.S., Civil and Environmental Engineering, University of California, Berkeley B.S. with Honors, Evolution and Ecology, University of California, Davis Certified Professional in Storm Water Quality (CPSWQ) No. 0384 Qualified SWPPP Developer/Practitioner (QSD/QSP) No. 00238

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