Los Angeles River Ecosystem Restoration
Integrated Feasibility Report

FINAL Feasibility Report and Environmental Impact Statement/Environmental Impact Report

VOLUME 1: INTEGRATED FEASIBILITY REPORT
Los Angeles County, California

September 2015

US Army Corps of Engineers®
Los Angeles District
Los Angeles River Ecosystem Restoration Feasibility Study  
Los Angeles County, California

The Federal lead agency responsible for implementing the National Environmental Policy Act (NEPA) is the U.S. Army Corps of Engineers, Los Angeles District (USACE). The local lead agency responsible for implementing the California Environmental Quality Act (CEQA) is the City of Los Angeles.

The Integrated Feasibility Report (IFR) for the Los Angeles River Ecosystem Restoration Feasibility Study evaluates alternatives for restoring 11 miles of the Los Angeles River from approximately Griffith Park to downtown Los Angeles while maintaining existing levels of flood risk management.

Restoration measures considered include creation and reestablishment of historic riparian strand and freshwater marsh habitat to support increased populations of wildlife and enhance habitat connectivity within the study area, as well as to provide opportunities for connectivity to ecological zones such as the Santa Monica Mountains, Verdugo Hills, Elysian Hills, and San Gabriel Mountains. Restoration also includes the reintroduction of ecological and physical processes such as a more natural hydrologic and hydraulic regime that reconnects the river to historic floodplains and tributaries, reduces flow velocities, increases infiltration, improves natural sediment processes, and improves water quality. The study also evaluates opportunities for passive recreation that are compatible with the restored environment. The study evaluated the No Action Alternative and five action alternatives, Alternative 10, 13, 13v, 16, and 20. The Recommended Plan is Alternative 20, which includes compatible recreation features.

The official closing date for the receipt of comments is 30 days from the date on which the Environmental Protection Agency publishes the Notice of Availability of this Final IFR in the Federal Register.

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Appendix B: Economics
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Appendix F: Air Quality
Appendix G: Habitat Evaluation- Combined Habitat Assessment Protocol (CHAP)
Appendix H: Supplemental Environmental Information: (Part 1) Supplemental Information; (Part 2) Monitoring and Adaptive Management Plan; (Part 3) Mitigation Monitoring and Reporting Program
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Appendix J: Real Estate Plan
Appendix M: Clean Water Act 404(b) (1) Evaluation
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Appendix L: Public Comments on the Draft Integrated Feasibility Report: (Part 1) Public Comments; (Part 2) Responses to Public Comments
ACRONYMS AND ABBREVIATIONS

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<td>AAHU</td>
<td>Average Annual Habitat Units</td>
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<td>Lead</td>
</tr>
<tr>
<td>PCE</td>
<td>Perchloroethylene</td>
</tr>
<tr>
<td>PEMC</td>
<td>Palustrine emergent, seasonally flooded</td>
</tr>
<tr>
<td>PFOC</td>
<td>Palustrine forested, seasonally flooded</td>
</tr>
<tr>
<td>PLUM</td>
<td>Planning and Land Use Management Committee, Los Angeles City Council</td>
</tr>
<tr>
<td>PM</td>
<td>Particulate matter</td>
</tr>
<tr>
<td>Ppm</td>
<td>Parts per million</td>
</tr>
<tr>
<td>PSSC</td>
<td>Palustrine scrub-shrub, seasonally flooded</td>
</tr>
<tr>
<td>PSSF</td>
<td>Palustrine scrub-shrub, semi-permanently flooded</td>
</tr>
<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
</tr>
<tr>
<td>REC1</td>
<td>Water Contact Recreation</td>
</tr>
<tr>
<td>REC2</td>
<td>Non-contact Water Recreation</td>
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<tr>
<td>Acronym</td>
<td>Abbreviation</td>
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<tr>
<td>RED</td>
<td>Regional Economic Development</td>
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<tr>
<td>ROG</td>
<td>Reactive Organic Gas</td>
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<tr>
<td>RUM</td>
<td>River Update Meetings</td>
</tr>
<tr>
<td>RWQCB</td>
<td>Los Angeles Regional Water Quality Control Board</td>
</tr>
<tr>
<td>SCAB</td>
<td>South Coast Air Basin</td>
</tr>
<tr>
<td>SCAG</td>
<td>Southern California Association of Governments</td>
</tr>
<tr>
<td>SCAQMD</td>
<td>South Coast Air Quality Management District</td>
</tr>
<tr>
<td>SCCWRP</td>
<td>Southern California Coastal Watershed Research Program</td>
</tr>
<tr>
<td>SCS</td>
<td>Soil Conservation Service</td>
</tr>
<tr>
<td>SF6</td>
<td>Sulfur hexafluoride</td>
</tr>
<tr>
<td>SHPO</td>
<td>State Historic Preservation Office</td>
</tr>
<tr>
<td>SIP</td>
<td>State Implementation Plan</td>
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<tr>
<td>SO2</td>
<td>Sulfur dioxide</td>
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<td>SR</td>
<td>State Route</td>
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<tr>
<td>SVOC</td>
<td>Semi-volatile organic compounds</td>
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<td>SWPPP</td>
<td>Stormwater Pollution Prevention Plan</td>
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<td>SWRCB</td>
<td>State Water Resources Control Board</td>
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<td>TAC</td>
<td>Toxic Air Contaminants</td>
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<td>Trichloroethylene</td>
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<td>TMDL</td>
<td>Total Maximum Daily Load</td>
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<td>Traditional Navigable Waters</td>
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<td>TPCS</td>
<td>Total Project Cost Summary</td>
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<tr>
<td>TSS</td>
<td>Total Suspended Solids</td>
</tr>
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<td>ULARA</td>
<td>Upper Los Angeles River Area</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
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<tr>
<td>USEPA</td>
<td>U.S. Environmental Protection Agency</td>
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<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
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<td>USGS</td>
<td>U.S. Geologic Survey</td>
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<tr>
<td>VOC</td>
<td>Volatile Organic Compounds</td>
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<td>WARM</td>
<td>Warm Freshwater Habitat</td>
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<tr>
<td>WET</td>
<td>Wetland Habitat</td>
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<tr>
<td>WILD</td>
<td>Wildlife Habitat</td>
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<td>WRP</td>
<td>Water Recycling Program</td>
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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This document is an Integrated Feasibility Report, Environmental Impact Statement, and Environmental Impact Report—known as an Integrated Feasibility Report (IFR)—for the United States Army Corps of Engineers (USACE or Corps) Los Angeles River Ecosystem Restoration Feasibility Study (Study), for which the City of Los Angeles (City) is the non-Federal sponsor.

This IFR is prepared as a partial response to the resolution adopted by the Senate Committee on Public Works approved June 25, 1969, and Section 4018 of the Water Resources Development Act of 2007. This study was initiated in 2003, when funds were appropriated to conduct a reconnaissance study of ecosystem degradation in the “Cornfields” area (now Los Angeles State Historic Park) of the Los Angeles River in Los Angeles, California, to determine whether there was a Federal interest in ecosystem restoration for the study area. The Los Angeles River Cornfields Area Environmental Restoration Study Reconnaissance Phase 905(b) Report (USACE 2003) found that there was Federal interest to study the feasibility of solutions for ecosystem degradation on the Los Angeles River in the City of Los Angeles, California.

The feasibility phase of this study was initiated in 2006, when USACE and the City signed a Feasibility Cost Sharing Agreement (FCSA).

ES.2 BACKGROUND

The Los Angeles (River) is the 51-mile-long backbone of an 870-square-mile watershed. It once anchored a vast system of riparian foothill, riverine, and freshwater marsh habitat that carried seasonal rains and subterranean flows across the coastal plain to the Pacific Ocean. Over the last 150 years, the River has been degraded by a cycle of increasing urban development in the floodplain, flooding, and channelization, culminating in the mid-20th century with the construction of the Federal flood risk management project known as Los Angeles County Drainage Area (LACDA). These changes are illustrated in Figure ES-1.

Like many other rivers in the Southwestern United States, much of the River was an ephemeral stream, which would appear dry for much of the year, but become a powerful torrent during the rainy season, expanding over the floodplain. Prior to development, the river’s course was consistent through the San Fernando Valley, but “once the river rounded the bend of the Santa Monica Mountains at Griffith Park, however, its path became much more circuitous. Between the mouth of Verdugo Wash and the Arroyo Seco, the river spread over a broad depression two thousand feet wide, its course meandering considerably from year to year” (Gumprecht 2001). Below the gap between the Elysian and San Rafael Hills, the channel widened and banks disappeared, with floodwaters able to stretch more than a mile wide (Gumprecht 2001). During storm events, the river’s course could shift by as much as 90 degrees, changing its outlet from Santa Monica Bay to San Pedro Bay (see Figure ES-2 for a watershed map). Development removed vegetation and converted floodplains to agricultural uses, vineyards, and later, residential, industrial, and commercial areas. When the railroads arrived in the 1870s, they placed tracks close along its banks, further hemming in the river. Bridges and railroad trestles constrained and quickened flows and created barriers during major storm events (Figure ES-1). Groundwater and surface withdrawals reduced regular river flows significantly, but flood threats to the populace from the seasonal storm flows increased as development and infrastructure expanded within the river’s natural floodplain, constraining the river’s flow and removing supporting vegetation and areas for infiltration.
Figure ES-1 Changes to the Los Angeles River (source: Joe Linton with permission)
Figure ES-2 Los Angeles River Watershed
In the late 19th and early 20th centuries, storm flows in the river caused catastrophic flooding that resulted in the loss of lives and millions of dollars in property damage to areas in the river’s floodplain. As a result, City and County leaders initiated a formal flood risk management program (then known as “flood control”) to channelize the natural river system with the goal of moving flood flows to the ocean as efficiently as possible. In the 1930s, Congress tasked the USACE with engineering the flood risk management system, as outlined in the County’s Comprehensive Plan. The program resulted in the channelization of the river and its tributaries in concrete as part of the LACDA project.

Given the houses, businesses and infrastructure in the floodplain that encroached on the river channel, the increase in impervious surfaces accompanying development, and a complex system of storm drains that delivered runoff to the river, concrete channels were one of the few options left at the time for effective flood risk management.

“Federal flood control engineers had little choice but to confine the Los Angeles River to a relatively narrow channel, a fraction of the width of natural floodplain, because of the nature of existing development and the high price of real estate along its course.” (Gumprecht 2001).

The further channelization and engineering of the already degraded river provided flood protection for the increasingly developed region and a consistent path for the River course. However, by encasing the river in concrete banks and a mostly concrete bed, widening and deepening its channel, and straightening the river’s course, the channelization project further diminished the diversity and quality of the river system’s plants and wildlife and disconnected it from its floodplain and significant ecological zones. The final section of the LACDA project in the Study Area was completed in 1959 as one component of the transformation of the region’s watersheds through development and flood risk management projects. The LACDA project continues to provide critical protection against flooding of surrounding and downstream areas. The project is operated by the Corps and the County of Los Angeles.

ES.3 LOS ANGELES RIVER STUDY AREA

Today the Los Angeles River flows through the nation’s second-largest urban region—from the San Fernando Valley into the Pacific Ocean at Long Beach. The first 32 miles of the river flow through the City of Los Angeles and along the cities of Burbank and Glendale (see Figure ES-2). Restoration of the river has been a long-standing priority of the City, and this is reflected in the Los Angeles River Revitalization Master Plan (Plan), adopted by the City Council in 2007. The Plan proposes ecosystem restoration with natural open spaces, wildlife habitat areas, recreational facilities and more than 240 projects connecting to five key “opportunity areas”: Canoga Park, River Glen, Taylor Yard, Cornfields/Chinatown, and Downtown Industrial. Initially, the study area for this IFR included the 32 miles of the river within the City. However, the iterative study process resulted in a narrowing of the Study’s geographic focus from the entire 32 miles to the 11 miles that includes the soft-bottomed Glendale Narrows stretch because that area shows the most promise for ecosystem restoration (Figure ES-3). Apart from the Sepulveda Basin, the San Fernando Valley area of the River (upstream of the study area) is characterized by large segments of channel that are entirely concrete with very few opportunities for adjacent land acquisition. In Studio City, the River is even more constrained—with a narrow boxed channel configuration less than 200 feet wide with development on either side. The lower reach of the river is highly constrained by development, including downtown Los Angeles and a heavy industrial corridor that also includes a major transmission corridor and a freeway system. The upper and lower reaches of the river have less potential to connect nationally and regionally significant ecological zones because of the state of existing development. These considerations make the potential for habitat connectivity and expansion very difficult in the near term.

The Glendale Narrows stretch of the river, in contrast, features a non-concrete bottom or natural bed (due to high groundwater levels), which has robust patches of vegetation—important habitat for birds and other wildlife—and free-flowing water that supports aquatic species. In addition, this area offers an opportunity to connect to existing large habitat areas of importance. Key tributary confluences connect to the river in this reach along and within Griffith Park, the eastern terminus of the Santa Monica Mountains. These connections include the Verdugo Wash, which connects to the Verdugo Mountains, and the Arroyo Seco, which connects to the San Gabriel Mountains and another USACE Feasibility Study area further upstream on the Arroyo Seco. The area also directly connects large open spaces either used as publicly-accessible parks with habitat areas or intended for this future use: USACE Headworks Feasibility Study area, California State Parks’ Bowtie Parcel, the Taylor Yard, Río de Los Angeles State Park, and Los Angeles State Historic Park (formerly known as the Cornfields). Three of the five key opportunity
areas of the City’s Plan are located within the Study area: River Glen, Taylor Yard, and Cornfields/Chinatown. Restoration within the study area would assist with the goal of transforming the river corridor into the “green spine” of the City. Existing habitat and perennial surface flow in the ARBOR (Area with Restoration Benefits and Opportunities for Revitalization) reach provide a base for restoration and maintain the most diverse assemblages of wildlife on the river today. The study thus focuses on the ARBOR reach, from Griffith Park to downtown Los Angeles.

Figure ES-3 Study Area, the ARBOR Reach
**ES.4 RESOURCE SIGNIFICANCE**

Consideration of significant resources is central to plan formulation, especially in the context of ecosystem restoration planning because non-monetary outputs are being considered. Per USACE Engineering Regulation (ER) 1105-2-100, significance of resources and effects will be derived from institutional, public, or technical recognition as discussed in further detail in Chapter 2 of the IFR. Table ES-1 summarizes resource significance within the study area.

<table>
<thead>
<tr>
<th>HABITAT SCARCITY</th>
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<tbody>
<tr>
<td><strong>Global</strong> – Study area is within the rare Mediterranean ecosystem that covers only 2% of the Earth’s land surface but accounts for 20% of all known plant species (Kaufman 2003).</td>
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<tr>
<td><strong>Western Hemisphere</strong> – The western riparian ecosystem is one of the rarest habitat types in North America (Krueper 1995).</td>
</tr>
<tr>
<td><strong>United States</strong> – Western cottonwood-willow forest is one of the rarest and most endangered forest types in the U.S. (Noss &amp; Peters 1995).</td>
</tr>
<tr>
<td><strong>Southwest</strong> – Due to arid Mediterranean climate, riparian areas are critical ecosystem as they occupy a very small area but support the majority of the region’s biodiversity (Levick 2008).</td>
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<table>
<thead>
<tr>
<th>BIODIVERSITY</th>
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<tr>
<td>California has the highest total number of species of plants and animals, including native species not found anywhere else, than any other state in the U.S. (Stein et al. 2000).</td>
</tr>
<tr>
<td>The California Floristic Province has been declared a global biodiversity hotspot and is one of the world’s 25 most biologically rich and threatened terrestrial ecoregions. Hotspots must contain at least 1,500 species of endemic vascular plants, and lost at least 70 percent of its original habitat (Myers et al. 1999).</td>
</tr>
<tr>
<td>The California Floristic Province is one of the world’s 25 most biologically rich and threatened terrestrial ecoregions (Myers et al. 1999).</td>
</tr>
<tr>
<td>California ranks number one in the United States for endemic (native) plants, amphibians, reptiles, mammals, and freshwater fish species that are unique to the state. Approximately 61% of the plants in the California occur nowhere else in the world. Approximately 50% of bird species and mammals in the United States are found in California (Bittman et al. 2003).</td>
</tr>
<tr>
<td>Approximately 80 percent of all wildlife use the riparian ecosystem at some life stage, with over 50 percent of bird species nesting primarily in riparian habitats (Krueper 1993). The abundance and diversity of riparian vegetation, as compared to uplands areas, is key in providing food, shelter, water, breeding habitat, and movement corridors.</td>
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<tr>
<td>In terms of species richness, the Los Angeles River area includes over 50 plant alliances and approximately 1,000 plant types (Bittman et al. 2003).</td>
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<td>The upper Los Angeles River watershed has a relatively high occurrence of rare plant species, due to underlying soil properties and other geomorphic and environmental conditions. The lower watershed includes rare special status invertebrates (Bittman et al. 2003).</td>
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<tr>
<td>Approximately 140 federally protected bird species are supported on the LA River. Restoration would support the federally endangered least Bell’s vireo, the yellow breasted chat, yellow warbler (State Species of Concern), hooded and Bullock’s oriole, lazuli bunting, blue grosbeak, western tanager, woodpeckers, owls, ducks (Cinnamon teal, ring-necked duck, northern pintail), hawks (sharp shinned hawk, osprey), and shorebirds (great blue heron, spotted sandpiper, black necked stilt). Over 20 species of mammal are supported on the LA River. Restoration of movement corridors could support use by top predators such as bobcat and coyote. Nine species of bat are supported on the LA River. Restoration would expand bat habitat along bridges and support local bat populations that are known to regulate insect populations (vector control).</td>
</tr>
</tbody>
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Table ES-1 Summary of Resource Significance
<table>
<thead>
<tr>
<th>Status &amp; Trends</th>
<th>The study area is in one of the top 25 global hotspots experiencing rapid biodiversity loss (Stein et al. 2000).</th>
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<tbody>
<tr>
<td></td>
<td>Only 45,000 square miles of the California Floristic Province (or 25%) remains out of 183,000 square miles of the historic extent of vegetation (CEPF website).</td>
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<td>A total of 31% of plant and animal species at risk within the United States are found within California. This figure includes 32% of plant species, 41% of mammals, and 29% of reptiles at risk (Bittman et al. 2003). Less than 10% of wetlands’ surface area remains in California, a 90% loss compared to wetland loss of 50% in the rest of the country (Dahl 1990).</td>
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<td></td>
<td>Over 90 percent of southern California’s coastal region riparian habitat including Valley Foothill riparian habitats (Faber et al. 1989), and over 95 percent of California’s wetlands and freshwater marsh, have been lost (Dahl 1990).</td>
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<td></td>
<td>Due to the unique hydrology in the semi-arid southwest, the Los Angeles Basin supported a small but native freshwater fish population (Swift and Siegel 1993). At least five of the seven fish species native to southern California have been extirpated from this watershed (Gumprecht 2001; FoLAR 2008). Extirpated fish species include federally listed southern California steelhead, unarmored threespine stickleback, and Pacific lamprey. California listed species arroyo chub and Santa Ana sucker still exist in small numbers in the upper watershed (Gumprecht 2001). Current conditions support non-native fish species that thrive in highly altered habitats with perennial flow, high nutrient levels, higher temperature, and lack of a flood disturbance regime (FoLAR 2008).</td>
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<td></td>
<td>Prior to habitat loss and conversion, the river was home to least Bell’s vireo (federally endangered, state endangered), yellow billed cuckoo (federally threatened), and yellow warbler (state species of special concern), and provided foraging habitat for CA coastal gnatcatcher (federally threatened) and southwestern willow flycatcher (federally endangered, state endangered).</td>
</tr>
<tr>
<td>Connectivity</td>
<td>River channels in arid regions provide wildlife movement corridors essential to species survival due to the continuous chains of vegetation that wildlife can use for cover and food (Levick et al. 2008).</td>
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<td></td>
<td>The remaining fragments of Los Angeles River aquatic and riparian habitat (or habitat “nodes”) within the urban landscape context contribute significantly to the integrity of the larger ecosystem by supporting metapopulations (assemblages of local populations connected by migration) (Hanski and Gilpin 1991). By increasing patches and reducing the distances between them, colonization among populations improves (Hanski and Thomas 1994).</td>
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<td></td>
<td>The existing habitats in the Glendale Narrows and connection to major tributaries provide the backbone for restoration of regional habitat connectivity and wildlife movement between significant ecological areas including the Santa Monica Mountains, the Verdugo Hills, and nationally significant San Gabriel Mountains National Monument.</td>
</tr>
<tr>
<td>Hydrologic &amp; Geomorphic Character</td>
<td>The highly seasonal hydrology and permeable sediments create a dynamic system where the river constantly shifts with the highly variable flood regime. Historically, “the river spread over a broad depression two thousand feet wide” between the Verdugo Wash confluence and the Arroyo Seco (Gumprecht 2001).</td>
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<td></td>
<td>The dynamic channel and floodplain structure supports a diverse assemblage of plants and wildlife. High flows transport sediment, displace benthic invertebrates, clear gravel beds of accumulated silt allowing attachment of insect eggs, and import woody debris, creating new habitat. Overbank flows connect channels to floodplains, increases overall productivity and diversity, while scouring rejuvenates habitat. Low flows determine available habitat available during critical periods. Temporary drying of stream channels could provide habitat for specialized species (EPA 1999).</td>
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<td>Development, flood risk, and water supply projects have constrained and eliminated most such systems in the southwest (see Section 2.1.3). Flood control works in the Los Angeles region alone include 100 miles of channelization of major rivers and streams plus 370 miles of tributary channels (Gumprecht 2001). On the main Los Angeles River, 94% of its 51 miles is lined by concrete banks and only one-quarter of its length, including 6 miles within the ARBOR, has a non-concrete bottom.</td>
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</table>
The current hydrologic system has a highly altered regime that is simplified with intensified flows, functioning more as a drainage channel than a river ecosystem. Input of gravels and cobbles are prevented, water temperatures are higher, channel morphology is simplified, and the episodic succession-setting flood regime necessary to sustain the target riparian communities and native fish habitats has been altered.

**INSTITUTIONAL RECOGNITION**

| **U.S. Fish & Wildlife Service** | The U.S. Fish and Wildlife Service’s recovery plan for the federally threatened Santa Ana sucker recognizes the importance of the Los Angeles River for recovery of the species. Per the plan, the Los Angeles River Watershed Recovery Unit includes the Los Angeles River down to the Arroyo Seco confluence, which encompasses the study area. Increasing the extent of native fish habitat will provide opportunities to improve the resiliency and redundancy, improving the status of the species (USFWS 2014). |
| **Environmental Protection Agency** | The Los Angeles River was selected to be one of seven nationwide first-phase pilots for the Environmental Protection Agency’s (EPA) Urban Waters Federal Partnership. The Partnership includes the USACE, the Departments of Interior, Commerce, Agriculture, and Housing and Urban Development, the Environmental Protection Agency, four state agencies, seven local governmental entities, and 11 nongovernmental organizations. The group’s first goal is to “restore ecosystem function,” and half of the group’s 22 projects being tracked for progress are focused on this goal. This study was selected as the group’s top priority. |
| **Clean Water Act** | The Los Angeles River is protected by the Clean Water Act. In 2010, EPA designated the entire river as a Traditionally Navigable Water (TNW), citing the River’s historic and continuing importance and the potential beneficial impacts of river restoration on the region. The State of California cited the TNW designation and the character of the River in codifying the River’s status as a navigable water of the state protected as part of the Public Trust under the State Constitution in SB 1201, signed by the Governor in 2012. |
| **San Gabriel Mountains National Monument** | Approximately 350,000 acres of the San Gabriel Mountains, headwaters of the Los Angeles River Watershed, were designated in late 2014 as the “San Gabriel Mountains National Monument.” The San Gabriels contain some of the highest biodiversity in the country, with unique geological features and 300 endemic plants found nowhere else in the world. |
| **Department of Interior** | The President’s America’s Great Outdoors is an initiative to develop a 21st Century approach to conservation and outdoor recreation, identified the Los Angeles River watershed as a priority project in its “50 State Report.” |
| **Regional Conservation Agencies** | The State of California Santa Monica Mountains Conservancy (SMMC) and its affiliate agency, the Mountains Recreation and Conservation Authority (MRCA) have restored or protected valuable open space along the banks of the Los Angeles River, increasing public ownership and access along the river, while increasing restoration opportunities that were not available even 15 years ago. |
| **Los Angeles River Revitalization Master Plan (adopted 2007)** | The City’s Los Angeles River Revitalization Master Plan (adopted 2007) contains input of Federal, State, and regional agencies and stakeholders, and Congress specifically directed in WRDA 2007, section 4018, that the present study be consistent with the Master Plan goals. A key goal is to restore a functional riparian ecosystem to (1) create a continuous functional riparian corridor; (2) connect this corridor to other significant habitat and migration routes along the tributaries and into the mountains; (3) provide support for desirable fish species; and (4) bioengineer or naturalize the river’s edge where feasible. |
PUBLIC RECOGNITION

**Urban Waters Federal Partnership-Non-Governmental Organizations**

Eleven nongovernmental organizations actively participate alongside the 11 Federal agencies of the Urban Waters Federal Partnership and many have a Los Angeles River ecosystem restoration focus. Key groups include: 1. Friends of the Los Angeles River (FoLAR), founded in 1986, has spearheaded efforts to restore the river. 2. The Council for Watershed Health, formerly the Los Angeles and San Gabriel Rivers Watershed Council, collaborates with government agencies, businesses and scientists to enhance the social, ecological, and economic health of the watersheds through education, research, and planning. 3. Urban Forestry groups TreePeople and North East Trees have worked to “green” the Los Angeles River and surrounding urban communities, and 4. Other key Los Angeles River and watershed groups include the Los Angeles River Revitalization Corporation, the Arroyo Seco Foundation, The River Project, Los Angeles Conservation Corps, the Trust for Public Land, the Urban Rivers Institute, and Urban Semillas.

**Local, State, and Federal**

In summer 2013 and 2014, a portion of the river channel within the study area was opened for seasonal activities, reflecting increased public interest for ecological education and passive recreational opportunities. Activities include hiking, bird-watching, environmental education, and non-motorized boating. This local, State, and Federal collaboration supports California Senate Bill 1201, which facilitates restoration and recreation where compatible with flood risk management.

**Scholarly & Media Attention**

The Los Angeles River, its degradation and potential restoration, have been the subject of increasing scholarly attention, national media coverage, inclusion in environmental history texts, art exhibitions, 20 films, and news and magazine stories, inspiring local and national artists, filmmakers, authors and poets.

**National Recreation Trail System**

In 2012, the portion of the Los Angeles River Trail that extends throughout the study area was designated by the Secretary of the Interior as part of the National Recreation Trail System increasing awareness and stewardship of the River’s natural resources.

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**ES.5 PURPOSE AND NEED**

**Purpose:** The primary purpose of the alternatives and proposed project considered in this Study is to restore approximately 11 miles of the Los Angeles River from Griffith Park to Downtown Los Angeles by reestablishing riparian strand, freshwater marsh, and aquatic habitat communities and reconnecting the River to major tributaries, its historic floodplain, and the regional habitat zones of the Santa Monica, San Gabriel, and Verdugo mountain ranges while maintaining existing levels of flood risk management. A secondary objective is to provide recreational opportunities consistent with the restored ecosystem.

**Need:** The Los Angeles River was once the backbone of a vast system of riparian foothill, riverine and freshwater marsh habitat that carried seasonal rains and subterranean flows through the coastal plain to the Pacific Ocean. Over time, the river has been degraded by a cycle of urban development, flooding, and channelization. Plant and wildlife diversity and habitat quality has been severely diminished, and the river has been severed from its floodplain and nearby significant ecological zones.

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**ES.6 PLANNING OBJECTIVES**

The significant resources identified were used to develop problems and opportunities, and from there, objectives. The objectives of the study are to:

1. Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat: Restore Valley Foothill Riparian wildlife habitat types, aquatic freshwater marsh communities, and native fish habitat within the ARBOR
reach throughout the period of analysis, including restoration of supporting ecological processes and biological diversity, and a more natural hydrologic and hydraulic regime that reconnects the river to historic floodplains and tributaries, reduces velocities, increases infiltration, and improves natural sediment processes.

2. Increase Habitat Connectivity: Increase habitat connectivity between the river and the historic floodplain, and increase nodal connectivity for wildlife between restored habitat patches and nearby significant ecological zones such as the Santa Monica Mountains, Verdugo Hills, Elysian Hills, and San Gabriel Mountains within the ARBOR reach throughout the period of analysis.

3. Increase Passive Recreation: Include recreation that is compatible with the restored environment in the ARBOR reach throughout the period of analysis.

**ES.7 KEY CONSTRAINTS, CONSIDERATIONS AND POLICY ISSUES INFLUENCING ALTERNATIVES FORMULATIONS, COMPARISON, AND SELECTION**

Just as the national and regional perspective on the Los Angeles River has changed over time, the Corps mission has grown to include ecosystem restoration. Projects proposed by the Corps for ecosystem restoration should be responsive to the purpose, intent, and scope of the restoration mission.

- **Purpose:** “...to restore significant structure, function and dynamic processes that have been degraded” (Engineer Pamphlet or EP 1165-2-501).
- **Intent:** “...to partially or fully reestablish the attributes of a naturalistic, functioning, and self-regulating system” (EP 1165-2-502).
- **Scope:** “Nationally and regionally significant wetlands, riparian and other floodplain and aquatic systems” (ER 1105-2-100).

In developing and comparing alternatives, the Corps and City gave substantial consideration to the way in which structure, function and dynamic processes work together to achieve restoration objectives. Corps guidance states that, “Restoration projects should be conceived in a systems context ... in order to improve the potential for long-term survival as self-regulating, functioning systems. This system view will be applied both in examination of the problems and the development of alternative means for their solution. Consideration should be given to the interconnectedness and dynamics of natural systems...” (ER 1105-2-100). The final array of alternatives takes into account the physical dynamics of the aquatic ecosystem.

Further, the proposed restoration has a direct association with historic and ongoing Corps activities. Nationwide, the Corps is engaged in transforming single-purpose, 20th century infrastructure that did not evaluate environmental effects before construction into multi-purpose, 21st century infrastructure that incorporates consideration for the natural environment and public access and use. The Corps has a central role to play in ecosystem restoration projects that are related to its existing projects. The Corps continues to operate the LACDA project within the river in the study area today, and that project remains necessary for the continued management of flood risk in surrounding areas. In addition, the Corps is uniquely suited as the Federal proponent in this endeavor because it is a lead water resources agency with appropriate engineering and ecological expertise. In order to appropriately respond to the scale of the identified problems in and along the River and warrant Federal investment, ecosystem restoration features that directly connect overbank areas with the channel to restore degraded functions and processes are critical.

Key issues encountered in developing the alternatives were the high costs of real estate, the presence of sites contaminated with hazardous substances, levee policies that restrict planting on levees, and flood risk. Each of these issues is typical of urban areas—acquisition of lands in urban areas is more expensive because of development.

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1 The period of analysis is the period of time over which any alternative plan would have significant beneficial or adverse effects. The period of analysis is 50-years. (ER 1105-2-100)
pressures; a long-standing history of mixed uses for commerce, industry, intensive intermodal transportation yields contamination concerns; intensive development in historical floodplains includes associated building of roadways and other paved surfaces; and flood risk management infrastructure that is still critical to protecting adjacent communities is aging. The following summarize resolution and constraints related to key issues.

- Real estate costs for all plans identified for detailed study exceeded the Corps policy limitation that real estate costs not exceed 25 percent of total ecosystem restoration cost. To allow the study to consider recommendation of any of the plans identified, the City of Los Angeles offered to waive reimbursement for real estate costs exceeding its statutory share. The Assistant Secretary of the Army (Civil Works) granted the City’s request and granted a policy exception to allow the consideration of these plans.
- Hazardous, Toxic and Radioactive Waste (HTRW) is present or suspected to be present in parcels key to alternatives formulation. Because Corps policy is to avoid HTRW contaminated lands when practicable, the study confirmed that where contaminated lands were included in alternatives, they were necessary to meet objectives. The sponsor will ensure lands with soil contamination are remediated prior to any construction by the Corps.
- Levee policies limit the planting that can occur on levees within the study area.
- The study area overlaps with the existing LACDA flood risk management project. Alternatives may not decrease the flood risk management function or level of protection provided by that project. This limited the modifications that could be made to the river channel.

ES.8 PLAN FORMULATION, EVALUATION, AND COMPARISON

Management measures, the components of alternatives, were developed based on the expert opinions of Federal, State, and local agencies, the Corps, and the sponsor. The measures were combined along the potential project area based on the problems, opportunities, objectives, and the practicability of implementation of each measure at each site given the constraints and land uses along the river. Teams of experts in the disciplines of economics, biology, engineering, hydraulics, landscape architecture, geotechnical/soils engineering, planning, and recreation were able to apply their expertise—along with the information gathered from the public and other stakeholders during the Revitalization Master Plan outreach efforts—to a focused charrette process. The participants considered refinement of the study objectives and a wide variety of measures that could be combined into alternatives meeting the planning objectives. The alternatives were formulated for the entire study area during the planning charrette with additional alternatives formulated during public outreach and individual team efforts including the USACE design team, City design team, and a multi-agency habitat team (with members from the USACE, the sponsor, Regional Water Quality Control Board (RWQCB), United States Fish and Wildlife Service (USFWS), California State Parks, California Department of Fish and Wildlife (CDFW), and academic experts). Other conceptual alternatives such as widening of the entire channel were initially considered and dismissed based on feasibility.

This produced a preliminary array of 19 alternatives. Typical designs, costs, and habitat benefits were developed for the elements of these alternatives. For this study, benefits (or outputs) were quantified using a habitat model called the Combined Habitat Assessment Protocols (CHAP) approach. CHAP looks at species and their function within the habitat. After mapping, doing a field inventory of the study area, and assessing a species list, the habitat team forecast the change in habitat for each measure at each site along the river. Habitat value was measured in habitat units (HU) based on an assessment of multiple species, habitat features, and functions by habitat type. Since the CHAP model utilized species, habitat, and functions in calculating HUs, there is more than 1 HU per acre.

Due to the high velocity flows that are carried in the channel during storm events, several of the preliminary alternatives relied, in whole or in part, on the diversion of flood flows through an underground tunnel or storage mechanism. The alternatives requiring the most extensive and expensive engineering interventions, such as the creation of underground detention/retention basins or very large bypass culverts or tunnels, were determined to be infeasible because of their cost and because they only exacerbated or moved the problems with the current channelized system and deferred important decisions about what needs to occur regarding peak flow reduction in the river’s watershed.

The original 19 alternatives were each divided into eight reaches based on geomorphic character, which includes their physical shape, and channel configuration. Each reach plan from each of the 19 preliminary alternatives was input into the cost effectiveness/incremental cost analysis (CE/ICA) software (IWR Plan). The preliminary alternatives were also cost entered as a whole. The analysis then recombined the geomorphic reaches into plans for
comparison and evaluation with the preliminary plans, providing plans that were more cost effective and not
dependent on a tunnel or other diversion measure. The recombination of plans by reach produced an array of 171
cost effective plans and 21 best buy plans. “Cost effective” means that, for a given level of non-monetary output, no
other plan costs less, and no other plan yields more output for less money. The most efficient plans are called “Best
Buys.”

ES.9 DRAFT IFR ARRAY OF ALTERNATIVES

The array of alternatives presented in the Draft IFR was selected from the best buy plans based on the CE/ICA and
the study objectives. Four plans were identified that best combined the reach plans to present a reasonable range of
alternatives. The alternatives included in the final array involve a mix of working with and building upon the
existing habitat in the river and providing new solutions that extend existing habitat with new upstream-to-
downstream (such as at the key tributary confluences) and in-channel-to-outer-bank (such as with adjacent large
areas) connections. The alternatives were named to assist the team, reviewers, and the public. The final array of
alternatives from the Draft IFR is briefly described below:

- **Alternative 10** is called the ART (for ARBOR Riparian Transitions). It provides restoration in all reaches,
  restores a historic wash at the Los Angeles Trailer and Container Intermodal Facility (LATC) site, widens
  the river at Taylor Yard, restores a side channel and a seasonal flow area in the Griffith Park area, restores
  several daylighted streams, and provides transitions or connections between existing riparian corridors and
  concrete lined river reaches.

- **Alternative 13** is named ACE (for ARBOR Corridor Extension). It includes most of the features in
  Alternative 10, and it restores an additional side channel, increases widening of the river at Taylor Yard,
  and restores the Arroyo Seco confluence.

- **Alternative 16** is called AND (for ARBOR Narrows to Downtown). It includes most of the features in
  Alternative 13, and in addition, in Reach 5, it widens the river channel bottom and terraces the bank, and in
  Reach 8, it reconnects the river to the historic floodplain in LATC by removing the channel wall, restores
  the historic wash and freshwater marsh within the LATC site, removes concrete and restores wetlands
  within the channel bed, and terraces channel banks.

- **Alternative 20** is called RIVER (for Riparian Integration via Varied Ecological Reintroduction). It
  includes all the features of Alternative 16 except that in Reach 7 in addition to restoring the lower Arroyo
  Seco, it daylights three streams, restores freshwater marsh at the Los Angeles State Historic Park, and
  creates a terraced bank connection to the River. In addition, it widens the channel in Reach 2 and restores
  the confluence with Verdugo Wash in Reach 3.

ES.10 COMPARISON IN THE DRAFT IFR TO IDENTIFY THE NER AND TSP

As part of the planning process, the Corps and City identify an “NER” Plan, the National Ecosystem Restoration
Plan. The NER Plan is not always the plan recommended for authorization by Congress, as the City can decide to
take on the additional costs of implementing what is called a Locally Preferred Plan (LPP). Either an NER plan or an
LPP can be the recommended plan.

As described in Corps planning guidance, the NER Plan is the alternative and scale having the maximum monetary
and non-monetary beneficial effects over monetary and nonmonetary costs. This plan occurs where the incremental
beneficial effects just equal the incremental costs, or alternatively stated, where the extra environmental value is just
worth the extra costs. The guidance also notes that in all but the most unusual cases, the NER Plan should be derived
from the final set of “Best Buy” solutions. To put it simply, the Corps and City have to answer the question about
whether the plan’s benefits are worth the costs, but this is a difficult process because monetary calculations do not
capture all ecosystem benefits.
To further inform the decision on the NER and Tentatively Selected Plan (TSP), the alternatives array was compared using the study objectives, Principles and Guidelines comparison criteria, and the four comparison accounts of environmental impact statements (EISs) were all provided to the public in comparing alternatives and assist the Corps and City in identifying what is called the NER Plan, and choosing a plan to recommend for authorization.

Based on the comparison, the Draft IFR identified Alternative 13 as the NER plan. Alternative 13 was also identified as the Tentatively Selected Plan in the Draft IFR. Although Alternatives 16 and 20 provided the greatest habitat restoration output of the plans in the final array, they did so at a very high incremental cost when compared to Alternative 13. For example, the cost associated with the 121 additional acres in Alternative 20 is relatively high because the acres are restored through modifications to the river channel by removing concrete or reconfiguring channel walls, and widening the channel to restore hydrologic connectivity and additional wetland habitat.

**ES.11 ACTIONS SUBSEQUENT TO THE DRAFT IFR**

**Public Comments and Independent External Peer Review**

During the public comment period for the Draft IFR, which closed on 18 November 2013, the Corps received and evaluated nearly 500 comment letters, forms and emails. The majority of the public and public agencies indicated their support of Alternative 20, which was taken into consideration by the Corps in determining the recommended plan. Comments were received from Federal agencies, State and local agencies, Non-Governmental Organizations (NGOs), interest groups, elected officials, and private citizens. Many public comments received, as well as a comment from the project’s Independent External Peer Review (IEPR) Panel, suggested that an additional analysis of connectivity benefits would assist with alternative comparison and selection. The Corps used a framework suggested by the project’s IEPR panel to better quantify the beneficial outputs of connectivity. Four different metrics were developed to further quantify different connectivity outputs. By evaluating hydrologic, local, and regional connectivity and combining the resulting output with the initial habitat model output, the Corps was able to more comprehensively compare the alternatives in the final array.

Although quantifying connectivity showed more restoration output for each of the alternatives, larger alternatives also had substantially higher costs. Given the magnitude of the incremental costs relative to the incremental increase in benefits, quantifying these connectivity benefits did not provide sufficient basis to justify the selection of a much larger scale plan as the NER Plan.

**Identification of Variation on Alternative 13**

Following the public review period for the Draft IFR, the Corps performed a more detailed cost analysis using Mii software, real estate cost updates, and further modified contingencies based upon a full cost risk summary analysis. This analysis identified a more efficient variation on Alternative 13 that is identical to Alternative 13 except for Reach 7, where it includes the reach plan included in Alternative 20. This alternative is within the spectrum of alternatives considered in the Draft IFR.

Alternative 13v (for variation) includes all the features in Alternative 13 except that in Reach 7, in addition to restoring the lower Arroyo Seco, it restores freshwater marsh at the Los Angeles State Historic Park, creates a terraced bank connection to the River and daylights three streams rather than including a restructured bank with overhanging vines.

**Comparison of Final Array of Alternatives**

Table ES-2 below is a summary comparison of the restoration benefits across the final array of alternatives including Alternative 13v. Habitat benefits were calculated using a habitat evaluation method, CHAP (Combined Habitat Assessment Protocol), as described in Section 4.9.
Table ES-2 Comparison of Ecosystem Benefits of Alternatives

<table>
<thead>
<tr>
<th>Reach</th>
<th>Alt 10</th>
<th>Alt 13</th>
<th>Alt 13v</th>
<th>Alt 16</th>
<th>Alt 20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Pollywog Park to Bette Davis Park</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>866</td>
<td>same as 10</td>
<td>same as 10</td>
<td>same as 10</td>
<td>same as 10</td>
</tr>
<tr>
<td>Acres</td>
<td>82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Bette Davis Park to Ferraro Fields (Alt 20 Adds Reach 2 Channel Widening)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>392</td>
<td>same as 10</td>
<td>same as 10</td>
<td>same as 10</td>
<td>Δ = 55</td>
</tr>
<tr>
<td>Acres</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td>Δ = 20</td>
</tr>
<tr>
<td><strong>3. Ferraro Fields to Upstream Glendale Narrows (Alt 13 Adds Ferraro Fields; Alt 20 Adds Verdugo Wash)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>40</td>
<td>Δ = 160</td>
<td>same as 13</td>
<td>same as 13</td>
<td>Δ = 130</td>
</tr>
<tr>
<td>Acres</td>
<td>33</td>
<td>Δ = 17</td>
<td></td>
<td></td>
<td>Δ = 30</td>
</tr>
<tr>
<td><strong>4. Upstream Glendale Narrows to Los Feliz</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>492</td>
<td>same as 10</td>
<td>same as 10</td>
<td>same as 10</td>
<td></td>
</tr>
<tr>
<td>Acres</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5. Los Feliz to Bowtie Parcel (Alt 16 adds Reach 5 widening/terracing)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>87</td>
<td>same as 10</td>
<td>same as 10</td>
<td>Δ = 265</td>
<td>same as 16</td>
</tr>
<tr>
<td>Acres</td>
<td>41</td>
<td>Δ = 27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6. Bowtie Parcel to Downstream Glendale Narrows/Arroyo Seco (Alt 13 adds marsh/widening)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>1,256</td>
<td>Δ = 191</td>
<td>same as 13</td>
<td>same as 13</td>
<td>same as 13</td>
</tr>
<tr>
<td>Acres</td>
<td>138</td>
<td>Δ = 21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7. Downstream Glendale Narrows/Arroyo Seco to Main Street (Alt 13 Adds Arroyo Seco, Alt 20 Adds Cornfields)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>29</td>
<td>Δ = 230</td>
<td>Δ = 87</td>
<td>same as 13</td>
<td>same as 13v</td>
</tr>
<tr>
<td>Acres</td>
<td>27</td>
<td>Δ = 22</td>
<td>Δ = 32</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8. Main Street to First Street (Alt 16 Adds Channel Bottom Concrete Removal, Terracing, Off Channel Wetlands, and H&amp;H connection at LATC)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (HU)</td>
<td>2,159</td>
<td>same as 10</td>
<td>same as 10</td>
<td>Δ = 342</td>
<td>same as 16</td>
</tr>
<tr>
<td>Acres</td>
<td>109</td>
<td>Δ = 44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alternative Totals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total AAHU</td>
<td>5,321</td>
<td>5,902</td>
<td>5989</td>
<td>6,509</td>
<td>6,782</td>
</tr>
<tr>
<td>Total Acres</td>
<td>528</td>
<td>588</td>
<td>598</td>
<td>659</td>
<td>719</td>
</tr>
</tbody>
</table>

Δ = change from next smallest alternative

All five alternatives provide substantial ecosystem benefits as shown in the table. The larger alternatives provide more benefits, but they do so at a higher relative increase in costs.

Table ES-3 provides a comparison of alternatives based on habitat connections. Percent increase in nodal “connectedness” was performed based on the sizes of habitat nodes in the study area and the minimum distance of vegetated corridors between nodes (Rudd et al. 2002). “Connectedness” was calculated based on the size of habitat nodes with natural hydrologic connections to the river and the length of natural habitat corridors between them. Restoration of large nodes that are close together connected by natural habitat, corridors increase the level of “connectedness”. For each alternative in the final array, additional nodes and/or corridors are restored, increasing the level of “connectedness” in the project area.
Table ES- 3 Final Array Comparison by Objectives-Habitat Connections

<table>
<thead>
<tr>
<th>Habitat Connections</th>
<th>10 ART</th>
<th>13 ACE</th>
<th>Alt 13v</th>
<th>16 AND</th>
<th>20 RIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental / nodal</td>
<td>Minor</td>
<td>309% over Alt 10</td>
<td>33% over Alt 13</td>
<td>39% over Alt 13v</td>
<td>120% over Alt 16</td>
</tr>
<tr>
<td>increase between</td>
<td>improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>alternatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added Regional</td>
<td>Santa Monica</td>
<td>Santa Monica &amp; San Gabriel Mtns</td>
<td>Elysian Hills, Santa Monica &amp; San Gabriel Mtns</td>
<td>Santa Monica &amp; San Gabriel Mtns</td>
<td>Verdugo &amp; Elysian Hills, Santa Monica &amp; San Gabriel Mtns</td>
</tr>
<tr>
<td>Connections</td>
<td>Mtns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Connectivity benefits were evaluated in terms of nodal and regional connectivity as described in Sections 2.2.4 and 6.1. Nodal connectivity is provided when patches of habitat are connected by wildlife corridors. Connectivity improves with larger nodes that are closer together. Regional connectivity is a more general term referring to longer distance connections to significant habitat areas, such as the Santa Monica and San Gabriel Mountains.

Figure ES- 4 Draft IFR Final Array Comparison-AAHU’s and Restored Acres

Figure ES-4 provides a visual comparison of Average Annual Habitat Units (AAHUs) and restored acres by alternative. Alternative 13v is essentially the same as Alternative 13 with the change in Reach 7 resulting in an increase of 87 HUs and 10 acres.

Environmental Impacts

The alternatives were also evaluated and compared for their environmental impacts. The analysis identified beneficial impacts to biological resources, water resources, and other resource categories. All impacts were less than significant except for land use impacts under NEPA and CEQA and air quality under CEQA. All of the action alternatives include significant unavoidable adverse impacts under NEPA and significant and unavoidable impacts under CEQA to land use for construction and operations. All of the action alternatives other than 13v would have significant and unavoidable impacts to air quality under CEQA from construction emissions. These impacts are summarized in Table ES-4.
Table ES- 4 Final Array Comparison of Significant Unavoidable Adverse Environmental Impacts (NEPA) and Significant and Unavoidable Impacts (CEQA)

<table>
<thead>
<tr>
<th>Resource</th>
<th>Alternative 10 (ART)</th>
<th>Alternative 13 (ACE)</th>
<th>Alternative 13v (AND)</th>
<th>Alternative 16 (RIVER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIR QUALITY</td>
<td>The construction phase of the proposed project is expected to exceed the CEQA localized significance thresholds for NOx. This results in a significant unavoidable impact under CEQA. Impacts under NEPA would be less than significant.</td>
<td>Impacts under all air quality significance criteria would be less than significant.</td>
<td>Same as Alt 10.</td>
<td>Same as Alt 10.</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Restoration in Reach 8 would conflict with the Industrial and Light Industrial land use designation. This results in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA for both construction and operations.</td>
<td>Same as Alt 10.</td>
<td>Same as Alt 10.</td>
<td>Same as Alt 10, additional conflict with Industrial designation in Reach 3, resulting in a significant adverse impact (NEPA), and significant and unavoidable impact (CEQA) for both construction and operations.</td>
</tr>
</tbody>
</table>

**Refinement of NER Plan**

Based on the comparative analysis, the NER Plan was refined from what was identified in the Draft IFR. Because the variation on Alternative 13, Alternative 13v, provides more benefits than Alternative 13 at lower cost, it has been identified as the NER Plan.

Alternative 13v is the same as Alternative 13 except for the change in Reach 7. The inclusion of the different Reach 7 plan results in an increase of 87 HUs and decrease in cost of approximately $40,000,000 compared to Alternative 13. Alternative 13v generally performs equivalently to Alternative 13 in the categories analyzed except with more cost effectiveness and greater benefits in Reach 7. In addition, Alternative 13v meets all of the Principles and Guidelines criteria as an effective, efficient, complete, and acceptable plan. An updated cost comparison of Alternative 13 and 13v is provided in Table ES-5 below.
Table ES-5 Comparison of Alternative 13 and 13v (Price level October 2014)

<table>
<thead>
<tr>
<th></th>
<th>Alt 13</th>
<th>Alt 13v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Cost</td>
<td>$147,851,000</td>
<td>$113,958,000</td>
</tr>
<tr>
<td>PED/EDC (14%)</td>
<td>$24,182,000</td>
<td>$15,954,120</td>
</tr>
<tr>
<td>S&amp;I (9.5%)*</td>
<td>$16,856,000</td>
<td>$10,826,010</td>
</tr>
<tr>
<td>Lands &amp; Damages</td>
<td>$350,474,000</td>
<td>$348,648,000</td>
</tr>
<tr>
<td>Utility/Facility Relocations</td>
<td>$168,437,000</td>
<td>$177,886,000</td>
</tr>
<tr>
<td>Total LERRDs</td>
<td>$518,911,000</td>
<td>$526,534,000</td>
</tr>
<tr>
<td><strong>TOTAL FIRST COST</strong></td>
<td><strong>$707,800,000</strong></td>
<td><strong>$667,272,130</strong></td>
</tr>
<tr>
<td>AAHU</td>
<td>5,902</td>
<td>5,989</td>
</tr>
<tr>
<td>Annualized Investment Cost*</td>
<td>$31,147,128</td>
<td>$27,810,000</td>
</tr>
<tr>
<td>Annual O&amp;M</td>
<td>$941,566</td>
<td>$951,887</td>
</tr>
<tr>
<td>Total Annual Cost</td>
<td>$32,088,695</td>
<td>$28,761,887</td>
</tr>
<tr>
<td>Total Annual Cost per AAHU</td>
<td>$5,438</td>
<td>4,802</td>
</tr>
<tr>
<td>Acres</td>
<td>588</td>
<td>598</td>
</tr>
</tbody>
</table>

* Interest during construction is included via simple addition of individual reach-based IDC calculations.

PED- Preconstruction, engineering and design
EDC- Engineering during construction
LERRDs-lands, easements, rights-of-way, relocations or disposal areas

The recreation plan option corresponding to ecosystem restoration Alternative 13 includes the following specific features:

- 5.89 miles of new unpaved non-motorized multi-use trail (to include decomposed granite surface and trail signage)
- 0.3 miles of new paved multi-use trail (short extension of current southern end of LA River Bike Path)
- 1 small bridge/crossing within Taylor Yard
- 1 medium bridge within LATC
- 2 paved parking lots, one at Taylor Yard and one at LATC (each about 15,000 square feet)
- 4 restrooms, one at Bette Davis Park, two at Taylor Yard, and one at LATC
- 1 pedestrian underpass at the south end of Taylor Yard
- 24 trail access points throughout the study area (access points would include grading and planting, signage, stairs, benches, gating, and trash receptacles to provide quality trail access)
- 6 wildlife viewing points throughout the study area (viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)
- 4 pedestrian underpasses along the river to support trail connectivity

**Request for Locally Preferred Plan**

By letter dated April 10, 2014, the City of Los Angeles requested that Alternative 20 be the plan recommended to Congress. The basis for the City’s request for Alternative 20 included: the Administration’s America’s Great Outdoors and Urban Waters Federal Partnership initiatives; strong public, agency, and stakeholder support; Los Angeles Congressional delegation support; the Corps’ acceptability criteria; the scarcity of Mediterranean-type habitat; the need to connect to opportunity areas highlighted in the City’s LA River Revitalization Master Plan; and redressing environmental injustice.

By memorandum of May 27, 2014, the Assistant Secretary of the Army (Civil Works) approved recommendation of Alternative 20 as a Locally Preferred Plan. Therefore, this Final IFR identifies Alternative 20 as the Locally Preferred Plan and the Recommended Plan.
ES.12 RECOMMENDED PLAN

The LPP and Recommended Plan

The recommended plan for restoration of the Los Angeles River in the ARBOR reach is Alternative 20 (RIVER), which is the locally preferred plan (LPP). The LPP includes additional restoration benefits above those identified for the NER plan. These additional benefits include restoration of the Verdugo Wash confluence in Reach 3, widening of the river’s natural bed in Reaches 2 and 5, and restoring channel bottom and a direct connection of the river into the LATC site in Reach 8. These additional restoration benefits include direct restoration of an additional 121 acres, nearly twice the acreage of local and increased hydrologic connectivity (298 acres total), and provision of a direct connection to the significant habitat areas of the Verdugo Mountains. It also includes all elements of the NER plan with the exception of the number of daylighted streams. This plan has 13 daylighted streams. Daylighting in this instance is defined as opening underground pipes and storm drains near their confluence with the River to restore them to a natural stream channel.

Nearly unanimous support for Alternative 20 was expressed by the public through review of the Draft IFR and public meetings. The LPP is consistent with the goals of the Los Angeles River Revitalization Master Plan published in 2007 by the City of Los Angeles. Implementation of the LPP appears to best address the public’s expressed desire for increased habitat and hydrologic connectivity, regional economic development and recreation, and restored community cohesion.

Environmental Commitments

Numerous environmental commitments and Best Management Practices have been developed and will be implemented to minimize or avoid any adverse effects that would occur primarily during construction. These measures are listed following the impact evaluation for each resource category addressed in Chapter 5.

Monitoring Commitments

An effective monitoring program is required to determine if the project outcomes are consistent with original project objectives. A Monitoring and Adaptive Management Plan (MAMP) was developed to identify performance measures along with desired outcomes and monitoring design in relation to specific objectives. Monitoring parameters for vegetation and native fish habitat are included. Results of the monitoring will be assessed in comparison to project objectives and decision-making triggers to evaluate whether the project is functioning as planned and whether adaptive management actions are needed to achieve project objectives. Cost-shared monitoring will not extend beyond ten years after construction of each component. The results of the monitoring will be provided to an Adaptive Management Team (AMT) who will evaluate and compare data to project objectives and decision making triggers. The information generated by the monitoring plan will be used by the Corps and City in consultation with the other AMT members to guide decisions on adaptive management that may be needed to ensure that the ecosystem restoration project meets the success criteria. Final decisions on implementation of adaptive management actions are made by the Corps. See Appendix H, MAMP, for the full discussion.

Recreation Plan

The LPP includes a recreation plan formulated to be consistent with the restoration plan. The recreation plan features are integrated into the ecosystem restoration plan; however, these features are formulated as separable components of the plan. The recreation plan associated with Alternative 20 includes the following specific features:

- 7.98 miles of new unpaved non-motorized multi-use trail (to include decomposed granite surface and trail signage)
- 1.26 miles of new paved multi-use trail (extension of current southern end of LA River Bike Path)
- 2 bridges spanning the LA River
- 1 smaller bridge/crossing within Taylor Yard
- 4 small/medium bridges within LATC
- 2 paved parking lots, one at Taylor Yard and one at LATC (each about 15,000 square feet)
- 4 restrooms, one at Bette Davis Park, two at Taylor Yard, and one at LATC
• 1 pedestrian underpass at the south end of Taylor Yard
• 28 trail access points throughout the study area (access points would include grading and planting, signage, stairs, benches, gating, and trash receptacles to provide quality trail access)
• 11 wildlife viewing points throughout the study area (viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)
• 6 pedestrian underpasses along the river to support trail connectivity

8 ES. 13 COSTS OF THE NER AND LPP

A project cost summary for total first cost\(^2\) for the NER and the LPP are provided in Table ES-6 and Table ES-7. Note that these tables include costs for the recreation plans that were formulated for corresponding NER and LPP ecosystem restoration plans. Also note that preconstruction engineering and design (PED) and construction management (S&A) costs shown in the tables below include such costs for the construction of ecosystem restoration and recreation features, as well as for relocations, although all costs of relocations are assigned to LERRD.

### Table ES-6 Cost Summary of the NER Plan, Alternative 13v

<table>
<thead>
<tr>
<th>Construction Item</th>
<th>Cost ($1,000)</th>
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<tbody>
<tr>
<td>Lands and Damages (P.L. 91-646 Included)</td>
<td>$348,615</td>
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<tr>
<td>Utility/Facility Relocations</td>
<td>$181,305</td>
</tr>
<tr>
<td>Fish and Wildlife Facilities</td>
<td>$125,023</td>
</tr>
<tr>
<td>Recreation Facilities</td>
<td>$8,556</td>
</tr>
<tr>
<td>Preconstruction Engineering and Design (PED)</td>
<td>$27,556</td>
</tr>
<tr>
<td>Construction Management (S&amp;A)</td>
<td>$13,412</td>
</tr>
<tr>
<td><strong>Total First Cost</strong></td>
<td><strong>$704,467</strong></td>
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</table>

### Table ES-7 Cost Summary Table of the LPP, Alternative 20

<table>
<thead>
<tr>
<th>Construction Item</th>
<th>Cost ($1,000)</th>
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</thead>
<tbody>
<tr>
<td>Lands and Damages (P.L. 91-646 Included)</td>
<td>$526,285</td>
</tr>
<tr>
<td>Utility/Facility Relocations</td>
<td>$228,562</td>
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<tr>
<td>Fish and Wildlife Facilities</td>
<td>$462,483</td>
</tr>
<tr>
<td>Recreation Facilities</td>
<td>$14,921</td>
</tr>
<tr>
<td>Preconstruction Engineering and Design (PED)</td>
<td>$85,135</td>
</tr>
<tr>
<td>Construction Management (S&amp;A)</td>
<td>$39,222</td>
</tr>
<tr>
<td><strong>Total First Cost</strong></td>
<td><strong>$1,356,608</strong></td>
</tr>
</tbody>
</table>

\(^2\) First Cost is the project implementation cost not including ongoing costs such as Operation and Maintenance.
Average Annual Costs and Benefits

A summary of total and average annual benefits and costs is provided in Table ES-8 for ecosystem restoration and in Table ES-9 for the recreation plans formulated for the NER and LPP restoration plans.

Table ES-8 Equivalent Annual Benefits and Costs
(October 2015 Price Level, 50-Year Period of Analysis, 3.375 Percent Discount Rate)

<table>
<thead>
<tr>
<th>ECOSYSTEM RESTORATION</th>
<th>NER</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>$85,685,000</td>
<td>$329,118,000</td>
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<tr>
<td>Contingency</td>
<td>$28,952,000</td>
<td>$121,115,000</td>
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<tr>
<td><strong>Total Construction Cost</strong></td>
<td><strong>$114,637,000</strong></td>
<td><strong>$450,233,000</strong></td>
</tr>
<tr>
<td>PED/EDC</td>
<td>$19,760,742</td>
<td>$62,304,915</td>
</tr>
<tr>
<td>Contingency</td>
<td>$6,554,638</td>
<td>$20,666,540</td>
</tr>
<tr>
<td><strong>Total PED/EDC</strong></td>
<td><strong>$26,315,380</strong></td>
<td><strong>$82,971,455</strong></td>
</tr>
<tr>
<td>Construction Management</td>
<td>$9,649,373</td>
<td>$28,711,353</td>
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<tr>
<td>Contingency</td>
<td>$3,206,487</td>
<td>$9,540,782</td>
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<tr>
<td><strong>Total Construction Management</strong></td>
<td><strong>$12,855,860</strong></td>
<td><strong>$38,252,135</strong></td>
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<tr>
<td>Adaptive Management &amp; Monitoring</td>
<td>$7,763,000</td>
<td>$8,955,000</td>
</tr>
<tr>
<td>Contingency</td>
<td>$2,623,000</td>
<td>$3,295,000</td>
</tr>
<tr>
<td><strong>Total Adaptive Management &amp; Monitoring</strong></td>
<td><strong>$10,386,000</strong></td>
<td><strong>$12,250,000</strong></td>
</tr>
<tr>
<td>Lands &amp; Damages (P.L. 91-646 Included)</td>
<td>$303,144,000</td>
<td>$457,104,000</td>
</tr>
<tr>
<td>Contingency</td>
<td>$45,471,000</td>
<td>$69,181,000</td>
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<tr>
<td>Utility/Facility Relocations</td>
<td>$134,387,000</td>
<td>$168,718,000</td>
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<tr>
<td>Contingency</td>
<td>$46,918,000</td>
<td>$59,844,000</td>
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<tr>
<td><strong>Total LERRDs</strong></td>
<td><strong>$529,920,000</strong></td>
<td><strong>$754,847,000</strong></td>
</tr>
</tbody>
</table>

**Ecosystem Restoration First Cost**

<table>
<thead>
<tr>
<th></th>
<th>NER</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest During Construction</td>
<td>$26,235,000</td>
<td>$57,911,000</td>
</tr>
<tr>
<td><strong>Total Investment Cost</strong></td>
<td><strong>$720,349,240</strong></td>
<td><strong>$1,396,464,590</strong></td>
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<tr>
<td>Annualized Investment Cost</td>
<td>$30,022,181</td>
<td>$58,200,816</td>
</tr>
<tr>
<td>Annualized O&amp;M</td>
<td>$1,366,047</td>
<td>$2,306,385</td>
</tr>
<tr>
<td><strong>Total Annual Cost</strong></td>
<td><strong>$31,388,228</strong></td>
<td><strong>$60,507,201</strong></td>
</tr>
</tbody>
</table>

AAHU 5,989 6,782

Note: Total LERRD Costs for Ecosystem Restoration shown in the table above do not include the PED/EDC and construction management costs related to Relocations and are instead shown in PED/EDC and construction management lines (due to the breakdown of costs by Code of Accounts in the Cost Engineering WBS Structure). However, PED/EDC and Construction Management costs related to Relocations are part of LERRD rather than Construction. Because provision and performance of LERRD required for the project is a non-Federal responsibility, Relocation related costs (for PED/EDC and Construction Management) are included as separate line items in Cost Apportionment Tables. Also, a portion of the Lands and Damages line item represents Federal Administration costs for administration and review activities relating to the non-Federal Sponsor’s provision of LERRD. These costs are not part of sponsor LERRD and are a cost shared component of the project. These costs are also shown as separate items in Cost Apportionment Tables.
**Table ES-9 Recreation Component**

(October 2015 Price Level, 50 Year Period of Analysis, 3.375 Percent Discount Rate)

<table>
<thead>
<tr>
<th>Recreation Component</th>
<th>NER</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>$6,396,000</td>
<td>$10,907,000</td>
</tr>
<tr>
<td>Contingency</td>
<td>$2,160,000</td>
<td>$4,014,000</td>
</tr>
<tr>
<td><strong>Total Construction Cost</strong></td>
<td><strong>$8,556,000</strong></td>
<td><strong>$14,921,000</strong></td>
</tr>
<tr>
<td>PED/EDC</td>
<td>$931,600</td>
<td>$1,624,600</td>
</tr>
<tr>
<td>Contingency</td>
<td>$309,000</td>
<td>$538,900</td>
</tr>
<tr>
<td><strong>Total PED/EDC</strong></td>
<td><strong>$1,240,600</strong></td>
<td><strong>$2,163,500</strong></td>
</tr>
<tr>
<td>Construction Management</td>
<td>$417,600</td>
<td>$728,300</td>
</tr>
<tr>
<td>Contingency</td>
<td>$138,500</td>
<td>$241,600</td>
</tr>
<tr>
<td><strong>Total Construction Management</strong></td>
<td><strong>$556,100</strong></td>
<td><strong>$969,900</strong></td>
</tr>
<tr>
<td>Recreation First Cost</td>
<td>$10,353,000</td>
<td>$18,054,000</td>
</tr>
<tr>
<td>Interest During Construction</td>
<td>$33,200</td>
<td>$53,700</td>
</tr>
<tr>
<td><strong>Total Investment Cost</strong></td>
<td><strong>$10,386,200</strong></td>
<td><strong>$18,107,700</strong></td>
</tr>
<tr>
<td>Annualized Investment Cost</td>
<td>$432,900</td>
<td>$754,700</td>
</tr>
<tr>
<td>Annualized O&amp;M</td>
<td>$172,800</td>
<td>$223,400</td>
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<tr>
<td><strong>Total Annual Cost</strong></td>
<td><strong>$605,700</strong></td>
<td><strong>$978,100</strong></td>
</tr>
<tr>
<td>Average Annual Benefits</td>
<td>$2,479,100</td>
<td>$3,509,800</td>
</tr>
<tr>
<td>Net Benefits</td>
<td>$1,873,400</td>
<td>$2,531,700</td>
</tr>
<tr>
<td><strong>Benefit Cost Ratio (BCR)</strong></td>
<td>4.09</td>
<td>3.59</td>
</tr>
</tbody>
</table>

**ES.14 COST APPORTIONMENT AND NON-FEDERAL SPONSOR RESPONSIBILITIES**

The non-Federal sponsor is responsible for providing 100 percent of lands, easements, rights of way, relocations, and disposal sites (LERRD) but has voluntarily offered to forgo reimbursement for the value of LERRD that exceed its statutory share (35%) of total ecosystem restoration costs. The ASA(CW) has approved this voluntary request. Cost sharing policy for LPP requires the non-Federal sponsor to pay 100 percent of ecosystem restoration costs above the NER plan. A cost share which incorporates this information has been developed. In addition a non-standard cost sharing option is also presented in response to a request by the non-Federal sponsor. As explained in Section 7.5.1, specific statutory language would be required for the implementation of the non-standard cost sharing option. The two options are presented in Chapter 7. Selection of a cost sharing option for recommendation to Congress will be made subsequent to the circulation of this Final IFR and documented in the Chief of Engineers’ Report.

**ES.15 CONCLUSION AND RECOMMENDED PLAN**

By letter dated April 10, 2014, the City of Los Angeles requested that Alternative 20 be the plan recommended to Congress. The basis for the City’s request for Alternative 20 included: the Administration’s America’s Great Outdoors and Urban Waters Federal Partnership initiatives; strong public, agency, and stakeholder support; Los Angeles Congressional delegation support; the Corps’ acceptability criteria; the scarcity of Mediterranean-type habitat; the need to connect to opportunity areas highlighted in the City’s LA River Revitalization Master Plan; and redressing environmental injustice. The ASA(CW) granted the Corps permission to recommend Alternative 20 as the LPP. Chapter 7 of this Final IFR provides comparison of the NER and LPP, as well as the cost share options for the LPP referenced above.
1 INTRODUCTION

This document is an Integrated Feasibility Report, Environmental Impact Statement, and Environmental Impact Report for the Los Angeles River Ecosystem Restoration Study, which is referred to as the IFR. This IFR presents the potential alternatives for environmental restoration of the Los Angeles River, analyzes the environmental impacts of implementing those alternatives, reviews the process for selecting the best alternative, and concludes with recommendations for project implementation.

The U.S. Army Corps of Engineers, Los Angeles District (USACE or Corps) is the National Environmental Policy Act (NEPA) lead agency, and the City of Los Angeles, Department of Public Works (LADPW) Bureau of Engineering, referred to as the City of Los Angeles, City or non-Federal sponsor, is the California Environmental Quality Act (CEQA) lead agency for this IFR. These two co-lead agencies, as well as the Los Angeles County Department of Public Works (LACDPW), have historically been responsible for overseeing various functional aspects of the Los Angeles River (River). They have been engaged, both separately and cooperatively, in ongoing efforts to manage flood risks, maintain and improve water quality and supply, restore natural ecosystem functions of the River, and enhance the quality of life along the River.

1.1 STUDY AUTHORIZATION

The study is authorized as a partial response to Senate Committee on Public Works Resolution, approved June 25, 1969, reading in part:

Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on the Los Angeles and San Gabriel Rivers and Ballona Creek, California, published as House Document Numbered 838, Seventy-sixth Congress, and other pertinent reports, with a view to determining whether any modifications contained therein are advisable at the present time, in the interest of providing optimum development of all water and related land resources in the Los Angeles County Drainage Area.

In addition, Section 4018 of the Water Resources Development Act of 2007 provided authorization for a “feasibility study for environmental ecosystem restoration, flood risk management, recreation, and other aspects of Los Angeles River revitalization that is consistent with the goals of the Los Angeles River Revitalization Master Plan published by the city of Los Angeles….” The implementation guidance for this section identified that the scope and substance of the study under the Senate resolution is identical to the study mandated by section 4018 and directed that the ongoing study incorporate the section 4018 study. The feasibility study incorporates, where applicable, conceptual elements and addresses restoration goals from the City’s Los Angeles River Revitalization Master Plan.

This feasibility study provides interim partial response to the study authority, and the study efforts will determine the feasibility of ecosystem restoration of the Los Angeles River and surrounding environment. There is no sponsor available to investigate flood risk management at this time.
1.1.1 Purpose

The primary purpose of the proposed project and alternatives considered in this Study is to restore approximately 11 miles of the Los Angeles River from Griffith Park to downtown Los Angeles by reestablishing riparian strand, freshwater marsh, and aquatic habitat communities and reconnecting the River to major tributaries, its historic floodplain, and the regional habitat zones of the Santa Monica, San Gabriel, and Verdugo mountain ranges while maintaining existing levels of flood risk management. A secondary objective is to provide recreational opportunities consistent with the restored ecosystem. This reach is identified as the “Area with Restoration Benefits and Opportunities for Revitalization” reach, or ARBOR (Figure 1-2). This reach is referred to as the study area or ARBOR reach for the purposes of this IFR.

1.1.2 Need

The Los Angeles River was once a 51-mile-long backbone of a vast system of riparian foothill, riverine, and freshwater marsh habitat that carried seasonal rains and subterranean flows to the coastal plain and the Pacific Ocean. Over time, the River has been degraded by a cycle of increasing urban development, flooding, and channelization. This process culminated in the mid-20th century with the Federal flood risk management project, the Los Angeles County Drainage Area (LACDA) project. The LACDA project encased the river in concrete banks and a mostly concrete bed, and straightened the river’s course, thereby diminishing its plant and wildlife diversity and quality, and disconnecting it from its floodplain and significant ecological zones. Apart from the Sepulveda Basin, the San Fernando Valley area of the River (upstream of the study area) is characterized by large segments of concrete channel with very few opportunities for adjacent land acquisition. The lower reach of the river is constrained by development, including downtown Los Angeles and a heavy industrial corridor that also includes a major transmission corridor and a freeway system. The upper and lower reaches of the river have less potential to connect nationally and regionally significant ecological zones because of the state of existing development. These considerations make the potential for habitat connectivity and expansion very difficult in the near term.

Despite its degraded condition, the ARBOR reach has the greatest potential for restoration along the River because it includes the Glendale Narrows, one of the few reaches in the River with a non-concrete bed and natural flows fed by underground sources. This portion of the River also has connections to the Verdugo Wash and Arroyo Seco tributaries that can eventually link to significant habitat areas, as well as to Griffith Park, the eastern terminus of the Santa Monica Mountains. Habitat within the Glendale Narrows area continues to be nourished by treated effluent discharges, which supplement the remaining natural flows in the River. Although wildlife use is primarily by species adapted to urban environments, habitat continues to degrade due to both the establishment of invasive species, such as giant reed (Arundo donax), and inflows from storm drain runoff. The existing habitat and perennial surface flow in the ARBOR reach provide a base for restoration and support the most diverse assemblages of wildlife on the River today. This reach is adjacent to state and local parks and natural areas. Some of the railroad facilities have been abandoned or removed from the channel corridor, providing opportunity for widening the channel while maintaining existing flood risk management levels. The ARBOR reach, therefore, provides the backbone for restoring significant habitat and reconnecting the River to other vital habitat areas. Expansion of riparian and marsh habitat along this portion of the River and at the confluences of key tributaries is a first step in putting portions of the once vast riverine ecosystem back together.
1.2 WATERSHED LOCATION AND LOCATION OF STUDY AREA

1.2.1 Watershed Description and Location

The confluence of Arroyo Calabasas and Bell Creek forms the start of the Los Angeles River. From that confluence, the River flows through the western San Fernando Valley to the Sepulveda Basin (a USACE flood risk management facility), receiving flows from various tributaries along the way (e.g., Browns Canyon Wash, Aliso Creek/Canyon Wash, Caballero Creek and within the Basin, Bull, Hayvenhurst, Woodley, and Encino Creeks). In Studio City, the River connects with the Tujunga Wash. The Tujunga Wash receives flows from the USACE’s Hansen Dam facility and the Pacoima Wash. The Burbank-Western Channel connects to the Los Angeles River just north of Griffith Park in the City of Burbank, and smaller creeks draining the western San Gabriel Mountains join the River as it flows through the eastern San Fernando Valley. The River bends southward at its confluence with the Verdugo Wash, which flows from the east and serves as the border between the cities of Glendale and Los Angeles at the confluence. From this point, the River flows south through the Glendale Narrows and onto the broad coastal plain. Along the way, the River is joined by a number of tributaries, including the Arroyo Seco and the Rio Hondo Diversion Channel, which carries runoff from Whittier Narrows Dam. From the Rio Hondo Diversion Channel confluence, the River continues south another 12 miles and discharges into the Pacific Ocean at the San Pedro/Long Beach Harbor.

Figure 1-1 Study Area within the State of California

The watershed has highly varied terrain consisting of precipitous mountains, low-lying foothills, valleys, and coastal plains. The upper portion of the watershed (about 360 square miles) is predominantly forest or open space including more than 100 square miles of the Angeles National Forest. The remainder of the watershed (about 464 square miles) lies in the coastal plain, which includes the entire City of Los Angeles.
Los Angeles. It is a highly developed area with commercial, industrial, and residential land uses. North of
Downtown Los Angeles to the confluence with the Rio Hondo, the River flows through industrial and
commercial areas and is bordered by rail yards, freeways, and major commercial/industrial and
government facilities. From the Rio Hondo Diversion Channel to the Pacific Ocean, the River flows
through industrial, residential, and commercial areas, including major refineries and petroleum products’
storage facilities, freeways, rail lines, and rail yards serving the Ports of Los Angeles and Long Beach.
The River and most of its tributaries in the urbanized portions of the Los Angeles watershed have been
highly modified from their original natural courses to protect property and human life from the effects of
flooding.
From its headwaters to the Pacific Ocean, the River drops approximately 790 feet in elevation over
roughly 51 miles (about 15 feet per mile, yielding an average slope of approximately 0.3 percent). During
the rainy season from October to March, heavy flows and occasional floods occur. In times of peak flow,
the river carries more than 180,000 cubic feet of water per second (cfs) at velocities exceeding 25 feet per
second in some areas. That volume of discharge is approximately 14 times the flow of New York’s
Hudson River moving at a velocity of more than 17 miles per hour. Prior to channelization, seasonal
flows slowed to a trickle throughout most of the dry season, and the winter storm flood threat increased as
development expanded on the River’s natural floodplain. Storms produced massive flows in the River
causing flooding that resulted in the loss of lives and millions of dollars in property damage in the late
19th and early 20th centuries.
Modifying the River to contain these periodic floods has rendered it a flood damage reduction channel
that does not resemble a natural river system. Improvements for flood risk management have included
bank hardening and lining the bed of the channel with concrete for most of its 51 miles. An approximately
6-mile stretch of the River in the study area has a non-concrete bed and grouted riprap side slopes, and is
the only portion of the study area left with a soft bed; this soft bottom area was originally engineered with
a cobblestone bed, but that has migrated or washed away over the years. During the dry season, base
flows in the channel are often less than 100 cfs and are entirely composed of discharge from municipal
and industrial wastewater treatment plants and urban/irrigation runoff. Open space, parks, and greenways
are scarce. Instead, impervious surfaces, industrial development, and residential and commercial areas
dominate the study area.
With the exception of publically owned steep mountain headwaters, the Los Angeles River watershed is
completely built out. The LACDA damage reduction project includes two large dams upstream from the
project plus numerous debris basins. In addition, Los Angeles County owns and maintains several water
supply dams and hundreds of debris basins and check dams along the foothills of the upper watershed.
There are a dozen or so grade stabilizers/cut-off walls and derrick stones within the ARBOR reach.
Although the ARBOR reach of the river is stable, existing cross sections along the ARBOR reach reflect
an uneven invert due to capture and entrapment of sediment by vegetation as well as horizontally varying
velocities that create localized scour.

1.2.2 Location of Study Area

The baseline study area that was initially considered during the planning process included the 32 miles of
the River that are within the City of Los Angeles, within a half mile of each bank. This reach begins at the
origin of the River, which is the confluence of Bell Creek and Arroyo Calabasas in the northwest San
Fernando Valley at Owensmouth Boulevard, and ends near the City of Vernon in the downtown Los
Angeles area. Figure 1-1 shows the City of Los Angeles where the study area is located, and Figure ES-2
shows the watershed. The upper watershed, which begins in the Santa Susana, Santa Monica, and San
Gabriel Mountains, is dominated by coastal sage, chaparral, pine forest, and open space. The watershed is
highly urbanized and densely populated, encompassing a broad alluvial plain dominated by residential,
commercial, and industrial land uses. The 51-mile River enters the Pacific Ocean at the San Pedro/Long Beach Harbor.

Through initial investigation of constraints in the baseline study area and the identification of where ecosystem restoration might best be accomplished, the planning process defined the focused study area as the ARBOR reach, which extends from the Headworks site downstream to First Street (see Figure 1-2).

The major reason the ARBOR reach became the focused study area was the potential for increased habitat connectivity. In key San Fernando Valley sites, there was limited ability for habitat connections because of urbanization in the surrounding areas and the 100 percent concrete character of the LA River and tributary channels between the habitat “node” areas. Although restoration is possible along completely concrete channels, the lack of available space adjacent to the river in combination with concrete channel bottoms lowered the priority of this area compared to the Glendale Narrows stretch. By contrast, in the Glendale Narrows there is considerable indigenous in-channel habitat that may be connected to adjacent areas and, since the survivability of the existing habitat in the Narrows is under threat from invasive species and further fragmentation if connections are not strengthened, that area was prioritized for near-term restoration. Moreover, there are already meaningful habitat connections for avian species and small mammals between the LA River in the Glendale Narrows and nearby large habitat areas, including Griffith Park, Angeles National Forest, and the Santa Monica, San Gabriel, and Verdugo mountain ranges. Finally, the Glendale Narrows area was most robustly supported by community stakeholders when asked for their input regarding the area with the greatest ecosystem restoration potential. Recent actions in the area demonstrate this support. California State Parks has recently acquired large parcels along the River (at Taylor Yard and the Cornfields), small parks and greenways have been implemented throughout the area by various organizations and individuals, and informal fishing, boating, and wildlife viewing activity have increased in the area. The narrowing of the study area early in the process based on the factors stated above represents a narrowing of the scope and purpose to identify attainable and implementable alternatives within the existing constraints.
Figure 1-2 Study Area, the ARBOR Reach
Historic Conditions

The Los Angeles Basin is a broad alluvial plain stretching from Santa Monica to Newport Beach, where historically the waters of the Los Angeles, San Gabriel, and Santa Ana Rivers joined during intense flood events. The natural rivers’ braided channels spread across wide areas and their courses migrated considerably over time. These channels carried various sediments (boulders, rocks, gravel, sand, and silt) that were eroded from the adjacent mountains and deposited in the valleys and plains along the path to the ocean (Gumprecht 2001).

The natural river is typical of watercourses in the arid/semi-arid southwest, which are unlike river systems in any other part of the country. Landscapes in the arid southwest are characterized by low, but highly variable rainfall. The resulting dry conditions create a stark contrast between riverine and riparian areas and the adjacent upland vegetation. In this way, the riparian ecosystem in the southwest is a critically important system because it occupies a very small area but supports the majority of the ecological and hydrologic connectivity in the local landscape and the biodiversity in the region (Levick et al. 2008). The highly seasonal hydrology and permeable sediments that are characteristic of the southwest region create a dynamic system, wherein river courses are constantly shifting in response to the highly variable seasonal storm regime, creating expansive floodplains that are often miles wide. Where river beds are dry much of the year, seasonal storms can result in high velocity, turbulent flash floods that carry heavy sediment loads (including coarse sediments) through the system. In some southwestern rivers and streams, there may not be perennial or intermittent surface flow, but rather water may be present below ground and accessible to a rich assemblage of plant and animal life. These more ephemeral streams also perform the same critical hydrologic functions as perennial streams: they move water, sediment, nutrients, and debris through the river system and provide both hydrologic and habitat connectivity within the watershed (Levick et al. 2008).

Due to the deposition of this alluvium, much of the runoff during winter rains infiltrated into the ground, creating large underground basins. As a result, the river channel only carried significant surface flow during major storms. This periodic surface flow resulted in shallow, poorly defined river channels where sudden storms transformed the typically dry streamed into a powerful, flowing river. Seasonal storm flows overtopped the ill-defined river banks, flooding large areas and creating lakes on the coastal plain. The forceful floodwaters, which carried large amounts of rock, sediment, and debris, carved new river channels, reshaped the topography of the surrounding landscape, and created new sloughs, marshes, and ponds. For much of the year, the river on the surface was a gentle stream that flowed through a wide, sandy bed. Winter storms, however, generated powerful and unpredictable flows that resulted in the river’s course shifting significantly across the coastal plain from year to year (Gumprecht 2001).

The original Pueblo de Los Angeles location was chosen because of its adjacency to the river, near where downtown Los Angeles is today. The river north of downtown had in some cases constant flows, fed by springs in the study area and other underground sources. South of downtown, the river’s course would disappear at times into floodplain forest but would reappear during seasonal rains and major storm events, jumping its old channel and changing direction. The river’s historic course to the ocean often migrated by as much as ninety degrees. Some years the river flowed west emptying into Santa Monica Bay near Playa del Rey, some years the river flowed south emptying into San Pedro Bay, and other years it was so dry it never met the ocean and instead emptied into small lakes along its course. On its southerly course, the river channel was very indistinct, sometimes meandering east toward Long Beach or joining with the San Gabriel River. Where flows were pushed to the surface or seasonal floodwaters inundated the surrounding lands, large marshlands were created. At San Pedro Bay, the river mouth and its location were in constant flux, with the mouth migrating 1,400 feet over 20 years in the late 1800s (Hughes 1937). Seasonal winter overflow at the river mouth created extensive saltwater marshes and tidal lagoons along the coast between Palos Verdes and Long Beach. Likewise, 2,100 acres of mud flats and lagoons were created at the river.
Los Angeles River Ecosystem Restoration

Introduction

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outlet to Santa Monica Bay. Most of the year, the river would not have carried enough water to reach the
ocean and, therefore, each new flood flow created a new outlet (Gumprecht 2001).

Loss of habitat is illustrated in Figure 1-3, which compares study area mapping created in 1896-97 to
cover types in 2010 (Compston and Dockweiler 1897). Additional discussion of historic habitat is
provided in Section 2.2.3. As is apparent, vast expanses of valley foothill riparian habitat once existed in
the floodplain. As late as 1888, after some marshlands had been drained and groundwater pumped for
human consumption, surveys of the coastal plain documented nearly 6,000 acres of freshwater marsh,
3,000 acres of wetlands, and 15,000 acres of coastal salt marshes and estuaries (Hall 1888). Intense
urbanization and subsequent infestation by non-native invasive plant species has led to the loss of these
native habitats.

The river historically meandered across the coastal plain, periodically flooding the area during the rainy
winter season and changing course. The photograph in Figure 1-4 was taken from a balloon in June 1887
and shows the river flowing across its floodplain and the beginnings of urban encroachment in downtown
Los Angeles (downtown in foreground of photo, with farthest north river crossing on Mission Street on
left side of photo).

Figure 1-3 Comparison of Los Angeles River Habitat Covers 1896-2010.

(1897 Map obtained from Huntington Library, developed by C.S. Compton and J.H. Dockweiler, City Engineers)
When the railroads arrived in the 1870s, tracks were constructed along the river’s banks, hemming it in and quickening flows. Bridges and trestles further constrained flows and created barriers during major storm events. After William Mulholland secured the Owens River water to supply the city, the city’s dependence on the river’s surface flow as a water source diminished, and it became a dumping ground for trash, dead horses, and sewage. In the late 19th and early 20th centuries, very large storm flows in the river caused catastrophic flooding that resulted in the loss of lives and millions of dollars in property damage. As a result, the City of Los Angeles and Los Angeles County leaders initiated a flood risk management program that eventually channelized the natural river system with the goal of moving flood flows to the ocean as efficiently as possible.

The USACE joined the effort in the 1930s during the Great Depression, directed by Congress to assist with flood risk management efforts under Emergency Relief Acts. Soon after, Congress authorized the USACE, with the County as partner, to undertake a modified version of the County’s comprehensive plan, thereby solidifying the implementation of a structural solution to flood risk management.

Urbanization and infrastructure constrained options for flood risk management. Development in the floodplain included agricultural, residential, commercial, and industrial uses, as well as paved surfaces and railroads alongside the channels. Multiple bridges depended on a narrowed riverbed, and the County developed a complex system of storm drains delivering runoff to the river. The channel built in the 20th century—constrained and largely concrete—was thus one of the few options left at the time without revisiting the entire system of development. Even though the river was already substantially altered, channelization and concreting under the Federal project degraded the remaining habitat values by straightening the river’s course, diminishing its plant and wildlife diversity and quality, fully disconnecting it from its floodplain and significant ecological zones, and dramatically changing its appearance and function. Figure 1-5 depicts the evolution of changing conditions along the River caused by agricultural development and increasing urbanization.
1.3 STUDY/PROJECT PARTICIPANTS AND COORDINATION

The development of proposed restoration measures has been conducted with the assistance of a wide variety of organizations, communities, agencies, and other stakeholders and achieved through a systematic 3-step process as follows: (1) evaluating the River’s existing conditions and the associated problems and opportunities, (2) identifying objectives to help solve the problems, and (3) inviting public and agency coordination and input to help identify the types of measures that would achieve restoration of the study area in a way compatible with the Corps restoration policy, local interests, and regulatory needs. Throughout this process, public involvement has been essential. Over the course of the past eight years, the public has been invited to engage in the decision-making process at each step. An overview of public and stakeholder involvement throughout this process is described in detail in Chapter 8.
1.4  RELATED STUDIES AND REPORTS

The following section provides a list of the studies that have been conducted within the study area in the past, and which are relevant to this IFR. It includes several reports prepared primarily by the City of Los Angeles, USACE, and LACDPW, and also includes reports prepared by other agencies, individuals, and local community groups. Each of the reports listed below was reviewed as a part of this study. Several study efforts connected to the River are being conducted concurrently and, as a result, are not ready for review or incorporation into this study.

1.4.1  U.S. Army Corps of Engineers Reports

• Los Angeles County Drainage Area Review, December 1991.
• Hansen Dam Sediment Modeling Study, 1983.
• Interim Feasibility Report for Ballona Creek and Tributaries, 1982.
• Flood Control in the Los Angeles County Drainage Area, 1939.

1.4.2  Individual, Local, and Agency Reports

• Tujunga Wash Ecosystem Restoration Feasibility Study, 2012.
• City of Los Angeles, Los Angeles River Revitalization Master Plan, 2007.
• City of Los Angeles, Widening and Seismic Retrofitting of the Riverside Drive Bridge at Zoo Drive, June 2007.
• California Department of State Parks, Los Angeles District Office, Cornfield Interim Public Use Plan, June 2003.
• Cal Poly Pomona’s College of Environmental Design Graduate Program, Case Studies Relative to Taylor Yard, January 2002.
• California Coastal Conservancy, Taylor Final Multiple Objective Feasibility Study Final Report, June 2002.
• UCLA Berkeley’s Environmental Planning Studio, Connecting Communities at Taylor Yard, February 2002.
• The River Project for the California Coastal Conservancy, Taylor Yard Preliminary Groundwater and Surface Water Study, March 2002.
• Common Ground from the Mountains to the Sea, San Gabriel and Los Angeles Rivers Watershed and Open Space Plan, 2001.
• California Department of Fish and Wildlife, The California Natural Diversity Database, Last updated spring 2001.
• Los Angeles and San Gabriel Rivers Watershed Council, Current Water Quality Improvement, Land Acquisition and Restoration Projects in Los Angeles County, August 1999.
• Los Angeles County Department of Public Works, Los Angeles River Master Plan and Update, June/July 1996.
• Los Angeles River Advisory Committee, Los Angeles River Master Plan, Los Angeles, 1996.
• Los Angeles County Department of Public Works, Multi-Use Study on the Los Angeles River at Taylor Yard, 1994.
• Los Angeles County Departments of Public Works, Parks and Recreation, Regional Planning, National Parks Service, Rivers, Trails and Conservation Assistance Program.

1.4.3 Concurrent Studies

• Headworks Ecosystem Restoration Feasibility Study. This ongoing USACE feasibility study, initiated in 2004, is adjacent to the River and the westernmost extent of the ARBOR reach, and is sponsored by the City of Los Angeles Department of Water and Power. The study is transitioning to a USACE Continuing Authority Program project, and is evaluating restoration of wetlands and riparian habitats as well as ancillary recreation opportunities. The ARBOR directly connects to this study’s area. The Headworks study continues to have strong support from the local sponsor (City of Los Angeles DWP), and stakeholders. Though originally started under the General Investigations program, the District has established, with concurrence from the sponsor, that due to the limited size, anticipated cost, and the lack of complexity of the project, it would be more appropriate to pursue implementation under CAP Section 1135 (Project Modifications for Improvement to the Environment) focused on 23 acres of the Headworks study site. With conversion to CAP (planned for August 2015), the next milestone would be the Alternatives Formulation Briefing in FY16.
• Arroyo Seco Watershed Ecosystem Feasibility Study. This continuing USACE feasibility study is investigating ecosystem restoration opportunities between its headwaters in the San Gabriel Mountains and downstream near the confluence with the Los Angeles River. This study was
initiated in 2005 and concluded a Planning Rescoping Charrette in November 2013; it is proceeding towards an Alternatives Milestone in spring of 2015. The sponsor for this Study is the County of Los Angeles Department of Public Works.

- Sun Valley Ecosystem Restoration Feasibility Study. The Sun Valley Ecosystem Restoration Study was initiated in 2006 and covers a 2,800-acre urban watershed located approximately 14 miles northwest of downtown Los Angeles; the watershed is a tributary to the Los Angeles River and the sponsor is the County of Los Angeles. The USACE completed a reconnaissance report that recognized Federal interest in ecosystem restoration, flood risk management, stormwater recharge, and recreation; the study is on hold pending funding.

- East San Pedro Bay Ecosystem Restoration Feasibility Study. This effort, in partnership with the City of Long Beach, will seek opportunities to increase aquatic ecosystem function at the mouth of the Los Angeles River and within East San Pedro Bay up to the Long Beach Breakwater. The USACE completed a reconnaissance report in 2010 and in 2015 rescoped the study effort to be compliant with new USACE planning requirements, so now the study can move forward as funding permits.

- The boundaries of these studies do not overlap with the Los Angeles River study area.

1.4.4 Details of Selected Background Reports

This IFR has drawn on existing information and planning efforts in the Los Angeles River watershed. Notable reports including the Los Angeles River Master Plan, Los Angeles River Revitalization Master Plan (LARRMP), LARRMP Final Programmatic Environmental Impact Report/Environmental Impact Statement (EIR/EIS), Integrated Regional Water Management Plan for the Los Angeles River watershed, City General Plans, Arroyo Seco Watershed Management and Restoration Plan EIR, Los Angeles State Historic Park (Cornfields) reports, City of Los Angeles Integrated Resources Plan (IRP) and EIR, and a plan and EIR for the Rio de Los Angeles State Park.

**Los Angeles River Master Plan, 1996**

Los Angeles County’s Department of Parks and Recreation and Department of Regional Planning coordinated the development of the original master plan for the Los Angeles River right-of-way. The plan identified ways to revitalize the publicly owned rights-of-way along the River and Tujunga Wash by developing a uniform landscaping protocol featuring appropriate native vegetation and enhancement of aesthetic, recreational, flood risk management, and environmental values, thereby creating a community resource, enriching the quality of life for residents, and recognizing the River’s primary purpose of flood risk management.

**The Los Angeles River Revitalization Master Plan, 2007**

Over the past two decades, the City of Los Angeles, non-governmental organizations, stakeholder groups, and individual communities have been actively pursuing the objectives of restoring the River by reconnecting it to its neighborhoods and improving its environmental/ecological health. The integration and conceptualization of these initiatives resulted in preparation of the LARRMP (City of Los Angeles 2007). With extensive public, private, nonprofit, and resident involvement, the plan was developed as a conceptual framework to guide the City of Los Angeles in the long-term revitalization of the River. The LARRMP provides a blueprint for restoring the River’s former ecological significance as a natural system, as a place that brings neighborhoods together and provides green space in the heart of the city, and as an amenity and investment that restores value to the city. Conceptual designs in the LARRMP call for improved natural habitat, water quality, recreation, open space, and public access to the river, as well
as incidental recreational space/trails, and opportunities to reinvest in the urban infrastructure system to encourage economic growth.

**LARRMP Programmatic EIR/EIS, 2007**

The USACE participated in the development of the LARRMP and acted as the lead Federal agency for the accompanying Final Programmatic Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The USACE determined that no Federal action resulted from the information and analyses developed for, and presented in, the LARRMP and accompanying Programmatic EIR/EIS since it was a local master plan with no associated Federal recommendations. Therefore, no finalization (e.g., Record of Decision) was prepared by the USACE for the Programmatic EIR/EIS.

**City of Los Angeles Integrated Resources Plan, 2006**

The City of Los Angeles applied a contemporary approach to develop its IRP by incorporating wastewater, stormwater and runoff, and recycled water management into a single strategy. This reflects the understanding that all water services are interdependent and recognizes the complex, intertwined relationships of the City’s varied water resource departments and functions. The Los Angeles Department of Public Works and Department of Water and Power partnered in developing the IRP, a departure from prior single-purpose plans.

**Los Angeles County Integrated Regional Water Management Plan for the Los Angeles River Watershed**

The purpose of the Integrated Regional Water Management Plan (IRWMP) is to define a clear vision and direction for the sustainable management of water and land resources in the greater Los Angeles County region over the next 20 years—a process that is required by the State of California to demonstrate coordination on the local level. The plan, adopted in December 2006, presents basic information regarding possible solutions, the costs and benefits of those solutions, quantified goals and objectives, and a list of projects that can be implemented to achieve the goals. Management agencies and groups that participate include those in the watersheds of North Santa Monica Bay, Upper Los Angeles River, Upper San Gabriel River and Rio Hondo, Lower San Gabriel and Lower Los Angeles Rivers, and the South Bay.

**Arroyo Seco Watershed Management and Restoration Plan and EIR**

In 2000, two non-governmental organizations, the Arroyo Seco Foundation and North East Trees, initiated the Arroyo Seco Watershed Restoration Program. This program assessed resource challenges including flood and stream management, habitat restoration, water resources, and recreational opportunities in the Arroyo Seco watershed. The program also identified goals and projects for conservation, better management, and restoration. Out of these efforts, North East Trees, in partnership with the Arroyo Seco Foundation, released the Arroyo Seco Watershed Restoration Feasibility Study in 2002. This study provided a blueprint for an environmentally sensitive and sustainable plan to manage and restore the Arroyo Seco watershed. The Arroyo Seco is one of the LA River’s most significant tributaries and its confluence with the River is included in each of the study’s final alternatives.

**City General Plans, 2012**

General Plans have been prepared for the purpose of guiding and regulating development and protection of land uses within each city that borders the study area, including the Cities of Los Angeles (2012), Burbank (2012), and Glendale (2012). These General Plans, prepared and maintained by the cities’ planning departments, have a comprehensive, long-range declaration of purposes, policies, and programs for developing lands and protecting common uses into the future. They provide a comprehensive strategy for accommodating long-term growth should it occur as predicted. General Plans are regularly amended and updated.
A Cornfields Reconnaissance Study, Section 905(b) Analysis (USACE 2003) was conducted to determine if there was a Federal interest in participating in a cost-shared feasibility phase study to provide environmental and riparian restoration, improved water quality, and flood risk management for a 5-mile reach of the river channel named the Cornfields area located approximately between the Glendale Freeway (CA-2) to the north and First Street to the south. This study was expanded to encompass the entire River, and was a precursor to the current study.

California State Parks prepared the Los Angeles State Historic Park General Plan and Final EIR, resulting in an interim park opening in September 2006 (California State Parks 2005). The Cornfield State Park Advisory Committee saw the Cornfield as a place to engage both nature and culture, to create a regional gathering space around the theme of a larger, more diverse Los Angeles history, which reconnected the City to the River.

In June 2013 the Cornfields-Arroyo Seco Specific Plan (CASP) and associated EIR was adopted by the Los Angeles City Council. The CASP was prepared through a comprehensive, community-based planning and environmental review process. The objective was to produce three documents, including: (1) the Specific Plan, which will guide future land uses, community development strategies, and infrastructure improvements; (2) goals, guidelines, and regulations for the plan area; and (3) a programmatic EIR, which will support the preparation and adoption of the Specific Plan and its associated land use instruments.

California State Parks prepared a General Plan and EIR for a park at the Taylor Yard site, about 2.5 miles north of downtown and within the IFR study area. The General Plan serves as a guide for future development, parkland acquisition, and construction of trails, parks, and other public facilities.

1.5 REPORT ORGANIZATION

This document has been divided into 14 primary chapters, each dealing with a specific subject area relating to the project components, alternatives, and planning process. Chapters noted below by an asterisk (*) are compliant with and required by the Council on Environmental Quality’s Regulations for Implementing the National Environmental Policy Act. The proposed project is sponsored by the City of Los Angeles, which has determined that construction of the proposed project could have a significant effect on the environment. Therefore, this report also follows guidance provided in CEQA (Public Resources Code [PRC] 21000 et seq.) and other relevant regulations. Potential environmental impacts that may accompany implementation of all alternatives, including the No Project Alternative, have been identified and evaluated against baseline physical conditions (CEQA Guidelines 15125[a]).

- Chapter 1*, Introduction, provides background information concerning the purpose of and need for the project, project authorization, and project status, as well as the scope of the study. This chapter also notes relevance and integration of other related studies and reports.
- Chapter 2*, Problems and Opportunities, identifies resource significance, then identifies current and expected problems and opportunities in the study area based on the evaluation of existing and expected future without project conditions.
- Chapter 3*, Affected Environment, provides a detailed presentation of the existing environmental conditions within the study area. This chapter also includes a complete discussion of environmental resources that would be affected by implementation of project alternatives.
- Chapter 4*, Formulation of Alternative Plans, describes the USACE planning process with respect to the selection of candidate alternative plans for detailed analysis. In this chapter,
planning goals are set, objectives are established, and constraints are identified. This chapter
identifies a range of potential management measures that address specific problems identified in
Chapter 2 and various combinations to create a series of alternative plans that adequately address
the goals and objectives established. Likewise, a discussion is also provided for why some
alternatives were eliminated from further consideration.

- Chapter 5*, Evaluation of Alternative Plans and Potential Environmental Consequences,
  qualitatively and quantitatively describes potential impacts on and benefits to the environment as
  a result of implementation of the alternative plans relative to existing conditions.
- Chapter 6*, Comparison of Alternative Plans, the rationale and methodology behind the
  identification of final alternatives for detailed evaluation. This chapter includes a comparison and
  analysis of the final array of alternative plans and preliminary selection of one alternative plan
  that best meets the study objectives.
- Chapter 7, Details of NER and Recommended Plan, summarizes the environmental, economic,
  and social benefits and costs of both plans.
- Chapter 8*, Public Involvement, describes the numerous coordination and public involvement
  activities conducted throughout the course of the study. These activities include information
  workshops, status reports, informal briefings, presentations, and correspondence with various
  resource agencies.
- Chapter 9, Remaining Reviews, Approvals, Implementation, and Schedule, identifies the
  estimated project timeline for future actions, defines commitments and responsibilities, and
  verifies the fulfillment of procedural notice and review requirements.
- Chapter 10*, Environmental Compliance, identifies key environmental regulations that are
  relevant to this project.
- Chapter 11, Recommendations, presents the study conclusions and recommendations by the
  District Engineer.
- Chapter 12*, List of Preparers, identifies the list of individuals and organizations that contributed
to the preparation of this report.
- Chapter 13*, Document Recipients, lists the individuals and organizations that will receive a copy
  of the draft IFR.
- Chapter 14, References, lists references including studies, reports, analyses, and other reference
  materials used in the preparation of this report.
- Chapter 15*, Index, includes an alphabetical listing of important terms, phrases, and acronyms to
  aid the reader in understanding the document.
2 PROBLEMS AND OPPORTUNITIES

2.1 RESOURCE SIGNIFICANCE OVERVIEW

Consideration of significant resources is central to plan formulation, especially in the context of ecosystem restoration planning because non-monetary outputs are being considered. Per ER 1105-2-100, significance of resources and effects will be derived from institutional, public, or technical recognition. Institutional recognition of a resource or effect means its importance is recognized and acknowledged in the laws, plans, and policies of government and private groups. Technical recognition of a resource or an effect is based upon scientific or other technical criteria that establish its significance. Public recognition means some segment of the general public considers the resource or effect to be important (USACE 2000). The importance of these resources, information specific to the Los Angeles River watershed, and restoration of these resources, is further described in more detail in the sections that follow this summary.

2.1.1 Technical Recognition

Several criteria for evaluating technical merit are reviewed in this section including: habitat scarcity/rarity, biodiversity, status and trends, special status species, connectivity, hydrologic and geomorphic character.

A. Scarcity – The Los Angeles River study area includes several scarce/rare ecosystem types that support significant life functions for myriad species (see Section 2.2.1 for additional detail).

i. The western cottonwood-willow forest association, a riparian ecosystem habitat type once prominent in the Los Angeles River, has been identified as one of the rarest forest types in North America (Krueper 1995), and one of most endangered ecosystems in the United States (Noss and Peters 1995).

ii. The Los Angeles River study area is within a globally scarce Mediterranean ecosystem. Mediterranean ecosystems only cover 2 percent of the Earth’s land surface but account for 20 percent of all known plant species. This climate is found along the west coasts of continents in mid-latitudes from 30 degrees to 50 degrees N and 30 degrees to 40 degrees S, encompassing five places in the world including California/Baja California, the old world Mediterranean region (Europe, North Africa), and the subtropical regions of Chile, South Africa, and Australia. Mediterranean climates are characterized by hot, dry summers and mild, wet winters and support evergreen or drought deciduous shrublands and associated habitats (Kauffman 2003).

Semi-arid southwestern landscapes are characterized by low, but highly variable winter rainfall. The resulting dry conditions create a stark contrast between riverine and riparian areas and the adjacent upland vegetation. As a result, riparian ecosystems in the southwest are very important systems because although they occupy a very small area, they support the majority of ecological and hydrologic connectivity in a landscape and biodiversity in the region (Levick 2008).

B. Biodiversity – In terms of richness, California has the highest total number of species of plants and animals, including endemic species not found anywhere else, than any other state in the U.S. (Stein et al. 2000) (see Section 2.2.2 for additional detail).

i. The California Floristic Province, also referred to as a biodiversity hotspot (Stein et al. 2000), is considered one of the world’s 25 most biologically rich and threatened terrestrial
ecoregions (Myers et al. 1999). To qualify as biodiversity hotspot, an ecoregion must have at least 1,500 vascular plants as endemics and must have 30 percent or less of its original natural vegetation. While these 25 biodiversity hotspots cover less than 1.5 percent of the earth’s land surface, they account for roughly 60 percent or more of the remaining diversity of life on earth (Myers et al. 1999).

ii. California ranks number one in the United States for endemism of plants, amphibians, reptiles, mammals, and freshwater fish species that are unique to the state (Bittman et al. 2003). Approximately 61 percent of the plants in the California Floristic Province are endemic, occurring nowhere else in the world. Approximately 50 percent of bird species and mammals in the United States are found in California.

iii. The scarce riparian habitat in the arid southwest is crucial for species survival due to the high temperatures and dryness outside of the riparian ecosystem (Levick 2008). Approximately 80 percent of all wildlife use the riparian ecosystem at some life stage, with more than 50 percent of bird species nesting primarily in riparian habitats (Krueper 1993). The abundance and diversity of riparian vegetation, as compared to uplands areas, provide food, shelter, water, breeding habitat, and movement corridors.

iv. In terms of species richness, the Los Angeles River is within a region that includes over 50 plant alliances or groupings of plants that share similar structural conditions and approximately 1,000 plant types (depending on location within the watershed) (Bittman et al. 2003).

v. In terms of rarity, the upper Los Angeles River watershed has a relatively high occurrence of rare plant species, due to underlying soil properties and other geomorphic and environmental conditions (Bittman et al. 2003). The lower watershed includes rare special status invertebrates (Bittman et al. 2003).

vi. Approximately 140 bird species, which are federally protected under the Migratory Bird Treaty Act, are supported on the LA River. Restoration of large nodes of riparian habitat could support species such as the federally endangered least Bell’s vireo, the yellow breasted chat, yellow warbler (State Species of Concern), hooded and Bullock’s oriole, lazuli bunting, blue grosbeak, western tanager, several species of woodpeckers, owls, many species of ducks (Cinnamon teal, ring-necked duck, northern pintail), hawks (sharp shinned hawk, osprey), and shorebirds (great blue heron, spotted sandpiper, black necked stilt).

vii. Over 20 species of mammal are supported on the LA River. Restoration of movement corridors could support use by top predators such as bobcat and coyote whose ranges are currently limited by physical barriers and lack of regional pathways connecting populations. These are important species because they regulate the population of mesopredators (such as skunks and weasels).

viii. Nine species of bat are supported on the LA River (1 State Species of Special Concern). Restoration would expand bat habitat along bridges and support local bat populations that are known to regulate insect populations (vector control).

C. Status and Trends – The California Floristic Province has been declared a global biodiversity hotspot. Hotspots must contain at least 1,500 species of endemic vascular plants, and have lost at least 70 percent of their original habitat. The California Floristic Province is one of the world’s 25 most
biologically rich and threatened terrestrial ecoregions (Myers et al. 1999). (See Section 2.2.3 for additional detail).

i. Only 45,000 square miles of the California Floristic Province (or 25 percent) remains out of 183,000 square miles of the historic extent of vegetation that supports the highest levels of biodiversity in the United States (CERF website).

ii. A total of 31 percent of plant and animal species at risk within the United States are found within California. This figure includes 32 percent of plant species, 41 percent of mammals, and 29 percent of reptiles at risk (Bittman et al. 2003).

iii. Historically within the study area, “the river spread over a broad depression two thousand feet wide” between the Verdugo Wash confluence and the Arroyo Seco (Gumprecht 2001). Like modifications to many rivers in the western United States, extensive channelization and damming of the LA River over the last century has altered the natural hydrologic process preventing input of larger substrates (i.e. gravel and cobble), increasing water temperatures, simplifying channel morphology, and altering the episodic succession-setting flood regime necessary to sustain the target riparian communities and native fish habitats.

iv. Less than 10 percent of wetlands surface area remains in California, a loss of more than 90 percent, compared to wetland loss of 50 percent in the rest of the country (Dahl 1990). Over 90 percent of the riparian habitat including Valley Foothill riparian habitats (Faber et al. 1989) and over 95 percent of the region’s wetlands including freshwater marsh have been lost (Dahl 1990). Due to this large-scale habitat conversion, natural riparian communities persist only as isolated remnants of what was once a vast, interconnected system of rivers, streams, marshes, and vegetated washes (Krueper 1995).

v. Due to the unique hydrology in the semi-arid southwest, the Los Angeles Basin historically supported a small but highly endemic native freshwater fish fauna (Swift and Seigel 1993), none of which remained extant in the main river channel for more than several years following the channelization of the River that occurred in 1938 (Hall and Linton 2008). At least five of the seven documented native fish species, endemic to southern California, have been extirpated from this watershed (as well as surrounding watersheds) (Gumprecht 2001). Extirpated fish species include southern California steelhead and unarmored threespine stickleback, which are both listed as endangered under the Endangered Species Act. Pacific lamprey is a Federal species of concern. Arroyo chub (California species of special concern) and Santa Ana sucker (California threatened species) still exist in tributaries to the Los Angeles River but in very small numbers (Gumprecht 2001).

vi. Current channelized conditions in the mainstem no longer support endemic native fish species but do support non-native fish species. Alterations from the natural river ecosystem include perennial flow, high nutrient levels, higher temperature, and lack of a flood disturbance regime. This has led to the “homogenization of freshwater biota” and is seen as an increasing threat to biodiversity in California, and in other Mediterranean climate areas throughout the world (Ball et al. 2013). Although no native fish species currently exist in the ARBOR reach, the more natural channel bottom area supports non-native fish like tilapia and mosquitofish; a fish survey of the area in 2008 identified eight different species of fish (FoLAR 2008).

vii. Essential habitat components reduced or eliminated with channelization and change in geomorphic character include fish refugia (to allow fish to withstand high flows) and soft-
bottom spawning areas to bury eggs. Restoration of riffle/pool complexes and natural geomorphic character could support native species, including Santa Ana sucker and arroyo chub, further discussed in Institutional Recognition.

viii. Prior to habitat loss and conversion, the river was home to least Bell’s vireo (federally endangered, state endangered) and yellow warbler (state species of special concern), and provided foraging habitat for CA coastal gnatcatcher (federally threatened) and southwestern willow flycatcher (federally endangered, state endangered) and yellow-billed cuckoo (federally threatened). Limited numbers of least Bell’s vireo nest on the upper Los Angeles River but its historic range includes the ARBOR reach.

D. Connectivity – River channels in arid regions provide wildlife movement corridors that are essential to species survival due to the continuous chains of vegetation that wildlife can use for cover and food otherwise not supported in drier upland habitats (Levick et al. 2008) (see Section 2.2.4 for additional detail).

i. The remaining fragments of Los Angeles River aquatic and riparian habitat (or habitat “nodes”) within the urban landscape context contribute significantly to the integrity of the larger ecosystem by supporting metapopulations (assemblages of local populations connected by migration) (Hanski & Gilpin 1991). By increasing patches and reducing the distances between them, colonization among populations improves (Hanski & Thomas 1994).

ii. The existing habitats in the Glendale Narrows and connection to major tributaries provide the backbone for restoration of regional habitat connectivity and wildlife movement between significant ecological areas including the Santa Monica Mountains, the Verdugo Hills, and nationally significant San Gabriel Mountains National Monument (see Institutional Recognition). Habitat restoration within the study area would contribute to greater regional connectivity, amplifying the effects of other ecosystem restoration studies and projects in progress.

E. Hydrologic and Geomorphic Character The loss of the naturally dynamic hydrologic and geomorphic character on Southern California rivers has had significant consequences for habitat and species richness and diversity (see Section 2.2.5 for additional detail).

i. The highly seasonal hydrology and permeable sediments of the natural systems of the Southern California region create dynamism, where the river courses are constantly shifting with the highly variable flood regime and the floodplains are expansive. This in turn supports a diverse channel and floodplain structure, and a diverse assemblage of plant and wildlife communities.

ii. The natural hydrologic pattern supports habitat diversity, ecosystem productivity, and biodiversity. High flows transport sediment, displace benthic invertebrates, clear gravel beds of accumulated silt allowing attachment of insect eggs, and import woody debris, creating new habitat. Overbank flows connect channels to floodplains, increasing overall productivity and diversity, while scouring rejuvenates habitat for plant species. Low flows may determine the amount of habitat available during critical periods. In some systems, temporary drying of stream channels provides habitat for specialized species (EPA 1999).

iii. Development and flood risk and water supply projects have constrained and eliminated most such systems in the southwestern United States. Flood control works in the Los Angeles region alone include over 100 miles of channelization of major rivers and streams plus 370...
miles of tributary channels. The broad meandering of the river across the floodplain, two thousand feet or more in some areas, was reduced to a narrow channel. On the main Los Angeles River, 94 percent of its 51 miles is lined by concrete banks and only one-quarter of its length, including 6 miles within the ARBOR, has a non-concrete bottom (Gumprecht 2001).

2.1.2 Institutional Recognition

Public agencies and private interests, from the Federal to local levels, have worked collaboratively for years to restore the Los Angeles River. Many of these non-governmental organizations, local, State and Federal institutions are dual-purpose agencies with both natural resources management missions and recreational objectives. Managed passive recreation is necessary to protect sensitive and scarce habitat. This approach allows for the >10 million residents living in the vicinity of the watershed to recreate, steward and enjoy natural resources without severely impacting habitat value.

A. National Institutional Recognition

i. The U.S. Fish and Wildlife Service’s recovery plan for the endangered Santa Ana sucker recognizes the importance of the Los Angeles River for recovery of the species (U.S. Fish and Wildlife Service 2014). Restoration in the study area has the potential to create and improve habitat for select native fish species including the federally threatened Santa Ana sucker (SAS). SAS are one of only a few native fish currently extant in southern California, and their historic range is limited to the rivers and larger streams in southern California. Per the plan, the Los Angeles River Watershed Recovery Unit (LARW-RU) includes the Los Angeles River down to the Arroyo Seco confluence, within the study area. Increasing the extent of native fish habitat will provide opportunities to improve the resiliency and redundancy of the Santa Ana sucker, thereby improving the status of the species (USFWS 2014).

ii. The Los Angeles River was selected to be one of seven nationwide first-phase pilots for the Environmental Protection Agency’s (EPA) Urban Waters Federal Partnership. The Partnership includes the USACE, the Departments of Interior, Commerce, Agriculture, and Housing and Urban Development, the Environmental Protection Agency, four state agencies, seven local governmental entities, and 11 nongovernment organizations (see Public Recognition). The group’s first goal is to “restore ecosystem function.” Half of the 22 studies and projects currently being tracked for progress are focused on ecosystem restoration. This USACE restoration feasibility study was selected as the group’s top priority; also on the group’s list are five active USACE ecosystem restoration feasibility studies and one USACE project.

iii. At the national level, the Los Angeles River has been protected by the Clean Water Act since the Act’s inception. However, in 2010, EPA designated the river as a Traditionally Navigable Water (TNW) in its entirety, citing the river’s historic and continuing importance and the potential beneficial impacts of river restoration on the region.

iv. Approximately 350,000 acres of the San Gabriel Mountains, as the headwaters of the Los Angeles River Watershed, were designated in late 2014 as the “San Gabriel Mountains National Monument.” The San Gabriels contain some of the highest biodiversity in the country, with unique geological features and 300 endemic plants found nowhere else in the world.
v. The President’s America’s Great Outdoors is an initiative to develop a 21st Century approach to conservation and outdoor recreation. The initiative identified the Los Angeles River watershed as a priority project in its “50 State Report.” Leaders including the Secretary of Interior, the USEPA Administrator, the Assistant Secretary of the Army (Civil Works), the Chair of the White House Council on Environmental Quality, Congressional representatives, and state agency heads joined the Mayor of Los Angeles on the river’s banks in the study area in 2012 to highlight the need to restore the River.

vi. The ARBOR reach contains some of the only wetlands remaining on the Los Angeles River and tributaries. Wetlands are recognized as special aquatic sites under the Clean Water Act and subject to protection under Executive Order 11990.

vii. The Department of the Interior conducted a study examining possible areas for inclusion in the national park system (i.e., the Rim of the Valley Corridor Special Resource Study). The Rim of the Valley study area extends North, East and West of the study area, and the river serves as a vital connection between the Santa Monica and San Gabriel Mountains within its boundaries. These two mountain ranges have previously been found by the National Park Service to contain nationally-significant resources, including unique geologic and cultural resources, as well as high quality biodiversity.

B. Statewide and Regional Institutional Recognition

i. The State of California cited the TNW designation and the character of the River in codifying the River’s status as a navigable water of the state protected as part of the Public Trust under the State Constitution in SB 1201, signed by the Governor in 2012.

ii. The State of California has been involved in environmental enhancement and revitalization activities on the Los Angeles River since the 1990s through the Santa Monica Mountains Conservancy (SMMC) and its affiliate agency, the Mountains Recreation and Conservation Authority (MRCA). SMMC’s mission is to implement strategic actions that “preserve, protect, restore, and enhance treasured pieces of Southern California to form an interlinking system of urban, rural and river parks, open space, trails, and wildlife habitats.” SMMC and MRCA have reclaimed or protected valuable open space along the banks of the Los Angeles River by replacing derelict industrial or housing sites with a string of passive parks filled with native riparian plants and floodable permeable walkways. These efforts by the SMMC and MRCA to increase public ownership along the river have increased the restoration opportunities that were not available even 15 years ago.

C. Local Institutional Recognition

i. Congress specifically directed in WRDA 2007, section 4018, that this study develop a plan that is consistent with the goals of the City’s Los Angeles River Revitalization Master Plan. The City’s LARRMP contains input of Federal, State, and regional agencies and stakeholders. The Los Angeles City Council adopted the Los Angeles River Revitalization Master Plan in 2007. That plan identified opportunities for environmental restoration, including habitat improvements, in concert with recreation, water quality, flood risk management, and community revitalization benefits. One of the major goals is to restore a functional riparian ecosystem with recommendations to (1) create a continuous functional riparian corridor that provides habitat for birds, mammals, amphibians, reptiles, invertebrates, and fish within the channel bottom; (2) connect this corridor to other significant habitat and migration routes along the tributaries and into the mountains; (3) provide support for...
desirable fish species (see Technical Recognition); and (4) bioengineer or naturalize the river’s edge where feasible.

### 2.1.3 Public Recognition

#### A. Eleven nongovernmental organizations actively participate alongside the 11 Federal agencies of the Urban Waters Federal Partnership. Most of these groups hold the Los Angeles River as central mission focus or a priority. Key groups include:

1. **Friends of the Los Angeles River (FoLAR)** was founded in 1986 and has generated steadily increasing public attention to the River over the decades. This year marks FoLAR’s 26th annual Great Los Angeles River clean up, expanded to cover three weekends in April and regularly drawing thousands of volunteers. FoLAR’s mission is to protect and restore the natural and historic heritage of the Los Angeles River and its riparian habitat. FoLAR has spearheaded efforts to restore the river since its founding, and contributed funding to this study in 2013 to facilitate its completion.

2. **The Council for Watershed Health** was recently renamed after over 10 years as the Los Angeles and San Gabriel Rivers Watershed Council. It began as a watershed restoration group but has since expanded to collaborate with government agencies, businesses and scientists to enhance the social, ecological, and economic health of the region’s watersheds through education, research, and planning.

3. **Urban Forestry groups TreePeople and North East Trees** have worked to “green” the Los Angeles River and surrounding urban communities. Their programs include urban green infrastructure, restoration, education, and watershed planning and policy programs. TreePeople enjoys significant media coverage and has successful urban sustainability programs. North East Trees employs local at-risk youth and has built a series of whimsical pocket parks along the Los Angeles River Bikeway with native plants, permeable paving and hardscape featuring local artists.

4. **The Los Angeles River Revitalization Corporation** is focused on developing a 51 mile greenway along the River, and implementing the City of Los Angeles’ Los Angeles River Revitalization Master Plan. One of its strengths is developing creative public-private partnerships along the river to facilitate sustainable land use projects with community benefits.

5. **The Arroyo Seco Foundation** is a group dedicated to restoring the Arroyo Seco sub-watershed, a major tributary to the Los Angeles River, and a historically and culturally significant corridor. The Arroyo Seco region sparked the 20th century Arts and Crafts movement and is home to the Arroyo Seco Parkway, the oldest parkway in the west.

6. **Other groups with Los Angeles River restoration, education, policy and revitalization programs** include The River Project, Los Angeles Conservation Corps, the Trust for Public Land, the Urban Rivers Institute, and Urban Semillas.

**B. In summer 2013 and 2014, a portion of the river channel within the study area was opened for seasonal activities. This unprecedented public access allowance, for the first time since the Los Angeles County Drainage Area (LACDA) Project was constructed, was a significant policy shift for governance and operation of the River. It reflected increased public interest and commitment to ecological education and passive recreational opportunities. River access has promoted**
activities such as hiking, bird-watching, environmental education, and non-motorized boating.

This is part of an effort spearheaded by the City of Los Angeles and the Mountains Recreation
and Conservation Authority in coordination with the USACE and County, and which relates to
California Senate Bill 1201 as part of the direction to facilitate restoration and recreation where
compatible with flood risk management.

C. The Los Angeles River, its degradation and potential restoration, have been the subject of
increasing scholarly attention and national and international news, including environmental
history texts, art exhibitions, films, and news and magazine stories. The Los Angeles River is a
source of inspiration and imagination for local and national artists, filmmakers, authors, and
poets. The Los Angeles River is widely recognized as the wide concrete “freeway” featured in
over 20 films. This popular cultural icon has helped shape a “concrete jungle” image of Los
Angeles, completely negating the presence of a living river. Poet Lewis McAdams, founder of
FoLAR and the Los Angeles Rivers’ poet laureate, penned *The River: Books One, Two, and
Three*, chronicling over 30 years of living with and advocating for the Los Angeles River.

D. In 2012, the portion of the Los Angeles River Trail that extends throughout the study area was
designated by the Secretary of the Interior as part of the National Recreation Trail System. The
designated trail is an approximately 10-mile section of greenway and bikepath along the river,
increasing awareness and stewardship of the River’s natural resources through interpretive
signage that tells the story of the founding of Los Angeles and its relationship to water resources.
The trail also coincides with the National Park Service’s Juan Bautista de Anza National Historic
Trail.

### 2.2 SOUTHWEST RIPARIAN ECOSYSTEM SIGNIFICANCE

#### 2.2.1 Scarce/Rare Southwestern Riparian Ecosystems

Riparian ecosystems in the Los Angeles River watershed, as well as the arid/semi-arid southwest region
overall, are critical for wildlife, yet are exceedingly scarce. Vegetation communities along ephemeral and
intermittent streams provide wildlife habitat and structural elements not otherwise available in adjacent
dry upland communities, such as food, shelter, breeding habitat, and movement corridors. The importance
of western riparian areas cannot be overemphasized (Carothers 1977), because of the high temperatures
and dryness outside of the riparian ecosystem (Levick 2008). The abundance and diversity of riparian
vegetation, as compared to uplands areas, is therefore a critical wildlife habitat feature of rivers and
streams in the southwest. In the southwest region, approximately 80 percent of all wildlife use the riparian
ecosystem at some life stage, with more than 50 percent of bird species nesting primarily in riparian
habitats (Krueper 1993). The high wildlife species density and diversity associated with riparian habitats
is attributed to the presence of highly varied vegetative structure, high vegetative density and diversity,
availability of water and insect prey, and adjacency to several floral and faunal Eco regions (Krueper
1995).

Western riparian ecosystems are one of the rarest habitat types in the Western Hemisphere (Krueper
1995). Of the 106 forested types identified in North America, the western cottonwood-willow forest
association has been identified as the rarest (Krueper 1995). Noss and Peters (1995) concluded that
Southwestern riparian forests and California riparian forests and wetlands are two of the 21 most
endangered ecosystems in the United States. Historically, riparian habitats occupied 1 percent of the land
mass in western North America. Within the past century, an estimated 95 percent of this habitat has been
altered, degraded, or destroyed due to such land use activities as river channelization, unmanaged
livestock utilization, clearing for agriculture, water impoundments, and urbanization (Krueper 1995). Due
to habitat conversion, natural riparian communities persist only as isolated remnants of what was once a vast, interconnected system of rivers, streams, marshes, and vegetated washes (Krueper 1995).

The LA River Ecosystem Restoration Study focuses on restoration of the historically occurring marsh and riparian habitats, specifically the cottonwood-willow habitat which is the rarest habitat type in the Western Hemisphere (Krueper 1995). Restoration of this community would provide the habitat elements required to support a high density and diversity of wildlife species.

2.2.2 Biological Diversity

Over 175 species are known to occur on the LA River. Restoration of dense, structurally diverse riparian habitat and wetland communities would provide expanded habitat for species populations and restoration of habitat for sensitive and charismatic species. Restoration of riffle/pool complexes and natural geomorphic character could support native species including the Santa Ana Sucker (Federally threatened) and the Arroyo chub (State Species of Concern). Amphibian numbers are on the decline globally and restoration of a riparian ecosystem would provide for expansion, refuge, and habitat for amphibian populations on the river.

Approximately 140 bird species are supported on the LA River, which are Federally protected under the Migratory Bird Treaty Act. Restoration of large nodes of riparian habitat could support the Federally endangered least Bell’s vireo. Restoration of large nodes of riparian habitat could also support yellow breasted chat and yellow warbler (State Species of Concern). Many other charismatic bird species would be supported by restoring the river including the hooded and Bullock’s oriole, lazuli bunting, blue grosbeak, western tanager, several species of woodpeckers, owls, many species of ducks (Cinnamon teal, ring-necked duck, northern pintail), hawks (sharp shinned hawk, osprey), and shorebirds (great blue heron, spotted sandpiper, black necked stilt).

Over 20 species of mammal are supported on the LA River. Implementation of restoration could support top predators such as bobcat and coyote, whose ranges are currently limited by physical barriers and lack of regional pathways connecting populations. These are important species because they regulate the population of mesopredators (such as skunks and weasels). Left unchecked, mesopredators can impact populations of bird species (i.e. eating eggs) and other smaller wildlife. Nine species of bat are supported on the LA River (1 State Species of Special Concern).

2.2.3 Status and Trends

The natural river once covered the Los Angeles River Basin with marshes, thickets, and dense woodlands. The lowlands were covered by a dense floodplain forest of cottonwoods and willows (Garrett 1993). Where water ponded and soils were perennially saturated, marshland formed that supported cattails and bulrushes. At the coast, the salt marshes and lagoons were dominated by pickleweed and cordgrass. Nearby drier areas supported oaks and walnuts, cacti and yuccas, sage, and native prairie (Garrett 1993; Gumprecht 2001).

The species and structural diversity of native cottonwood and willow floodplain forests, oak woodlands and prairies, and fresh and salt water marshlands were lost due to urbanization and the spread of non-native invasive species, where invasive species out-compete natives (Garrett 1993). The wildlife species that depended on these habitats, including threatened and endangered species and their critical habitats, were also lost with the conversion of native habitat to urban uses and with non-native infestation.

Of the eleven historic vegetation types, four were particularly devastated by channelization of the river and introduction of non-native invasive plant species, two of which include (1) seasonal and permanent
freshwater and brackish wetlands and (2) lowland riparian forests and thickets, which would be restored by this study (Garrett 1993). The other two vegetation types are coastal estuaries and alluvial scrub. While minimal marginal habitat is still supported in certain portions of the river system, the historic habitat has been almost entirely eliminated (Garrett 1993). Figure 1-3 in Chapter 1 clearly illustrates this dramatic habitat type conversion from valley foothill riparian and freshwater emergent wetlands cover in 1896 to a largely urban land use cover today.

Changes to populations of mammal species are most evident in the lack of native carnivores, such as foxes, weasels, bear, and mountain lion, with remnant populations in the Santa Monica and San Gabriel Mountains (Barkley 1993). The channelized river now supports little remaining habitat suitable for native mammal species. The seven native fish species are no longer supported on the river, except on a few tributaries in the most upstream reaches (Friends of the Los Angeles River 2008; Swift and Siegel 1993). Only 58 percent of the pre-development reptile and amphibian fauna remain on the river today (Bezy et al. 1993). There has been local extirpation of several Federal and state sensitive bird species, including California condor, clapper rail, snowy plover, yellow-billed cuckoo, burrowing owl, as well as other common species. Data suggest that declines in many of these species are associated with river channelization in the early 20th Century (Garrett 1993). Myriad bird species still inhabit the river in the remaining isolated habitats; however, much of the wildlife diversity of the natural river system has been lost (Garrett 1993).

The continuing degradation is of concern, since over 90 percent of the region’s riparian habitat and over 95 percent of the region’s wetlands have been lost. The river is located within the California Floristic Province, which Conservation International identified as one of their top 25 global hotspots experiencing rapid biodiversity loss—the only hotspot in North America. Currently, wildlife in the Los Angeles River is restricted primarily to large mammals that are adapted to urban areas, as well as other small mammals and reptiles. Birds continue to use the river as much as is possible under current conditions. A diversity of shorebirds is consistently abundant on the river using the open water habitat where sediment and algal deposits encourage vegetation to establish in concrete reaches during winter rains. The least Bell’s vireo, a Federal and state endangered species, has been known to inhabit these reaches.

2.2.4 Habitat Connectivity

Importance of Nodal Habitat Connectivity

River channels in the southwestern region provide important wildlife movement corridors because they support continuous chains of vegetation that wildlife can use for cover and food (which may not be supported in drier upland habitats). These river corridors naturally guide wildlife movement, both daily and generationally, which is essential to species survival (Levick 2008).

The remaining fragments of aquatic and riparian habitat in the urban landscape (or habitat “nodes”) contribute significantly to the integrity of the larger ecosystem by supporting metapopulations (assemblages of local populations connected by migration) (Hanski & Gilpin 1991). By increasing patch sizes and reducing the distances between them, colonization among populations improves (Hanski & Thomas 1994). Metapopulations depend on seed dispersal and wildlife movements to persist, and such dispersal is in turn dependent on the connectivity of the landscape (Schippers et al. 1996). Improving nodal connectivity addresses aquatic habitat fragmentation.

Nodes may be larger or smaller. Large habitat nodes support colonization of wildlife in the smaller nodes, while smaller nodes act as peripheral refuge habitat (Rudd et al. 2002). Large nodes tend to have high biodiversity and provide important breeding and seeding habitat for interior species, as well as edge species and transients. Smaller nodes are partly or entirely dependent on individuals immigrating from the larger nodes as they have a higher rate of extinction and therefore need to be repopulated constantly.
Smaller nodes (those under 250 acres) may not be able to support large numbers of species on their own but are able to provide important peripheral habitat to species in the larger nodes (Hansson 1991).

Generally, nodes have a greater overall interaction when they are larger and closer together (Linehan et al. 1995). Well-connected systems prevent inbreeding depression and disease, and have a lower extinction rate as populations can more easily colonize if they are highly connected (Noss 1983; Schippers et al. 1996). Without connections between habitat areas, isolation and loss of genetic diversity is imminent (Hobbs & Saunders 1990).

In order to restore the biological integrity of a landscape, corridors must be restored to allow for dispersal between habitat areas. More corridors equal more routes to suitable habitat, creating more opportunities for dispersal. A complex network of nodes and corridors is therefore critical to restoration in an urban environment, as suitable habitat often remains unused if isolated (Hanski & Thomas 1994).

Ideally, movement corridors would consist of a relatively wide strand of natural channel bed, with patches or a contiguous length of vegetative cover for shelter, shading and forage opportunities. However, the opportunistic species that occur in urban settings can use almost any walkable surface of almost any width, as long as sufficient cover is present to avoid predators, and as long as a desired forage opportunity or other destination is within sight. The presence of vegetation and absence of barriers provides a visual cue that encourages movement.

As most wildlife movement occurs from dusk to dawn (when noise and human presence is somewhat diminished), even a narrow corridor would be sufficient to provide safe passage. Wildlife movement between patches of habitat is important to reconnect genetically isolated populations of species and prevent inbreeding depression, to provide necessary interactions between predators and prey to control population size and provide a healthy ecosystem balance, and to connect individual wildlife to required resources that may not be present within one isolated area.

**Importance of Regional and Watershed Habitat Connectivity**

In addition to loss of wildlife species, habitat corridors for wildlife movement have been fragmented (Garrett 1993). After build out of the Los Angeles Basin and the channelization of the river, connectivity between these nationally significant ecological areas is exceedingly limited in the region (Garrett 1993). Limited habitat connectivity contributes to declines in wildlife populations including restricted access to food, shelter, and mates; inhibited gene flow and dispersal of offspring resulting in inbreeding depression; inability to migrate and avoid seasonally unfavorable conditions; increased incidence of disease; and conflicts over territories and resources (Beier et al. 2006).

Regional connectivity is a more general term referring to longer distance connections that could potentially be made. Connectivity to the Santa Monica Mountains, San Gabriel Mountains, and Verdugo Mountains are the specific regional connections made within some alternatives. Immediate opportunities for regional connectivity apply mainly to birds. Additionally, direct connections can be made to the Santa Monica Mountains via Griffith Park for other species including reptiles and mammals. Future opportunities for connections that link other projects on the Arroyo Seco and Verdugo Wash tributaries to the project area would support improved regional connectivity to the San Gabriel and Verdugo Mountains for reptiles and mammals.

Wildlife use river systems as guiding paths and corridors for movement at multiple temporal and geographic scales. Plants use river systems as corridors for dispersal of their genetic material. The biggest challenge to restoring habitat connectivity in the Los Angeles region for plants and wildlife at all scales is
the 51 miles of channelization. Although small in the context of the river’s full length and its historic
floodplain, the study area is the critical, central backbone in the restoration of regional habitat
connectivity. Restoration of the study area would provide nodal habitat connections from the San Gabriel
and Verdugo Mountains to the Santa Monica Mountains, and would provide opportunities for future
direct habitat connections to these mountain ranges as well via tributaries. Since the study area is adjacent
to Griffith Park (and includes areas within the original Griffith Park land grant), the eastern terminus of
the Santa Monica Mountains, it provides opportunity for habitat and wildlife connectivity to the
nationally significant Santa Monica Mountains National Recreation Area and the Pacific Ocean.

The study area includes the Glendale Narrows, which currently supports some of the only remaining
riparian and freshwater marsh habitat on the river. The existing habitat and perennial surface flow in the
Narrows provide a base for restoration and maintenance of one of the most diverse assemblages of
wildlife on the river today. The USACE currently has other ecosystem restoration studies and projects on
the Los Angeles River and its tributaries, including the Arroyo Seco Ecosystem Restoration Feasibility
Study, the Headworks (adjacent to Griffith Park) Continuing Authority Program Restoration Study, the
completed Tujunga Wash Ecosystem Restoration Project, and the Sun Valley Ecosystem Restoration
Feasibility Study. Without restoration of the river, these projects would only provide isolated patches of
habitat and would not be able to contribute to a greater regional habitat connectivity effort. The study
area, therefore, provides the “bones” (structure) for restoring the river and serves as a hub for such
regional connectivity. Expansion of riparian and marsh habitat along this portion of the River and at the
confluences of the Arroyo Seco and Verdugo Wash tributaries is a first step in putting pieces of the once
vast natural river ecosystem back together.

Figure 2-1 Regional Potential for Habitat Connectivity (Los Angeles River Revitalization Master Plan)
2.2.5 Importance of Restoring a More Natural Hydrologic Regime and Geomorphic Character

Ecological and evolutionary processes include natural disturbance regimes maintained by hydrologic processes, which facilitate nutrient recycling and biotic interactions (EPA 1999). Ecosystems are characterized by natural hydrologic patterns that move water through the system, to support organisms (plant and wildlife) and reshape the landscape. These patterns also move abiotic and biotic materials through the system, such as energy and nutrients. Biodiversity, production, and sustainability of ecosystems are dependent on the dynamic nature and variation in the physical environment. Aquatic ecosystems are completely dependent on hydrology; the hydrologic patterns are integral to this dynamic physical environment. Furthermore, hydrology provides connectivity between ecosystems that is critical to regional ecological functioning (EPA 1999).

The natural hydrologic pattern is important for maintaining the form of the channel and floodplain, habitat diversity, ecosystem productivity, and biodiversity. Hydrologic connections may be made naturally, by widening the river channel, removing artificial barriers, and allowing the river to naturally meander and reshape the adjacent floodplain area. These natural connections support contiguous aquatic and riparian habitat and direct habitat connections for wildlife, which facilitate wildlife movement via restored corridors. Natural hydrologic connections also support aquatic processes such as exchange of sediment, nutrients, and energy between the river and floodplain. Connections may also be made through culverts or other constructed features to assist the hydrologic regime and to support habitat, using river water to feed overbank sites via pipes, culverts, or pumps. Artificial connections are valuable to establish habitat, but are less capable of supporting other ecological processes and exchanges. Hydrologic and hydraulic connectivity address the need to restore underlying processes that support a functioning ecosystem, to reestablish habitat patches and corridors, and to reduce the habitat fragmentation created by urbanization. Removal of the concrete channel bed and banks recreate natural hydrologic connections by reconnecting the river to its floodplain.

Maintaining ecological and evolutionary processes includes natural disturbance regimes, hydrologic processes, nutrient recycling, and biotic interactions (EPA 1999). This can only be achieved with reconnection of the river to its floodplain. This will protect the integrity of the ecosystem and increase sustainability. Biogeochemical interactions between the river and terrestrial sources are not as vital to riparian systems as overbank flow from floodplain connections (Hein 2003).

Reconnection of the river to the floodplain is important from a hydraulic perspective as well. Removal of concrete and widening the river into the floodplain could increase the flood carrying capacity of the river. This added conveyance may be offset by additional vegetation; however, widening and removal of concrete restores other ecosystem processes such as natural disturbance, the hydrologic regime, nutrient cycling, biotic interactions, population dynamics, and evolution, which determine the species composition, habitat structure, and ecological health of an ecosystem (EPA 1999). Channel widening allows the river to connect to the overbank, which restores a dynamic floodplain and supports diverse riparian and in stream habitat for plants and wildlife. The larger sites are more beneficial to flood risk management. Without channel widening in the proposed locations ‘removal of concrete’ would be unacceptable from a flood risk standpoint and opportunities to restore a comprehensive, sustainable ecosystem would be limited.

Floodplain connectivity is also important for restoration of fish habitat. Floodplain habitats provide critical spawning and rearing habitats for many large-river fishes. The standard that floodplains are essential habitats is often a key reason for restoring altered rivers to natural flow regimes (Burgess 2012). In addition, confluence restoration provides an improved hydraulic connection to the LA River. Widening or laying back the side slopes adds capacity. Removal of concrete sides slopes and/or inverts allow
establishment of vegetation which reduces velocities, increases infiltration, and improves the natural sediment processes.

Habitat connectivity to the historic floodplain can be achieved through direct or indirect means. Direct connections are those in which the channel is widened and a more natural configuration is realized or in some cases where flows are diverted from the main channel and allowed to run through the overbank area. Flora and fauna establish themselves more in line with a typical natural river system. Indirect connections are those in which lands adjacent to the river are restored for riparian habitat and wildlife can more easily migrate between the river and these adjacent parcels. Daylighting streams creates additional habitat connectivity especially if a direct connection can be made.

2.3 DESCRIPTION OF STUDY REACHES

There are eight geomorphically different reaches within the study area, which were defined based on the physical characteristics of channel morphology, bank characteristics, soil exposure, existing habitat, and surrounding land uses. Specific geomorphic criteria include: (1) channel bed type (either soft bed with groundwater/surface water exchange, or concrete), (2) side slope type (vertical or trapezoidal), and (3) adjacent land uses or open space. The eight reaches are described in the following sections with photographs and example channel cross sections taken from LACDA as-built summary sheets circa 1962-1986.
2.3.1 Reach 1: Pollywog Park/Headworks to Midpoint of Bette Davis Park

Reach 1 is the upstream segment of the study area and is approximately 1.5 river miles in length. It connects the study area to the Pollywog Park area of Griffith Park, the USACE Headworks Ecosystem Restoration Study Site, and the city of Burbank at Disney Studios. In this reach the River’s channel has a rectangular concrete-lined configuration with subdrains and no low flow channel (Figure 2-2) (the low-flow channel is located in the bottom center in other, all-concrete reaches. Its design enhances flow conveyance). There is a small temporary dam within the river bed near the upstream end of this reach that was once used to help divert water to the Headworks spreading grounds operated by the Los Angeles Department of Water and Power (LADWP). The channel is approximately 18 feet deep and the bank-to-bank width is approximately 115 feet.

![Figure 2-2 Typical Cross Section and Aerial Photo of Reach 1](image-url)
2.3.2  Reach 2: Midpoint of Bette Davis Park to Upstream End of Ferraro Fields

This reach is approximately 0.75 mile in length. It extends from the midpoint of the Bette Davis Park area on the left bank (facing downstream), where the bed transitions from concrete-lined to a cobblestone bed, and then transitions back to concrete at approximately the upstream edge of Ferraro Fields 9 (public soccer field facility) on the right bank (Figure 2-3). The channel has a trapezoidal configuration with grouted Derrick stone banks. The banks are toed-down (secured by extending the bank wall below the river bed) with sheet pile and quarry run stone. The bed is approximately 18 feet deep from the top of bank and approximately 175 feet wide. Sediment deposited in the channel has formed sand bars/islands, which have stabilized as the root systems of the many trees and other vegetation in the channel have trapped sediment over time. This reach, however, is not as densely vegetated as areas farther downstream in Reaches 4 to 6.

![Figure 2-3 Typical Cross Section and Aerial Photo of Reach 2](image-url)
2.3.3 Reach 3: Ferraro Fields to Brazil Street

This reach is approximately 1 mile in length. It begins at the upstream edge of the Ferraro Fields on the right bank where the bed transitions from cobbles to concrete. It makes an approximately 90-degree curve to the south around Griffith Park and transitions back to cobbles at approximately Brazil Street on the left bank. The channel in this area has a rectangular concrete configuration. The bed is approximately 18 to 23 feet deep from the top of bank and approximately 180 feet wide, widening to 380 feet downstream of the Verdugo Wash confluence. State Route (SR)-134 (Ventura Freeway) crosses the River at Verdugo Wash.

Figure 2-4 Aerial Photos of Reach 3
2.3.4 Reach 4: Brazil Street to Los Feliz Boulevard

This reach is approximately 1.75 miles long and extends from Brazil Street on the left bank downstream to the Los Feliz Boulevard Bridge. The bed transitions from a concrete-lined rectangular channel to a trapezoidal channel with a cobble bed and grouted derrick stone banks (Figure 2-5). Banks are toed-down with sheet pile and quarry run stone. The bed was constructed approximately 18 feet deep from the top of the slope, and the channel ranges from approximately 130 to 160 feet wide from top of bank to top of bank. Sediment deposited in the channel has formed sand bars/islands, which are stabilized by the root systems of the many trees and other vegetation. This reach ends at the Los Feliz Boulevard Bridge, where localized concrete lining of the bed and banks plus pier noses that extend upstream have been constructed to protect the bridge and lower the water surface underneath the bridge.

Figure 2-5 Typical Cross Section and Aerial Photo of Reach 4
2.3.5 **Reach 5: Los Feliz Boulevard to Glendale Freeway**

This reach is approximately 1.55 miles long and veers east between Hyperion Avenue and SR-2 (Glendale Freeway). The reach extends from the Los Feliz Boulevard Bridge, under the Sunnynook pedestrian bridge and the Hyperion Avenue Bridge, downstream to the Fletcher Drive Bridge and ends at the SR-2 Bridge. The bed transitions from concrete under each of the large bridges (e.g., Los Feliz Boulevard, Hyperion Avenue) to a trapezoidal channel with a cobblestone bed and grouted derrick stone banks between the bridges (Figure 2-6 and Figure 2-7). Banks are toed-down with sheet pile and quarry run stone. The bed is approximately 18 feet deep and the top of the channel is approximately 130 to 160 feet wide. Sediment deposited in the channel has formed sand bars/islands, which have stabilized as the root systems of the many trees and other vegetation have trapped sediment. This reach ends as the River begins to curve back east as it approaches Taylor Yard.

![Figure 2-6 Typical Cross Sections of Reach 5](image-url)
Figure 2-7 Aerial Photo of Reach 5
2.3.6 Reach 6: Glendale Freeway to I-5 Freeway

This reach is approximately 2.34 miles long and meanders through three river bends. It extends from the SR-2 Bridge to the downstream crossing of Interstate 5 (I-5), where the bed transitions from cobblestone to concrete-lined. Here, the channel is in a trapezoidal configuration with a cobble bed and grouted derrick stone banks (see Figure 2-8 and Figure 2-9). The banks are toed-down with sheet pile and quarry run stone. The bed is approximately 30 feet deep from the top of the slope and the top of the channel ranges from approximately 190 to 215 feet wide. Sediment deposited in the channel has formed sand bars/islands, which have become stabilized as the root systems of the many trees and other vegetation have trapped sediment. The channel narrows to 170 feet and transitions to a rectangular configuration just upstream of the complicated I-5 and SR-110 interchange.

Figure 2-8 Typical Cross Sections of Reach 6
Figure 2-9 Aerial Photo of Reach 6
2.3.7 Reach 7: I-5 Freeway to Main Street

This approximately 1-mile-long reach begins at the I-5 Bridge and extends to the Main Street Bridge. The channel in this area transitions out of the rectangular concrete channel at the Arroyo Seco confluence, and becomes a trapezoidal concrete channel that is approximately 30 feet deep, with a top of bank width that ranges from approximately 150 to 190 feet (Figure 2-10). Three bridges cross the River in this reach, including a railroad bridge, the North Broadway Bridge, and the Spring Street Bridge. The channel has adjacent rail lines on both banks.

Figure 2-10 Typical Cross Section and Aerial Photo of Reach 7
2.3.8 Reach 8: Main Street to First Street

This approximately 1-mile-long reach begins at the Main Street Bridge and extends downstream to the First Street Bridge. The trapezoidal concrete channel is approximately 30 feet deep with a top of channel width that ranges from approximately 170 to 200 feet (Figure 2-11). Rail lines run adjacent to the channel on both banks, and two railroad bridges cross the river. US-101 crosses the river between César Chávez and First Street.

Figure 2-11 Typical Cross Section and Aerial Photo of Reach 8.
2.3.9 Reach Groupings

In many cases, because adjoining reaches are so similar in land use conditions, they have been addressed as a group, particularly in Chapters 4 and 5 where environmental conditions and impacts are presented. These reach groupings include:

- Reaches 1 through 3, adjacent to Griffith Park. Reach 2 is soft bottomed but Reach 1 and 3 predominantly have concrete bed and banks that transition between rectangular and trapezoidal configurations.
- Reaches 4 through 6, which predominantly have grouted rock side slopes with a soft cobblestone bed; these reaches also have more vegetation than the other reaches.
- Reaches 7 and 8, which predominantly have a concrete trapezoidal configuration through downtown industrial, residential, and commercial areas.

2.4 SUMMARY OF PROBLEMS AND OPPORTUNITIES

The problems and opportunities in the Los Angeles River watershed and along the 32 miles of river from the San Fernando Valley downstream through the City of Los Angeles were identified and assessed during the reconnaissance study. The USACE conducted plan formulation meetings with the sponsor, key agencies, and stakeholders during this feasibility phase.

2.4.1 Problems

The Los Angeles River study area is unique due to the extremely large human population and massive infrastructure development in and adjacent to the river channel and floodplain. The study team and the agencies involved with these planning efforts identified the following problems during planning charettes held in December of 2009.

Urbanization and flood risk management projects have created the following problems:

1. The elimination of the ability of aquatic species to move freely upstream-to-downstream and to find adequate locations for refuge and proliferation—in particular, there is a considerable absence of aquatic habitat for fish and other wildlife species;
2. The degradation of ecological processes, such as the exchange and flow of nutrients and sediment within the system, that are necessary to support ecosystem function in valley foothills riparian and freshwater marsh habitats;
3. The replacement of diverse substrate, such as naturally-occurring mixes of fine silts and boulders, necessary to support valley foothills riparian, freshwater marsh, and fish habitats with concrete;
4. Breaks in connections between the river and its historic floodplain, such as a meandering, fluctuating relationship with its tributaries, which associated loss of ecosystem functioning;
5. A highly-altered hydrologic regime that is simplified (reduced flow options) and magnified (higher flows concentrated in smaller spaces);
6. A highly-altered habitat cycle since extremely high velocity flows within the study area prevent robust establishment of riparian habitat and the adequate protection of species attracted to it;
7. Disruption of natural sedimentation processes and exaggeration of atypical/ altered regimes, discouraging the ability of existing areas to support diverse habitat communities;
8. The inability of surface flows to infiltrate and recharge groundwater aquifers, which is necessary to restore native flow regimes and support native habitat communities;
9. The degradation of aquatic habitat due to flows conveyed through the many storm drains of
the channelized flood management system;
10. The proliferation of non-native/exotic species and trash/debris, which have degraded
aquatic habitat and prevented establishment of native species; and
11. An unpleasant human experience that provides very little understanding of the river’s natural
history and value and reinforces an inability to access and participate in recreation at the river
to learn more about its restoration potential.

The conceptual ecosystem model shown in Figure 2-12 and described in Table 2-1 presents the primary
drivers and stressors to the riverine, riparian, and floodplain environments. The primary drivers of habitat
quality, quantity, and distribution within the study area are: 1) climate and precipitation patterns; 2)
hydrology and runoff; 3) sediment and wood transport; 4) connections (or the lack thereof) between the
River and its floodplain; and 5) adjacent upland conditions. The primary stressors on the habitats include:
1) altered hydrology due to channelization and development (impervious surfaces) that increase the
rapidity of runoff and increase overall volumes and velocities; 2) altered sediment and wood transport due
to disrupted connections between natural sediment and wood sources and the river system (including the
elimination of those sources); 3) adjacent upland conditions; and 4) disruption of natural river to
floodplain connections and river/floodplain to groundwater connections.

![Figure 2-12 Conceptual Model Depicting the Study Area](image-url)
<table>
<thead>
<tr>
<th>Model Parameter</th>
<th>Ecological Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upstream Watershed</strong></td>
<td>Hydrology</td>
<td>Annual and decadal variations in flow volume and timing based on precipitation and runoff</td>
</tr>
<tr>
<td></td>
<td>Runoff</td>
<td>Volume and rate at which precipitation runs off watershed surfaces as surface water</td>
</tr>
<tr>
<td></td>
<td>Sediment/wood Transport</td>
<td>The source volume and delivery of sediment and wood into the river system and its rate of transport</td>
</tr>
<tr>
<td><strong>Riverine and Floodplain Environment</strong></td>
<td>Water quality</td>
<td>Water temperature, dissolved oxygen, nutrients, and other chemical constituents including pollutants</td>
</tr>
<tr>
<td></td>
<td>Habitat types</td>
<td>Quantity and distribution of habitat types (i.e., pools, riffles)</td>
</tr>
<tr>
<td></td>
<td>Substrate/sediment</td>
<td>Type of substrate and sediments (i.e., gravel/cobble, concrete, silt)</td>
</tr>
<tr>
<td></td>
<td>Adjacent riparian</td>
<td>Quantity, quality, and distribution of riparian habitats normally adjacent to river channels (i.e., cottonwood/willow forested and thickets)</td>
</tr>
<tr>
<td></td>
<td>Floodplain</td>
<td>Quantity, quality, and distribution of floodplain habitats normally adjacent to river channels (also including topography, connections; plant communities)</td>
</tr>
<tr>
<td></td>
<td>Groundwater</td>
<td>Elevation of and connections between groundwater table and river and floodplain habitats</td>
</tr>
<tr>
<td></td>
<td>Sediment chemistry</td>
<td>Presence/absence of various chemical constituents and pollutants</td>
</tr>
<tr>
<td><strong>Biota</strong></td>
<td>Movements/ migration</td>
<td>Movements of biota laterally between river, riparian, and floodplain and upstream/downstream to other habitat types; disrupted by habitat and corridor fragmentation</td>
</tr>
<tr>
<td></td>
<td>Primary production</td>
<td>The synthesis and storage of organic molecules during the growth and reproduction of photosynthetic organisms</td>
</tr>
<tr>
<td></td>
<td>Invertebrates</td>
<td>Various invertebrate species typical for riverine and floodplain habitats (i.e., mayflies, caddisflies, annelid worms)</td>
</tr>
<tr>
<td></td>
<td>Amphibians/reptiles</td>
<td>Amphibians and reptiles native to Southern California riverine and floodplain systems (i.e., Western toad, arroyo toad, salamanders)</td>
</tr>
<tr>
<td></td>
<td>Fish</td>
<td>Fish species native to Southern California riverine systems</td>
</tr>
<tr>
<td></td>
<td>Waterbirds</td>
<td>Birds most commonly found in and on water (i.e., waterfowl, alcids, pelicans, cormorants, grebes, and gull-like birds)</td>
</tr>
<tr>
<td></td>
<td>Other birds</td>
<td>Birds commonly found foraging or resting in riparian or upland areas (i.e., songbirds, raptors, including threatened and endangered species)</td>
</tr>
<tr>
<td></td>
<td>Mammals</td>
<td>Native mammals for Southern California region</td>
</tr>
<tr>
<td><strong>Adjacent Upland</strong></td>
<td>Pets and non-native wildlife</td>
<td>Pets and introduced species such as rats, bullfrog</td>
</tr>
<tr>
<td></td>
<td>Non-native plant species</td>
<td>Plants including ornamental species and non-native invasive species</td>
</tr>
<tr>
<td></td>
<td>Impervious surfaces</td>
<td>Development has led to primarily impervious surfaces in the uplands adjacent to the river preventing groundwater interactions and promoting rapid runoff of precipitation that can entrain pollutants</td>
</tr>
<tr>
<td></td>
<td>Trash and debris</td>
<td>Trash and debris washed into or dumped into riverine and floodplain habitats</td>
</tr>
<tr>
<td><strong>Atmosphere</strong></td>
<td>Precipitation</td>
<td>Rain, snow, or other precipitation typical for the study area climate</td>
</tr>
<tr>
<td></td>
<td>Chemical Constituents</td>
<td>Quantities of various chemicals present in air</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>Seasonal or typical air temperatures in the study area</td>
</tr>
<tr>
<td></td>
<td>Climate</td>
<td>Prevailing precipitation and temperature regimes; potential changes to climate over time</td>
</tr>
<tr>
<td><strong>Downstream Watershed</strong></td>
<td>Estuary/ocean</td>
<td>Water, sediment, wood, pollutants, and biota move from riverine/floodplain environment towards downstream estuary reaches and the ocean, and biota may move upstream</td>
</tr>
<tr>
<td></td>
<td>Sea level rise</td>
<td>Elevation of estuary/tidal reaches likely to move upstream over time and change habitat types and species distribution</td>
</tr>
</tbody>
</table>
2.4.2 Public Concerns

While flooding remains a concern in the ARBOR reach, much has already been accomplished to manage flood risk, including upstream dams and channelization of the River and its tributaries through the many USACE flood risk management projects in the watershed. The channel within the ARBOR reach provides a design conveyance that is less than the 1 percent Annual Chance Exceedance (ACE) (100-year) event. Following completion of the LACDA project, additional height was built into flood walls in the 1990s to protect the interests of downstream cities. However, no additional flood risk management features were constructed in the ARBOR reach in the years since LACDA, and extensive growth of vegetation, especially invasive species, and concentration of sediment have occurred within the soft-bottomed reaches of the River, including within the study area. This has the effect of reducing the flood flow capacity that can be conveyed by the LACDA project, thereby diminishing the benefits of higher walls. Therefore, the level of flood risk management in the ARBOR reach and the vegetation within the channel are important considerations—for both problems and opportunities—in formulating the study alternatives.

2.4.3 Opportunities

The study team and the agencies involved with these planning efforts agreed that the problems present the following opportunities for restoration of nationally and regionally significant ecosystem function within the study area. The relationship between each problem and opportunity is noted in parentheses. For example P1 refers to problem one in the previous list. Opportunities are as follows:

- Restore lost aquatic habitat including valley foothill riparian, freshwater marsh, and native fish habitat (P1).
- Improve diversity and abundance of native valley foothill riparian and freshwater marsh plants to support the diversity and abundance of wildlife species (P1).
- Improve and restore ecological processes in the project area to support ecosystem function in valley foothill riparian communities, freshwater marsh, and native fish habitats (P2).
- Restore substrate in valley foothill riparian, freshwater marsh, and native fish habitats (P3).
- Improve habitat connectivity to floodplains and functioning ecological zones (P4).
- Restore a more natural hydrologic regime (P5).
- Decrease peak discharges and/or increase floodplain area in the mainstem and at tributary confluences to reduce discharges and velocities that prevent establishment of native habitats (P6).
- Improve natural sedimentation processes (P7).
- Improve infiltration and recharge (P8).
- Improve water quality from urban runoff in the river, its tributaries, and other drainages entering the river to prevent degradation of aquatic habitat (P9). This project is not proposing measures to address water quality; any improvements will be ancillary to the project.
- Remove and manage invasives/exotics and trash to reestablish native vegetation (P10).
- Increase recreation allowing compatible human interaction with restored ecosystems (P11).

Objectives for the study described in Chapter 4 were developed based on the problems and opportunities as described in Chapter 4, which follows the Chapter 3 discussion of the Affected Environment.
3 AFFECTED ENVIRONMENT

The following sections describe the existing conditions within the study area for a suite of environmental resources. This provides a baseline to compare the potential impacts that may result from implementation of the proposed alternative (Figure 3-1). General descriptions are provided first, followed by reach-specific descriptions, typically grouped by geomorphic characteristics (Reaches 1-3, 4-6, and 7-8). Some resources cannot be described by reach, such as air quality. Also, operation and maintenance of the River is assumed to continue unchanged into the future. Chapter 5 described alternative impacts on the environment.

3.1 GEOLOGY, SEISMOLOGY, SOILS AND MINERALS

This section describes the geology, seismology, soils and minerals that are affected by the proposed project from an environmental impact viewpoint. In addition to the information provided herein, Appendix D (Geotechnical) provides descriptions, from an engineering perspective, of the geotechnical conditions of the study area. Appendix D also describes geotechnical constraints associated with each alternative as well as provides recommendations for future stages of study and design.

3.1.1 Topography, Geology, and Soils

The study area lies between two major geomorphic regions in the Los Angeles Basin: the east to west oriented Transverse Ranges and the north to south trending Peninsular Ranges (Figure 3-1). Elevations in the Los Angeles River watershed range from approximately 10,000 feet in the San Gabriel Mountains to sea level at the mouth of the river. Elevations within the study area range from a maximum of 490 feet at the upstream end of the study area to a minimum of 240 feet at the downstream end.

This upstream portion of the study area runs along the northeastern fringe of the Santa Monica Mountains in the Hollywood Hills through the San Fernando Valley. Elevations in Reaches 1-3 range from 490 feet upstream to 420 feet downstream. The San Fernando Valley is bounded by the Santa Susana Mountains to the northwest, the Simi Hills to the west, the Santa Monica Mountains to the south, the Verdugo Mountains to the east, and the San Gabriel Mountains to the northeast. These mountains and hills are part of the Transverse Ranges. Elevations in Reaches 4-6 range from 420 feet upstream to 300 feet downstream. Elevations in Reaches 7-8 range from 300 feet upstream to 240 feet downstream. Reaches 7-8 are bounded by the Elysian Hills to the west and the Repetto Hills to the east.

The parent material in the San Fernando Valley is derived from Miocene sedimentary rock consisting of siliceous and diatomaceous shale, siltstone, sandstone, and conglomerate. Santa Monica shale and highly metamorphosed sediment are found along the southern side of the valley (SCS 1980). The sediment within the westerly portion of the San Fernando Valley is comprised of relatively fine-grained silty and clayey debris eroded from the Santa Monica and Santa Susana Mountains which are principally comprised of Miocene sedimentary rock consisting of siliceous and diatomaceous shale, siltstone sandstone and conglomerate. The easterly portion of the valley is comprised of alluvial materials that were derived from granitic and metamorphic terrain to the north and east and contain significantly more sand gravel and boulders. The soils of the study area have been highly modified as a result of grading and cut and fill practices. Artificial fill was generally brought in and deposited along the major streams and river channels to fill in low lying areas and to channelize the river. Fill was also used in areas to raise the grade for the construction of roads, bridges, and railroads. In general, fill soils are brownish and consist of silty sands with gravel. However, fill material in the area ranges from clayey silt and silty clay to angular gravel with sand (City of Los Angeles 2005).
Figure 3-1 Los Angeles River Watershed
Prior to development and construction of the existing flood risk management features the dominant soil within the river channel was Tujunga fine sandy loam (LACDPW 2006). This soil consists of deep and somewhat excessively drained soils formed in alluvium, weathered primarily from granitic sources. These soils are found on floodplains and alluvial fans with slopes of 0 to 9 percent (Figure 3-2). This soil type is characteristic of much of the western San Fernando Valley (Natural Resources Conservation Service [NRCS] 2012).

Other soil types found in the study area and displayed in Figure 3-2 include:

- **Altamont Clay Loam**: This soil series consists of deep, well drained soils that are formed from the weathering of sandstone and shale found on gentle slopes to very steep upland areas. This soil type is found on the right bank of Reaches 4-6, on the gradually sloping to steep sloped areas of the northeastern fringe of the Santa Monica Mountains, and above the left bank along the Repetto Hills.

- **Upper Los Angeles River**: These soils are located above the right bank on the slopes of the Santa Monica Mountains.

- **Hanford Fine Sandy Loam**: These soils are very deep, well drained soils that are formed in moderately coarse textured granitic alluvium. Hanford soils are usually found on stream bottoms, floodplains, and alluvial fans that have slopes of 0 to 15 percent. Hanford fine sandy loams can be found in this reach above the left bank at the base of the Repetto Hills. From the Arroyo Seco confluence to the end of Reach 8, the dominant underlying soil type is Hanford fine sandy loam.

- **Yolo Loam**: These soils consist of fine silty alluvial material, primarily found on nearly level, or flat sloped alluvial fans. Yolo loam is found in Reaches 4-6 in drainages along the River and upper drainage areas.

- **Ramona Clay Loam**: These soils are fine-loamy, mixed soils formed in alluvium derived from granitic and related rock sources. Ramona soils are located on nearly level to moderately sloping terraces and fans. Ramona soils are found in Reaches 4-6 at various locations along the Elysian and Repetto Hills.

- **Chino Silt Loam**: These soils are somewhat poorly drained silty loam soils found in basins and floodplains. Chino soils are found along the base of the Repetto Hills.

- **Hanford Gravelly Sandy Loam**: These soils are very deep, well drained soils that are formed in moderately coarse textured granitic alluvium. Hanford soils are usually found on stream bottoms, floodplains, and alluvial fans that have slopes of 0 to 15 percent (NRCS 2012). Hanford gravelly sandy loam occurs at the Arroyo Seco confluence in Reach 7 (LADPW 2006).

A preliminary review by the California Geological Survey (CGS) indicates that most of the project area is located on lands classified MRZ-2 for Portland cement concrete-grade aggregate (Busch, pers. comm., 2012). This classification occurs in areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence. However, the project footprint is not in an area designated by the State Mining and Geology Board as containing significant mineral resources.
Figure 3-2 Soils
3.1.2 Seismicity, Faults, and Landslides

The study area is located in an active seismic zone where approximately 30 earthquakes of generally low Richter magnitude occur daily (below 2.0). The last appreciable earthquake in the Los Angeles area was in January 1994 when the Northridge Earthquake hit the San Fernando Valley at a magnitude of 6.7 (USGS 2012).

Faults in the project area are shown in Figure 3-3. The San Andreas Fault, located 30 miles to the northeast of the study area, forms the boundary between the North America and Pacific Tectonic Plates, and is the most significant fault in the area (Figure 3-3). It runs along the base of the San Bernardino and San Gabriel Mountains (Harden 1998). Other nearby faults include the San Fernando Fault Zone and the Verdugo Fault, which occur within 2 miles of the northern end of the project area. Faults that pass through the project area include the Elysian Park, Raymond, and Hollywood Faults. The Verdugo Fault has a minimum uplift rate of 1.1 millimeters per year (mm/yr) (Arkle and Armstrong 2009). The Elysian Park anticline forms a segment of the southern boundary of the Transverse Ranges and has an estimated time-average rate of slip of 0.8 to 2.2 mm/year (Oskin et al. 2000). The Raymond Fault, which runs through Reach 5 upstream of Glendale Boulevard, is about 16 miles long, with a slip rate of between 0.10 and 0.22 mm/yr (Southern California Earthquake Data Center 2006). It has been identified by the California Alquist-Priolo Earthquake Zoning Act as an active surface fault or fault that has been active in the past 11,000 years (California Department of Conservation [CADC] 2012a). The Hollywood Fault is about 9.3 miles long and has a slip rate of between 0.33 mm/yr and 0.75 mm/yr. The San Fernando Fault Zone is about 10.5 miles long and runs from the area of Big Tujunga Canyon north to the San Fernando Valley. The slip rate is not well known but is believed to be about 5 mm/yr. The last major rupture was February 9, 1971, and is known as the Sylmar or San Fernando Earthquake, which had a magnitude of 6.6. The rupture was roughly 12 miles long, with a maximum slip of 6 feet (Southern California Earthquake Data Center 2012).

Ground shaking is the primary cause of earthquake damage in Southern California rather than the creation of fissures, ground ruptures, or landslides. The intensity of the ground shaking is related to the magnitude of the earthquake, type of fault, depth of the quake, and distance from the epicenter. Buildings on poorly consolidated and thick soils typically incur more damage than buildings on consolidated soils and bedrock. Areas near major active faults generally experience stronger seismic shaking more frequently (Los Angeles County 2005).

In addition to causing property damage and the loss of human life, seismic events have the potential to cause liquefaction, modify surface water courses, and depending on the time of year and ambient weather conditions, may be the catalyst for landslides. Liquefaction is caused when the ground shakes wet granular soil and changes it to an unstable liquid state. Areas prone to liquefaction have thick alluvial soils that are poorly consolidated. Areas with high liquefaction potential in the study area include all lowland areas along the Los Angeles River and tributaries. In addition there is high liquefaction potential along the foothills of the Santa Monica Mountains in Reaches 1-3, along the base of the Elysian and Repetto Hills in Reaches 4-6, and along the base of the Elysian Hills in Reaches 7 and 8.
Figure 3-3 Seismicity and Faults
Figure 3-4 Landslide and Liquefaction Zones

Legend:
- ARBOR Reach
  - Reaches 1-3
  - Reaches 4-6
  - Reaches 7-8
- City Boundaries
- Landslide Zones
- Liquefaction Zones

Data Source: CA Geological Survey, 2002
Basemap Source: USGS, ESRI; 2009

Los Angeles River Ecosystem Restoration
Final Integrated Feasibility Report

Affected Environment
September 2015
Landslides are rated a moderate priority natural hazard in Los Angeles County, especially along hillsides (Los Angeles County 2005). Factors that affect slope failure are angle, substrate, climate (e.g., precipitation), and seismic shaking. Mudslides due to heavy precipitation are more localized in small gullies. These are typically shallow landslides, where the surface material becomes saturated and begins to flow downhill. Debris flows are known to start on slopes as low as 15 degrees but are more likely to develop on steeper slopes. Within the study area, landslide potential occurs along the eastern Santa Monica Mountains (Reaches 1-6), Elysian Hills (Reaches 4-8), and Repetto Hills (Reaches 4-6).

3.2 AIR QUALITY AND GREENHOUSE GASES

This section describes the existing setting for ambient air quality and discusses the applicable air quality regulations in the study area.

3.2.1 Environmental Setting

Area of Influence
The study area is located within the South Coast Air Basin (SCAB) under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). Emissions from construction and operation of the proposed project would affect air quality in the immediate Project area and the surrounding region. The air quality area of influence for the proposed project is included in the SCAB, which consists of the urbanized areas of Los Angeles, Riverside, San Bernardino and Orange Counties, and the ocean offshore of the South Coast waters. The SCAB onshore area covers 6,000 square miles.

Climate and Meteorology Conditions
The SCAB lies within the semipermanent high-pressure zone of the eastern Pacific Ocean. The climate of the region is classified as Mediterranean; the climate is generally characterized by warm, dry summers and mild winters with moderate rainfall. Prevailing daily winds in the region are westerly, with a nighttime return flow. This pattern is typically broken five to ten days a year when strong northeasterly winds, commonly known as “Santa Ana Winds,” sweep down from the desert.

The SCAB’s climate and topography are conducive to the formation of ozone (O₃). The heaviest concentrations of O₃ occur during the summer months when there are warm temperatures, stagnant wind conditions, high solar radiation, and an inversion layer at lower elevations. An inversion layer forms when cooler, denser air is trapped by warmer, lighter air. Sea breezes transport air pollutants to adjacent air basins, such as the Mojave Desert Air Basin and the SSAB. Carbon monoxide (CO) concentrations are highest during the winter, when relatively stagnant air conditions result in an accumulation of this pollutant. Highest CO concentrations are found near heavily traveled and congested roadways (SCAG 1994). However, in the case of particulate matter, maximum concentrations may occur during high wind events or near man-made ground-disturbing activities, such as vehicular activities on roads and earth moving during construction activities.

Winds across the study area are an important meteorological parameter as they control both the initial rate of dilution and direction of pollutant dispersion. Winds blowing from the west are dominant during February and April, and the prevailing winds during March and summer (May through July) blows from the south. During August through January, dominant winds blow from the west-northwest.

Regional and Localized Air Quality
Air pollutant emissions in the SCAB are generated from stationary, mobile, and natural sources. Stationary sources can be divided into two major subcategories: point and area sources. Point sources occur at an identified location and usually are associated with manufacturing and industry. Examples are
boilers or combustion equipment that produce electricity or generate heat. Area sources are distributed widely and produce many small emissions. Examples of area sources include residential and commercial water heaters, painting operations, portable generators, lawn mowers, agricultural fields, landfills, and consumer products such as barbeque lighter fluid and hair spray. Construction activities that create fugitive dust such as excavation and grading also contribute to area source emissions. Mobile sources refer to emissions from on- and off-road motor vehicles, including tailpipe and evaporative emissions. On-road sources may be operated legally on roadways and highways. Off-road sources include aircraft, trains, and construction equipment. Mobile sources account for the majority of the air pollutant emissions within the air basin. Air pollutants also can be generated by the natural environment such as when fine dust particles are pulled off the ground surface and suspended in the air during high winds.

To protect the public health and welfare, the Federal and state governments have identified five criteria air pollutants and a list of air toxics and have established ambient air quality standards through the Federal Clean Air Act and the California Clean Air Act. The air pollutants for which Federal and state standards have been promulgated and that are most relevant to air quality planning and regulation in the air basins include ozone (O₃), carbon monoxide (CO), suspended particulate matter (PM), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and lead (Pb). PM comes in a range of sizes. PM emissions are regulated in two size classes: Particulates up to 10 microns in diameter (PM₁₀) and particulates up to 2.5 microns in diameter (PM₂.₅). PM₁₀ and PM₂.₅ are so small that they can enter the lungs and cause serious health problems.

Ozone (O₃) is a problematic air contaminant in the SCAB. O₃ is formed from the precursor pollutants volatile organic compounds (VOC) and nitrogen oxides (NOₓ). VOC and NOₓ react to form O₃ in the presence of sunlight through a complex series of photochemical reactions. As a result, unlike inert pollutants, O₃ levels usually peak several hours after the precursors are emitted and many miles downwind of the source.

Nitrogen dioxide (NO₂) is a byproduct of combustion, such as fuel combustion in power plants and internal combustion engines. Carbon monoxide (CO) is a product of inefficient combustion, principally from automobiles and other mobile sources of pollution. In many areas of California, CO emissions from sources such as wood-burning stoves and fireplaces also can be measurable contributors during cold-weather months. Industrial sources of pollution generally contribute less than 10 percent of ambient CO levels. Peak CO levels occur typically during winter months because of a combination of seasonal contributions from home heating devices and stagnant weather conditions. Sulfur dioxide (SO₂) is produced when any sulfur-containing fuel is burned. Chemical plants that treat or refine sulfur or sulfur-containing chemicals also emit SO₂. Because of the complexity of the chemical reactions that convert SO₂ to other compounds (such as sulfates), peak concentrations of SO₂ occur at different times of the year in different parts of the state, depending on local fuel characteristics, weather, and topography. In moist environments, SO₂ may combine with water to form sulfuric acid, a component of acid rain.

Particulate matter in the air is composed of windblown fugitive dust; particles emitted from combustion sources (usually carbon particles); and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, sulfur oxides, and oxides of nitrogen. Lead is found in old paints and coatings, plumbing, and various other materials.

Typically, air pollutants are classified as primary or secondary pollutants. Carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide, and lead are considered primary pollutants because they are emitted directly into the atmosphere. Ozone is considered a secondary pollutant because it is formed through a photochemical reaction in the atmosphere with VOCs and NOₓ in the presence of sunlight.
Both the Federal and state governments have established ambient air quality standards for outdoor concentrations of various pollutants to protect public health, as shown in Table 3-1. These standards have been set at levels whose concentrations could be generally harmful to human health and welfare and that protect the most sensitive persons from illness or discomfort with a margin of safety.

Table 3-1 Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>California Standards 1</th>
<th>Federal Standards 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Concentration 3</td>
<td>Measurement Method 4</td>
</tr>
<tr>
<td>Ozone (O₃)</td>
<td>1 Hour</td>
<td>0.09 ppm (180 µg/m³)</td>
<td>Ultraviolet Photometry</td>
</tr>
<tr>
<td></td>
<td>8 Hours</td>
<td>0.070 ppm (137 µg/m³)</td>
<td>—</td>
</tr>
<tr>
<td>Respirable Particulate Matter (PMₐ)</td>
<td>24 Hours</td>
<td>50 µg/m³</td>
<td>—</td>
</tr>
<tr>
<td>Fine Particulate Matter (PM₂.₅)</td>
<td>24 Hours</td>
<td>No Separate State Standard</td>
<td>35 µg/m³</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>8 Hours</td>
<td>9.0 ppm (10mg/m³)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>20 ppm (23 mg/m³)</td>
<td>Non-Dispersive Infrared Photometry (NDIR)</td>
</tr>
<tr>
<td></td>
<td>8 Hours (Lake Tahoe)</td>
<td>6 ppm (7 mg/m³)</td>
<td>—</td>
</tr>
<tr>
<td>Nitrogen Dioxide (NO₂)</td>
<td>Annual Arithmetic Mean</td>
<td>0.03 ppm (56 µg/m³)</td>
<td>Gas Phase Chemiluminescence</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>0.18 ppm (339 µg/m³)</td>
<td>—</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO₂)</td>
<td>24 Hours</td>
<td>0.04 ppm (105 µg/m³)</td>
<td>Ultraviolet Fluorescence</td>
</tr>
<tr>
<td></td>
<td>3 Hours</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>0.25 ppm (655 µg/m³)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Annual Arithmetic Mean</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Lead (Pb) ⁸</td>
<td>30 Days Average</td>
<td>1.5 µg/m³</td>
<td>Atomic Absorption</td>
</tr>
<tr>
<td></td>
<td>Calendar Quarter</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Rolling 3-Month Average</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pollutant</td>
<td>Averaging Time</td>
<td>California Standards ¹</td>
<td>Federal Standards ²</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------</td>
<td>------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concentration ³</td>
<td>Measurement Method ⁴</td>
</tr>
<tr>
<td>Visibility Reducing Particles</td>
<td>8 Hours</td>
<td>Extinction coefficient of 0.23 per kilometer, visibility of ten miles or more (0.07-30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70%. Method: Beta Attenuation and Transmittance through Filter Tape.</td>
<td>No Federal Standards</td>
</tr>
<tr>
<td>Sulfates (SO₄)</td>
<td>24 Hours</td>
<td>25 µg/m³</td>
<td>Ion Chromatography</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>1 Hour</td>
<td>0.03 ppm (42 µg/m³)</td>
<td>Ultraviolet Fluorescence</td>
</tr>
<tr>
<td>Vinyl Chloride²</td>
<td>24 Hours</td>
<td>0.01 ppm (26 µg/m³)</td>
<td>Gas Chromatography</td>
</tr>
</tbody>
</table>

¹California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter (PM₁₀, and PM₂.₅) and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the table of Standards in Section 70200 of Title 17 of the California Code of Regulations. ²National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM₁₀, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one. For PM₂.₅, the 24-hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or less than the standard.Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas. Any equivalent procedure that can satisfy the California Air Resources Board (CARB), which gives equivalent results at or near the level of the air quality standard, may be used. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Reference method as described by the USEPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the USEPA. CARB has identified lead and vinyl chloride as ‘toxic air contaminants’ with no threshold level of exposure for adverse health effects determined. These actions allow for implementing control measures at levels below the ambient concentrations specified for these pollutants. Source: CARB 2010a, CARB 2010b, SCAQMD 2007.

While ambient air quality standards have been developed specifically for O₃ and NOₓ, there is no state or Federal Ambient Air Quality Standard (AAQS) for VOCs. VOCs include many compounds of carbon. There are certain classes of carbon compounds that are not VOCs, including: carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, and methane, among others. While the state and Federal government agencies have not established ambient attainment levels for VOCs, they have for O₃. Because VOCs react with NOₓ through photochemical reactions to form ozone, air districts, including SCAQMD, have provided VOC significance thresholds for study level analysis in order to further limit the levels of VOCs in the atmosphere that could be converted to ozone.

A state or region is given the status of “attainment” or “unclassified” if ambient air quality standards have not been exceeded. A status of “nonattainment” for particular criteria pollutants is assigned if the ambient air quality standard for that pollutant has been exceeded. Once designated as nonattainment, attainment status may be achieved after three years of data showing non-exceedance of the standard. When an area is reclassified from nonattainment to attainment, it is designated as a “maintenance area,” indicating the requirement to establish and enforce a plan to maintain attainment of the standard.

California classifies areas of the state as attainment, nonattainment, nonattainment-transitional, extreme or unclassified with respect to the state AAQS.
State and Federal attainment status designations for the SCAB are summarized in Table 3-2.

Table 3-2 Federal and State Attainment Status Designations for the South Coast Air Basin

<table>
<thead>
<tr>
<th>Air Pollutants</th>
<th>State</th>
<th>Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (1-Hour)</td>
<td>Extreme(^1)</td>
<td></td>
</tr>
<tr>
<td>Ozone (8-Hour)</td>
<td>Nonattainment</td>
<td>Nonattainment – extreme</td>
</tr>
<tr>
<td>PM(_{2.5})</td>
<td>Unclassified</td>
<td>Nonattainment</td>
</tr>
<tr>
<td>PM(_{10}) (24-Hour)</td>
<td>Unclassified</td>
<td>Attainment/Maintenance</td>
</tr>
<tr>
<td>PM(_{10}) (Annual)</td>
<td>Unclassified</td>
<td>Unclassified</td>
</tr>
<tr>
<td>NO(_{2})</td>
<td>Attainment</td>
<td>Attainment/Maintenance</td>
</tr>
<tr>
<td>CO</td>
<td>Unclassified</td>
<td>Attainment/Maintenance</td>
</tr>
<tr>
<td>SO(_{2})</td>
<td>Attainment</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>Nonattainment(^2)</td>
<td>Nonattainment(^2)</td>
</tr>
<tr>
<td>Particulate Sulfate</td>
<td>Unclassified</td>
<td></td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>Unclassified</td>
<td></td>
</tr>
<tr>
<td>Visibility Reducing Particles</td>
<td>Unclassified</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)CARB classification of ozone ambient concentration exceeding 0.2 ppm. Source: CARB 2011, USEPA 2010.

\(^2\)EPA classification of the Los Angeles area as nonattainment for the 2008 lead standard on November 8, 2011

Air quality problems in the SCAB include periodic violations of Federal and state air quality standards for ozone, PM\(_{10}\), and PM\(_{2.5}\). The frequency with which ozone standards have been exceeded has declined significantly over recent decades.

Ambient Air Monitoring Stations

The State and Local Air Monitoring Network Plan provides the results of the annual review of the air monitoring stations in California. These stations house monitoring instruments that measure ambient levels of air pollutants. The closest air monitoring stations to the study area include: (1) Reseda Air Monitoring Station, which is about two miles north of the study area; (2) Burbank West Palm Avenue Air Quality Monitoring Station, which is about 0.5 miles west of the study area; and (3) Los Angeles-North Main Street Air Quality Monitoring Station, which is about 0.5 miles west of the study area. Table 3-3 presents the exceedance data for 2011 at these three air quality monitoring stations. All other pollutants measured at these stations were below threshold.

Table 3-3 Ozone Exceedances at Air Quality Monitoring Stations (2011)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Measurement</th>
<th>Standard</th>
<th>Reseda</th>
<th>Burbank West Palm Avenue</th>
<th>Los Angeles-North Main Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone</td>
<td>Highest 1-hour observation, ppm</td>
<td>0.09</td>
<td>0.130</td>
<td>0.120</td>
<td>0.087</td>
</tr>
</tbody>
</table>

Toxic Air Contaminants

Toxic air contaminants (TACs) are a diverse group of air pollutants that can affect human health, but without established AAQS. This is not because they are fundamentally different from the pollutants discussed above, but because their effects tend to be local rather than regional. Major sources of TACs are typically industrial plants, which are commonly located near populated centers and impacts from TACs emissions are thus considered local effects.

CARB has designated nearly 200 air contaminants as toxic. Additionally, CARB has implemented control measures for numerous compounds that pose high risks and show potential for effective control. The majority of the estimated health risks from TACs can be attributed to a relatively few compounds, the most important of which are toxic ingredients in the form of particulate matter from diesel-fueled engines. Other TACs include benzenes, toluene and xylene.

Reactive Organic Gases (ROG) ROGs are organic compounds that can react with nitrogen oxides in the atmosphere to form ozone under direct sunlight. Major source of ROG are coatings and solvents.

Secondary PM2.5 Formation

Within the SCAB, PM2.5 particles are directly emitted into the atmosphere (i.e., primary particles) and are formed through atmospheric chemical reactions from precursor gases (i.e., secondary particles). Primary PM2.5 includes diesel soot, combustion products, road dust, and other fine particles. Secondary PM2.5 is formed from reactions with directly emitted NOX, sulfur oxides (SOX), VOCs, and ammonia some distance downwind of the emission sources. However, the air quality analysis in this EIR/EIS focuses on the effects of direct PM2.5 emissions and their ambient impacts. This approach is consistent with the recommendations of the SCAQMD.

Sensitive Receptors

The impact of air emissions on sensitive members of the population is a special concern. Sensitive members of the population include those that may be more negatively affected by poor air quality than other members of the population, such as children, the elderly, or the infirm. Schools, hospitals, and convalescent homes are considered sensitive land uses because children, the elderly, and the infirm are more susceptible to respiratory distress and other air-quality-related health problems than the general public.

Greenhouse Gases

Gases that trap heat in the atmosphere are often called greenhouse gases (GHGs). GHGs are emitted by natural processes and human activities. Examples of GHGs that are produced both by natural processes and industry include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Examples of GHGs created and emitted primarily through human activities include fluorinated gases (hydrofluorocarbons [HFCs] and perfluorocarbons [PFCs]) and sulfur hexafluoride (SF6).

The accumulation of GHGs in the atmosphere regulates the earth’s temperature. Without these natural GHGs, the earth’s surface would be about 61°F cooler (AEP 2007). However, emissions from fossil fuel combustion for activities such as electricity production and vehicular transportation have elevated the concentration of GHGs in the atmosphere above natural levels. According to the Intergovernmental Panel on Climate Change (IPCC 2007), the atmospheric concentration of CO2 in 2005 was 379 ppm compared to the pre-industrial levels of 280 ppm. In addition, the Fourth U.S. Climate Action Report concluded, in assessing current trends, that CO2 emissions increased by 20 percent from 1990 to 2004, while methane and nitrous oxide emissions decreased by 10 percent and 2 percent, respectively.
There appears to be a close relationship between the increased concentration of GHGs in the atmosphere and global temperatures. Scientific evidence indicates a trend of increasing global temperatures near the earth’s surface over the past century due to increased human-induced levels of GHGs. GHGs differ from criteria pollutants in that GHG emissions do not cause direct adverse human health effects. Rather, the direct environmental effect of GHG emissions is the increase and/or change in global temperatures, which in turn has numerous indirect effects on the environment and humans. For example, some observed changes include shrinking glaciers, thawing permafrost, later freezing and earlier break-up of ice on rivers and lakes, a lengthened growing season, shifts in plant and animal ranges, and earlier flowering of trees (IPCC 2001). Other, longer term environmental impacts of global warming may include sea level rise, changing weather patterns with increases in the severity of storms and droughts, changes to local and regional ecosystems including the potential loss of species, and a significant reduction in winter snow pack (for example, estimates include a 30 to 90 percent reduction in snow pack in the Sierra Nevada mountain range). Current data suggest that in the next 25 years, in every season of the year, California could experience unprecedented heat, longer and more extreme heat waves, greater intensity and frequency of heat waves, and longer dry periods. More specifically, the California Climate Change Center (Roland-Holst 2006) predicted that California could witness the following events:

- Temperature rises between 3 to 10.5°F
- 6 to 20 inches or more of sea level rise
- 2 to 4 times as many heat-wave days in major urban centers
- 2 to 6 times as many heat-related deaths in major urban centers
- 1 to 1.5 times more critically dry years
- 10 to 55 percent increase in the risk of wildfires

### 3.3 LAND USE

This section discusses the land use within and near the study area. Land uses typically include habitation, economic production, institutional uses, recreation, and natural resources conservation. The River channel flows through the central corridor of the study area, flanked by maintenance roads. The SR-134 and I-5 Freeway run close alongside the river for much of its length in the study area. A LADWP utility corridor runs alongside the north and east side of the channel. Other surrounding land uses include Griffith Park, state and local parks including Los Angeles State Historic Park and Taylor Yard, industrial areas at LATC and the mouth of Verdugo Wash, and residential areas near Bette Davis Park and Pollywog Park. Land uses are displayed in Figure 3-5 through 3-7.

Land use is guided and influenced by management plans, policies, zoning ordinances, and regulations that determine the types of uses allowable and occur at the Federal, state, regional, and local levels. The City of Los Angeles and other municipalities have regulatory authority for land use within the study area. Regional land use management is provided by the Southern California Association of Government (SCAG) Regional Comprehensive Plan and Guide. Local management is found in various land use plans and policy documents such as the General Plans of the Cities of Los Angeles, Glendale, and Burbank and the associated Community Plans and Specific Plans for those communities that fall within and adjacent to the study area. These guidelines and regulations are discussed below.

Management of land uses in the study area includes the USACE and the LACFCD if those uses have potential to affect the flood risk management function of the LACDA system. The water is owned by the local jurisdiction, the Los Angeles Department of Water and Power, a subdivision of the City of Los Angeles, through long-held pueblo rights that have been subject to numerous legal interpretations over the years and will not be further discussed in this section.
Figure 3-5 Land Use, Reaches 1-3
Figure 3-6 Land Use, Reaches 4-6
Figure 3-7 Land Use, Reaches 7-8
3.3.1 Land Management and Administration Agencies and Organizations

The USACE and Los Angeles County have jurisdiction over the River and its major tributaries for flood risk management. These agencies maintain service roads along the channels for inspection and study area maintenance activities. The current Los Angeles River channel and Verdugo Wash channel were constructed by USACE and the County as part of the LACDA. USACE has operation and maintenance responsibility for the portion of the Los Angeles River within the study area and for its confluence with Verdugo Wash. LACDPW maintains the Verdugo Wash upstream of the USACE portion of maintenance responsibility. Although USACE maintains the identified portions of the Los Angeles River, it does not own the lands in the river itself. The lands in the channel are largely owned by the LACFCD and by the City of Los Angeles, along with others. Where entities other than LACFCD own the fee interest, LACFCD generally holds an easement for construction and operation of the flood risk management project. Operation and maintenance of the Los Angeles River and Verdugo Wash for flood risk management purposes is conducted in accordance with the LACDA OMRRR Manual. Construction activities, channel modifications, and other uses of and within the river channel and wash may not conflict with the flood risk management purpose and flood risk management operation and maintenance needs. The Arroyo Seco, another direct tributary to the Los Angeles River within the study area, was channelized by local interests in the 1930s with the assistance of state funds and the Works Progress Administration. It is maintained by LACDPW.

Sponsored by the LACFCD, the Integrated Regional Water Management Plan is intended to define a clear vision and direction for the sustainable management of water resources in the greater Los Angeles County region through at least the year 2025, to present the basic information regarding possible solutions, and the costs and benefits of those solutions, and to inspire the region and potential funding partners outside the region that these solutions make sense, are good for the community, and are economically feasible. The draft plan was released for comment in 2006, and is still in draft form to date. The plan includes proposed projects within the study area and identifies priority projects for initial funding and implementation (Los Angeles County 2006, 2012).

The Rio de Los Angeles State Park (247 acres) extends into Reach 5 and is jointly managed by California State Parks and the Los Angeles Department of Parks and Recreation. The Los Angeles State Historic Park along Reach 7 (32 acres) is under development with funds from the California State Parks system (California State Parks 2009).

SCAG is the primary regional planning agency for Southern California. SCAG represents six counties, including Los Angeles County, and approximately 18 million people. SCAG’s Intergovernmental Review section is responsible for performing consistency review of regionally significant local plans, projects, and programs with SCAG’s adopted regional plans. SCAG’s criteria for determining regional significance include any proposed local General Plan, element, or amendment thereof for which an EIR was prepared.

The LACFCD developed the Los Angeles River Master Plan for the entire 51-mile reach of the River in 1996. It provides planning for the optimization and enhancement of aesthetic, recreational, flood risk management, and environmental values by creating a community resource, enriching the quality of life for residents and recognizing the River’s primary purpose for flood risk management (LACDPW 1996). The master plan also includes published guidelines for landscaping (LADPW 2004b) and signage (LADPW 2003). This plan and its associated goals, objectives, and design guidelines serves as a guide to the development of subsequent River planning and development efforts.

The City of Los Angeles developed and adopted the Los Angeles River Revitalization Master Plan in 2007. The plan is a 20- to 50-year planning document for revitalizing the first 32 miles of the River.
that flow through the City of Los Angeles (and which flow along the cities of Burbank and Glendale in the study area). In an effort to explore the potential for expanded revitalization of the River, the plan identified community revitalization measures as well as natural resource, recreation, and open space opportunities in a manner that reflects the unique geographic and existing land use patterns of these areas and, for the first time, called for changes to the river’s concrete channel. The Plan’s proposed community reinvestment opportunities were designed with local communities in mind to achieve economic redevelopment and revitalization objectives that include, but are not limited to, replacing aging infrastructure and addressing land uses changes to ameliorate blight, encourage the attraction and retention of family-sustaining jobs and foster stability in existing neighborhoods. This plan is further described elsewhere in this IFR.

3.3.2 Applicable General Plans

California state law (Government Code Section 65300 et seq.) requires that each city prepare and adopt a comprehensive, long-term General Plan for its future development. The General Plans must contain seven elements, including land use, circulation, housing, conservation, open space, noise, and safety. In addition to these, state law permits cities to include optional elements in their General Plans, thereby providing local governments with the flexibility to address the specific needs and unique character of their jurisdictions. In the City of Los Angeles, the General Plan contains citywide elements for all topics except land use for which community plans establish policy and standards for each of the 35 community planning areas. The General Plans of the Cities of Glendale and Burbank also include land use elements. More specifically, Government Code Sections 65860, 66473.5, and 656474 require that zoning ordinances and subdivision and parcel map approvals be consistent with the General Plan (State of California 2012).

<table>
<thead>
<tr>
<th>Community Planning Area</th>
<th>Reaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hollywood</td>
<td>1-5</td>
</tr>
<tr>
<td>Northeast Los Angeles</td>
<td>3-6</td>
</tr>
<tr>
<td>Silverlake/Echo Park/Elysian Valley</td>
<td>5-6</td>
</tr>
<tr>
<td>Central City North</td>
<td>6-7</td>
</tr>
<tr>
<td>Central City</td>
<td>7-8</td>
</tr>
<tr>
<td>Boyle Heights</td>
<td>7-8</td>
</tr>
</tbody>
</table>

The land use element of the City of Los Angeles General Plan is composed of 35 Community Plans. These plans are the official guide to future development in the City, and are intended to promote an arrangement of land uses that foster economic growth, as well as the social and physical health of the people who live and work in these communities. The Community Plan Areas within the study area are shown in Table 3-4.

Additionally, specific plans are sometimes developed to describe allowable land uses, to identify open space, and to detail infrastructure availability and financing for a portion of a community. Specific plans implement, but are not technically a part of, the General Plan. Los Angeles, Glendale, and Burbank have various specific plans throughout their cities. A specific plan may not be adopted or amended unless the proposed plan or amendment is consistent with the General Plan pursuant to State Code (65454). Zoning, subdivision, and public works projects must be consistent with the General Plan and specific plan pursuant to §65455 (State of California 2012).
3.3.3 Land Use Plans Under Development

Located within the Central City North and Northeast Los Angeles Community Plans is the Cornfield Arroyo Seco Specific Plan (effective 8/13/13) created as a direct result of the LARRMP (City of Los Angeles 2007). Reflecting many of the recommended changes put forth in the LARRMP, the plan changes much of the existing zoning from industrial to new zoning designations and zoning districts. One example of a new zoning designation would be Hybrid Industrial. The use of zoning districts is based on development intensity and use mix instead of segregated land use zones. The zoning districts would include Greenway, Urban Center, Urban Innovation, and Urban Village.

The City of Los Angeles completed a Vision Plan and Economic Development Strategy for the Northeast Los Angeles Riverfront District (www.mylariver.org). The boundaries of this district contain the Verdugo Wash at the northernmost point and the Los Angeles State Historic Park at the southernmost point. The Vision document aims to highlight the northeast Los Angeles River landscape by creating a continuous, linear, recreational experience. The purpose of the Vision document is to provide a shared community-wide vision framework that informs elected officials long with various City, State, and Federal agencies of future economic and recreational investment priorities. A grant from the HUD-DOT-EPA Partnership for Sustainable Communities supported this effort. Goals also include building off of river revitalization efforts to ensure that the adjacent riverfront neighborhoods co-benefit along the Los Angeles River.

The Los Angeles River Improvement Overlay (LA-RIO) District is a special use district that was adopted by the Los Angeles City Council in 2014. The LA-RIO would implement many of the design and land use goals proposed in the LARRMP. The purpose of the overlay district, which includes approximately 2,500 feet on either side of the River, is to support the goals of the LARRMP, contribute to the environmental and ecological health of the City’s watersheds, establish a positive interface between river adjacent property and river parks/and or greenways, promote pedestrian, bicycle and other multi-modal connections between the River and its surrounding neighborhoods, provide native habitat and support local species, provide an aesthetically pleasing environment for pedestrians and bicyclists accessing the River area, and promote the river identity of river adjacent communities. The LA-RIO establishes landscaping and urban design standards that will be required of all future development projects within the LA-RIO District. All of the study’s reaches are within the LA-RIO District.

3.3.4 Land Use in the Study Area

Land uses in the study area include parkland, residential, industrial, and commercial. It is also a major transportation corridor, with the I-5 and SR-134 adjacent to much of the river corridor. The areas upstream of the study area have similar uses. Descriptions of general land use designations are shown in Table 3-5. Within the study area, open space/recreation is the most prevalent type of land use in the study area followed by industrial, at approximately 59 and 25 percent, respectively (Table 3-5). These are the primary land use categories potentially most affected by implementation of the proposed project.

As documented in the City’s 2006 – 2014 Housing Element of the General Plan (City of Los Angeles 2009), the study area is essentially built out. Nearly all new housing development activity will involve recycling of land, and no large-scale changes to land use patterns are anticipated. Annual growth in population for the study area is projected to decline to less than 0.3% over the next 25 years, with primary land use changes limited to redevelopment (LAEDC 2012).
### Table 3-5 Land Use Acreages and Percent of Total in Study Area

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Types of Land Uses in Category</th>
<th>Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>Retail uses, professional offices, business parks.</td>
<td>1.69</td>
<td>0.24%</td>
</tr>
<tr>
<td>Industrial</td>
<td>Manufacturing activities, warehouse and storage, utilities and substations, freight operations.</td>
<td>195.96</td>
<td>25.24%</td>
</tr>
<tr>
<td>Open Space/Recreation</td>
<td>Environmentally sensitive habitat, wildlife refuge/preserve, river, stream or floodplain, coastal bluff, vacant urban land. State, county, city parks or beach, recreation facility, cultural center, golf course, campground.</td>
<td>455.61</td>
<td>58.68%</td>
</tr>
<tr>
<td>Public Facilities</td>
<td>Major facilities built and maintained for public use such as civic buildings, airports, military installations, hospitals, water and sewer facilities, maintenance yards, roads, freeway, and river channels.</td>
<td>113.78</td>
<td>14.84%</td>
</tr>
<tr>
<td>Residential</td>
<td>Single and multiple family residential, condominium and apartment, mobile homes, hillside management area.</td>
<td>9.76</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total Study Area</strong></td>
<td></td>
<td><strong>776.80</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

### Open Space/Recreation

The study area contains many existing recreational amenities. Reaches 1-3 include portions of one of the City of Los Angeles’ oldest and largest park, Griffith Park. With a wide variety of uses from large preserved open space to the zoo and golf courses, Griffith Park affords many opportunities for wildlife and habitat enhancement. Reaches 4-6 contain some of the City’s newest parks including Rio de Los Angeles State Park at Taylor Yard, and the City’s oldest park, Elysian Park. There are a number of small “pocket parks” adjacent to the River in these reaches that have been developed by various agencies as part of the overall effort to green the River and make it more accessible. In Reaches 7-8, the Los Angeles State Historic Park is on a site formally known as the Cornfields. The Los Angeles River bikeway runs along the west side of the River (from Zoo Drive near Griffith Park to Barclay Street in Elysian Valley—approximately 10 miles) directly connecting some of the smaller parks; the bikeway is a multi-year effort to connect the entire River from the San Fernando Valley to Long Beach. There are plans currently underway to expand or build parks on parcels adjacent to the River; this trend is likely to continue even without alterations to the River flood conveyance infrastructure.

### Residential

Residential neighborhoods line many parts of the River and include both single and multiple family dwellings. Downtown Los Angeles (Reaches 7-8) has seen an increase of residences due to a change in zoning laws promoting residential uses and many buildings are being re-purposed as residences. Despite being stalled by the recession beginning in 2008, the number of people residing in Downtown Los Angeles is likely to increase. As other parts of the study area are already built out, some increase in density may occur as the result of rehabilitating or changing housing stock, but uses are unlikely to dramatically change.

### Industrial

At some locations, industrial enterprises are directly adjacent to the River, especially near SR 134 in Reaches 1-3, the neighborhoods of Atwater Village and Elysian Valley in Reaches 4-6, and south of Elysian Park as the River flows into downtown LA. Many of the older industrial facilities in all the study areas may be ripe for conversion to other purposes. However, because there is a desire on the part of the cities to preserve jobs, changes to zoning may not be forthcoming in the near future. Heavy rail, rail yards and utility lines are adjacent to the River on its east side, most notably LATC (Mission Yard) in Reaches 7-8. Rail lines are found on both sides of the River south of the confluence with the Arroyo Seco.
Public Facilities

In addition to recreation, the City of Los Angeles owns and maintains a number of parcels in the study area for various purposes. In Reaches 1-3 these include the Los Angeles/Glendale Water Treatment Plant, which treats sewage to advanced tertiary treatment and discharges to the River. Just downstream of the plant on the east side, LA Department of Recreation and Parks have a large maintenance facility—the Central Service Yard. Adjacent to the confluence of the River and Arroyo Seco in Reaches 4-6, the City operates a trash and recycling center transfer facility. Downstream of the area on the east side is the old City Jail in Lincoln Heights and a tow yard facility at the corner of Pasadena Avenue and Avenue 19. The LADWP facility at Main Street and the River has a maintenance yard used for repairs to both water and power infrastructure. Some of these parcels have been in discussion for conversion to other uses; however, the costs of relocating such facilities and finding other suitable sites for these activities have been severely limiting factors. Major freeways in the area include I-5 and SR-134.

3.4 WATER RESOURCES

3.4.1 Los Angeles River

The Los Angeles River watershed has a total drainage area of 570 square miles at its downstream study area boundary at First Street. The principal tributaries of the study area include Burbank Western Channel, Verdugo Wash, and Arroyo Seco. The main channel of the River is 51 miles long, and the study area has a stream length of 11.5 miles. Its tributaries have an aggregate length of 40.6 miles (from their headwaters). Stream slopes range from very steep in the mountain tributaries with slopes commonly over 200 feet per mile (3.8 percent) to approximately 3 feet per mile (less than 1 percent) in the River mainstem and coastal plain.

Impervious drainage in the study area is estimated to be 32 percent of ground cover, based on assumptions of impervious areas of each land use type in the River watershed (LADPW 2005). Due to the high amount of impervious surfaces in the drainage area, water makes its way to the storm drains, creeks, and eventually to the River in a short time. Flood hydrographs from single storm events are typically of less than 12 hours duration and are almost always less than 48 hours duration. An example of the quick response (flashiness) to excess rainfall occurred in February 1980 when the flow rate increased from approximately two-thirds of the channel capacity (86,000 cfs) to full (129,000 cfs) in the River at Wardlow, located 0.5 miles downstream of the 405 Freeway, in less than an hour (USACE 1991).

Shallow surface soils, impervious bedrock, fan-shaped stream systems, steep gradients, and occasional denudation of the area by fire result in intense debris-laden floods. However, flood and debris flows are regulated at dams and debris basins.

Flooding

The Los Angeles River is a central component in the LACDA flood risk management project. Federal flood risk management improvements in the reach of the Los Angeles River being studied in this IFR were first authorized for construction under Emergency Relief Acts, then authorized by the Flood Control Act of June 1936, as amended by the Flood Control Acts of 1937 and 1938, as well as the Flood Control Act of 1941. Modifications to the Los Angeles River channel have been addressed in later Flood Control Acts. Design discharges of the Los Angeles River range from 40,000 ft³/s to 104,000 ft³/s within the study area. A complete list of design flows for all eight reaches in the study area can be found in Table 14 of the Hydrology and Hydraulics Appendix (Appendix E).

The Los Angeles River as originally constructed within the study area from the 1930s to the 1950s was designed to convey a design flood, not a specific frequency event such as the 1 percent ACE (100-year)
event. The Corps studied improvements to flood risk management conveyance capacity along the Los Angeles River in its 1992 LACDA Review. The 1992 LACDA Review Feasibility Study showed that the LACDA channel and dam flood control system had a relatively low level of flood protection for a metropolitan area. This low level of protection was and is attributable to the following factors: (1) the original design storm, which was based upon the Capital Flood/Standard Project Flood concept in use in the 1930s was too small; (2) modern day freeboard requirements for flood control channel design means that the safe conveyance capacity of a portion of the Los Angeles River is significantly lower than the original design capacity with a lower freeboard; and (3) the increased runoff response of the watershed due to intensive urbanization produces a higher peak discharge for the same rainfall event.

Although Congress authorized the Corps to upgrade flood risk management features for the Los Angeles River downstream of the Rio Hondo confluence to provide for the 0.8 ACE event (133 year), Congress did not authorize upgrades for the upper Los Angeles River including the ARBOR reach. Flood risk management upgrades within the study area were not found to be economically justified in the 1992 review. Therefore, the flood risk management design conveyance capacity remains far less than the 1 percent ACE. Existing vegetation within the channel further decreases the conveyance capacity below that of design.

As described in the Hydrology and Hydraulics Appendix, inundation mapping was generated for the 4 percent ACE (25-year), 2 percent ACE (50-year), 1 percent ACE (100-year), and the 0.2 percent ACE (500-year) events using the most current survey data. The floodplain maps show significant floodplain areas for all the flood events that were analyzed. The channel has two major breakout areas within the ARBOR reach in the non-concrete bottom reaches. The upstream area with extensive overbank flooding is between Barham Boulevard and the confluence with Verdugo Wash and has an average floodwater depth of 5.2 feet in the overbank areas during the 1 percent ACE (100-year) event. The downstream area with extensive overbank flooding is from the Verdugo Wash confluence to the Golden State Freeway, where the in-channel vegetation ends, and has an average floodwater depth of 3.9 feet in the overbank areas during the 1 percent ACE (100-year) event. Floodplain mapping can be found within Appendix E.

Levees

The National Levee Database indicates that five levees are within the study area. Each of these levees is maintained by the Federal government. These include LAR 2, LAR 3, LAR 5, LAR 6, and LAR 7 and are found in Reaches 1 to 5, and Reaches 7 and 8. Additional information pertaining to the levees is found in Section 6.2.2 and Appendix D, Geotechnical.

3.4.2 Los Angeles River Study Area Tributaries

The Burbank Western Channel originates in La Tuna Canyon in the northern end of the Verdugo Mountains and conveys 25 square miles of drainage to its confluence with the Los Angeles River at the downstream portion of Reach 1 (Figure 3-1). As seen in Table 3-6, the Burbank Western Channel adds 15,000 cfs during design flows. The channel’s design flows are between the 200-year (0.5 percent annual exceedance chance) and 500-year (0.2 percent annual exceedance chance) event frequency discharges.

As the River bends to the south, the Verdugo Wash joins from the east in Reach 3 (Figure 3-1). Draining approximately 28.8 square miles, including the City of Glendale, the Verdugo Wash is a concrete-lined channel. Maximum daily peak flows in the lower reaches of Verdugo Wash are typically less than 400 cfs, with many years actually measuring peaks of considerably less than 100 cfs. However, maximum daily peak flows have occasionally exceeded 1,000 cfs. As seen in Table 3-6, Verdugo Wash adds 42,900 cfs during design flows. The channel’s design flows are well above the 0.2 percent ACE (500-year) frequency discharge. Downstream of the confluence of Verdugo Wash, the River flows through what is
colloquially known as the Glendale Narrows. All of the water from the San Fernando Valley funnels through this narrow passage between the hills.

The 22-mile-long Arroyo Seco drains the southwestern section of the San Gabriel Mountains. Starting high in the San Gabriel Mountains and running through Pasadena near the Rose Bowl, it continues through South Pasadena to meet the River at Reach 6 just north of downtown Los Angeles (Figure 3-1). The Arroyo Seco flows through the communities of La Canada-Flintridge, Altadena, Pasadena, South Pasadena, and northeast Los Angeles with a watershed of approximately 47 square miles (Figure 3-1). The upper Arroyo Seco watershed is in the Angeles National Forest and is managed for recreation, watershed protection, and wildlife conservation. The upper watershed is generally undeveloped, whereas the lower portion is highly urbanized. As seen in Table 3-6, Arroyo Seco adds 43,000 cfs during design flows; the Arroyo Seco channel’s design flows are well above the 0.2 percent ACE (500-year) frequency discharge.

Table 3-6 Tributary Frequency Discharges

<table>
<thead>
<tr>
<th>Arbor Reach</th>
<th>RS</th>
<th>2-year</th>
<th>5-year</th>
<th>10-year</th>
<th>25-year</th>
<th>50-year</th>
<th>100-year</th>
<th>200-year</th>
<th>500-year</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burbank Western</td>
<td>18+04</td>
<td>2,150</td>
<td>4,320</td>
<td>4,990</td>
<td>7,040</td>
<td>8,360</td>
<td>12,400</td>
<td>14,200</td>
<td>16,900</td>
<td>15,000</td>
</tr>
<tr>
<td>Verdugo Wash</td>
<td>12+62</td>
<td>3,790</td>
<td>7,550</td>
<td>8,720</td>
<td>12,700</td>
<td>15,100</td>
<td>23,200</td>
<td>26,500</td>
<td>30,300</td>
<td>42,900</td>
</tr>
<tr>
<td>Arroyo Seco</td>
<td>9+26</td>
<td>1,500</td>
<td>3,200</td>
<td>4,190</td>
<td>10,200</td>
<td>12,500</td>
<td>17,700</td>
<td>22,200</td>
<td>26,400</td>
<td>43,000</td>
</tr>
</tbody>
</table>

Source: USACE 2012a.

3.4.3 Surface Water Quality

Water quality in the study area is affected by point source and non-point source pollution entering tributaries and the main channel of the River. The River is an effluent-dominated waterbody. Nearly 70 percent of the volume in the River is from Water Reclamation Plant tertiary-treated effluent discharged outside of storm events (Ackerman 2003). Although groundwater interactions exist (particularly in the Glendale Narrows and Arroyo Seco tributary), the majority of storm drain discharges are believed to arise from urban discharges.

Stormwater runoff and associated contaminants found in the study area are from surrounding urban areas and are the prominent sources of water quality degradation. Runoff from pervious and impervious areas (i.e., streets, parking lots, lawns, golf courses and agricultural land) carry accumulated contaminants (i.e., atmospheric dust, trace metals, street dirt, hydrocarbons, fertilizers and pesticides) directly into receiving waters. The Southern California Coastal Water Research Project (SCCWRP) conducted a stormwater sampling program over five seasons (2000 through 2005) to characterize the effect of stormwater on water quality. Constituent concentrations were measured over entire storm durations from eight different land use types over 11 storm events in five watersheds in the greater Los Angeles region (SCCWRP 2007). These data were collected to better characterize contributions of specific land use types to loading of bacteria, trace metals, and organic compounds and to provide data for watershed model calibration.

The 2007 SCCWRP study found that all pollutants were strongly correlated with high levels of total suspended solids (TSS), and the highest concentrations of TSS were correlated with urbanized land uses and degraded watershed habitat. Stormwater sampling revealed that TSS concentrations were higher in early season storms (October – December) than late season storms (April-May), which suggests that the amount of time available for pollutant buildup affects the magnitude of pollutants; there is a longer period of time (summer months) before early season storms in comparison to late season storms.
Stormwater runoff from watershed and land use-based sources is a significant contributor of pollutant loading and often exceeds water quality standards. Results indicate that urban stormwater is a substantial source of a variety of constituents to downstream receiving waters. Substantially high constituent concentrations were observed throughout the study, and constituent concentrations frequently exceeded water quality criteria.

All constituents were strongly correlated with TSS. High TSS loads in rivers contribute to water quality impairments, habitat loss, and excessive turbidity, resulting in impairments in recreational, fish/wildlife, and water supply designated uses of the rivers. These results suggest that controlling TSS at specific land uses may reduce other particle-bound constituents.

Land use-based sources of pollutant concentrations and fluxes varied by constituent. No single land use type was responsible for contributing the highest loading for all constituents measured. Industrial land use sites contributed higher trace metals than other land use types. Recreational (horse) land use sites contributed significantly higher storm fluxes for E. coli, while agricultural land use sites contributed the highest TSS fluxes. Substantially higher TSS fluxes were also observed at the industrial sites.

Stormwater runoff of trace metals from the urban watersheds in this study produced a similar range of annual loads as those from other point sources such as large publicly owned treatment plants. Stormwater runoff concentrations improved over time when compared with the Nationwide Urban Runoff Program. Results showed an improvement in water quality between constituent concentrations reported by the program in 1983 and those observed in this study. Long-term overall trends of decreasing median constituents were observed at all land uses with the exception of total zinc, which showed an increase over the course of the studies. For example, lead concentrations have exhibited a 10-fold reduction over the last 20 years. The decreasing concentrations of lead observed in these studies can most probably be attributed to regulations banning the use of leaded gasoline.

Peak concentrations for all constituents were observed during the early part of the storms. For all storms sampled, the highest constituent concentrations occurred during the early phases of stormwater runoff (first flush) with peak concentrations usually preceding peak flow. In all cases, constituent concentrations increased rapidly, stayed high for relatively short periods, and often decreased back to base levels within one to two hours.

Because the Los Angeles region is so densely populated and industrialized, the quality of its surface water runoff is typically degraded. Baseflow in the River is substantially affected by permitted discharges associated with industry and municipal water treatment. The Clean Water Act National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Industrial, municipal, and other facilities must be permitted if their discharges go directly to surface waters. There are two general types of permits: individual permits are specifically tailored to an individual facility based on the type of activity, nature of discharge, and quality of receiving water while general permits cover multiple facilities within a specific category and region (USEPA 2006).

Section 303(d) of the CWA requires states to develop lists of impaired waters that do not meet established water quality standards (State Water Resources Control Board [SWRCB] 2010a). Water quality standards are developed in order to protect existing watershed beneficial uses identified by the SWRCB, and designated in specific regions by local regional boards. The Los Angeles Regional Water Quality Control Board has designated over 25 beneficial uses for the Los Angeles region, ranging from recreation and wildlife to resource extraction and hydropower (SWRCB 1994). Specific to the study area the following surface water beneficial uses have been designated for the mainstem and tributaries:
• **Municipal (MUN)** Water used for military, municipal, individual water systems, and may include drinking water.

• **Recreation 1 (REC1)** Uses of water body for recreational activities, where skin contact with water is probable, and the potential for ingestion of water is possible (swimming, wading, surfing, fishing, etc.).

• **Recreation 2 (REC2)** Recreational activities are near water body, but skin contact with water body is unlikely (picnicking, sunbathing, beachcombing, camping, hiking, sightseeing, etc.).

• **Warm Freshwater Habitat (WARM)** Uses that support warm water ecosystems for preservation or enhancement of aquatic habitats, vegetation, fish, wildlife, and aquatic invertebrates.

• **Coldwater Habitat (COLD)** Uses of water that support cold water ecosystems for the preservation and maintenance of aquatic habitat and wildlife species (flora and fauna).

• **Wildlife Habitat (WILD)** Uses of water that support terrestrial ecosystems.

• **Wetland Habitat (WET)** Uses of water that support wetland habitat.

The CWA requires the states to establish priority rankings for waters on the lists and to develop total maximum daily loads (TMDLs) for these waters. A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards and allocates pollutant loadings among point and nonpoint pollutant sources. The USEPA must approve or disapprove lists and TMDLs. All three major tributaries converging with the River within the study area are water quality impaired. Water quality impairments within the study area tributaries include indicator bacteria, in-stream health (benthic macro-invertebrate indicators), metals (copper, lead, and selenium), cyanide, and trash.

The study area mainstem on the River is also listed as impaired for a number of pollutants: ammonia, copper, cyanide, indicator bacteria, lead, benthic macroinvertebrates, nutrients (algae), oil, selenium, and trash. Some of these constituents are of concern throughout the watershed. TMDLs in the River watershed, which includes upstream of and within the study area, have been developed and implemented for bacteria, metals, nutrients, and trash pollutants. Following is a summary of each TMDL.

The bacteria TMDL came into effect on March 23, 2012 due to high levels of bacteria not protective of beneficial uses. Bacteria levels are used to indicate the potential for human and non-human sources of pathogens and pollutants. The watershed, which includes all tributaries in the study area, upstream of the study area, and the southern study area from Figueroa downstream to First Street, is highly contaminated by bacteria (SWRCB 2010b). Bacteria impairments are not supportive of REC1 and REC2 uses, which include swimming, wading, fishing, picnicking, sunbathing, beachcombing, camping, hiking, and sightseeing.

In June 2005, the Regional Water Quality Control Board (RWQCB) adopted the TMDL for metals. Reaches of the River, which includes the entire study area and tributaries, are listed as impaired for copper, cadmium, lead, zinc, aluminum, and selenium. Numeric water quality targets are based on the numeric water criteria established by the California Toxics Rule (SWRCB 2005).

The current TMDL for trash was adopted by the RWQCB in September 2008 and is applicable for the study area and tributaries. Trash impairments are not protective of REC1, REC2, WARM, WILD, COLD, and WET beneficial uses (SWRCB 2007).

The nitrogen TMDL became effective on March 23, 2004 for the River main channel and tributaries due to impairments from nitrogen compounds and related effects, such as algae, pH, odor, and scum. These reaches were listed because water quality objectives for nitrogen compounds and related effects were exceeded, thereby impairing freshwater, wildlife habitats, and recreational uses. The principal source of nitrogen compounds is from Publicly Owned Treatment Works. Discharges from the Donald C. Tillman Water Reclamation Plant upstream of the study area, and the Los Angeles-Glendale and the Burbank
Water Reclamation Plants are contributors to the River, contributing 20, 15.5, and 6.4 million gallons per day, respectively, or 31, 24, and 10 cfs, respectively (City of Burbank 2013a). During dry weather periods, these major Publicly Owned Treatment Works contribute 84 percent of the total dry weather nitrogen load. Urban runoff, stormwater, and groundwater discharge also contribute to the nitrogen loadings (SWRCB 2003). Nitrogen impairments are not protective of aquatic life beneficial uses, which include WARM, COLD, and WET (SWRCB 1994).

In summary, the River is an effluent-dominated waterbody. Nearly 70 percent of the volume in the River is from Water Reclamation Plant tertiary-treated effluent discharged outside of storm events (Ackerman 2003). Although groundwater interactions exist (particularly in the Glendale Narrows and Arroyo Seco tributary), the majority of storm drain discharges are believed to arise from urban discharges.

3.4.4 Groundwater

The project area and tributaries sit above two major groundwater basins: the San Fernando Valley and the Coastal Plains of Los Angeles Central Groundwater Basins (see Groundwater Figure 3-8). Groundwater is a major component of the water supply in the Los Angeles metropolitan area and is also used by private industries, as well as a limited number of private agricultural and domestic users. Local groundwater provides about 15 percent of the total water supply and has provided nearly 30 percent of the total supply in drought years. Of this 15 percent, 86 percent comes from the Upper Los Angeles River Area (ULARA) and the Coastal Plains of Los Angeles Central Groundwater Basin. The remaining water for the city comes from the Los Angeles Aqueduct system and supplemental water purchased from the Metropolitan Water District of Southern California (City of Los Angeles 2005).

Groundwater in the study area is encountered at shallow depths form 15 to 30 feet along the upper banks of the river channel and at ground surface within locations of the channel. Additional detail pertaining to groundwater in the study area can be found in Appendix D Geotechnical. A large portion of the River channel in the ARBOR reach has an unlined bottom because of close proximity of the groundwater to the surface. This section of the river has almost always been perennial because of this; that is why the Native Americans chose this area to settle. The treated effluent does not change the hydrologic condition from ephemeral to perennial in this section of the river. In fact, the current perennial condition may be more akin to historic conditions prior to extensive groundwater pumping. The proposed restoration features will also not change the perennial hydrologic flow conditions in the ARBOR reach, changes would only be in areas where concrete is removed and overbank is restored to river channel level.

The shallow groundwater currently supports riparian vegetation in several soft bottom reaches of the river. It is assumed based on observations of existing conditions that there is sufficient water to both support existing vegetation and restored areas within the river channel.
Figure 3-8 Groundwater Basins

San Fernando Valley Groundwater Basin

The San Fernando Valley Groundwater Basin is part of the ULARA, which also includes the Sylmar, Verdugo, and Eagle Rock Basins. The ULARA was adjudicated in 1968 after a court decision to grant water rights to the City of Los Angeles. It is under management by an administrative committee, which consists of representatives from the cities of Burbank, Glendale, San Fernando, Los Angeles, and the Crescenta Valley Water District, who oversee and advise the ULARA watermaster (ULARA 2013). The
primary job of the ULARA watermaster is to determine optimum water levels in the management area’s groundwater basin.

The San Fernando Valley Groundwater Basin has a surface area of 145,000 acres, or 226 square miles, and includes water-bearing sediments beneath the San Fernando Valley, Tujunga Valley, Browns Canyon, and the alluvial areas surrounding the Verdugo Mountains near La Crescenta and Eagle Rock (DWR 4-12). As detailed in Section 4.1.1, surficial topographic features (mountains and hills) are abundant in this reach of the project (Reaches 1-6 and associated tributaries), and bound the San Fernando Valley. These same surficial topographic features extend underground, creating geologic boundaries that define the extent of the San Fernando Valley Groundwater Basin and sub-basins.

The storage capacity of the San Fernando Valley Groundwater Basin was calculated to be 3,670,000 acre-feet, which includes the total of the San Fernando, Sylmar, Verdugo, and Eagle Rock Basins. Groundwater levels have undergone a general decline during recent years due to an increase in urbanization (runoff leaving the basin before it can infiltrate), reduced artificial recharge, and continued heavy pumping (ULARA 2013). The San Fernando Valley Groundwater Basin is recharged by the spreading of imported water and runoff occurring in the Pacoima, Tujunga, and Hansen spreading grounds (ULARA 1999). Runoff includes natural mountain streamflow, precipitation, reclaimed wastewater, and industrial discharges (DWR 4-12).

Groundwater monitoring efforts in the San Fernando Valley Groundwater Basin, including responsible agencies, parameters, number of wells, and the frequency of measurements, are summarized in Table 3-7 (DWR 4-12). Water quality in public supply wells has also been used to characterize groundwater quality in the Central Basin. Table 3-8 displays constituent groups, number of wells sampled, and number of wells sampled in exceedance of water quality standards (DWR 4-12). The number of wells sampled represents the distinct number of wells sampled as required under the California Regulatory Compliance Title 22 program from 1994 through 2000. The program requires the monitoring of drinking supply wells to ensure compliance with drinking water standards for public health.

Accordingly, the Los Angeles Region Water Quality Control Plan has identified groundwater beneficial uses, which serve to establish protective use criteria common to both the San Fernando and Central Basins, including:

- **Municipal and Domestic Supply (MUN)** Water used for military, municipal, individual water systems, and may include drinking water.
- **Industrial Process Supply (PROC)** Uses of water for industrial activities that depend primarily on water quality.
- **Industrial Service Supply (IND)** Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
- **Agricultural Supply (AGR)** Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
Table 3-7 San Fernando Valley Groundwater Basin Monitoring Efforts

<table>
<thead>
<tr>
<th>Agency</th>
<th>Parameter</th>
<th>Number of Samples and Frequency of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULARA</td>
<td>Groundwater Level and Water Quality</td>
<td>19 daily, monthly, and quarterly</td>
</tr>
<tr>
<td>EPA</td>
<td>Water Levels</td>
<td>1,379 daily, monthly, yearly, and quarterly</td>
</tr>
<tr>
<td>EPA</td>
<td>Water Quality</td>
<td>2,366 daily, monthly, yearly, and quarterly</td>
</tr>
<tr>
<td>Department of Health Services and Cooperators</td>
<td>Title 22 Water Quality</td>
<td>126 wells annually</td>
</tr>
</tbody>
</table>

Source: DWR 4-12

Table 3-8 San Fernando Valley Public Supply Wells Water Quality

<table>
<thead>
<tr>
<th>Constituent Group</th>
<th>Wells Sampled</th>
<th>Wells Above Maximum Concentration Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inorganics, Primary</td>
<td>129</td>
<td>6</td>
</tr>
<tr>
<td>Radiological</td>
<td>122</td>
<td>13</td>
</tr>
<tr>
<td>Nitrates</td>
<td>129</td>
<td>44</td>
</tr>
<tr>
<td>Pesticides</td>
<td>134</td>
<td>3</td>
</tr>
<tr>
<td>Volatile organic compounds and semi-volatile organic compounds</td>
<td>134</td>
<td>90</td>
</tr>
<tr>
<td>Inorganics, Secondary</td>
<td>129</td>
<td>17</td>
</tr>
</tbody>
</table>

Source: DWR 4-12

It should be noted that each well confirmed with a concentration above Maximum Concentration Level (MCL) was confirmed with a second detection above MCL. This does not indicate the type of water quality that is delivered to the consumer, but the characteristics of contamination in the groundwater basin. Following is a detailed description of each water quality parameter.

- **Inorganics Primary and Secondary** Inorganics primarily include antimony, asbestos, barium, beryllium, mercury, chromium, cyanide, and thallium. Primary inorganics have a wide variety of health effects in humans and aquatic wildlife including kidney problems, cancer, nervous system disorders, and circulatory problems. Secondary inorganics include copper, aluminum, pH, chloride, color, fluoride, silver, zinc, and total dissolved solids. Secondary inorganics can cause poor taste in drinking water and cause teeth discoloration to consumers.

- **Radiological** constituents naturally occur at extremely low levels in groundwater basins and include radon, gross alpha, and uranium.

- **Nitrates** Though nitrates are classified as inorganic, they are one of California’s leading contaminants, and are therefore addressed separately. High levels of nitrates can cause serious drinking water health risks to humans and can impair aquatic ecosystems. Natural levels of inorganic nitrogen are found in surface waters. However, the majority of nitrogen impairments originate from mismanaged agricultural land, where livestock are overcrowded or fertilizers are heavily applied. When nitrogen percolates its way down from the surface water to groundwater it becomes nitrate.

- **Pesticides** can have damaging effects on plants and aquatic life that were not originally targeted (RWQCB 1995).

- **Volatile and Semi-volatile Organic Compounds** VOCs are chemical compounds that vaporize at normal temperature and pressure, typical of the lighter fuels and gasoline. Semi-volatile organic compounds (SVOCs) are heavier hydrocarbon compounds/oil products, which are less mobile in the environment and tend to cling to soils. SVOCs and VOCs are introduced into the environment...
Specific VOCs and SVOCs include trichloroethylene (TCE) and perchloroethylene (PCE) (USEPA 2006). These contaminants are from numerous companies improperly disposing of chemicals. In spite of the presence of these contaminants, the LADWP performs the necessary actions to ensure that the city’s drinking water meets or exceeds water quality standards. These actions include water quality monitoring of contaminant plumes, management of production well operations, operation of groundwater treatment facilities, and capital improvements (LADWP 2005).

The San Fernando Valley Superfund Site (SFVSS) (Areas 2 and 4) is near the Crystal Springs and Pollock Well Fields. The San Fernando Valley Superfund Site (SFVSS) (Areas 2 and 4) runs under the majority of the study area, except most of Reaches 7-8, and is near the Crystal Springs and Pollock Well Fields. The Pollock and Crystal Springs Well Fields are part of the San Fernando Groundwater Basin. Groundwater is contaminated with various chlorinated VOCs, specifically TCE and PCE. Since the contamination was discovered, residents have been provided with alternate drinking water supplies, including imported water or groundwater mixed with imported water (USEPA 2006). This site is currently being remediated by the USEPA via a series of pumps and treatment wells that are strategically located along the plume. Treatment has been ongoing for approximately 10 years and has effectively stabilized much of the higher HTRW concentration; however, groundwater treatment is anticipated to be ongoing for approximately 50 years.

Coastal Plains of Los Angeles Central Groundwater Basin

The Coastal Plains of Los Angeles Central Groundwater Basin is one of four sub-basins found in the larger Coastal Plains of Los Angeles Groundwater Basin. The Central Basin has a surface area of 177,000 acres, or 277 square miles (DWR 4-11.04), only a small portion of which is located within the project area. As detailed in Section 4.1.1, Project Reaches 7-8 and associated tributaries are bound by the Elysian and Repetto Hills. The geology of these hills extends underground, creating impermeable boundaries that define the groundwater basin’s extent within the project area.

The Central Basin was adjudicated in 1965 and the California Department of Water Resources (DWR) was appointed as the Watermaster, allowing DWR to regulate water rights in the sub-basin (DWR 4-11.04). Water levels in the basin have varied over a range of 25 feet from 1961 to 1977 and 5 to 10 feet since 1996. In 1999, water levels were shown to be in the upper range of historical trends. The total storage capacity of the Central Basin is 13,800,000 acre-feet (DWR 4-11.04).

The Central Basin is recharged through surface and subsurface flows by percolation of precipitation, stream flow, and groundwater recharge management activities (DWR 4-11.04). Natural replenishment of the groundwater basin is primarily from surface infiltration, and secondarily from underflow through the Whittier Narrows from the San Gabriel Valley. Artificial recharge activities, located at the Rio Hondo and San Gabriel spreading grounds, utilizes purchased imported water (DWR 4-11.04).

Groundwater monitoring efforts in the Central Basin, including responsible agencies, parameters, number of wells, and the frequency of measurements are summarized in Table 3-9 (DWR 4-11.04). Water quality in public supply wells has also been used to characterize groundwater quality in the Central Basin. Table 3-10 displays constituent groups, number of wells sampled, and number of wells sampled in exceedance of water quality standards (DWR 4-11.04). The number of wells sampled represents the distinct number of wells sampled as required under the California Regulatory Compliance Title 22 program from 1994 through 2000. The program requires the monitoring of drinking supply wells to ensure compliance with drinking water standards for public health.
As seen in Table 3-10, all constituent groups listed excluding the pesticides group were in exceedance of the MCL at least once. It should be noted that each well confirmed with a concentration above MCL was confirmed with a second detection above MCL. This does not indicate the quality of water that is delivered to the consumer, but the characteristics of contamination in the groundwater basin. Several sites along the study area may also contain localized groundwater contamination as discussed in the HTRW Survey Report (Appendix K). A detailed description of each parameter can be found under the San Fernando Valley Groundwater Basin discussion in this section.

### 3.4.5 Water Budget

A water budget was prepared for this project and is described in Appendix E, Hydrology and Hydraulics, Section 10. That water budget characterizes the current conditions along the ARBOR reach of the Los Angeles River and provides comparison to each of the alternatives. It is a systematic presentation of the data and use of water for specific periods of time. The pertinent factors presented in the guidance are included and both an annual and a seasonal period were analyzed.

The water budget was calculated by determining the volume of water available from the sources and comparing to the water demands. The water sources include surface water and precipitation. The water demands include infiltration, evaporation, and evapotranspiration. Groundwater, although very important, was not included at this time so a conservative estimate of the water sources and demands could be assessed. As detailed in the appendix the water sources are estimated to provide 211,000 acre feet/year annually. This includes from both streamflow and rainfall runoff.
3.5 BIOLOGICAL RESOURCES

Biological resources within the proposed study footprint are limited due to channelization and intense development along the River and its tributaries. The River is mostly confined to a concrete-lined channel surrounded by urbanized areas and much of it is virtually devoid of any natural vegetation. Exceptions include Reaches 4-6 in the study area, roughly from Brazil Street to the Glendale Freeway. Few areas exist where transportation, commercial, recreational, or residential development has not completely filled the adjacent areas that were once the riparian zone and floodplain. Therefore, riparian and aquatic habitat for fish and wildlife is extremely degraded and often non-existent.

3.5.1 Vegetation

The River corridor is located in a Mediterranean climate region, which is characterized by hot, dry summers and mild, wet winters. This climate is found only in 5 locations around the world, one of which is California. The limited extent of the Mediterranean climate region (2 percent of the Earth’s land surface) and its isolation provide for a high biodiversity and high endemism of uniquely adapted plant species.

A recent review of baseline habitat was conducted to determine habitat benefits based on the Combined Habitat Assessment Protocol (USACE 2012b). This study provides the most up-to-date inventory of vegetation conditions in the River corridor. Details regarding classification of community types and acreages can be found in the CHAP report (Appendix G), and a summary description of each appears below. Habitat types include eucalyptus, open water/riverine, pasture agricultural, perennial grassland, valley foothill riparian, and urban (high density and low density). Structural conditions included: grass-forb, shrub, and tree layers along with constrained river channel and urban with various levels of impervious surfaces.

Valley Foothill Riparian Dominant species include cottonwood, western sycamore, and willows. Forest understory may consist of shrubby willows and mule fat with herbaceous species including sedges, rushes, and mugwort. Scrub habitat has less vertical structure, with shorter willows dominant. These communities occur on sub-irrigated and frequently overflowed lands along rivers and streams. This is considered a very valuable habitat type as it provides habitat for a wide variety of species, including threatened and endangered species.

Eucalyptus Several species of eucalyptus including blue gum, red gum, and silver gum are established in dense, pure stands and are typically adjacent to urban areas and non-native grasses. Eucalyptus is a non-native species that was introduced for ornamental purposes and to provide wood for rail construction.

Pasture Agricultural Characterized primarily by Bermuda grass.

Perennial Grassland Dominant species include introduced annual grasses such as wild oats, bromes, and fescues. Non-native forbs including filaree and clovers may be present. Native species may also be present.

Open Water Intermittent or continually running water distinguishes river and stream communities. In the higher velocity stretches of natural streams, riffle/pool complexes are dominant and vegetation includes water moss and filamentous algae that are attached to rocks. In slower moving waters, with increasing temperatures, decreasing velocities, and accumulating bed sediment, emergent freshwater marsh vegetation, such as rushes, sedges, and cattails, is established along river banks (Mayer and Laudenslayer 1988).
Urban This category includes landscapes dominated by urban structures, residential units, industrial areas, highways, and other such structures. Park areas may include alternately categorized vegetation such as ornamental or hardwood mixture.

Low Density Urban This is composed of urban uses such as parks, recreational fields, golf courses, and other such urban open space areas.

Vegetation within the River channel can inhibit the channel’s capacity to convey floodwaters. The channel is designed to be maintained free of vegetation to avoid impacts to flood conveyance and channel structures. However, lack of funds for maintenance has resulted in substantial vegetation growing within the channel. Due to limited funds available to maintain vegetation in the channel, USACE has focused on removing non-native vegetation using both herbicide and mechanical means. Non-native plants often out-compete natives, degrading the ecological vitality and productivity of native habitats. The most prevalent non-native and invasive plant is giant reed (Arundo donax). It spreads quickly, has little habitat value, and contributes to fire hazards through fuel loading. Other invasive species targeted by removal efforts include tree of heaven (Ailanthus altissima), Mexican fan palm (Washingtonia robusta), castor bean (Ricinus communis) and eucalyptus (Eucalyptus spp.) (California Coastal Conservancy 2002).

Vegetation community types present in Reaches 1-3 include pasture, perennial grasses (invasives), eucalyptus, and valley foothill riparian (Figure 3-9). Riparian communities are narrow and disturbed throughout these reaches and occupy only small and disconnected areas. Several small patches of riparian habitat are located within the River channel and are subject to occasional mechanical removal by the USACE, with most recent efforts focused on non-native removal. The vast majority of the study area uplands in these upper reaches are composed of urban or residential landscaped vegetation. A sizeable patch of pasture agricultural habitat is present at Pollywog Park in Reach 1. Much of this land is ruderal or weedy. Staging areas between Forest Lawn Drive and Zoo Drive are bordered by perennial invasive grasses. The eucalyptus community stretches along Zoo Drive near Ferraro Fields (Reach 3).

Vegetation becomes established in the River channel where sediment tends to accumulate. As gravel, mud, and debris become trapped in the channel bed, vegetation can become rooted and contribute to additional gravel, mud, and debris collection. This process can result in sizeable areas of vegetation establishment, including native and non-native grasses, trees, and shrubs within the non-concrete (or “soft river bottom”) channel bed in Reach 2. In Reaches 1 and 3, where concrete bed exists, minimal accumulation of sediment occurs and supports hummocks of herbaceous vegetation, which are typically washed out during high flows. Vegetation growth at Verdugo Wash has become a concern for inhibiting water flow and all vegetation is periodically mechanically removed in Reach 3.

Habitat value of these vegetation communities is degraded due to disturbance, small size, continuous noise of the adjacent highways, and presence of humans. Riparian vegetation does provide a visual buffer between highways and the River, as well as small islands of habitat within the open water area. However, overall, vegetation is limited and degraded in these reaches.
Figure 3-9 Biological Resources, Reaches 1-3
Habitat types present in Reaches 4-6 includes valley foothill riparian, urban, and open water (Figure 3-10). This reach is unique in that the bed of the channel is natural. Just downstream of SR-134, roughly parallel with Brazil Street in Glendale, the entirely concrete channel transitions to a soft bed channel with concrete trapezoidal walls. Because of this natural bottom, plants become more readily established. As a result, vegetation occupies much of the channel in these reaches, forming a nearly continuous strip of riparian habitat composed of native and non-native grasses, shrubs, and trees. In contrast to most of the upper reaches, vegetation that grows beneath the overpasses has been removed. In particular, extended bridge piers beneath Hyperion and Los Feliz Boulevards require vegetation removal to allow adequate flow conveyance. Riparian communities continue south throughout the reaches and stop just upstream of the I-5 overpass, where the channel bed becomes concrete once again.

Herbaceous and woody species in these unlined reaches consist of low elevation mats and large islands of southern willow scrub vegetation. Some of these vegetated areas are so overgrown that physical access to and through them is quite restricted. Dominant species include: black willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and arroyo willow (*Salix laevigata*). Emergent marsh is dominated by cattail and bulrush. Exotic species include giant reed and non-native species of ash (*Fraxinus* spp.). While scouring during high floods has at times cleared some of the understory vegetation in these reaches, well-rooted willows have persisted.

No other vegetation community types have been identified in these reaches (USACE 2012b). The River in Reaches 7-8 is virtually devoid of vegetation within the channel, and has extremely limited community types outside the channel within the study area and its staging locations (Figure 3-11). A small area of riparian habitat occurs along the top of the left bank of the Arroyo Seco channel, but no instream vegetation occurs. Any vegetation within the main River channel is composed of weedy species that have become rooted in the cracks of the channel walls or hummocks of vegetation that grow on the minimal accumulated sediment and wash out with high flows. Outside the channel, a small patch of coastal scrub habitat occurs just north of Broadway Street on the west side of the channel. This community is part of the relatively undeveloped hills near the neighborhood of Solano Canyon. Urban land uses dominate the overbanks of the downstream reaches and any vegetation is ruderal or ornamental.
Figure 3-10 Biological Resources, Reaches 4-6
Figure 3-11 Biological Resources, Reaches 7-8

Data Source: CNDDB 2009, USFWS 2009, NHI 2012
Aerial Source: LARIC 2008
3.5.2 Wildlife

Because of the study area’s scarce vegetation, minimal connection to other habitat areas, and extremely limited riparian communities, wildlife species that are the most tolerant of human activity and the extremely modified landscapes inhabit the study area. Common mammals include opossum (*Didelphis virginiana*), black rat (*Rattus rattus*), raccoon (*Procyon lotor*), California ground squirrel (*Spermophilus beecheyi*), fox squirrel (*Sciurus niger*), striped skunk (*Mephitis mephitis*), coyotes (*Canis latrans*), and several species of bats (CDFW 1993).

Though abundance of native bird species is limited by habitat quantity and quality along the River, diversity of native birds in the study area fluctuates with seasonal migration and can be relatively high. Resident birds use the existing small and intermittent pockets of vegetation along the waterway to nest, roost, as a base for feeding, and to take cover. Birds commonly found along the River corridor include American robin (*Turdus migratorius*), red-winged black bird (*Agelaius phoeniceus*), house sparrow (*Passer domesticus*), killdeer (*Charadrius vociferous*), mallard (*Anas platyrhynchos*), northern mockingbird (*Mimus polyglottos*), common yellowthroat (*Geothlypis trichas*), swallows (e.g., *Hirundo* spp. and *Petrochelidon* spp.), and yellow warbler (*Dendroica petechia*) (Bureau of Reclamation 2004). In addition, bird species commonly seen in the city are also found within the study area including: rock dove (*Columba livia*), mourning dove (*Zenaida macroura*), American crow (*Corvus brachyrhynchos*), European starling (*Sturnus vulgaris*), and house finch (*Carpodacus mexicanus*). Migratory species include shorebirds, wading birds, and ducks of the Pacific Flyway. These species are primarily found roosting or feeding. The least Bell’s vireo has been observed within the study area near Taylor Yard (USACE 2009).

Herpetofauna in the Los Angeles Watershed consists of a variety of amphibians and reptiles. Four salamanders that may occur within the study footprint include Pacific slender salamander (*Batrochoseps pacificus*), arboreal salamander (*Aneides lugubris*), ensatina (*Ensatinae schschohltzii*), and black-bellied slider salamander (*Batrochoseps nigrvirens*). Three frogs may occur in the study area including western toad (*Bufo boreas*), Pacific tree frog (*Hyla regilla*), and bullfrog (*Rana catesbeiana*). Six lizards potentially occur within the study area including: California legless lizard (*Anniella stebinsii*), western whiptail (*Cnemidophorus tigris*), western skink (*Eumeces skiltonianus*), southern alligator lizard (*Gerrhonotus multicarinatus*), western fence lizard (*Scelopus occidentalis*), and side-blotched lizard (*Uta stansburiana*). Finally, six snakes are considered to occur within the study area including western rattlesnake (*Crotalus viridis*), ringneck snake (*Diadophis punctatus*), common kingsnake (*Lampropeltis getulus*), California whipsnake (*Masticophis lateralis*), gopher snake (*Pituophis melanoleucus*), and two-striped garter snake (*Thamnophis hammondii*) (CDFW 1993).

3.5.3 Fish

Seven species of fish historically occurred in the freshwaters of the River including the now endangered species of southern California Distinct Population Segment of steelhead (*Oncorhynchus mykiss*) and unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), the now threatened species of Santa Ana sucker (*Catostomus santaanae*) and arroyo chub (*Gila orcuttii* in its native habitat, the species of concern Pacific lamprey (*Lampetra tridentata*), and the non-listed species Pacific brook lamprey (*Lampetra pacifica*) and Santa Ana speckled dace (*Rhinichthys osculus*) (CDFW 1993; FoLAR 2008).

The City of Los Angeles conducted a fish survey of the River in September 2004 (LADWP 2004) with a 1-day field survey at Balboa Boulevard (upstream of study site), Los Feliz Boulevard (Reach 4), and near SR-2 (Reach 2). Six non-native species were collected, including mosquitofish (*Gambusia affinis*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), black bullhead (*Ameiurus melas*), fathead minnow (*Pimephales promelas*), and tilapia (*Oreochromis* spp.). Mosquitofish and green sunfish were the most prevalent species captured. No native fishes were collected. The timing of the survey was ideal to
determine the presence or absence of native species such as Santa Ana sucker, arroyo chub, and speckled dace; none were collected. It is unlikely that species such as steelhead, lamprey, or stickleback exist. The report’s authors also concluded that it is unlikely any endangered species or species of special concern inhabit the areas sampled (LADWP 2004).

In the late summer and fall of 2007, the Friends of the Los Angeles River conducted a fish study in the Glendale Narrows (Reaches 4-6), at four sites and on four occasions both before and after significant rainfall events. This study collected eight non-native fish species including fathead minnow, carp (Cyprinus carpio), black bullhead, Amazon sailfin catfish (Pteroplichthys pardalis), green sunfish, mosquito fish, tilapia, and largemouth bass (Micropterus salmoides). A total of 1,214 individuals were collected, with mosquitofish and tilapia being the most abundant (FoLAR 2008). No native fish were collected.

3.5.4 Special Status Species

The greater Los Angeles Basin includes portions of the Angeles National Forest, the Santa Monica Mountains, and coastal areas where a number of sensitive plants and animals may occur. Sensitive species include plants or wildlife listed as threatened or endangered under the Federal Endangered Species Act (ESA) or as threatened, endangered, fully protected, or a species of concern under the state Endangered Species Act (CESA). Special status species also include plant species designated by the California Native Plant Society (CNPS) as presumed extinct in California (List 1A); plants designated as rare, threatened, or endangered in California and elsewhere (List 1B); and plants designated as being rare, threatened, or endangered in California but more common elsewhere (List 2).

The complete list of species that may occur in the study area was compiled by reviewing Federal, state, and other databases and comparing the habitat requirements of the species found in these lists to the types of habitat that occur in riparian areas of southern California waterways. These databases include the California Natural Diversity Database (CNDDB), which reports verifiable occurrences of sensitive species by USGS topographic quadrant (CNDDB 2012); U.S. Fish and Wildlife and California Department of Fish and Wildlife sensitive species lists for Los Angeles County (USFWS 2012a, and CDFW, 2012, respectively); and sensitive plant species lists developed by the California Native Plant Society (CNPS 2012). From this initial list, those species that could occur in habitats that were identified in the CHAP appendix (Appendix G) were considered in greater detail. Species for which suitable habitat occurs in the study area are discussed in the following paragraphs. All others were identified as “not likely to occur” and are listed in Appendix H.

Although several special status plant species have historically occurred in the study area or environs (24 total), none of these species are expected to occur within the project footprint. Habitat conditions needed for listed plant species to grow are either not available or are in degraded condition and not suitable. Special status plant species that have historically occurred in the project area are reported, along with their preferred habitat types, in Appendix H.

There are a total of 28 special status wildlife species with the potential to occur in the greater Los Angeles Basin (Appendix H). However, of these special status species, only least Bell’s vireo (Vireo bellii pusillus)(federally endangered, State endangered) has been sighted within the project area in recent years. There is low potential for the southwestern willow flycatcher (Empidonax trailliiextimus)(federally endangered, State endangered) and the coastal California gnatcatcher (Polioptila californica)(federally threatened) to use the study area. In general, the study area is unlikely to contain Federal or state listed endangered or threatened species or species of concern due to the degraded conditions.
Protocol level surveys for least Bell’s vireo, southwestern willow flycatcher, and California gnatcatcher were completed during the 2005 and 2007 bird-breeding season at USACE-managed areas within Los Angeles County. Least Bell’s vireo were documented in the vicinity at Hansen Reservoir and Santa Fe Reservoir, and in the lower Sepulveda Reservoir/Los Angeles River above and downstream of Burbank Boulevard. Within the study area, vireo were reported in Reach 6 near the Taylor Yard area. In 2009, no least Bell’s vireo were detected (USACE, 2009). An incidental observation of an unpaired male vireo near Taylor Yard was documented in April 2013 during a one-day nesting bird survey of the area. However, a similar one-day nesting survey of the area in May 2013 did not detect vireo (Cooper 2013a, 2013b).

Within the study area, marginal habitat for least Bell’s vireo exists. The only riparian vegetation exists in Reach 2 and in the Glendale Narrows Reaches 4, 5, and 6. This vegetation is linear and confined, lacks suitable adjacent foraging habitat, and is unlikely to support nesting. No breeding pairs were documented in the study area during the most recent protocol surveys, and were not detected during 2013 observations.

No flycatchers or gnatcatchers were found during these studies, and the most recent documented occurrence of the southwestern willow flycatcher was over 13 miles west of the project area in the Angeles National Forest. The gnatcatcher, which generally occupies coastal scrub habitat, is unlikely to occur since there is less than 1 acre of this habitat type in the corridor.

3.5.5 Waters of the United States/Waters of the State

The study area encompasses waters of the United States as defined under the Clean Water Act: the Arroyo Seco, Los Angeles River, and Verdugo Wash. These jurisdictional areas also include wetlands and other special aquatic sites. The discharge of dredged or fill materials into waters of the United States is regulated pursuant to Section 404 of the Clean Water Act. Preliminary findings of compliance with Section 404 has been documented in the draft Section 404(b)(1) analysis included with this Final IFR. A final Section 404(b)(1) evaluation will be included with the Record of Decision for this project.

The Los Angeles River has been identified as a traditionally navigable waterway (TNW), a term established by the Supreme Court in its Rapanos decision. The Los Angeles River has been protected by the CWA as a water of the United States since its passage in 1972. In 2008, in light of the Rapanos decision, the Corps further determined that two reaches of the river, within the Sepulveda Basin and the tidally influenced portion of the river, were TNWs. On August 17, 2008, EPA invoked procedures established in a memorandum of agreement between the agencies, designating the Los Angeles River as a “special case” to allow EPA to make the final determination of its jurisdictional status. On December 3, 2008, the EPA affirmed that available evidence supported the Corps’ TNW determinations for the two study reaches. In 2010, EPA determined that the entire mainstem, including the study area, constitutes a TNW. None of the TNW determinations changed the applicability of the CWA to the Los Angeles River, because the Los Angeles River, as a tributary of the Pacific Ocean, would also meet the Rapanos plurality test or the Kennedy test. The importance of a TNW determination for the CWA is generally in its relation to its tributaries.

No wetland delineation has been completed to date to identify jurisdictional wetlands. For planning purposes, CHAP and National Wetland Inventory information was consulted. Riverine wetlands were the only wetland type found during the habitat assessments conducted for the CHAP. Additional wetland data were reviewed using the USFWS National Wetland Inventory (NWI) maps. Although NWI maps are not definitive with regard to the presence or absence of wetlands, they are useful as an initial planning tool. NWI mapping shows the presence of six different types of wetlands within the study area. These wetlands occur within the River channel only and include R2UBH (lower perennial riverine), PSSC (palustrine scrub-shrub, seasonally flooded), PSSF (palustrine scrub-shrub, semi-permanently flooded), PSS/EMC...
(palustrine shrub/emergent), PFOC (palustrine forested, seasonally flooded), and PEMC (palustrine emergent, seasonally flooded) (USFWS 2012b).

Aerial mapping backdrops to NWI data indicate that emergent, shrub, and forested communities within the River channel have already migrated and are no longer in the locations shown on the wetland mapper. As a result, wetlands have not been shown in habitat mapping for this report. Existing in-channel vegetation was most recently mapped in the CHAP process and shown in Figures 3-8 to 3-10. Overall, wetlands within the study area are assumed to be only within the Los Angeles River channel. These areas are under the jurisdiction of the USACE and subject to modification for operation and maintenance of the flood risk management channel. There are no other special aquatic sites in the study area as defined under the CWA.

Waters of the State of California are defined more broadly than waters of the United States, and include all waters of the United States, and all surface waters that are not waters of the United States such as non-jurisdictional wetlands, groundwater, and territorial seas. In this instance, waters of the state include the portions of the bank above the ordinary high water mark (below which is found waters of the United States) and overbank riparian areas that may be dependent on moisture found in the bank to bank area. Waters of the State are found throughout the top-of-bank to top-of-bank portion of the study area.

### 3.5.6 Significant Ecological Areas

The City of Los Angeles, through its General Plan, established Significant Ecological Areas that include a wide variety of ecological communities (City of Los Angeles 1995). Within the study area, the expansive Griffith Park is the only Significant Ecological Area. This park, located at the east end of the Santa Monica Mountains along Reaches 1-4, supports coastal scrub, chaparral, riparian, and oak woodland habitats. The area also includes the Hollywood Reservoir. Griffith Park is considered an important habitat island for migrating birds, as well as a reservoir for native species. Though the highly urbanized cities of Burbank and Glendale separate Griffith Park from the Verdugo Mountains, Griffith Park is an important extension of the Santa Monica Mountains and offers the nearest natural habitats to the Verdugo Mountains, which are adjacent to the much larger expanse of native habitats in the San Gabriel Mountains. Birds and larger mammals in particular utilize this area as a corridor. The Department of Recreation and Parks manages a portion of Griffith Park as a bird sanctuary.

### 3.5.7 Wildlife Corridors

A wildlife corridor is a strip of habitat that connects two otherwise separated larger habitat areas (Santa Monica Mountains Conservancy 1990). Connecting isolated habitats helps to reduce population isolation, increases the species’ range, and allows for greater survival of the population. The combination of the River channel with adjacent highways and development has effectively blocked much of the wildlife movement that would have historically occurred between the Santa Monica Mountains to the west and Verdugo Mountains and San Gabriel Mountains to the east. Additional development further blocks wildlife passage between the Verdugo Mountains and the much larger Angeles National Forest.

Due to the urbanized environment, wildlife movement through and beyond the study area is limited to urban adapted species and opportunities for passage are disconnected. Bats and birds are less restricted by development, though human occupation may discourage passage through the study area. Ground dwelling animals that occur in the study area are migrating into the project area via the extremely limited pathways available. These pathways can be composed of narrow riparian strips, but more often are provided by culverts, paved pathways along the River, and concrete tunnels beneath highways. Despite the man-made nature of these pathways, wildlife are known to utilize them. A study in the Simi Valley found that tunnels, equipment passages, corrugated culverts, paved roadways, and pathways were utilized by skunks,
opossum, raccoons, grey fox, coyote, mule deer, mountain lions, and bobcats (LSA 2004). Movement in
the study area is currently being studied by USGS. Some wildlife, including coyotes, are known to use
equestrian tunnels under the freeways. However, movement is most limited by human presence and
development. Portions of the river that are unvegetated with a concrete bottom also limit movement
through the river channel.

Existing equestrian tunnels near Griffith Park in Reaches 1, 2, and 4 are expected to support regional
movement of wildlife to and from the project area to this portion of the Santa Monica Mountains. Recent
studies using wildlife cameras indicate these tunnels have been used by coyote and deer, with one bobcat
sighting. The tunnels are primarily used at night, when human presence is decreased. Other species that
could use the tunnels, if presence of appropriate habitat were available surrounding them, include
raccoons, skunks, and gray foxes. While these species are known in the vicinity of the project area, they
were not specifically documented using the tunnels during the studies. Use of these tunnels to move to
and from the study area provides regional connectivity for wildlife with Griffith Park and the Santa
Monica Mountains. On-going restoration plans at the Headworks site (Corps/City of LA DWP) adjacent
to Reach 1, as well as the outlet of Sennet Creek (FoLAR/North East Trees) upstream of Reach 1, will
contribute to connectivity between Griffith Park and the LA River study area. Access to the LA River
from these sites is available through the existing equestrian tunnel downstream of the Headworks site.

3.6 CULTURAL RESOURCES

This section is an overview of cultural resources that may be present within the study area. Cultural
resources are artifacts of human activity, occupation, or use. They include expressions of human culture
and history in the physical environment, such as archaeological sites, historic buildings and structures, or
other culturally significant places.

Archaeological resources refer to surface or buried material remains, buried structures, or other items
used or modified by people. Prehistoric archaeological resources predate European presence in Los
Angeles, and can include villages or campsites, food remains, basketry fragments, shell and stone tools
and tool-making debris. Ethnohistoric or protohistoric archaeological resources are those that can be
attributed to native cultures, but include evidence of European contact, such as trade beads in a site that
otherwise appears to be prehistoric. Historic archaeological sites are those deposits that post-date
European contact.

Historic building and structures generally must be over 50 years old and are typically identified through
archival and library research, followed by field reconnaissance and recordation. Historic buildings and
structures are architecturally, historically, or artistically important individual and groups of residential,
commercial, industrial, and transportation properties.

Traditional cultural properties (TCP’s) are places associated with the cultural practices or beliefs of a
living community. The significance of these places is derived from the role the property plays in a
community’s cultural identity, as defined by its beliefs, practices, history, and social institutions.
Examples include natural landscape features, plant gathering places, sacred sites, and Native American
burial locations. They can also include urban neighborhoods whose structures, objects, and spaces reflect
the historically rooted values of a traditional social group.

3.6.1 Cultural Resource Identification

USACE consulted with the State Historic Preservation Officer (SHPO) staff by telephone in June of 2013
on the reasonable level of effort for cultural resource identification during the feasibility study. The SHPO
agreed to the use of existing information from the records and literature search, and acknowledged that
further compliance actions under Section 106 of the National Historic Preservation Act (NHPA) could occur in the next phase of the project, under terms laid out in a Programmatic Agreement (PA) (Dibble 2013). Project-specific PAs are often recommended when the preferred alternative is complex, will consist of multiple undertakings or when the alternatives under consideration consist of corridors or large land areas where access to properties is restricted. More information on the NHPA Section 106 process and PA are provided in Chapter 5.6.

Consequently, the USACE, in consultation with the SHPO, the City of Los Angeles, the California Department of Parks and Recreation and affected tribal organizations have developed a PA in accordance with 36 C.F.R. § 800.14, to fulfill their obligations under Section 106 of the NHPA (Appendix O). Prior to study implementation or construction, the PA establishes additional cultural resource identification efforts to be conducted, which are appropriate to the proposed measures at each location. Identification efforts would include additional archaeological and historical surveys, test excavations, trenching, archival research, and construction monitoring for unanticipated discovery.

In order to compare alternatives and identify potential impacts to cultural resources, the USACE has established the likely presence of historic properties within the Area of Potential Effects (APE) through background research, visual inspections of the APE, and tribal consultation. Specific identification efforts for this undertaking are discussed below. The APE identified by the USACE includes the proposed project footprint and physical disturbance areas for river channel and bank alterations, storm drain outlet conversions to natural stream confluences, creation of freshwater marshes, diversions of river flow into side channels, riparian planting, invasive species management, re-vegetation, construction of elevated railroad trestles, and all potential temporary construction staging areas. The APE takes into account a reasonable and good faith effort to capture the potential for visual, auditory, and other non-direct effects. Ground disturbance will occur mostly in areas that were previously disturbed by construction of the concrete-lined flood control project. There are, in fact, virtually no undisturbed ground surfaces in this highly urbanized environment for the entire reach of the project. Some undisturbed and intact subsurface deposits may, however, still be present in and in association with old river terraces. The vertical APE varies from a few inches to several feet; or to the maximum height of constructed features eligible to the NRHP, such as bridges. Horizontally, the APE includes a 1/8-mile (660-foot) buffer around each depicted feature for noise and visual impacts. On September 5, 2014, the USACE consulted with the SHPO on the appropriateness of the APE. By letter dated October 3, 2014, the SHPO did not object to the defined APE.

The record search and literature review conducted by Tetra Tech Inc. for the Los Angeles River Revitalization Master Plan EIS/EIR provided the basic overview information for this IFR (City of Los Angeles 2007). An updated cultural resource records and literature search was conducted by staff of the South Central Coastal Information Center at California State University, Fullerton, in August 2012, focusing on footprints and disturbance areas specific to the feasibility study and the River corridor, with an added 50-meter (164-foot) buffer. The South Central Coastal Information Center is the regional repository for the California Historical Resources Information System. The record search there included archaeological site records and reports, California Points of Historical Interest, California Historical Landmarks (CHL), the California Register of Historical Resources (CRHR), the National Register of Historic Places (NRHP), the California Historical Resources Inventory, the City of Los Angeles Historic-Cultural Monuments (LAHCM), and the Caltrans Historic Bridge Inventory. The record search only includes the results of previous archaeological or historical surveys and other investigations. Most of the parcels in the APE have not been fully inventoried, and further identification methods would need to be tailored to the specific locations. No new fieldwork to identify historic properties was conducted to support the feasibility study, such that unrecorded and buried cultural resources may be present. Many Los Angeles River containment and flood risk management facilities, moreover, are now of historic age and may be eligible for listing on the NHRP and CRHS, including structures making up the LACDA.
The USACE contacted the California Native America Heritage Commission (NAHC) for a search of the Sacred Lands Inventory file to determine if there is any record of sensitive sites or TCPs in the APE, and to obtain the most current list of Native American contacts for consultation. The NAHC responded that there were Native American cultural resources present, and provided a list of tribal contacts for the USACE to consult on these resources. The USACE contacted these tribal representatives by letter in September of 2012 (Appendix O), and requested information about TCPs and resources of concern within the APE. To date no responses have been received by the USACE. The USACE will continue efforts to inform and consult with tribal representatives on any cultural concerns they may have. A copy of the draft Integrated Feasibility Report and EIS, with the PA, was provided to the tribal contacts for their review in December 2014. No responses or other comments have been received by the USACE.

3.6.2 Cultural Resource Setting

Archaeologists have placed the earliest occupations of southern California at roughly 12,000 to 10,000 years before present (BP), based primarily on data from coastal and desert sites around Holocene or recent era marshes, lakes, and streams. As in all arid and semi-arid lands, water sources and river systems are centers for settlement and food procurement. Prior to channelization, wetlands and marshes were associated with the changing course of the free-flowing Los Angeles River. Soils in the floodplain were periodically enriched by sediment deposition, and an abundant variety of plant and game resources were available to native populations. At the time of contact, the Spanish encountered native populations organized in villages with social elites, well-established trade networks and elaborate mortuary customs. Local Tongva or Gabrielino oral traditions speak of the importance and use of rivers in the inland San Gabriel and San Fernando valleys, and named settlements have been documented along nearly every river and ephemeral stream. Although missionization, disease, and colonization decimated organized Tongva villages along the Los Angeles River, some Native American use of the River persisted throughout the nineteenth century.

The original Pueblo of Los Angeles was founded along the Los Angeles River by Spanish settlers, who immediately constructed a ditch system to irrigate their crops. Land grants were later made to soldiers and other settlers, and used primarily for grazing sheep and cattle. This trend continued through the duration of Mexican rule and into the time after California was annexed into the United States. In the latter half of the nineteenth century, large land grants in the San Fernando Valley were broken up, and large-scale agriculture for both domestic and international markets gradually replaced ranching. Rail lines and stations were constructed that paralleled old river travel routes across the southland. Beginning in the 1880s, residential and industrial development along the Los Angeles River grew rapidly. This growth required a more reliable water supply than the river could provide, and measures to protect life and property from periodic ravaging floods. In 1913, Owens River water was brought from Central California to Los Angeles via an aqueduct. After heavy storms that same year, however, the Los Angeles River broke out and flooded nearly twelve thousand acres of land and washed out roads, bridges, and rail facilities, which even then were aligned along the River. Such periodic devastating floods continued until 1959, when the River had been completely contained in a series of concrete channels, flood risk management reservoirs, and debris basins under the Los Angeles County Drainage Area (LACDA) project.

LACDA project features are present throughout the study area. Although not yet formally documented or evaluated for historic significance, the containment and flood risk management facilities on the Los Angeles River and its tributaries may be eligible for listing on the NRHP due to their association with important events and for their engineering innovation, as further described in Section 5.6.3. The
containment and flood risk management facilities together represent a major engineering effort that
greatly contributed to the development of the Los Angeles area and is one of the most extensive flood risk
management system ever constructed to protect a metropolitan area (LACDA Feasibility Report 1992).
The features within the study area were constructed from the 1930s to the 1950s.

The following paragraphs provide an overview of the past use of each of three geomorphic reach
groupings of the river, as well as a summary of the results of the record search and a table of recorded
cultural resources. Despite past disturbances potential remains for buried archaeological resources, as well
as for unrecorded and unevaluated buildings and structures. It should be emphasized that no new field
work was conducted for this feasibility study phase. In addition to the investigations summarized below,
there are 54 historic property investigations have been conducted that identified potential resources that
have not been mapped due to insufficient or unconfirmed locational information. These 54 prior
investigations range from very early 20th century investigations, reconnaissance level surveys, or
“windshield” type historic building surveys where it is impossible to ascertain the extent of the
investigation.

Reaches 1-3

The Los Angeles River in the upstream Reaches 1-3 flows to the east at the southeast end of the San
Fernando Valley, and then makes a sharp turn to the south at its confluence with the Verdugo Wash. It
defines the border between two pre-1800 Spanish land grants: Rancho Los Feliz on the west side and
Rancho San Rafael on the east. Jose Vicente Feliz and José María Verdugo were military officers who
served Spain in the establishment of their colony in Alta California. A large portion of Rancho Los Feliz
remains intact, and was donated to the City of Los Angeles in 1896 by Griffith J. Griffith. As such it is
now known as Griffith Park. Rancho San Rafael was broken up in 1869 and includes most of the City of
Glendale extending into Pasadena.

The study area in Reaches 1-3 includes the confluence of the River with the Burbank Western Channel
and the Verdugo Wash. The City of Los Angeles purchased surface water rights in this reach from Mr.
Griffith in 1885, allowing the City to better control and to use this resource. Historic maps show little
urban development in the immediate vicinity of the River prior to 1921, while Glendale, Burbank, and
Los Angeles were experiencing a residential boom. Agricultural land uses north and east of the River
were eventually replaced, as the river was channelized from the 1920s through the early 1960s, by
industrial development primarily related to aeronautical engineering, the movie industry, and
manufacturing. Many structures from that era remain, including the Republic/Universal, Warner Brothers
and Walt Disney studios. The channelization beginning in the late 1930s allowed for even denser
development of all kinds closer to the River.

The former location of the Griffith Park Aerodrome (later the California National Guard Airport), which
operated from 1912 to 1939, is south and west of the River. It encompassed Ferraro Fields, the I-5
(Golden State Freeway), theSR-134 (Ventura Freeway) interchange, and the current Gene Autry Museum
and zoo parking lot. The Glendale Airport (later the Grand Central Airport) operated from 1923 to 1959
just north of the River. Grand Central was the first official airline terminal for the Los Angeles area. Also
adjacent to the River on the east side is the former site of the Roger Jessup Dairy, which operated from
the 1920s through the 1960s. Channelization and construction of the Golden State Freeway in 1947, and
the Ventura Freeway in 1962, took out portions of Griffith Park and separated the River and some
parkland from recreational facilities at Griffith Park, including extensive equestrian facilities (City of Los
Angeles 2007).

The record search confirmed 11 cultural resource investigations, reports, or inventories that have been
conducted in or adjacent to reaches 1-3 in the study area. From the summary of available reports, it
appears that the immediate River corridor through Reaches 1, 2, and 3 has been minimally investigated for cultural resources. Los Angeles River containment and flood risk management facilities have not been documented or evaluated. Bridges across the River, however, have been inventoried and evaluated for historic significance. Pollywog Park has not been inventoried. Ferraro Fields has been surveyed for archaeological resources and approximately two-thirds of the Verdugo Wash study area has been inventoried for historic structures. No cultural resources have been identified at Ferraro Fields or in the Verdugo Wash Study Area. Table 3-11 lists the recorded cultural resources present or adjacent to the Reach 1-3 study area.

Table 3-11 Recorded Cultural Resources in Reaches 1-3

<table>
<thead>
<tr>
<th>Resource Designation</th>
<th>Resource Type</th>
<th>Listing or Status 1, 2</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old House of Lopez P-19-150415</td>
<td>Historic Place – no physical remains are apparent.</td>
<td>Not located or evaluated</td>
<td>Mapped location of structures occupied in 1868. Structure destroyed. Near Reach 1 and Pollywog Park.</td>
</tr>
<tr>
<td>Griffith Park P-19-175297</td>
<td>District</td>
<td>NRHP CRHR LAHCM #942</td>
<td>1896-1944 – Large urban park with contributing buildings and designed and natural landscapes. Not all areas or features fully documented evaluated. Includes Bette Davis Park, Ferraro Fields, Adjacent to Reaches 1, 2 and 3.</td>
</tr>
<tr>
<td>Riverside-Zoo Drive Bridge, 53C1298 P-19-187573</td>
<td>Bridge</td>
<td>NRHP CRHR LAHCM #910</td>
<td>1938 – Concrete bridge. Bette Davis Park, Reach 1 and 2.</td>
</tr>
<tr>
<td>The Little Nugget</td>
<td>Object</td>
<td>LAHCM #474</td>
<td>1937 – Stationary display – Railroad passenger car at Travel Town, Griffith Park, Reach 1</td>
</tr>
</tbody>
</table>

1 CRHR: California Register of Historical Resources – Eligible, NRHP: National Register of Historic Places – Eligible, CHL: California Historic Landmark, LAHCM #: Los Angeles Historical-Cultural Monument and monument number, Not Evaluated: Resource has been recorded but not been evaluated for historic significance, Not eligible: Resource has been evaluated and there has been some level of determination that it does not meet eligibility criteria.

2 Note: Eligible properties are not necessarily formally listed on the NRHP or the CRHR, but have been evaluated and meet the criteria for listing and consideration in the planning process.

Reaches 4-6

The River in Reaches 4-6 continues south and then southeast, bordered by the Golden State Freeway (I-5) and Griffith Park on the west and mostly industrial and commercial properties on the east. Adjacent to the River on the east side is the Los Feliz 3-Par Golf Course developed in 1962, which is still operating. The River through Reaches 5 and 6 travels southeast through portions of the Los Angeles neighborhoods of Atwater Village, Silver Lake, Glassell Park, Elysian Valley, and Cypress Park. The River in this area was always a natural transportation route, even in prehistoric times. What became San Fernando Road along the River through this reach, and to the north, was part of El Camino Real linking Los Angeles with Mission San Fernando and northern coastal settlements through the Cahuenga Pass; and on to the San Joaquin and Central Valleys via the Tejon Pass. Later, the Butterfield Overland Mail line passed through these reaches. Rail transportation through Reaches 4-6 began in 1876, connecting to the east coast via San Francisco; and with a second transcontinental line added in 1886. Very quickly the old ranches were broken up and new residential communities were laid out to accommodate the influx of people from the east, and the growth of Los Angeles. Channelization of the River and freeway construction increased the industrial nature of adjacent land use through this reach. Table 3-12 lists recorded cultural resources present or adjacent to the Reach 4-6 study area.

As rail traffic increased, it was necessary to construct a number of rail yards along the River north of downtown Los Angeles. In 1888 the Southern Pacific established a freight storage yard adjunct at what is now known as the Cornfields site in Reach 7. In 1925 the Southern Pacific Railroad shifted supervision of
its entire Los Angeles freight handling operations from the Cornfields site to a new freight facility at Taylor Yard adjacent to the east side of the River in the southern part of Reach 6. The yard operated 24 hours a day and for much of its history; nearly all freight rail transport in and out of downtown had to pass through Taylor Yard. The workers would disassemble and reassemble as many as 60 freight trains a day.

Table 3-12 Recorded Cultural Resources in Reaches 4-6

<table>
<thead>
<tr>
<th>Resource Designation</th>
<th>Resource Type</th>
<th>Listing or Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Griffith Park P-19-175297</td>
<td>District</td>
<td>NRHP CRHR LAHCM #942</td>
<td>1896 -1944 – Large urban park with contributing buildings and designed and natural landscapes. Not all areas or features fully documented evaluated. Reaches 4 and 5.</td>
</tr>
<tr>
<td>Arroyo Seco Parkway, P-19-179645 SR110, Pasadena Freeway</td>
<td>Linear Transportation Facility, Bridges</td>
<td>NRHP CRHR</td>
<td>1940 – The first controlled-access freeway in the West. Arroyo Seco confluence, Reach 6 and 7 (boundary).</td>
</tr>
<tr>
<td>Riverside-Figueroa Street Bridge 53C0160</td>
<td>Bridge</td>
<td>NRHP CRHR LAHCM #908</td>
<td>1928, 1939 – Concrete and steel truss bridge. Scheduled for reconstruction. Reach 6.</td>
</tr>
<tr>
<td>Fletcher Drive Bridge P-19-173432</td>
<td>Bridge</td>
<td>NRHP CRHR LAHCM #332</td>
<td>1927 – Concrete bridge over the River. Reach 5.</td>
</tr>
</tbody>
</table>

1 CRHR: California Register of Historical Resources – Eligible, NRHP: National Register of Historic Places – Eligible, CHL: California Historic Landmark, LAHCM #: Los Angeles Historical-Cultural Monument and monument number, Not Evaluated: Resource has been recorded but not been evaluated for historic significance, Not eligible: Resource has been evaluated and there has been some level of determination that it does not meet eligibility criteria.

2 Note: Eligible properties are not necessarily formally listed on the NRHP or the CRHR, but have been evaluated and meet the criteria for listing and consideration in the planning process.

Repairs and maintenance of rail cars and engines were also done on site. Improvements and updates were continually made to yard facilities. Because Taylor Yard was situated above the River’s natural floodplain and was protected by a levee, it was spared from extensive damage during the worst flood in the City’s history, in 1938, which led to channelization of the River. Taylor Yard continued as the City’s major railway hub and employed hundreds of workers in surrounding communities until 1973. The completion of a modern freight yard in the City of Colton later reduced the importance of Taylor Yard as a rail center. The Southern Pacific Railroad closed most operations at the yard in 1985 and the land was eventually cleared (CDPR 2005a). Metrolink now operates a rail maintenance facility on a portion of the site. Other parcels have been developed into the Rio de Los Angeles State Park, offices, and educational facilities, although large parcels remain undeveloped.

The record search confirmed 15 cultural resource investigations, reports, or inventories that have been conducted in or adjacent to the Reach 4-6 study area. The actual River corridor through Reaches 4, 5, and 6 has been minimally investigated for cultural resources and there are no documented surveys of lands adjacent or parallel to the River. River containment and flood risk management facilities have not been documented or evaluated. Bridges across the River have been inventoried and evaluated for historic significance. There have been no surveys of the two golf courses in Reach 4. There have been cultural
resource surface surveys on adjacent parcels and along the edge of the Taylor Yard, but no inventory of
the study area or subsurface excavation has been recorded.

Reaches 7-8

The River continues south through Cypress Park and Lincoln Heights and past the confluence with the
Arroyo Seco toward downtown. Adjacent to and crossing the River are mostly industrialized zones and
heavily used transportation corridors. The Arroyo Seco historically added substantial inflows to the River
from the San Gabriel Mountains and was a major water supply for the growing city in the late 19th
Century. In 1870 the Buena Vista Reservoir was built in the hills of Elysian Park immediately west of the
confluence of the Arroyo Seco and the River. In the 1880s the reservoir was expanded and other facilities
were constructed to tap the River for a rapidly growing population. In 1904 William Mulholland and Los
Angeles completed the southernmost of this series of diversion facilities, the Narrows Gallery, to capture
more water. A 1,178-foot tunnel was drilled at a depth of 115 feet through the bedrock beneath the River
and up the Arroyo Seco. Nine wells were drilled to allow water to percolate into the tunnel where it was
then collected and conveyed through the Zanja Madre to downtown Los Angeles. The Zanja Madre was
the main irrigation ditch supplying water to Los Angeles (Brick 2012).

The Cornfields site at the Los Angeles State Historic Park is located west of the River on the former
location of the Southern Pacific River Station and freight yard. The River Station was the first Southern
Pacific facility in Los Angeles, and site of the first transcontinental railroad station and depot in the region
from 1876 through 1888. It served as the center of railroad freight operations for the Southern Pacific in
Los Angeles until 1925, and continued to serve as a freight yard until its closing in 1992. The railroad
facility included a two-story depot and hotel, a large freight house, round house, turntable, ice house, and
maintenance shops. No standing structures remain, but extensive archaeological resources have been
recorded. Cornfields is immediately north of the site where Los Angeles was founded. Some of the
earliest recorded Euro-American agriculture (1805) in Los Angeles was conducted in the River floodplain
in this area, and remnants of the original Zanja Madre have also been found. Much of the early industrial
development of Los Angeles occurred here, and it is surrounded by some of the original ethnic
neighborhoods in Los Angeles (CDPR 2005b).

Farther south, on the east side of the River is the Los Angeles Transfer Container Facility or LATC. A
rail maintenance facility was established here by the Union Pacific in the early 1900s. Historic maps show
a roundhouse and structures that comprised “general shops”, where heavy repairs and building of freight
cars took place. The need for general shops on all railroads decreased when they changed from steam
engines to diesels in the 1940s and 1950s. It evolved, therefore, to become a place to load truck trailers
“piggyback” onto railroad flat cars, as well as a site for two or three big freight forwarder operations
(FoLAR 2012).

The record search identified 46 cultural resource investigations, reports, or inventories that have been
conducted in or adjacent to Reaches 7-8 in the study area. Given the intense urban development in this
reach and transportation corridors on the edges of the concrete River channel, few of the investigations
involve block surveys of open land. Many of the references are literature reviews and record searches
focusing on the built environment and rail system or monitoring reports conducted for ground disturbing
activities involving utilities and infrastructure. Los Angeles River containment and flood risk
management facilities have not been documented or evaluated. Bridges across the River have been
inventoried and evaluated for historic significance. There have been previous cultural resource
investigations at the Arroyo Seco confluence site. The Cornfields site has been surveyed for cultural
resources and limited subsurface excavations have been conducted locating features of the past uses.
There have been no investigations of the LATC study area. Table 3-13 lists the recorded cultural
resources present in or adjacent to Reaches 7-8 in the study area.
Table 3-13 Recorded Cultural Resources in Reaches 7-8

<table>
<thead>
<tr>
<th>Resource Designation</th>
<th>Resource Type</th>
<th>Listing or Status¹, ²</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA-Lan-3100</td>
<td>Archaeological site</td>
<td>Not Individually Evaluated</td>
<td>Historic artifact scatter, within the River Station Area/Southern Pacific Railroad LAHCM #82 – Cornfields</td>
</tr>
<tr>
<td>CA-Lan-3101</td>
<td>Archaeological site</td>
<td>Not Individually Evaluated</td>
<td>Historic artifact scatter, within the River Station Area/Southern Pacific Railroad LAHCM #82 – Cornfields</td>
</tr>
<tr>
<td>Cornfield/River Station P-19-003101</td>
<td>Archaeological site</td>
<td>LAHCM #82</td>
<td>Historic structural/rail yard remains and artifacts within the River Station Area/Southern Pacific Railroad. Cornfields. Reach 7.</td>
</tr>
<tr>
<td>Richmond Junction P-19-003685</td>
<td>Archaeological site</td>
<td>Not Evaluated</td>
<td>Historic artifact scatter – 1880s to present. Adjacent to LATC. Reach 8.</td>
</tr>
<tr>
<td>1709 North Spring Street, P-19-150244</td>
<td>Building</td>
<td>Not Eligible</td>
<td>Heavily altered 1895 brick commercial/industrial building. Adjacent to Cornfields. Reach 7.</td>
</tr>
<tr>
<td>Portola Trail Campsite #1 P-19-174919</td>
<td>Historic Place-historic location, no physical remains.</td>
<td>CHL</td>
<td>1769, location where Portola camped and where the first Catholic Mass was celebrated in Los Angeles. Near Cornfields and Reach 7.</td>
</tr>
<tr>
<td>Department of Water and Power, General Services Headquarters P-19-176368</td>
<td>District</td>
<td>NRHP CRHR</td>
<td>1923-1944 grouping of municipal/industrial structures – adjacent to Reach 8.</td>
</tr>
<tr>
<td>Arroyo Seco Parkway, SR110, Pasadena Freeway P-19-179645</td>
<td>Historic Transportation Facility, Bridges</td>
<td>NRHP CRHR</td>
<td>1940 – The first controlled-access freeway in the West. Arroyo Seco confluence, Reach 7.</td>
</tr>
<tr>
<td>Southern Pacific Los Angeles Division; Union Pacific P-19-186112</td>
<td>Historic Transportation Route</td>
<td>Not Eligible</td>
<td>1874-present – Railway corridor. Adjacent to LATC, crosses Reach 8.</td>
</tr>
<tr>
<td>Arroyo Seco Flood Control Channel P-19-186859</td>
<td>Linear Water Conveyance Feature</td>
<td>Unknown</td>
<td>1937 – Concrete open flood risk management channel – appears eligible for the NRHP, but no concurrence. Arroyo Seco confluence. Reach 7.</td>
</tr>
<tr>
<td>P-19-187085</td>
<td>Linear</td>
<td>Missing record – requested</td>
<td></td>
</tr>
<tr>
<td>North Broadway Bridge, Buena Vista Viaduct 53C0545 P-19-188229</td>
<td>Bridge</td>
<td>NRHP CRHR LACHM #907</td>
<td>1910 – Beaux Arts details – first viaduct and the longest and widest concrete bridge in California at that time. Adjacent to the Cornfields, Reach 7.</td>
</tr>
<tr>
<td>Mission Tower, AT&amp;SF³ Tower P-19-188246</td>
<td>Building</td>
<td>NRHP CRHR</td>
<td>1916 – Enlarged 1938, Railroad Traffic Control Tower. Adjacent to Reach 8 across the River from LATC.</td>
</tr>
<tr>
<td>Resource Designation</td>
<td>Resource Type</td>
<td>Listing or Status¹,²</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cesar Chavez-Macy Street Bridge</td>
<td>Bridge</td>
<td>NRHP CRHR LACHM #224</td>
<td>1926 – Concrete bridge in the Spanish Colonial Revival style to commemorate its location along the El Camino Real. Reach 8 near LATC.</td>
</tr>
<tr>
<td>North Main Street Bridge 53C1010</td>
<td>Bridge</td>
<td>NRHP CRHR LACHM #901</td>
<td>1910 – Concrete arch bridge. Reach 7 and 8 boundary.</td>
</tr>
<tr>
<td>North Spring Street Bridge 53C0859</td>
<td>Bridge</td>
<td>NRHP CRHR LACHM #900</td>
<td>1928 – Concrete arch bridge. Reach 7 near Cornfields.</td>
</tr>
</tbody>
</table>

¹CRHR: California Register of Historical Resources – Eligible, NRHP: National Register of Historic Places – Eligible, CHL: California Historic Landmark, LACHM #: Los Angeles Historical-Cultural Monument and monument number, Not Evaluated: Resource has been recorded but not been evaluated for historic significance. Not eligible: Resource has been evaluated and there has been some level of determination that it does not meet eligibility criteria.

² Note: Eligible properties are not necessarily formally listed on the NRHP or the CRHR, but have been evaluated and meet the criteria for listing and consideration in the planning process.

### 3.7 TRAFFIC AND CIRCULATION

#### 3.7.1 Transportation

The roadway system in the study vicinity consists of a dense network of Federal and state highways and city streets. Federal and state highways include interstates, U.S. and state routes, and are managed and maintained by the California Department of Transportation (Caltrans). The Los Angeles Department of Transportation (LADOT) manages the approximately 6,500 miles of city streets (LADOT 2009). These streets generally carry less traffic than state highways and are managed and maintained by the city in which they are located.

Federal and state highways in the study area generally have three to five lanes of travel in each direction and experience very high traffic volumes. Such highways cross the River in six locations within the study area Figure 3-12). Interstate 5 runs alongside the channel between Reaches 3 and 6, and SR 134 runs very close to the channel in Reach 3. Rail lines servicing passenger and freight carriers run along the overbank area of the River in Reaches 7 and 8.
Figure 3-12 Traffic and Circulation
Table 3-14 Federal and State Highways in the Study Area

<table>
<thead>
<tr>
<th>Route</th>
<th>Alternate Name</th>
<th>2011 Annual Average Daily Traffic¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Route 2 (SR-2)</td>
<td>Glendale Boulevard, Glendale Freeway</td>
<td>156,000</td>
</tr>
<tr>
<td>Interstate 5 (I-5)</td>
<td>Santa Ana Freeway, Golden State Freeway</td>
<td>237,000</td>
</tr>
<tr>
<td>Interstate 10 (I-10)</td>
<td>Santa Monica Freeway, San Bernardino Freeway</td>
<td>207,000</td>
</tr>
<tr>
<td>U.S. Highway 101 (Hwy 101)</td>
<td>Hollywood Freeway, Ventura Freeway</td>
<td>209,000</td>
</tr>
<tr>
<td>State Route 110 (SR-110)</td>
<td>Pasadena Freeway, Harbor Freeway</td>
<td>123,000</td>
</tr>
<tr>
<td>State Route 134 (SR-134)</td>
<td>Ventura Freeway</td>
<td>112,000</td>
</tr>
</tbody>
</table>

¹Total number of vehicles, both directions. In some cases, annual average daily traffic counts were not available in or near the study area for some state highway segments. In these cases, the traffic count location nearest the study area was chosen for inclusion in this table. Source: Caltrans 2011.

City streets are designed to accommodate various amounts of traffic and assigned one of five classifications. In descending order of traffic capacity, the five classifications are: major highway class I (126-foot right-of-way), major highway class II (104-foot right-of-way), secondary (90-foot right-of-way), collector (64-foot right-of-way), and local (60-foot right-of-way). Class I, class II, and secondary streets generally have four to eight lanes of travel (two to four in each direction) while collector and local streets have two lanes (one in each direction). There are no Class I streets in the study area (City of Los Angeles 1997). Glendale and Burbank use somewhat different terms for classifying city streets; however, the classifications serve the same purpose as the City of Los Angeles’ classifications (City of Glendale 1998; City of Burbank 2013b). Selected roadways and intersections in the study area with their annual average daily traffic are shown in Table 3-15.

Table 3-15 Selected Roadways in the Study Area

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Annual Average Daily Traffic¹</th>
<th>Cross Street Where Annual Average Daily Traffic Counted</th>
<th>Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Lawn Drive</td>
<td>23,834</td>
<td>Zoo Drive</td>
<td>1-3</td>
</tr>
<tr>
<td>Zoo Drive</td>
<td>9,934</td>
<td>Zoo Drive N</td>
<td>1-3</td>
</tr>
<tr>
<td>Victory Boulevard</td>
<td>44,778</td>
<td>Laurel Canyon Blvd</td>
<td>1-3</td>
</tr>
<tr>
<td>Los Feliz Boulevard</td>
<td>35,485</td>
<td>Western Avenue</td>
<td>5</td>
</tr>
<tr>
<td>Hyperion/Glendale Blvd</td>
<td>1,389</td>
<td>Hoover</td>
<td>5</td>
</tr>
<tr>
<td>Silver Lake Boulevard</td>
<td>25,331</td>
<td>Van Pelt Pl.</td>
<td>5</td>
</tr>
<tr>
<td>Fletcher Drive</td>
<td>38,707</td>
<td>Glendale Blvd</td>
<td>5</td>
</tr>
<tr>
<td>Riverside Drive</td>
<td>23,569</td>
<td>San Fernando Drive</td>
<td>5-7</td>
</tr>
<tr>
<td>Cypress</td>
<td>4,756</td>
<td>Jefferies</td>
<td>6-7</td>
</tr>
<tr>
<td>North Main Street</td>
<td>13,716</td>
<td>Gibbons Street</td>
<td>7</td>
</tr>
<tr>
<td>North Avenue 18</td>
<td>2,345</td>
<td>Pasadena Avenue</td>
<td>7</td>
</tr>
<tr>
<td>North Broadway</td>
<td>12,310</td>
<td>Avenue 18</td>
<td>7</td>
</tr>
<tr>
<td>Mission Road</td>
<td>23,315</td>
<td>Cesar E. Chavez Avenue</td>
<td>8</td>
</tr>
<tr>
<td>Cesar Chavez Avenue</td>
<td>28,566</td>
<td>Mission Road</td>
<td>8</td>
</tr>
<tr>
<td>First Street</td>
<td>10,468</td>
<td>Alameda Street</td>
<td>8</td>
</tr>
</tbody>
</table>

¹Total number of vehicles, both directions) In some cases, annual average daily traffic counts were not available in or near the study area for some state highway segments. In these cases, the traffic count location nearest the study area was chosen for inclusion in this table. All roadways shown are classified as Local Neighborhood. Source: LADOT 2010.
Traffic congestion is an ongoing issue throughout Los Angeles; however, due to constraints to roadway expansion, local and regional governments have shifted focus to utilizing existing roadways more efficiently. Approximately 50 percent of the County’s Federal and state highways and 20 percent of major arterials currently experience congestion in morning and evening commute periods. Because commuting patterns are more complex than the traditional suburban to urban regions, congestion can occur in both directions simultaneously (Metro 2010). Easing congestion has been addressed by the addition of carpool lanes and synchronization of traffic signals. Focus has also shifted to alternative means of travel such as public transit and non-motorized transport, as well as to encouraging land use development patterns where residents live close to public transit and job opportunities (City of Los Angeles 1997).

Caltrans is currently constructing a high occupancy vehicle lane (or carpool lane) in each direction on I-5 between SR-134 and Magnolia Boulevard across Burbank and Glendale in the study area, as well as sound and retaining walls. The project is expected to be completed in 2015 (Caltrans 2012).

3.7.2 Public Transit

Metro is the regional transportation planning agency for all of Los Angeles County and is the largest provider of mass transit in the study area. Metro develops and oversees transportation plans, policies, funding programs, and short-term and long-term solutions that address the County’s increasing mobility, accessibility, and environmental needs. Metro also operates 200 bus lines, 2 heavy-rail subway lines (Red and Purple Lines), and 4 electric-powered light rail lines (Expo, Blue, Green, and Gold Lines).

LADOT separately provides local transit services including DASH, Commuter Express, and CityRide. LADOT’s fleet consists of nearly 400 vehicles that accommodate approximately 30 million passenger boardings per year (LADOT 2012a). DASH provides bus service 7 days a week, while Commuter Express service generally operates Monday through Friday during peak commute hours. CityRide provides point to point service for citizens 65 years of age or older.

Overall, the usage of the transit system in the Los Angeles area is relatively stable or increasing. Metro’s ridership statistics for the period of June 2010 and June 2012 indicate that monthly bus boardings decreased slightly from 30.9 million to 29.7 million while rail boardings increased from 8.7 million to 9.3 million (Metro 2012b). For the portion of the transit network evaluated in the Los Angeles County Congestion Management Program (including services within the study area), passenger throughput (a measure that combines the number of people moved and the speed at which they move) increased 44 percent and network speed increased about 6 percent from 1992 to 2009 (Metro 2010).

3.7.3 Railroads

The Los Angeles River corridor is one of the City’s main rail transportation corridors (Figure 3-12). Railroad lines run immediately adjacent to both banks in Reaches 7 and 8. Major rail operators in the study area are Union Pacific, Burlington Northern Santa Fe Railway (BNSF), Southern California Regional Rail Authority (Metrolink), and Amtrak. Union Pacific, BNSF, and LACMTA operate freight service, while Metrolink, Amtrak, and LACMTA provide passenger rail service over Union Pacific and BNSF tracks (City of Los Angeles 2007). Demand for both passenger and freight rail capacity is at or near capacity in portions of Los Angeles and the surrounding area, and demand is expected to continue to grow. The closer the system operates to capacity, the more congested tracks become and delays become longer and more frequent (City of Los Angeles 2007; Wilbur Smith Associates 2008).

Union Pacific carries goods for import and export and operates over 100 freight trains per day in its Los Angeles service area, which passes through the study area. BNSF rail lines in the Los Angeles area transport passengers and a variety of freight, including intermodal containers, raw materials, and finished goods. Affected Environment

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goods. They operate over 100 trains per day in the area, approximately 40 percent of which are passenger trains operated on behalf of Amtrak and Metrolink. BNSF tracks enter Los Angeles County from the north and pass through Union Station to three major rail yards. The study area includes the LATC rail yard operated by UPRR. First established as a rail maintenance facility in the early 1900s, today it serves as an intermodal facility mainly handling domestic cargo. UPRR reports that it receives, sorts, and distributes approximately 240,000 cargo containers per year, ninety-five percent of which are domestic (UPRR 2013). LATC is one of four intermodal facilities operated by UPRR in the Los Angeles Basin. The next closest rail yard to the study area is 3 miles south of the study area on Washington Boulevard (City of Los Angeles 2007). Metrolink is a regional commuter rail system that operates seven lines, six of which originate from Union Station. Metrolink has a 512-mile route network, operates 55 stations, and serves approximately 40,000 weekday riders (Metrolink 2012). Amtrak operates several long-distance passenger trains and also partners with the State of California to operate the Pacific Surfliner (City of Los Angeles 2007). In 2011, Amtrak served 1,606,121 passengers in Los Angeles (Amtrak 2012).

3.7.4 Parking

There are no public parking areas dedicated to River access, and public parking with nearby access to the River is limited. On-street parking is available near Reach 1 in Burbank and Reach 3 in Glendale. Public parking lots that are near the River in Reaches 1-3 are located in Griffith Park along Zoo Drive, at the Griffith Dog Park, at Ferraro Soccer Fields, south of Harding Golf Course at the Crystal Springs Picnic Area, and on the left bank at Atwater Park. There is also a large parking lot in Griffith Park between the Los Angeles Zoo and Autry National Center. In Reaches 4-6, public parking is found near the right bank of the River at the south end of Griffith Park near the Griffith Park swimming pool and William Mulholland Memorial Fountain and on the left bank of the River at the Rio de Los Angeles State Park. Street parking on the right bank of the River along Fletcher Drive, Ripple Street, and Crystal Street is frequently used by recreational users. Parking is also available at the following Mountains Recreation and Conservation Center parks that are near the River in the project area: Mark Park, Elyria Canyon Park, Elysian Valley Pocket Park, Vista Hermosa Natural Park, and the Los Angeles River Center and Gardens.

3.7.5 Airports

The nearest airport to the study area is the Bob Hope Airport, which is approximately 3 miles north of the study area in Burbank. The Los Angeles International Airport is the largest airport in Los Angeles, but is well outside the study limits, approximately 12 miles southwest.

3.7.6 Non-Motorized Transportation

Walking and biking are the primary means of non-motorized transportation in the study vicinity (Figure 3-12). The Los Angeles River Bike Path, also called the Los Angeles River Greenway Trail, follows the right bank of the River through much of the study area and is used by bicyclists and pedestrians (LADOT 2012c). Other streets in the study vicinity provide bike lanes. Most of the streets in the vicinity have sidewalks and sidewalks are provided on several bridges that cross the River. The Los Angeles River Bike Path follows the right bank of the River from the Riverside Drive Bridge at Bette Davis Park through the entire length of the study area, ending at North Figueroa Street. The Mariposa Equestrian Bridge and the Sunnynook Drive Pedestrian Bridge provide crossing points.
3.8 NOISE

This section presents information on existing noise conditions in the study area and identifies the noise sensitive receptors that are present.

Noise is measured in decibels (dB) and then frequencies are weighted based on the human response to sound, denoted as dBA. In general, a difference of more than 3 dBA is a perceptible change in environmental noise, while a 5 dBA difference typically causes a change in community reaction. An increase of 10 dBA is perceived by people as a doubling of loudness (USEPA 1974). Metrics used to describe sound pressure levels in this document include the $L_{eq}$, $L_{max}$, and CNEL:

- **$L_{eq}$**: Conventionally expressed in dBA, the $L_{eq}$ is the energy-averaged, A-weighted sound level for the complete time period. It is defined as the steady, continuous sound level over a specified time, which has the same acoustic energy as the actual varying sound levels over the specified period.
- **$L_{max}$**: The maximum A-weighted sound level as determined during a specified measurement period. It can also be described as the maximum instantaneous sound pressure level generated by a piece of equipment.
- **CNEL**: Community Noise Equivalent Level (CNEL) is another average A-weighted $L_{eq}$ sound level measured over a 24-hour period; however, this noise scale is adjusted to account for some individuals' increased sensitivity to noise levels during the evening and nighttime hours. A CNEL noise measurement is obtained after adding 5 dB to sound levels occurring during evening hours (7:00 p.m. to 10:00 p.m.) and 10 dB to sound levels occurring during nighttime hours (10:00 p.m. to 7:00 a.m.).

The ambient acoustic environment within 500 ft of the study area represents the limits of this acoustical analysis and encompasses a variety of noise sources. The assumed existing primary source of noise is from high traffic arterials, which generate consistent noise patterns in the study area. Other major noise sources include railways, industrial yards, events at Dodger Stadium, and surface street use.

Noise sensitive receptors are located within 500 ft of the study area. Generally, noise sensitive receptors are locations where people sleep or where noise can affect the function of the receptor. Examples of noise sensitive receptors include, but are not limited to, residential dwellings, schools, parks, community centers, public facilities, hotels, hospitals, places of worship, and office buildings. Noise sensitive receptors within the area studied are inventoried below.

Ambient noise conditions are documented in this report primarily through qualitative assessment of potential noise sources in the study area. Noise monitoring was not conducted as a part of this EIS/EIR. Instead baseline ambient noise levels were established by using referenced ambient noise levels as defined by the Los Angeles Department of City Planning which were a result of the City’s monitoring program in 1998 and updated in 2012, see Table 3-16 (City of Los Angeles 1998b, City of Los Angeles 2012b).
Table 3-16 Presumed Ambient Noise Level by Zone within Los Angeles

<table>
<thead>
<tr>
<th>Zone</th>
<th>Day (7:00 a.m.–10:00 p.m.)</th>
<th>Night (10:00 p.m.–7:00 a.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural, Suburban, Residential including Single and Multiple Family Homes (A1, A2, RA, RE, RS, RD, RW1, RW2, R1, R2, R3, R4, and R5)</td>
<td>50 dBA</td>
<td>40 dBA</td>
</tr>
<tr>
<td>Parking Areas and Commercial (P, PB, CR, C1, C1.5, C2, C4, C5, and CM)</td>
<td>60 dBA</td>
<td>55 dBA</td>
</tr>
<tr>
<td>Limited and Restricted Light Industrial (M1, MR1, and MR2)</td>
<td>60 dBA</td>
<td>55 dBA</td>
</tr>
<tr>
<td>Light and Heavy Industrial (M2 and M3)</td>
<td>65 dBA</td>
<td>65 dBA</td>
</tr>
</tbody>
</table>

Source: City of Los Angeles 2012b.

Wildlife species are also sensitive to noise. Animals rely on meaningful sounds for communication, navigation, avoiding danger and finding food. Behavioral and physiological responses of wildlife to noise have the potential to cause injury, energy loss, decrease in food intake, habitat avoidance and abandonment, and reproductive losses (National Park Service 1994). Studies have reported noise impacts to least Bell’s vireo from highway noise (Barrett 1996), and to other grassland and forest dwelling birds (AASHTO 2008). These species have the potential to occur in the study area and are subject to the effects of noise.

3.8.1 Reaches 1-3

Highway road noise is generated immediately adjacent to the River through much of its length in the upper reaches. Reaches 1-3 are paralleled by either Highway 134 or I-5 and have little or no noise buffer between them. These highways are major transportation arterials for commuters and commercial trucking. Industrial areas contribute noise from the east bank of the River, just south of the Highway 134 overpass.

Sensitive receptors within 500 ft of the study area include Griffith Park and its recreational facilities, specifically the Los Angeles Zoo and Botanical Gardens, Autry National Center, and Forest Lawn Cemetery. Other sensitive facilities include the Los Angeles Equestrian Center, Ferraro Fields, Disney Studios, Glendale Meditation House, and Bette Davis Park (Figure 3-13). There are no hospitals, schools, motels, libraries or retirement homes in the area. There are a few residential neighborhoods within 500 ft of the study area with the nearest neighborhood, Riverside Rancho, located north of Highway 134.

3.8.2 Reaches 4-6

Reaches 4 and 5 are immediately adjacent to I-5 and have little or no noise buffer between them. Reach 6 is separated from I-5 by a residential neighborhood, but is still within audible distance of the highway. Other noise sources include rail lines and yards immediately adjacent to Reach 6 on the east side of the river.

Sensitive receptors within 500 ft of the study area include Harding Golf Course, Griffith Park and its many recreational facilities, North Atwater Park, Los Feliz Golf Course, Rattlesnake Park, Glenhurst Park, Rio De Los Angeles State Park, Lincourt Stables, River Garden Park, Egret Park, Elysian Park, Kadampa Meditation Center, Dorris Place Elementary School, Glenfeliz Elementary, Los Feliz Nursery School, Los Feliz Charter School for the Arts, Kedren Community Head Start, Choong Hyun Mission Church, Iglesia Evangelica Shalom, Sumsang Korean Catholic Church, St. Ann Church and School, and Elysian Valley Recreation Center (Figure 3-14). There are no hospitals, motels, libraries or retirement homes in the area. Several residential neighborhoods are located within 500 ft of the study area including those of Atwater Village, Los Feliz, and Elysian Valley.
3.8.3 Reaches 7-8

Railroad lines run immediately adjacent to both banks in Reaches 7 and 8. Highways, surface streets, and industrial areas also contribute to the acoustic environment. Sensitive receptors within 500 ft of the study area include Elysian Park, the Downey Recreation Center and Swimming Pool, Los Angeles Historic State Park (Cornfields), Young Nak Presbyterian Church, Temple Gethsemani, Tribe of Los Angeles, and El Salvador Baptist Church (Figure 3-15). There are no hospitals, hotels, nursing homes, schools, or libraries within the area. Residential neighborhoods include portions of Lincoln Heights and Chinatown.
Figure 3-13 Noise Sensitive Receptors, Reaches 1-3
Figure 3-14 Noise Sensitive Receptors, Reaches 4-6
Figure 3-15 Noise Sensitive Receptors, Reaches 7-8
3.9 RECREATION AND PUBLIC ACCESS

For this analysis, the recreation resource area is defined as being a half-mile buffer on either side of the River. The inventory of larger regional parks and other resources that exist outside the study area are beyond the geographic scope of this assessment other than to demonstrate the lack of regional parks and open space available within the greater Los Angeles area.

3.9.1 Regional Context and Demand

The City of Los Angeles has approximately 24,000 acres of parks, with approximately 15,899 acres of parkland under the jurisdiction of the Department of Recreation and Parks. Other agencies managing parklands include the Los Angeles Department of Water and Power, Mountains Recreation and Conservation Authority, the Santa Monica Mountains Conservancy, California State Parks, and the County of Los Angeles. In all, this equates to a city-wide average of 6.26 acres of park per 1,000 residents (Trust for Public Land 2011). The City of Glendale has 39 developed parks comprising 280 acres, or about 1.4 acres per 1000 residents (City of Glendale 2012c). The City of Burbank operates 26 park facilities covering over 700 acres, equating to approximately 7.1 acres of parkland per 1,000 residents (City of Burbank 2013b). Including all parks identified in the assessment presented below, the recreation resource area has an estimated 5,000 acres of park, or 38.77 acres per 1,000 residents. This value is high compared to the city-wide average due to the presence of some larger than average parks near the study area, such as Griffith Park (the largest park at 4,210 acres) and Elysian Park (575 acres).

Much of Los Angeles is considered to be park deficient which refers to any geographic area that provides less than 3 acres of green space per 1,000 residents, as defined by California law (GreenInfo Network 2010). In particular, the industrial areas surrounding Reaches 7-8 have the least parkland, with fewer than 3 acres per 1,000 people. Other areas, particularly on the southwest side of Reaches 1-3, have greater than 3 acres of parkland per 1,000 residents, which is due to the presence of Griffith Park. In general, access to parks and acres of parkland per 1,000 residents is lowest in areas that have the highest number of families below the poverty line of $47,331.

According to Southern California Association of Governments (SCAG), public parks are intended to serve all residents, but not all neighborhoods and people have equal access to these public resources. SCAG calls for a multiagency effort and public transportation to improve access for all to parks throughout Southern California (SCAG 2008). The City Project, a local nonprofit research organization was founded to find ways to improve park availability for all neighborhoods, regardless of ethnicity or income level (Garcia et al. 2009).

Residents of Los Angeles place a high priority on the quality of natural and environmental resources. In a study from 2000, 75 percent of those surveyed said that preserving wetlands, rivers, and environmentally sensitive areas would be either “somewhat effective” or “very effective” at improving their quality of life. There is also strong support for protecting cultural resources and for environmental education (Public Policy Institute of California 2000).

3.9.2 Recreation Opportunities in the Study Area

Approved uses of the River in the study area are generally limited to pedestrian, cyclist, and equestrian trails along the banks. Some Two areas of the River’s watershed have recently been permitted for seasonal recreation, fishing or canoeing/kayaking on a year-to-year basis. These include the (Sepulveda Basin Recreation Zone (not in the Study Area, but a USACE facility) and the Elysian Valley Recreation Zone, which is found), were approved in Reach 6, between Fletcher Dr. and Egret Park, The Elysian Valley Recreation Zone has successfully operated in was authorized in within the study area in summer 2013 and 2014 (Memorial Day to Labor Day), as a Los Angeles River Pilot Recreational Zone authorized
by the City of Los Angeles and was administered by the Mountains Recreation and Conservation Authority, a state agency, in coordination with the USACE and the County of Los Angeles. This zone permitted vendor-operated kayaking and canoeing, bird watching, walking, and fishing within the riverbed, through entry at designated points from Fletcher Drive to Steelhead Park, subject to clear weather conditions in the watershed and other safety restrictions. The pilot recreational zone function will be assessed by the coordinating agencies after summer 2013 for determination of future seasonal in-channel recreation in that zone. Outside the seasonal recreation zone, where public use is not currently authorized, citations are not often issued for fishing, which takes place mostly in the soft bed areas of the River (Los Angeles 2011a). Other activities along the River include bird watching, sightseeing, and tours by local interest groups. There are no areas approved for swimming in the study area, and instances of swimming and wading are likely low due to water quality concerns; local agencies and interest groups typically advise users to stay out of the water (Los Angeles River Revitalization Corporation [LARRC] 2011b).

Small parks along the River’s pathways provide an improved pedestrian recreation experience with facilities such as benches and grassy areas. These parks are a combination of city parks and small pocket parks funded by local non-profit groups seeking to develop a greenway along the River (Santa Monica Mountains Conservancy and Mountains Recreation Conservation Authority 2007).

The Los Angeles River Bike Path is a Class I Bike Path (off-roadway, paved), and runs along the right bank of the River from Griffith Park through Glendale Narrows to Elysian Park, offering an off-roadway route for pedestrians and cyclists. This route is managed by the City of Los Angeles’ Department of Transportation. Another route between Griffith Park and Elysian Park relies on a combination of bike lanes and bike routes (on-roadway) but does not follow the River, making it a Class III Route, less appropriate for recreation and more of a transportation route. This route is managed by Los Angeles County Metro. Both routes are included in the City of Los Angeles Bicycle Plan (Metro 2012d). Class I-III bike routes are also found near or adjacent to the study area within the City of Burbank. See Appendix H, Supplemental Baseline Conditions, for a list of recreational resources in the study area.
Figure 3-16 Recreation, Reaches 1-3
Figure 3-17 Recreation, Reaches 4-6
Figure 3-18 Recreation, Reaches 7-8

Data Source: LA County 2012
Aerial Source: LARIC 2008

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3.10 AESTHETICS

Aesthetic resources are generally defined as both natural and built features of the landscape that contribute to the public experience and appreciation of the environment. These include the urban and scenic characteristics which are observable from within the study area and which can be seen when looking at the area from the surrounding space. For the purposes of this report, visual resources in the study area include the channel of the River, its surrounding areas of residential, commercial, and industrial development, and open space, as well as the more distant areas that can be viewed from the River, including downtown Los Angeles, Griffith Park, Elysian Park, and the Verdugo Hills. This section will also consider the olfactory conditions that currently exist in the study area. The aesthetics of the study area affect local residents and visitors, those employed in or visiting adjacent buildings, recreationists at adjacent parks and golf courses, and travelers on the many surrounding highways, railways, surface streets, bikeways, and sidewalks.

Visually, the River and floodplain have changed dramatically from their historic appearance. The once free-flowing River has been channelized and surrounded to a large extent by impervious surfaces and highly urbanized areas. Sand banks and willow riparian zones have been widely replaced with concrete, stone, and asphalt. Roadways, homes, industrial areas, businesses, rail yards, parks and golf courses have replaced the historic floodplain.

Within the River, aesthetics are dominated by the trapezoidal concrete or hardened channel, urban development at the top of the banks, fluctuating water flows, debris and graffiti, and intermittent vegetation within the channel. The entire length of the study area has concrete or hardened walls, intermittently broken by stormwater outfalls or confluences with tributaries. The majority of the reaches within the study area also have a concrete bottom. This vast concrete expanse attracts graffiti artists and homeless encampments, which compromise the visual quality of the area for many residents. Homeless encampments are common within the river channel within the study area, particularly in Reaches 6 and 7.

Businesses, neighborhoods, and parks along the River are generally not oriented to view the River, and it is difficult to see the River from just beyond the top of the bank. The lack of visual connection to the River facilitates continued vandalism and camping, and also contributes to the River as a dumping ground for debris. Plastic bags, shopping carts, and beverage containers are just a few of the types of litter that are abundant within the River in all reaches, though reaches with vegetation tend to retain litter and debris more efficiently than other areas.

In general, water fluctuations change the view of the River from a flowing stream several feet deep in the winter and spring months to a shallow trickle in the summer. However, where non-concrete river bed is present, water levels can fluctuate in comparison to concrete bottom areas throughout the year. Water from the Tillman Treatment Plant and the Los Angeles/Glendale Water Reclamation Plant, and stormwater from surrounding cities, are discharged into the River. During the summer months these inputs may be the only source of water in the River and as a result, water levels may change several inches throughout the day based on these releases. The effluent released from the Tillman Plant that is the primary source of water is tertiary treated, reducing nutrient levels in the water. Trash, industrial air and water discharges, and motor vehicle exhaust occasional contribute to odors within the area.

Vegetation has become established within the study area including both those areas with a natural river bed and those that have been fully channelized. As cracks develop in the concrete or channel hardening materials, or as debris becomes lodged in the River, plant seeds are caught and vegetation begins to grow. Wide swaths of vegetated areas have become common.
Around the River are the Cities of Los Angeles, Glendale, and Burbank and their associated development, traffic, and utility corridors. In some cases, utilities pass over the River or utilize its path as a corridor. Green spaces are composed primarily of parks and golf courses, which are most abundant in the upstream reaches and diminish in size and quality moving downstream. From the River, views may extend out to include portions of downtown Los Angeles, the hills of Elysian Park and Griffith Park, and on a clear day, the distant Verdugo Mountains. Views from the upper reaches often include Griffith Park in particular, which rises above the study area to the west and offers a hilly, forested backdrop to the local views. Lighting in the area is provided along the River bike path, the surrounding surface streets, parks and sports fields. The River itself is lighted only where lighting incidentally broadcasts over the River. Continual fluctuations in nighttime lighting occur due to motor vehicle headlights.

3.10.1 Study Area Details

The aesthetic resources of Reaches 1-3 include views within the River of concrete channel walls in trapezoidal and box configurations, overpasses, utilities, and sparse vegetation. From the channel overbank areas, views are generally from the bike path and are largely limited to the channel, power lines on the right bank, Los Angeles Equestrian Center, Bette Davis Park, Ferraro Soccer Fields, and highway infrastructure. Views into the River are briefly afforded to passing motorists along SR-134 and I-5.

Cyclone fencing runs along much of the length of both banks and very little vegetation is present in the historic riparian zone. Graffiti, trash, debris, and encampments are most abundant where the Riverside Drive and I-5 overpass pilings back up debris and trash, and allow vegetation to become established. Verdugo Wash was recently scraped to remove all vegetation at the confluence with the River. In some places, long range views are accessible from the study area in these reaches. Where there are no obstructions to the view, the green hills of Griffith Park can be seen and the even more distant Verdugo Mountains are sometimes visible.

Reaches 4-6 are generally soft bed and have amassed enough vegetation to create habitat within the channel. The channel through this area appears more natural than other areas; thick growths of cottonwoods and willows occur along the margins of the channel, and both low elevation mats of vegetation and large trees islands occur within the channel. Trapezoidal hardened banks occur throughout the length of these reaches.

Again, visual conditions within the channel and overbank area are generally limited to the immediately adjacent area. The bike path offers the best access and from here views are dominated by the channel itself, the vegetation within the channel, trash, debris, graffiti, power lines, and roadway infrastructure. Views of the River are possible from overpasses and adjacent roads including Colorado Boulevard, Los Feliz Boulevard, Hyperion Avenue, Fletcher Drive, SR-2, and I-5.
In some areas, the forested and scrub-shrub habitats of Griffith Park and Elysian Park can be seen rising in the west, though they are both separated from the River by roads and other development. Atwater Park just south of Chevy Chase Drive is the only overbank park with an open connection to the River. All other green spaces are fenced off from the channel area.

Moving south, Taylor Yard on the left bank comprises a large area of Reach 6 and dominates much of the visual landscape from within the River channel here. Long range views from unobstructed areas allow visitors to glimpse the distant Verdugo Mountains on a clear day. From some spots within these reaches, it may be possible to also view the skyscrapers rising from downtown Los Angeles.
South of I-5, Reaches 7 and 9 are once again a concrete trapezoidal channel with a concrete bottom. Decreasing vegetation and increasing industrial areas give this reach a dominantly urban aesthetic; rail yards, warehouses, parking lots, and overpasses are abundant. The lack of vegetation, both within the River and along the overbank areas, contributes to this apparent absence of any natural areas. Graffiti, trash, and encampments further deteriorate the appearance.

Aesthetic value is provided by a series of Art Deco and Classical Revival style bridges that span the River, including those at North Broadway, North Spring Street, and Main Street, which are also the most publicly accessible areas from which to view the River (Los Angeles County 1996). Other architectural samples or cultural resources are sparse. Businesses and industry in this reach have opted to orient away from the River, or have been disconnected from the River by railways. Views of the River itself are not currently an attractive value for businesses. Views of downtown Los Angeles buildings are possible from these downstream reaches. However, flat elevations and the urban infrastructure around the study area generally obstruct much of the downtown view, as well as long range views of surrounding mountain ranges.

The section of SR-110 in the area has been designated as a National Scenic Byway by the Federal Highway Administration (FHWA) due to its historic significance (U.S. Department of Transportation...
3.11 PUBLIC HEALTH AND SAFETY INCLUDING HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

This section is a discussion of conditions in the study area related to public health and safety. The public health and safety topics of concern for this evaluation are: water safety; wildfire; methane zones; vector borne-diseases; and hazardous, toxic and radioactive waste (HTRW).

3.11.1 Public Health and Safety

Los Angeles River Water Safety

Under normal conditions, the River usually contains a low volume of slow-moving water which is often restricted to a concrete slot in the centerline of the channel bottom or a shallow depth in soft bottom reaches. However, during periodic storms, the channel volume increases with rapidly-moving water from the upper watershed and stormwater runoff. During and following these storms, water levels and flow velocities in the River channel rise quickly, without warning, dramatically increasing the risk of accidental death and injuries to people and animals venturing into the channel. Much of the River is fenced and signed to prevent accidental injury or death.

The Los Angeles Fire Department (LAFD) has a Swiftwater Rescue team of personnel specially trained and equipped to respond to water-related emergencies (LAFD 2012). The Glendale Fire Department, Burbank Fire Department, and the Los Angeles County Fire Department also have swiftwater rescue capabilities (Glendale Fire Department 2012, Burbank Fire Department 2011, Los Angeles County Fire Department 2012).

Access points to the River corridor in Reaches 1-3 include Griffith Park, Bette Davis Park, and at Los Feliz Blvd., where pedestrians and cyclists are able to enter through gates onto the paved paths along the River. Access at Reaches 4-6 is offered near North Atwater Park, the pedestrian bridge at Sunnynook St., and residential areas that border the River. Access points along the more industrial downstream reaches (7-8) are limited by private and commercial properties, though surface streets do come near the River.

Wildfire

Portions of the study area are designated as very high, high, or moderate fire hazard severity zones (Figure 3-19). Fire is more likely to occur in these areas than in other areas due to the type of vegetation, topography, weather, and other conditions. Fire hazard severity zones are established by city ordinance. Such zones are prone to incidence of wildfires, which may be caused either by natural forces, such as lightning, or by human negligence or mischief. Very high, high, and moderate fire hazard severity zones are present in the study area throughout much of Griffith Park and Elysian Park. No very high, high, or moderate fire hazard severity zones are present in Reaches 7-8.
Figure 3-19 Fire Hazard and Methane Zones
Methane Zones

Methane gas is found below ground in proximity to methane gas sources such as former landfills and naturally-occurring petroleum deposits. Methane gas can be harmful if inhaled or can cause a fire or explosion under certain conditions. The City of Los Angeles has established methane gas zones and methane gas buffer zones under LAMC Section 91.7101 et seq. Portions of the study area are in such zones, as shown in Figure 3.18. Projects occurring in these zones must test for methane gas prior to construction and mitigation measures may be required to reduce health and safety hazards.

Methane zones occur east of I-5 and south of SR-134 and the buffer zone for this area overlaps the River (Reach 1). Methane zones may be present in Glendale or Burbank; however, a map of these zones was not available. There are no methane zones in Reaches 4-6. In Reach 7 a methane zone that overlaps the study area is located south of the intersection of I-110 and I-5. Several small methane zones overlap the study area in Reach 8 between Alhambra Ave. and the southern end of the study area at 1st St.

Vector-Borne Diseases

A vector is an animal or insect such as a rodent or mosquito that can transmit a disease to another animal or to humans. Vector-borne diseases are diseases that can be transmitted to humans from contact with a vector. The Greater Los Angeles County Vector Control District (GLACVCD) is a public health agency that works to keep the area in its jurisdiction free of vector-borne health threats. The GLACVCD is one of five mosquito and vector control districts in Los Angeles County serving approximately 6 million residents in a 1,330 square mile area that includes Los Angeles and Glendale. The GLACVCD provides mosquito abatement, disease surveillance, and public health outreach (GLACVCD 2012a).

Mosquitoes, black flies, and midges breed in water and may be found in the study area, though black flies and midges are not disease vectors in California. Mosquito-transmitted diseases that are of concern in Southern California are West Nile virus, Saint Louis encephalitis, western equine encephalomyelitis, malaria, and heartworm (heartworm affects dogs and cats, but rarely humans). With the exception of West Nile virus, incidences of these diseases are rare (GLACVCD 2012a). In 2011, there were 44 human cases of West Nile virus and 2 fatalities in the GLACVCD’s jurisdiction (GLACVCD 2012b). As of September 2012, 12 human cases of West Nile virus and no fatalities have occurred (California West Nile Virus Website 2012).

3.11.2 Hazardous, Toxic and Radioactive Waste (HTRW)

The USACE prepared an HTRW survey report for the proposed project as required by Engineering Regulation 1165-2-132 (Appendix K). The study area is in a densely populated area with a history of manufacturing and industrial land use. A large number of HTRW cases listed in regulatory databases were initially identified. From these, 22 open cases were determined to overlap the study area. One additional site of localized groundwater contamination in remediation at the Cornfields site was determined through other document searches. The LATC site is also anticipated to contain HTRW contamination, based on its similarity in historical use to Taylor Yard, for a total of 22 known and 1 likely HTRW sites in the study area. The site locations are depicted on figures found in Appendix K. As shown in Table 3-17, 3 of the 23 relevant HTRW sites have a high impact within the study area due to the larger size of the contaminated area compared to the others and their likelihood of overlapping with project features. The three high impact sites are the San Fernando Valley Superfund Site and Taylor Yard sites G1 and G2. The LATC site is also a site of concern with potentially high levels of contamination based on its historical uses, although there are no public records available for that site. The USACE determined that the other 19 sites are of low impact and have a moderate amount of overlap within the study area; they are in various stages of remediation, and contamination is not as widespread at those sites. Each of the three known and one suspected high impact site is discussed below.
### Table 3-17 Relevant HTRW Sites

<table>
<thead>
<tr>
<th>Site*</th>
<th>Database in which Case is Listed</th>
<th>Extent of Overlap with Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Fernando Valley Superfund Site</td>
<td>NPL</td>
<td>High</td>
</tr>
<tr>
<td>Taylor Yard G1</td>
<td>DTSC</td>
<td>High</td>
</tr>
<tr>
<td>Taylor Yard G2</td>
<td>DTSC</td>
<td>High</td>
</tr>
<tr>
<td>Former Manufactured Gas Plant</td>
<td>DTSC</td>
<td>Moderate</td>
</tr>
<tr>
<td>Former Manufactured Gas Plant</td>
<td>DTSC</td>
<td>Moderate</td>
</tr>
<tr>
<td>Bortz Oil</td>
<td>DTSC</td>
<td>Moderate</td>
</tr>
<tr>
<td>San Fernando Consolidated Facility</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Three Chevron Gasoline Stations</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Former Bortz Oil</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Shell Gas Station</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Former Triangle Gasoline Station</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Former Hawkes Finishing</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Mount Sinai Forest Lawn Cemetery</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Former Albion Dairy</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Burlington-Northern Santa Fe Tower</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Valspar Corporation</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Chromal Plating and Grinding Company</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Infinity Outdoor Company</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Gannett Outdoor System, Inc.</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Metropolitan Transportation Agency</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Morton International Whittaker Corporation</td>
<td>LARWQCB</td>
<td>Moderate</td>
</tr>
<tr>
<td>Union Pacific Railroad – Cornfield Yard</td>
<td>LARWQCB/DTSC</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Source: USACE 2013

* Although some sites have similar names, each listing in the table represents a different regulatory case.

DTSC = (California) Department of Toxic Substances Control; LARWQCB = Los Angeles Regional Water Quality Control Board; NPL = National Priorities List

The San Fernando Valley Superfund Site overlaps parts of the northern portion of the study area from Reach 1 to Reach 4. Shallow groundwater in the area is contaminated with various chlorinated VOCs, specifically TCE and PCE. The Environmental Protection Agency (EPA) completed a basinwide remedial investigation and is working with state and local agencies and other responsible parties to prevent exposure to contaminated groundwater, provide alternate sources of drinking water, determine the extent of the contamination, and address contamination through remediation and monitoring. Remedies to address VOC contamination have been operating since 2000. Several areas of known groundwater contamination near the River are being treated by extracting groundwater and treating it at the surface. Groundwater extraction wells near the project area are at the Glendale and Pollock Treatment Plants and the Los Angeles Reclamation Plant. Although contaminant levels have been substantially reduced in many places, contaminants remain above safe drinking water levels and remediation is ongoing (CH2M Hill, Inc. 2009; EPA 2013). Investigation of chromium contamination are ongoing. Remediation is anticipated to continue for the next 50 years. The project site primarily overlaps the outer portions of the groundwater plumes, where contaminant concentrations are lower. The lateral extent of groundwater contamination from these contaminants is shown on figures in Appendix K.
Taylor Yard is a 243-acre rail yard that was used for about 100 years. The G1 (19 acres) and G2 (50 acres) sites are portions of this rail yard. At the G1 site, four areas with elevated levels of lead and arsenic in soil were identified. These were remediated to meet site remediation goals that satisfy human health standards for industrial properties but not ecological or recreational standards and the property was sold to the California Department of Parks and Recreation (Camp Dresser & McKee Inc. 2011).

Remediation at the Taylor Yard G2 site is ongoing. The primary contaminants of concern at this site are metals, volatile organic compounds, semi-volatile organic compounds, and petroleum products. The contaminants are present in soil and groundwater. Remedial activities that have already occurred at the site include soil removal and soil vapor extraction. The Department of Toxic Substances Control (DTSC) approved a Feasibility Study for site remediation of the site in August 2012 (DTSC 2012). The project proponent will then prepare a remedial work plan and conduct additional remediation. When remedial activities are complete, soil with residual levels of contamination will remain beneath caps and building foundations. The site remediation goals will satisfy human health standards for industrial properties but not ecological or recreational standards (Camp Dresser & McKee Inc. 2011).

LATC is a modern railroad freight transfer yard. The USACE’s HTRW survey found no records of any active or open CERCLA HTRW concerns or actions associated with this property. However, the City of Los Angeles has indicated that there are remaining HTRW concerns regarding the LATC property. In a 1953 USGS topographic map, a portion of LATC is identified as a railroad maintenance yard, the same identifier used for Taylor Yard. Because LATC and Taylor Yard were in use as railroad maintenance yards at the same time, similar activities likely occurred on both properties. Also, historical maintenance activities were the source of much of the contamination at Taylor Yard. Therefore, although there is no record confirmation of HTRW issues at LATC, some HTRW is likely to exist at the site.

Despite a records review to identify HTRW sites of concern, it is possible that additional contaminated soil or groundwater is present in the study area, and the study area will be subject to further investigation as described in the HTRW appendix. Because the current configuration of the channel was created by both deepening and widening the natural channel, any contaminated sediments in the channel prior to construction of the flood risk management structures are likely to have been removed by these grading operations. Discharges into the river today from storm drains are regulated by permits issued by the Regional Water Quality Control Board. However, no investigation or sampling has been conducted of channel sediments at this time.

### 3.12 UTILITIES AND PUBLIC SERVICES

This section discusses the utilities infrastructure and public services in the study area. Utilities addressed in this section are electricity, water supply, sewer and wastewater treatment facilities, stormwater, natural gas, and telecommunications. An overview of utilities in the study area is shown on Figure 3-20 to Figure 3-22. Nearly all the utilities in the study area are in Los Angeles; only a fraction of the utilities are in Glendale or Burbank. Accordingly, information about utilities in Glendale and Burbank is limited to a description of those utilities that are found in the study area.
Figure 3-20 Utilities, Reaches 1-3

Data Source: LA County, AT&T, LADWP,
Time Warner Cable, & So. CA Gas Company
Aerial Source: LARIC 2006
Figure 3-22 Utilities, Reaches 7-8
3.12.1 Electric Power

LADWP provides power to 3.9 million people in a 465-square-mile service area that includes Los Angeles. In addition to serving residents and businesses in their territory, LADWP uses its electricity to light public roads and power the water supply system.

LADWP holds powerline easements and rights-of-way along the River in the study area. Easements sometimes coincide with County ownership and flood risk management easements. Aboveground transmission lines run along the River through nearly all of the study area. Substations and service buildings are also present in the study area.

**Reaches 1-3** LADWP above-ground transmission lines run along one bank of the River or the other through this portion of the study area. The transmission lines cross the River at five locations: near the equestrian bridge in Burbank, just downstream of the equestrian center, near the intersection of I-5 and SR-134, near Brazil Street, and just north of Los Feliz Boulevard. Although these lines are physically in Burbank for a short stretch in Reach 1 near the equestrian bridge, they are owned by LADWP. An electrical power plant and substation are in Reach 3 in Glendale on the left bank of the River south of Flower Street (City of Los Angeles 1996).

**Reaches 4-6** LADWP above-ground transmission lines run along the right bank of the River, cross the River just north of Fletcher Drive, and then run along the left bank of the River for the remainder of this portion of the study area. An electrical substation is on the left bank of the River at the south end of Reach 5 just north of Fletcher Drive (City of Los Angeles 1996).

**Reaches 7-8** LADWP above-ground transmission lines run along the right bank of the River until just south of Main Street, where the lines cross the River and run along both banks for the remainder of this portion of the study area. No electrical power plants or substations are in or near this portion of the study area (City of Los Angeles 1996).

3.12.2 Water Supply

LADWP provides water to Los Angeles’s residents and businesses, over 60,000 fire hydrants, and for irrigation and recreation. Water supply and demand are central issues in arid and heavily populated Southern California. In Los Angeles, mandatory water conservation measures implemented in 2009 have reduced demand; at the same time, the increasing population increases demand. Overall, the demand for water is still increasing, although at a slower rate than before water conservation became a widespread practice. Los Angeles’s 2010 Urban Water Management Plan projects a 1 percent average annual water demand growth rate over the next 25 years. Projected water demand can vary up to 5 percent from the baseline forecast depending on weather (LADWP 2011, 2012d). Water supply lines are present throughout the study area. The water lines range in diameter from 6 inches to 69 inches and cross the River in 13 locations (Figure 3-20 to Figure 3-22).

Los Angeles’s Integrated Resources Plan, adopted in 2006, recognizes that water supply, wastewater (including recycled or reclaimed water), and stormwater are interdependent systems and provides an integrated approach to infrastructure planning and management. The plan establishes the water infrastructure requirements to adequately serve the City’s residents given projected population growth (Bureau of Sanitation and LADWP 2006). The Greater Los Angeles County Region Integrated Regional Water Management Plan, which takes an even wider view at integrating the region’s approach to addressing its extremely complex water quality and water supply issues and planning for appropriate infrastructure (Leadership Committee of Greater Los Angeles County Integrated Regional Water Management Plan 2006).
Water lines cross the River in five locations: in Burbank near the equestrian center, near Flower Street, at SR-134, and near Goodwin Avenue All of the crossings are below the River, with the exception of the SR-134 crossing, which is part of the street bridge.

Reaches 1-3 Burbank Water and Power (BWP) is the municipal utility that provides drinking water to the portion of study area in Burbank. BWP’s supply consists of imported water purchased from the Metropolitan Water District of Southern California, groundwater, and recycled water that is produced at the Burbank Water Reclamation Plant. Burbank’s water system is composed of approximately 280 miles of pipelines ranging in size from 1.5 to 30 inches in diameter as well as booster pumps, reservoirs, and wells (BWP 2011). A water supply line in the study area briefly traverses a portion of Burbank in Reach 1 near the equestrian bridge.

Reaches 4-6 Water supply lines run along the left bank of the River in some places. Water lines cross the River in three locations: at Tyburn Street, just south of Garcia Street, and between Fletcher Drive and SR-2. The Tyburn Street water line is above-ground while the other two crossings are under the River.

Reaches 7-8 Water supply lines cross the River in three locations: at the North Figueroa Street Bridge, near the railroad bridge near Humboldt Street, and at the North Broadway Bridge. The crossing near the railroad is under the River while the other two crossings are part of the street bridges.

3.12.3 Wastewater

The Los Angeles Bureau of Sanitation is responsible for installing, operating, and maintaining the City’s wastewater infrastructure. The Bureau’s wastewater program provides collection, conveyance, treatment, and disposal of 550 million gallons of wastewater per day for over four million people in a 600-square-mile area. Treatment plants near the River contribute the bulk of the daily flow. Though Tillman Treatment Plant is not within the study area, it contributes 291 cfs to the River on average throughout the year. This plant is a tertiary treatment nitrification/denitrification, disinfection, and dechlorination facility. This is highly treated effluent and suitable for use in irrigation, in lakes and in discharge to the river. The Bureau maintains over 6,500 miles of sewer pipelines between 6 inches and 12 feet in diameter. Wastewater entering the sewer system is routed to and treated at one of four treatment and water reclamation plants including the Los Angeles-Glendale Water Reclamation Plant in the study area (Bureau of Sanitation 2012a).

A major sewer line, the Northeast Interceptor Sewer, runs near the River from south of SR-2 to the southern end of the study area and crosses beneath the River bed just north of the Glendale Freeway through part of study area in Reaches 4-8. Another major piece of sewer infrastructure, the North Outfall Sewer, runs the length of the study area. Service access shafts for these major sewer lines are within a half mile of the River (LADPW 2012a).

Sanitary sewer lines that transport wastewater to treatment plants are present in the study area. The sewer lines range in diameter from 6 inches to 96 inches and cross the River in seven locations.

Multiple sewer lines are near the equestrian center, crossing the River several times. Sewer lines are near SR-134 in Griffith Park and cross the River along the SR-134 overcrossing near the intersection with I-5. A sewer line runs west of I-5 at Harding Golf Course.

The Glendale Department of Public Works is responsible for the sewer infrastructure in the study area within Glendale. Glendale’s sewer system has approximately 360 miles of sewer lines (Glendale Department of Public Works 2012). A sewer line in the study area briefly traverses the River in a portion of Glendale in Reach 3 near SR-134.
The Burbank Department of Public Works owns and operates the sewer infrastructure in the study area within Burbank. A sewer line in the study area traverses the River in a portion of Burbank in Reach 1 near the equestrian bridge.

The Los Angeles-Glendale Water Reclamation Plant is in the study area on the left bank of the River south of Colorado Boulevard. The plant serves the eastern San Fernando Valley, portions of Los Angeles, and the Cities of Glendale, Burbank, and La Crescenta. The plant treats approximately 20 million gallons of wastewater per day. The stringent treatment process results in some water that is suitable for reuse for irrigation and industrial processes, which conserves over a billion gallons of potable water per year (LADPW 2012b).

Sewer lines run near the left bank of the River from Fletcher Drive to SR-2, crossing the River just north of SR-2. Sewer lines also cross the River at Newell Street and just upstream of I-5.

Sewer lines run near the left bank of the River from SR-110 to Humboldt Street and in LATC area (from the railroad overcrossing west of Alhambra Street to Cesar E Chavez Avenue). Sewer lines are near the right bank of the River near North Broadway. No sewer lines cross the River in this portion of the study area.

3.12.4 Stormwater System

The primary purpose of the stormwater system is to manage stormwater runoff to prevent flooding. Los Angeles’s stormwater system consists of a network of approximately 35,000 catch basins (points where water enters the system), over 1,500 miles of underground pipes, and 100 miles of open channels. The stormwater system is mostly separate from the sewer system and much of the water that enters the stormwater system is not treated or filtered, although the City operates low-flow diversions in selected locations which direct dry weather urban runoff to the sanitary sewer system for treatment. Stormwater is captured in local catch basins, travels through local pipes, drains into larger channels such as the River and Ballona Creek, and eventually is discharged to the Pacific Ocean (City of Los Angeles Stormwater Program 2012).

The City’s stormwater system averages 100 million gallons of water flow on days without rain. When it rains, the amount of water flowing through the system can increase to 10 billion gallons (City of Los Angeles Stormwater Program 2012). Portions of the City’s stormwater system do not have the required capacity to handle a 10-year rain event, which is the maximum volume of rain expected to occur once in a 10-year period (Troyan 2003).

There are 283 stormwater outfalls throughout the study area that allow stormwater to enter the River. They range in size from 2 inches to 108 inches in diameter. The outfalls include multiple types of pipes, spillways, flap gates, and drainage ditches.

There are 70 stormwater outfalls along Reaches 1-3, ranging in size from a 12-inch-diameter pipe to a 15-foot by 15-foot box. Stormwater features along these reaches include pipes, spillways, and flap gates constructed of clay and reinforced concrete. Four stormwater outfalls are in Burbank and three are in Glendale. The Glendale and Burbank Departments of Public Works manage their respective stormwater infrastructure. There are 104 stormwater outfalls along Reaches 4-6, ranging in size from 6-inch-diameter pipe to a 12-foot by 11-foot box. Stormwater features along these reaches include pipes, spillways, flap gates, and ditches constructed of plastic, steel, and reinforced concrete. Reaches 7-8 have 109 stormwater outfalls along this section, ranging in size from 2-inch-diameter pipe to two 8-foot by 8-foot square boxes. Stormwater pipes along these reaches are constructed of iron, steel, and reinforced concrete.
3.12.5 Natural Gas

The Southern California Gas Company provides natural gas to 20.9 million people in a 20,000-square-mile service area that includes the study area through a series of transportation, distribution, and storage facilities. Its operations are regulated by the California Public Utilities Commission (Southern California Gas Company 2012).

Natural gas lines cross the River at Victory Boulevard, Fletcher Drive, North Figueroa Street, East Cesar E. Chavez Avenue, and just north of First Street via dedicated utility crossing. No natural gas lines run north-south along the banks of the River in the study area.

3.12.6 Telecommunications

Telecommunications infrastructure consists of both wired and wireless means of providing telephone, television, and internet service. Wired services include both overhead and underground lines. Wireless infrastructure includes towers containing antennas, and satellites that transmit wireless signals.

Time Warner Cable aerial lines are near the equestrian center in Reach 1, where they run along the left bank for 1,800 feet and then cross the River to the right bank. Time Warner Cable lines again cross the River just south of Fletcher Drive and at I-5. AT&T telephone lines cross the River at North Figueroa Street, North Broadway, North Spring Street, and Main Street.

3.12.7 Public Services

Public services relevant to the project area are police and fire protection, emergency medical services, and schools. Los Angeles, Glendale, and Burbank each have police departments, fire departments, and public school districts that provide those services to their respective cities. The city fire departments also provide emergency medical services (i.e., ambulance or paramedic services), swift water rescue, search and rescue, and hazardous materials response. Fire stations near the project area are shown in Figure 3-20 through Figure 3-22.

3.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The study area is in a densely populated area of Los Angeles County with centers of substantial commercial and industrial activities. The study area contains a wide range of land uses and economic activities. Census tract and community level socioeconomic and demographic data are presented in this section. At the community level, data for the Cities of Los Angeles, Glendale, and Burbank are presented. Figure 3-23 displays the 35 census tracts, covering approximately 25.1 square miles, which are used to compute census tract level statistics. These census tracts were chosen by creating a 0.5 mile buffer on either side of the River and then including all census tracts that lie wholly or partially within it.

The description of the without-study economic conditions contained in the various sections below is based on the 2008-2012 American Community Survey as well as other regional and local data as available (U.S. Census Bureau 2012).
Figure 3-23 Study Area Census Tracts
3.13.1 Population and Housing

Los Angeles County spans over 4,700 square miles and has approximately 10 million residents (U.S. Census Bureau 2010b). Within the 35 census tracts in the assessment area, total population is estimated at approximately 127,000 residents, equating to an average density of 5,077 residents per square mile, about three times denser than the County as a whole. The population, density, and racial profile of the assessment area compared to adjacent communities and the County are provided in Table 3-18.

Table 3-19 show the recent and projected population for the County and Cities in the study area. For both, the rate of annual growth has generally been declining, and the County and City population rate of growth is projected to be around 0.3 percent by 2040 (Los Angeles County Economic Development Corporation [LAEDC] 2012).

Because the extent to which redevelopment and increased density will affect population in the socioeconomic assessment area has not been quantified, it is assumed that conditions in the assessment area will generally follow the same trends as the County and the City, with overall growth slowing throughout the period of analysis.

Housing in the socioeconomic assessment area is summarized in Table 3-20, which includes household, housing, and ownership metrics. Among the 35 census tracts, total housing units range from 0 to 2,707, with a total of 46,246 units in the assessment area, and an overall vacancy rate of 6.45 percent. The vacancy rate in the assessment area is 0.4 percent less than the City of Los Angeles, and 0.2 percent less than the County. Additionally, the assessment area contains a larger proportion of rental units, with only 33 percent owner-occupied units, compared to 38 percent in the City of Los Angeles and 47 percent in the County.

<table>
<thead>
<tr>
<th>Area</th>
<th>2010 Population¹</th>
<th>Density (per square mile)</th>
<th>% White</th>
<th>% Black</th>
<th>% Hispanic</th>
<th>% Asian</th>
<th>% Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Burbank</td>
<td>103,340</td>
<td>5,890</td>
<td>58</td>
<td>3</td>
<td>25</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>City of Glendale</td>
<td>191,719</td>
<td>6,405</td>
<td>62</td>
<td>1</td>
<td>17</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>City of Los Angeles</td>
<td>3,792,621</td>
<td>8,092</td>
<td>29</td>
<td>10</td>
<td>49</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>9,818,605</td>
<td>2,397</td>
<td>27</td>
<td>9</td>
<td>48</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Assessment Area Tracts¹</td>
<td>127,269</td>
<td>5,077</td>
<td>32</td>
<td>4</td>
<td>48</td>
<td>16</td>
<td>0</td>
</tr>
</tbody>
</table>

¹The most recent complete data source was the 2008-2012 American Community Survey. Race information derived from tables “Hispanic or Latino and Race,” where Hispanic includes all those identifying as Hispanic or Latino, and races are one-race statistics (White-Alone, Black-Alone, etc.) ²Population is a sum. Race profile totals are weighted averages using population as the weights. Source: U.S. Census Bureau 2012.
Table 3-19 Population by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Compound Annual Growth Rate (1)</th>
<th>Population (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Los Angeles County</td>
</tr>
<tr>
<td>2000</td>
<td>-</td>
<td>9,540</td>
</tr>
<tr>
<td>2005</td>
<td>-</td>
<td>9,810</td>
</tr>
<tr>
<td>2010</td>
<td>-</td>
<td>9,819</td>
</tr>
<tr>
<td>2015¹</td>
<td>0.65%</td>
<td>10,140</td>
</tr>
<tr>
<td>2020¹</td>
<td>0.70%</td>
<td>10,500</td>
</tr>
<tr>
<td>2030¹</td>
<td>0.59%</td>
<td>11,140</td>
</tr>
<tr>
<td>2040¹</td>
<td>0.27%</td>
<td>11,450</td>
</tr>
</tbody>
</table>

(1) Growth rate from LAEDC 2012 and applied to area cities

Table 3-20 Housing in the Study Area (2010)

<table>
<thead>
<tr>
<th>Area</th>
<th># Households</th>
<th># Housing Units</th>
<th>% Vacant</th>
<th>% Owner-Occupied</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Burbank</td>
<td>41,940</td>
<td>44,309</td>
<td>7.8</td>
<td>44.0</td>
</tr>
<tr>
<td>City of Glendale</td>
<td>70,710</td>
<td>76,269</td>
<td>7.3</td>
<td>39.2</td>
</tr>
<tr>
<td>City of Los Angeles</td>
<td>1,317,663</td>
<td>1,413,995</td>
<td>6.8</td>
<td>38.0</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>3,218,511</td>
<td>3,444,342</td>
<td>6.6</td>
<td>47.3</td>
</tr>
<tr>
<td>Assessment Area Tracts</td>
<td>43,262</td>
<td>46,246</td>
<td>6.5</td>
<td>33.0</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2012.

3.13.2 Employment and Income

Los Angeles County has a highly diverse economy, with a gross annual product in 2010 of approximately $544 billion (LAEDC 2012), or approximately 29 percent of the gross annual product for all of California. Table 3-21 shows some of the basic economic indicators at the county and state level compared to the assessment area. Socioeconomic conditions in the assessment area are likely to reflect similar trends as the county and state. Trends over the last decade largely mimic the effects of the Great Recession that began in 2008 and has had national impact. California still has one of the highest unemployment rates in the nation, and this is reflected in parts of the assessment area, though on the whole, the most recently evaluated unemployment rate in the assessment area is about 2 percent lower than the unemployment rate for Los Angeles County (12.4 percent) and 2.6 percent lower than the City of Los Angeles. Within the census tracts making up the environmental justice communities, the unemployment rate ranges from 6.2 to 21.8 percent, with an average of 12.6 percent, nearly 50 percent higher than in the study area as a whole.

According to the Los Angeles County Economic Development Corporation (2012), Los Angeles County’s economic base (based on the concept of exports of goods and services), in order of importance, resides in the entertainment, trade (transportation, logistics, distribution), business services, knowledge creation, and fashion industry clusters. While Los Angeles County had an estimated non-farm employment of 3.77 million in 2010, the Great Recession resulted in the loss of over 350,000 jobs and contributed to the high unemployment rate. Like the state overall, the LAEDC forecasts a slow but steady recovery for Los Angeles County.
Table 3-22 provides the aggregated employment by industry for the 35 census tracts in the socioeconomic assessment area. These data illustrate that while the largest industries in the County are entertainment and trade, employment in the assessment area is driven by the education, health care, social services, and professional and scientific industries.

Table 3-21 Comparison of Southern California County Economic Indicators (2010)

<table>
<thead>
<tr>
<th>Area</th>
<th>Median Household Income</th>
<th>2010 Unemployment Rate</th>
<th>2010 Poverty Rate</th>
<th>2010 Median Home Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Burbank</td>
<td>$67,693</td>
<td>9.2</td>
<td>8.5</td>
<td>$570,500</td>
</tr>
<tr>
<td>City of Glendale</td>
<td>$54,369</td>
<td>12.7</td>
<td>12.9</td>
<td>$597,000</td>
</tr>
<tr>
<td>City of Los Angeles</td>
<td>$49,745</td>
<td>13.0</td>
<td>21.2</td>
<td>$470,000</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>$56,241</td>
<td>12.4</td>
<td>17.1</td>
<td>$443,400</td>
</tr>
<tr>
<td>All of California</td>
<td>$61,400</td>
<td>12.8</td>
<td>15.3</td>
<td>$383,900</td>
</tr>
<tr>
<td>Assessment Area Tracts</td>
<td>$53,072</td>
<td>10.4</td>
<td>18.4</td>
<td>$485,100 (1)</td>
</tr>
</tbody>
</table>

(1) Average of assessment area tracts


Table 3-22 Assessment Area Employment by Industry (2010)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational services, and health care and social assistance</td>
<td>18.4</td>
</tr>
<tr>
<td>Professional, scientific, and management and waste management services</td>
<td>13.3</td>
</tr>
<tr>
<td>Retail trade</td>
<td>10.8</td>
</tr>
<tr>
<td>Arts, entertainment, and recreation, and accommodation and food services</td>
<td>10.6</td>
</tr>
<tr>
<td>Information</td>
<td>9.3</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>8.6</td>
</tr>
<tr>
<td>Construction</td>
<td>6.2</td>
</tr>
<tr>
<td>Other services, except public administration</td>
<td>5.3</td>
</tr>
<tr>
<td>Finance and insurance, and real estate and rental and leasing</td>
<td>4.9</td>
</tr>
<tr>
<td>Transportation and warehousing, and utilities</td>
<td>4.7</td>
</tr>
<tr>
<td>Public administration</td>
<td>3.7</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>3.7</td>
</tr>
<tr>
<td>Agriculture, forestry, fishing and hunting, and mining</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010b.

3.13.3 Environmental Justice

This section provides a discussion of environmental justice in accordance with Executive Order (EO) 12898 and the protection of children from environmental health risks in accordance with EO 13045. The ethnic data from the 2008-2012 American Community Survey and the 2010 Census (U.S. Census Bureau 2010a, 2012) for the census tracts comprising the assessment area, as well as Los Angeles County, are described below.

As outlined in a 2009 City of Los Angeles report, Los Angeles River Access and Use: Balancing Equitable Actions with Responsible Stewardship, “Many local organizations have stressed the importance of making sure that the River’s revitalization addresses environmental justice issues (See, e.g., the City.
Project’s work at: www.cityprojectca.org. Of key concern in Los Angeles is the growing disparity of access to and use of open space resources, including parks, ball fields, and natural areas by those living in low-income communities of color.”

Within the census tracts that encompass the study area, the Hispanic or Latino population was the dominant group, with about 50 percent of the population. The Caucasian population was second, with about 30 percent of the population. Third was the Asian population, with 14 percent, followed by the Black population at 4 percent, and other races at 2 percent. Largely similar, the City of Los Angeles reported 49 percent Hispanic, 29 percent White, 11 percent Asian, 10 percent Black, and 1 percent other races. In the County, some differences become apparent, where the population is 60 percent White, 25 percent Hispanic, 10 percent Asian, 2 percent Black, and 1 percent other races.

In 2010, approximately 25 percent of the state’s population was made up of children (those under 18 years old). Approximately 24 percent of the population in Los Angeles County was under 18 years of age (U.S. Census Bureau 2011). Within the 28 census tracts of the assessment area, approximately 22 percent of the population was under 18 years of age (U.S. Census Bureau 2010a).

As shown in Table 3-23, below, about two-thirds of the population’s primary language spoken at home is a language other than English. About 41 percent of the population in the study area tracts speaks Spanish at home, 35 percent speak English, and the remaining 24 percent speak other languages. The substantial Spanish-speaking population is consistent with the demographic information summarized previously.

<table>
<thead>
<tr>
<th>Area</th>
<th>English Only</th>
<th>Other than English</th>
<th>Spanish</th>
<th>Other Indo-European languages</th>
<th>Asian and Pacific Islander languages</th>
<th>Other languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area Tracts</td>
<td>34.7</td>
<td>65.3</td>
<td>41.2</td>
<td>10.6</td>
<td>12.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>43.9</td>
<td>56.1</td>
<td>39.6</td>
<td>5.3</td>
<td>10.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Burbank</td>
<td>55.9</td>
<td>44.1</td>
<td>20.1</td>
<td>16.0</td>
<td>6.3</td>
<td>1.7</td>
</tr>
<tr>
<td>Glendale</td>
<td>32.7</td>
<td>67.3</td>
<td>15.2</td>
<td>37.8</td>
<td>12.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>40.3</td>
<td>59.7</td>
<td>43.6</td>
<td>6.7</td>
<td>8.1</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Source: U.S. Census 2010, 2010a, and 2012. Percentages for study area tracts are based on a weighted average using population as the weights.

As shown in Table 3-24, below, poverty in the study area is generally consistent with regional data. Poverty in the study area is slightly lower than the City of Los Angeles, but about 3 percent higher than in the whole County. The portions of Burbank and Glendale within the study area have higher poverty rates than those cities do overall.

<table>
<thead>
<tr>
<th>Area</th>
<th>All People</th>
<th>Under 18</th>
<th>18 to 64</th>
<th>Over 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area Tracts</td>
<td>18.5</td>
<td>28.0</td>
<td>16.2</td>
<td>15.6</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>15.4</td>
<td>22.1</td>
<td>13.5</td>
<td>10.7</td>
</tr>
<tr>
<td>Burbank</td>
<td>8.3</td>
<td>9.7</td>
<td>8.3</td>
<td>5.8</td>
</tr>
<tr>
<td>Glendale</td>
<td>12.3</td>
<td>16.4</td>
<td>10.8</td>
<td>13.1</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>19.1</td>
<td>27.9</td>
<td>16.7</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: U.S. Census 2010, 2010a, and 2012. Percentages for study area tracts are based on a weighted average using population as the weights.
Table 3-25 presents the percentage of people with disabilities in Los Angeles County, the City of Los Angeles, Burbank, and Glendale, as well as in the project area. The proportion of people with disabilities in the project area is 10 percent greater than in the County or City as a whole, 20 percent higher than Burbank, and slightly higher than Glendale. The proportion is also higher in all age groups than the corresponding rates in the County and the three cities.

<table>
<thead>
<tr>
<th>Area</th>
<th>All People</th>
<th>Under 18</th>
<th>18 to 64</th>
<th>Over 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area Tracts</td>
<td>10.4</td>
<td>3.2</td>
<td>7.3</td>
<td>41.8</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>9.3</td>
<td>2.8</td>
<td>7</td>
<td>38.1</td>
</tr>
<tr>
<td>Burbank</td>
<td>8.1</td>
<td>1.7</td>
<td>4.4</td>
<td>34.1</td>
</tr>
<tr>
<td>Glendale</td>
<td>10.1</td>
<td>0.9</td>
<td>6.4</td>
<td>44</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>9.4</td>
<td>3</td>
<td>6.9</td>
<td>40.1</td>
</tr>
</tbody>
</table>


The information above does not illustrate the differences in race, poverty, and disabilities among the communities along the river. Census tracts with poverty rates above the Los Angeles City and County averages are found in the southern portion of Reach 6 and in most of Reaches 7 and 8, and along both sides of the Los Angeles River. Census tracts with percentages of non-white population above the City and County average are generally concentrated in Reaches 4 through 8, and generally along the eastside of the river (both sides in portions of Reaches 7 and 8). Finally, a look at disabled populations show a focus again in Reaches 6 through 8 (both sides of the river), as well as in Zones 2, 3, and 4 (east side of the river). When all of these factors are taken into account, the Environmental Justice communities can generally be found in the southern reaches of the project (Reaches 7 and 8), as illustrated in Figure 3-24. Table 3-26 highlights the variables in the environmental justice communities compared to the study area, City of Los Angeles, and Los Angeles County.
Figure 3-24 Environmental Justice Communities
### Table 3-26 Environmental Justice Criteria, Select Census Tracts (Percentages in 2010)

<table>
<thead>
<tr>
<th>Location</th>
<th>% Poverty</th>
<th>% Disabled</th>
<th>% Non-White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles City</td>
<td>19.1</td>
<td>9.4</td>
<td>71</td>
</tr>
<tr>
<td>Los Angeles County</td>
<td>15.4</td>
<td>9.3</td>
<td>73</td>
</tr>
<tr>
<td>Study Area</td>
<td>18.5</td>
<td>10.4</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Justice Community Census Tracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1853.10</td>
</tr>
<tr>
<td>1853.20</td>
</tr>
<tr>
<td>1990</td>
</tr>
<tr>
<td>1997</td>
</tr>
<tr>
<td>2035</td>
</tr>
<tr>
<td>2060.10</td>
</tr>
<tr>
<td>2060.31</td>
</tr>
<tr>
<td>2060.32</td>
</tr>
<tr>
<td>9800.1</td>
</tr>
</tbody>
</table>

Source: U.S. Census 2012  
Note: Percentages in **bold** are above Los Angeles City and Los Angeles County averages.
4 FORMULATION OF ALTERNATIVE PLANS

4.1 PLAN FORMULATION PROCESS

This Integrated Feasibility Report (IFR) has followed the USACE’s Six-Step Plan Formulation Process to develop, evaluate, and compare the array of potential alternatives that could solve identified problems described in the previous section. As described elsewhere in the IFR, plan formulation was implemented using the following six steps:

1. Specify problems and opportunities relevant to the study area. Identify planning constraints and establish planning objectives (Chapters 2 and 4).

2. Inventory and forecast conditions. Identify and document existing and future without project conditions Chapter 3 (existing) and Chapter 4 (future without project).

3. Formulate alternative plans. Develop alternatives comprising differing sets of measures to address the identified problems and planning objectives for ecosystem restoration (Chapter 4). A public involvement program sought separate public input in this process (Chapter 8).

4. Evaluate alternative plans. Evaluate each of the ecosystem restoration alternatives derived from Step 3 for overall effectiveness, efficiency, completeness, and acceptability (Chapters 4 and 6). Impacts of the alternatives were evaluated using the USACE Code of Federal Accounts Framework. Topics included National Economic Development; Environmental Quality; Regional Economic Development; and Other Social Effects, as specified in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council 1983) and the Planning Guidance Notebook ER 1105-2-100 (USACE 2000).

5. Compare alternative plans. Compare each of the ecosystem restoration alternatives in terms of cost effectiveness (Chapters 4 and 6) and other considerations. Cost effectiveness and incremental cost analysis (CE/ICA) modeling was used to prioritize and rank ecosystem restoration alternatives.

6. Select recommended plan. Based on the information and results from the previous steps, select recommended plan for ecosystem restoration (Chapter 6 and 7). Prepare documentation to justify the plan selection.

4.2 PLANNING OBJECTIVES

The USACE is authorized to carry out civil works water resources projects for ecosystem restoration, flood risk management, recreation, and water supply as well as navigation, storm damage prevention, and hydroelectric power. Planning for Federal water resources projects constructed by the USACE is based on the Economic and Environmental Principles and Guidelines for Water and Land Related Resources Implementation Studies adopted by the Water Resources Council (U.S. Water Resources Council 1983). These principles and guidelines represent the “rules” that govern how Federal agencies evaluate proposed water resource development projects. They state that the primary Federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the nation’s environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Ecosystem restoration is one of the primary missions of the Corps of Engineers Civil Works program. The Corps objective in ecosystem restoration planning is to contribute to national ecosystem restoration (NER). Contributions to national ecosystem restoration (NER outputs) are increases in the net quantity and/or quality of desired ecosystem resources.
Assessing potential contributions to NER is based upon a system developed by the USACE for measuring changes in ecological resource quality as a function of improvement in habitat quality or quantity which are expressed quantitatively in physical units or indexes (non-monetary units). Contributions to NED, on the other hand, typically apply to projects such as flood risk management that result in increases in the net value of the national output of goods and services, expressed in monetary units.

This IFR is charged with determining the Federal interest in ecosystem restoration opportunities within the ARBOR reach and how these opportunities can help meet the USACE mission and the Federal objective. This will be accomplished by developing a recommended NER plan composed of environmental restoration measures that reasonably maximize ecosystem benefits compared to costs. Recreation may provide benefits to meet the NED Federal objective, and incidental flood risk management benefits may accrue. Sufficient passive recreation will be needed to manage the human impacts to the restoration project within this highly urban area. Regional Economic Development Benefits (RED) and Other Social Effects (OSE) will also be considered in plan selection.

4.2.1 Specific Planning Objectives

The national objectives are general statements and not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are specific planning objectives that provide focus for the formulation of alternatives. These planning objectives address the problems and opportunities and represent desired positive changes.

Based on the problems and opportunities identified for Los Angeles River study area, the USACE, sponsor, and key agencies and stakeholders developed specific planning objectives to guide the formulation and evaluation of alternatives and the development of the recommended plan. Objectives development began during the without project conditions phase of study and were consistent with ongoing state and local efforts within the watershed, including the Los Angeles River Revitalization Master Plan published by the City of Los Angeles in 2007.

The objectives were refined throughout the formulation process, resulting in the following study objectives for the 11-mile reach of the River extending from Pollywog Park (north of Griffith Park) to First Street in Downtown Los Angeles, which includes approximately 6.4 miles of soft bottom channel and 4.5 miles of concrete channel (ARBOR reach).

1. **Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat:**

   - Restore valley foothill riparian wildlife habitat types, aquatic freshwater marsh communities, and native fish habitat within the ARBOR reach throughout the period of analysis\(^3\), including restoration of supporting ecological processes and biological diversity, and a more natural hydrologic and hydraulic regime that reconnects the River to historic floodplains and tributaries, reduces velocities, increases infiltration, and improves natural sediment processes.

   Sub-objectives for Objective 1 are:

   a) Restore and support ecological processes (i.e., biogeochemical processes, nutrient cycling).

---

\(^3\) The period of analysis is the period of time over which any alternative plan would have significant beneficial or adverse effects. The period of analysis is 50-years. (ER 1105-2-100)
b) Increase biological diversity.

c) Restore a more natural hydrologic and hydraulic regime with reconnections to floodplains and tributaries, areas of reduced velocities, increased infiltration, and improved natural sediment processes.

Meeting requirements for the sub-objectives for restoring valley foothill riparian strand and freshwater marsh will restore ecological processes, increase biological diversity and reduce the scarcity of this ecosystem in the region.

2. **Increase Habitat Connectivity:** Increase habitat connectivity between the River and the historic floodplain, and increase nodal habitat connectivity for wildlife between restored habitat patches and nearby significant ecological zones such as the Santa Monica Mountains, Verdugo Hills, Elysian Hills, and San Gabriel Mountains within the ARBOR reach throughout the period of analysis.

Sub-objectives for Objective 2 are:

a) Increase habitat connectivity to floodplains to reduce fragmentation of the river ecosystem.

b) Increase nodal habitat connectivity locally within the river ecosystem and regionally to nearby significant ecological zones such as the Santa Monica Mountains, Verdugo Hills, Elysian Hills, and San Gabriel Mountains within the ARBOR reach throughout the period of analysis to address patterns of habitat fragmentation, restore habitat corridors and remove barriers to wildlife movement.

Meeting sub-objectives for increased habitat connectivity will increase sustainability of the restored system areas and initiate regional opportunities for connectivity to nearby ecological zones. Areas have a greater interaction when they are larger and closer together (Lineham et al. 1995). The study used the connectivity definition in ER 1105-2-100, paragraph E.37.c.4, as follows:

“(4) Connectivity. This is a measure of the potential for movement and dispersal of species throughout a given area or ecosystem, and should be considered in the context of an entire landscape or watershed. The variation and quality of links between habitats in a landscape or watershed determine the level of connectivity. Landscape spatial patterns that affect the level of connectivity include the existence and suitability of habitat corridors, the degree and pattern of habitat fragmentation, and the presence of natural and man-made barriers. Often, rivers, waterways, and riparian forests serve as highly functional habitat corridors, and aquatic ecosystems inherently serve a connective function to other waterways and terrestrial landscapes. Corps planners may recognize as technically significant those restoration alternatives that serve to improve connectivity by creating or re-establishing habitat corridors; eliminating or addressing the pattern of fragmentation; or removing barriers, such as dams and other water blockages, that disrupt otherwise contiguous habitats.”

3. **Increase passive recreation that is compatible with the restored environment in the ARBOR reach throughout the period of analysis.** Recreation features at an ecosystem restoration project are permissible if they are compatible with the restoration and economically justified. Recreation elements are cost shared 50 percent Federal/50 percent non-Federal (ER 1105-2-100).

a. Provide connections to existing recreation infrastructure.

b. Increase environmental education opportunities.

c. Increase trail system to coincide with restored area.
Alternatives will be evaluated and compared to determine how well they meet the above ecosystem restoration objectives 1 and 2, and to what degree they result in restoration of a functioning, self-sustaining ecosystem within the study area. Then a recreation plan will be developed to complement and support the features of the tentatively selected alternatives. Recreation alternatives will be analyzed using a cost/benefit analysis.

4.2.2 Objectives Performance Criteria

While the extremely urbanized nature of the Los Angeles River watershed will prevent complete restoration of a natural, meandering river and floodplain, there are several opportunities to restore ecosystem functions on a limited scale. Alternatives considered for this study were considered minimally successful when they met the performance criteria below.

Since the minimum critical size of an ecosystem has not been determined for any region (Noses 1986), the following criteria were developed to evaluate and compare alternative plans. Quantitative criteria are based on review of scientific literature and the use of classes of animals (birds, reptiles, amphibians) as a proxy for the habitat requirements of other species.

Minimal performance criteria for meeting these objectives and success of a proposed project alternative are provided below:

1. Restore Valley Foothill Riparian and Freshwater Marsh Habitat

Each alternative carried forward must achieve each of the following criteria within restored aquatic areas:

a) Restore a minimum of two aquatic habitat nodes with a natural hydrologic connection to the river and riparian communities with a minimum distance of 150 meters from the water’s edge to create areas capable of functioning as core habitat and refuge for native reptiles and amphibians (Semlitsch and Bodie 2003) and to minimize the risk of localized extinction due to natural disasters (i.e., flood, fire, drought) (Schippers et al. 1996; Dunning et al. 1995).

b) Removal and management of invasives to less than 10 percent within 5-7 years post-construction of each feature.

c) Restore seasonal overbank flooding to river adjacent areas within 5-10 years post-construction.

For Valley Foothill Riparian Habitat:

a) Restore structurally diverse riparian habitat consisting of herbaceous (e.g., herbaceous vine cover), shrub (e.g., shrubby willow thicket), and tree (e.g., mature cottonwood-willow trees) layers in a minimum of five reaches resulting in three contiguous reaches. Restore riparian habitats with a varying number of structural layers (one, two, and three layers) to support survival and reproductive requirements for riparian obligate and transient wildlife species, including food, water, shelter, breeding, migration, and dispersal (Krueper 1995).

b) Within 5-10 years of construction, restore and maintain dense, structurally diverse riparian habitat sufficient to maintain survival and reproductive needs of wildlife. Restore a minimum of one habitat node with a minimum width of 250 meters (820 feet) to support high frequencies of the Federally endangered least Bell’s vireo (Kus 2002).

For Freshwater Marsh and Fish Habitat:

a) Restore functioning freshwater marsh habitat consisting of emergent herbaceous vegetation (i.e., cattails, rushes, sedges) adapted to saturated soil conditions.

b) Restore aquatic habitat to support survival and reproductive requirements for fish and wildlife species, including food, water, shelter, breeding, migration, and dispersal.
c) Restoration of natural channel geomorphic character in at least one concrete reach support refugia for native fish including the Federally threatened Santa Ana sucker.

For a More Natural Hydrologic and Hydraulic Regime:

a) Expand the River into at least one large, contiguous river adjacent area within the study area that promotes natural hydrologic connections to the floodplain and overbank areas.

b) Accommodate additional meandering of the River in at least one reach.

c) Connect river hydrologically (with assistance through culverts or naturally) to overbank with at least one such connection per reach.

d) Within the main stem of the river, reduce velocity to less than 12 feet per second (ft/s) and ideally 8 ft/s.

e) Restore seasonal overbank flooding to river adjacent areas to support riparian floodplain habitat.

2. Increase Habitat Connectivity

Each alternative carried forward must achieve each of the following criteria:

a) Restore riparian and wetland aquatic wildlife habitat at tributary confluences to create habitat connectivity to similar upstream habitats on the tributaries with ultimate nodal connection to the aquatic habitats in the San Gabriel and Verdugo Mountains (at least one major tributary connection should be restored.)

b) Restore wildlife habitat on channel banks to support movement along the river channel.

c) Improve aquatic habitat connectivity within the ARBOR area through restoration of habitat nodes with wetland and riparian habitat that are naturally hydrologically connected to the river corridor upstream and downstream of the Glendale Narrows.

d) Restore habitat corridors between large nodes in the ARBOR area to maximize connectivity for wildlife movement and dispersal on the local scale and minimize the risk of habitat sinks in an urban environment (Hilty et al. 2006; Hanski & Thomas 1994; Rudd 2002; Noss 1983), and to provide opportunities for regional wildlife movement.

e) Lengthen the extent of contiguous vegetated pathways for reptile and small/medium mammal movement (currently limited to Reaches 4 to 6), to achieve upstream and/or downstream connections to at least one additional tributary or habitat area that is currently isolated from the soft-bottom reach.

f) Reconnect the natural hydrologic process between the river and at least one main tributary to support regional habitat connectivity to nearby significant ecological areas.

Ideally, the alternatives will also achieve the following:

a) Expand riparian and wetland habitat into large, contiguous river adjacent lands within the study area to support higher abundance of wildlife and support more significant nodal connections to nearby ecological zones. Provide habitat connectivity (via contiguous or near-contiguous vegetated movement pathways) between all of the reaches within the study area.

b) Include Reach 7 to provide nodal connections to San Gabriel Mountains via Arroyo Seco Confluence and/or other smaller tributaries and to provide potential for future direct connections to the mountains via other projects upstream on Arroyo Seco.

4.3 PLANNING CONSTRAINTS AND CONSIDERATIONS

4.3.1 Planning Constraints

Planning constraints represent significant barriers or restrictions that limit the physical or policy-related aspects of formulated plans. An example of a constraint related to flood risk is that alternative which add vegetation to the channel must also: (1) increase conveyance capacity, or (2) reduce the peak flows
through detention or storage, otherwise, high velocities will rip out planted vegetation. Currently, flows vary in the reach between 15 to 19 ft/s, with some flows in the downtown areas potentially reaching 30 ft/s. The target velocity to sustain planted vegetation is closer to 8 to 12 ft/s or soft-bottomed channels areas. Several constraints apply specifically to this study. These are:

- HTRW sites will be avoided whenever practicable.
- Potentially contaminated groundwater plumes must be considered and avoided whenever practicable.
- Surrounding urbanization and infrastructure such as roads, highways, rail lines and power facilities must be avoided whenever practicable.
- The sponsor must be able to provide lands for the potential project area.
- The sponsor must provide lands for the project that have been cleared for HTRW (etc.).
- Existing levels of flood protection must be maintained.
- Restoration must avoid conflicts with the existing engineering policies for flood risk management projects, e.g., vegetation must not increase existing water surface elevations or floodplain extent.

In addition, there are several considerations specific to the study area. These are as follows:

- Limited water sources within the project reach will influence the sustainability of ecosystems, and alternatives will be formulated with understanding of the regional climate and understanding of water resources. Appropriate vegetation will be proposed to ensure future sustainability.
- Existing flood risk management project includes hardened bed and banks with levees that are important to maintain flood protection. If a measure shows induced flooding, mitigation may be required.
- In areas of existing habitat, construction must avoid nesting season, flood season, and minimize impacts to native vegetation where possible. Clearing of vegetation prior to construction would be performed outside of the bird breeding season, to the maximum extent practicable, to avoid impacts to nesting birds. Once vegetation is cleared outside of the breeding season, construction may occur year-round with the implementation of mitigation measures such as buffers around adjacent habitat or sound-buffering fencing, as necessary.
- Restoration must avoid cultural or historic sites when possible. If unavoidable, mitigation requirements pursuant to the Programmatic Agreement must be complied with.
- Recreation must not degrade restored areas. Recreation measure locations must be limited to land identified for the project.

During the formulation of measures for inclusion in the alternatives, constraints and considerations are one basis for assessing and screening out measures.

For the current plan formulation effort, the highly urbanized nature of the floodplain limits opportunities for land acquisition, due to competing land uses. USACE policies limit land acquisition costs as a percentage of the total project cost, further limiting the scope of the project area. The study team identified potential restoration locations opportunistically, based in large part on the availability of lands and the ability to acquire significant large parcels of floodplain lands.

Another important consideration in plan formulation is the funding authority of the USACE. The categories of project features that can be Federally cost-shared include ecosystem restoration and passive recreation such as trails; however, active recreation feature costs are a non-Federal sponsor responsibility. Further, the USACE cannot pay for upland restoration unless it is necessary for project success. Operation and maintenance is a non-Federal sponsor cost following project completion, except that there is an adaptive management and monitoring program of up to 10 years that is cost-shared with the Federal government. HTRW response and remediation are 100 percent non-Federal sponsor responsibility and

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100 percent non-project cost. The sponsor will remediate, or ensure the remediation of, any HTRW contamination to the standards required to support the restoration project. No construction on sites with soil contamination will occur prior to the completion of remediation activities at those sites. At this time, it is anticipated that the City will need to remediate contamination at two Taylor Yard sites and the LATC site prior to Federal construction at those sites. For groundwater contamination that cannot be addressed prior to construction, the City would be responsible for addressing such contamination during construction dewatering activities, including proper handling, treatment, and disposal, at 100 percent non-project cost. Water supply to the project (irrigation) is an associated non-Federal cost.

4.4 ALTERNATIVE DEVELOPMENT AND EVALUATION PROCESS

The alternatives formulated during this study followed requirements for a USACE Feasibility Report and the NEPA process. The alternatives described in the report are not plans for actual construction, nor are they of sufficient design detail to be constructed. Detailed design analysis and preparation of plans and specifications would begin following the completion of the Integrated Feasibility Report (which incorporates the EIS). Alternatives were formulated to a level of detail sufficient to determine economic feasibility and potential cost-sharing, technical feasibility, environmental feasibility, and resource issues associated with implementation and other criteria necessary to make an informed decision by the parties involved in its implementation. The selected ecosystem restoration plan must:

- Comply with NEPA and other environmental laws and regulations.
- Meet study objectives performance targets.
- Maintain (or improve) existing conveyance of flood flows and ensure that project implementation would not increase flood flows or worsen flooding conditions in existing developed areas.
- Produce NER benefits.
- Provide decision-makers, both Federal and local, with information that may be utilized to help determine plan selection and a balance between various competing interests.
- Blend existing and proposed improvements where possible. These improvements would take advantage of local projects, and provide consistency with the future master planning efforts of the local community.

a. Measures were developed based on the expert opinions of Federal, State, and local agencies, the Corps PDT, and the Sponsor PDT.

b. The measures were combined along the potential project area based on the problems, opportunities and objectives, the expert opinions of Federal, State, and local agencies, the Corps PDT and Sponsor PDT, and the practicability of implementation of each measure at each site given the constraints and land uses along the river.

c. This produced a preliminary array of 19 alternatives. Typical designs, costs, and habitat benefits were developed for the elements of these alternatives.

d. The habitat benefits and costs for the 19 alternatives were divided by reach for the cost effectiveness and incremental cost analysis (CE/ICA analysis). The IWR Planning Suite software was utilized to conduct the CE/ICA, which determined the best plans for each of the reaches in the 19 alternatives. The CE/ICA analysis formulated 21 Best Buy plans and over 171 cost effective plans for selection of the final array.

e. The final array was selected from the best buy plans based on the CE/ICA analysis and the study objectives.
4.4.1 Local Involvement in Plan Development

Public input and local expertise with similar restoration projects was incorporated throughout the plan formulation process. The primary areas of local concern identified during the study include: (1) technical considerations based upon the specifics of the study area; (2) maintaining or improving the existing level of flood risk management; and (3) coordinating recommended plans with ongoing development and local efforts in ecosystem restoration within the study area.

The plan formulation process has included extensive involvement by the non-Federal sponsor, agencies, and key stakeholders. Plan formulation workshops were conducted during the feasibility study to identify problems and opportunities, develop and refine measures and alternatives, address specific problems, and select the recommended plan.

To focus these efforts on ecosystem restoration, the USACE held a 3-day plan formulation charrette on December 2, 3, and 4, 2009. The charrette engaged stakeholders in a collaborative brainstorming process to expedite the development of plans, alternatives, and/or management measures to address study objectives. The purpose of the workshop was to receive input for the formulation of plans. The purpose of the plans was restoration of ecosystem function to the highest level possible within the Los Angeles River, with an emphasis on ecosystem restoration for development of the NER plan.

The charrette included a 6-hour field outing to critical locations within the study area with discussion of specific problems and opportunities at each site. It engaged the participants in organized brainstorming that developed long lists of problems and measures as well as personal vision statements. It also grouped teams of experts in the disciplines of economics, biology, engineering, hydraulics, landscape architecture, geotechnical/soils engineering, planning, and recreation. These teams were able to apply their expertise—along with the information gathered from the public and other stakeholders during the City’s Los Angeles River Revitalization Master Plan outreach efforts—to the focused charrette process.

Participants in the charrette workshop included representatives from the USACE, the City of Los Angeles as the non-Federal Sponsor, the U.S. Fish and Wildlife Service, the Los Angeles County Department of Public Works, the California Coastal Conservancy and the Mountains Recreation and Conservation Authority, the Audubon Society, California State Parks, the City of Glendale, non-governmental agencies such as the Friends of the Los Angeles River, The River Project, the Los Angeles and San Gabriel Rivers Watershed Council (now the Council for Watershed Health), and other stakeholders and experts having interest and knowledge about the Los Angeles River. Sixty-eight participants attended the workshop for either one or more of the three days.

During the charrette, group brainstorming activities included problem identification and validation of problems, opportunities, and objectives. Participants were divided into teams that developed measures and alternatives. Those brainstorming ideas from the diverse group of participants were a starting point for additional formulation.

4.4.2 Measure Development

Measures are the building blocks of alternatives. The identified environmental restoration measures consist of one or more actions or features in a particular location that are intended to solve specific problems or help meet the identified planning objectives. Measures were initially developed at the charrette described above. During this workshop, the participants considered refinement of the study objectives, and a wide variety of measures that could be combined into alternatives meeting the planning objectives. The process included assessment of each measure to determine whether to carry it forward into the alternatives. The public was given the opportunity to provide additional input to alternative
formulation at public meetings held by the City of Los Angeles. As the study progressed, the USACE’s study team, the Sponsor, and the habitat team have screened out those measures that did not meet objectives, were excessive in cost, were technically infeasible, conflicted with constraints, or did not meet performance criteria.

4.4.3 **Measure Screening**

Decision criteria for evaluation, comparison, and selection of measures were based on application of evaluation criteria established under Principles and Guidelines (U.S. Water Resources Council 1983) and the USACE Institute for Water Resources (IWR) Planning Manual (USACE 1996). These are effectiveness, completeness, efficiency, and acceptability, as defined below. Additional criteria considered were technical, environmental, and public acceptance feasibility. These criteria were applied in the first screening of measures and were considered iteratively as more was known about each site and measure. This section compares the retained and screened measures, and the criteria used to evaluate them.

**Effectiveness**

Effectiveness is the extent to which an alternative plan alleviates specified problems or achieves opportunities. It is defined as follows: “Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.” (P&G Section VI.1.6.2(c)(2)) Measures that did not address any objectives were screened out. Measures that did not accomplish their intended purpose were screened out.

**Completeness**

Completeness is defined as follows: “Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective.” (P&G Section VI.1.6.2(c)(1)) Measure completeness in this early stage of the study considered whether a measure could be implemented to realize planned effects. Consideration was given to its technical feasibility and whether constraints were too burdensome to implement the measure at a particular location (e.g., given current land use and known intensive infrastructure obstacles/constraints). For the purposes of the initial evaluation of alternatives, completeness was related to the level at which the measures included in the alternative met objectives and the possibility of implementation of the measure. Evaluation of the implementability of the measure considered whether it was possible on sites within the historic floodplain, whether property is in public ownership or expected to become available, level of impacts to infrastructure, and technical feasibility of the requirements to implement the measure successfully. Dropped features were those that were technically infeasible or conflicted with Federal or local law and policy. Features that were not sustainable without extreme measures were screened out, such as a 9-mile tunnel under the City of Los Angeles, and removal of all of the concrete in the channel while maintaining the same channel depth and width. In addition, features that were not feasible because of intense infrastructure or current or expected future land use conflicts were also screened out.

**Efficiency**

Efficiency is “the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation’s environment.” (P&G Section VI.1.6.2(c)(3)) Cost effectiveness analysis answers the question: “Does the measure accomplish the objective with the least cost?” Efficiency evaluation of the initial array included consideration of technical feasibility and constraints. The resulting array was further evaluated for efficiency through Cost Effectiveness and Incremental Cost Analysis (CE/ICA).
Acceptability

“Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies.” (P&G Section VI.1.6.2(c)(4) If there was a known conflict with Federal, state, or local laws or policies, the measure was screened out. Public acceptability was considered qualitatively.

4.4.4 Screened Measures Descriptions

Some measures were intended for implementation along the entire reach of the project area, and some sites along the project reach were screened from further consideration during the course of plan formulation. Eliminated measures are described below along with the reasons for their elimination.

1. Create Underground Basins for Attenuation -- ineffective, inefficient, and incomplete. Install underground basins to store floodwaters, and provide temporary water supply for restoration. Potential locations where basins could be constructed are identified throughout the study area. These are storm-type water storage modules, which are developed for subsurface stormwater detention or infiltration systems. Installation would require excavation of the site, which would then be covered with geotextile and filled with crushed stone; existing land uses would be returned to the site. The system design is to be utilized under parking lots, athletic fields, parks, etc. The estimated depth of the tank would be 11.3 feet.

a) Six areas were identified as potential sites and would have provided a total storage of 3,128 acre-feet. These are the Equestrian Center, Bette Davis Park, Ferraro Fields, Griffith Park Golf Course, Taylor Yard, and LATC.

b) Assuming basins are constructible and a structure could be designed to perfectly take the flow off the top of the design flow hydrograph (based on the frequency hydrographs from the 1992 LACDA study), flows would be “diverted” and adjusted downward downstream based on the size of the potential basin. In the preliminary analysis, there was some peak flow reduction showing some flood risk management benefit, but the amount of diversion was not enough to reduce the need for diversion of flow into tunnels sufficiently to reduce their size significantly nor did it allow for an adequate increase in vegetation within the channel (ineffective). This reduction assumes that the upstream basins are also in operation (incomplete). Because this analysis showed that the basins would be largely ineffective for attenuation and would provide little to no additional habitat value for the associated costs of their implementation (inefficient), this measure was dropped.

c) Use of the basins for water conservation would present difficulty in offloading because of the slope of the river. In addition, groundwater recharge would be difficult due to the existing high groundwater levels in the area and the distance to other spreading basins far upstream and/or downstream.

2. Tunnels/Culverts -- ineffective. Construction of tunnels or large culverts to divert storm season flows around the project reach. This would require excavation and construction of culverts that would need to be sized and designed based on results of hydraulic modeling. The culvert measure would include a culvert from Headworks to the LATC diagonally across the City to move storm flows around the project area. Culverts would divert storm flows into underground basins.

A tunnel diversion at Headworks would need to contain approximately 40,000 cfs of flow. Moving downstream, the diversion amount required increases. At Cornfields, a diversion to accommodate approximately 104,000 cfs would be required with an associated 42-foot-diameter tunnel. This means the tunnel would need to follow the River’s alignment so additional flow could be added. As
additional flow volume is diverted, tunnel sizing would need to be increased downstream – taking on additional volume at Verdugo and Arroyo Seco, etc. where additional flows are being added to the system.

The CE/ICA analysis showed that this measure would be excessive in terms of construction costs and lands, easements, rights-of-way, and disposal sites (LERRDS) because the preliminary alternative plans that included the measure provided only an 8 percent (643 habitat unit) increase in habitat benefit for at least a 113 percent ($1.8 billion) increase in total cost (inefficient). Given this, the measure was deemed ineffective and inappropriate at this time. Moreover, construction and operational impacts of the tunnel infrastructure were determined to be unacceptable to the Sponsor and the public because of anticipated cumulative adverse impacts with respect to priorities to preserve existing open spaces and to avoid creating another engineered channel for the river.

a) **Freeway Water Bypass.** This measure would have widened the river under the freeways. Similar to the tunnel measure, it would have been used to pass storm flows through the restored reach. It was eliminated for the same reasons the tunnel measure was eliminated and due to the expense and difficulty of installing a tunnel under the freeway (inefficient).

b) **Culvert under the Los Angeles River for Diversion of Storm Flows.** While it would be potentially cheaper than a diversion tunnel across the City of LA, the inlet and outlet for storm flows to the underground or under-river diversion structure would be cost prohibitive so the measure was eliminated (inefficient).

**3. Wildlife Bridges -- ineffective and incomplete.** These measures were deleted based on the assumption that bridges may facilitate the movement of wildlife into urban areas where wildlife would not benefit (i.e., bobcats/coyotes in urban LA would likely be killed in urban neighborhoods and could be a danger to pets and children). The preliminary analysis determined that bridges would not lead to any substantial/beneficial habitat to support any introduced wildlife.

**4. Widen Channel/cantilever Channel Bank -- ineffective and incomplete.** This includes widening of the channel by converting trapezoidal slopes to vertical walls, and installing a cantilevered section extending out over the channel from the top of the vertical wall. It was proposed in portions of Reaches 7 and 8. The measure would include excavation and rebuilding of the channel and adjacent infrastructure. The associated overhang would likely be walkways or promenades tied to hiking trails and adjacent streets. The cost of modifying and reconstructing the channel was determined to be too expensive when evaluated with respect to the habitat benefit that would result from this measure.

**5. Wildlife Tunnels -- ineffective.** Existing equestrian tunnels are located within the study area and are known to be used by wildlife. Additional tunnels in other locations were deleted based on the expert advice of the biologists on the team and wildlife agencies participating in the habitat evaluation. They advised that wildlife would likely not use the tunnels in other proposed locations due to the projected length and size of the tunnel being too small to accommodate wildlife comfortably.

**6. Pervious Parking on Streets and in Lots Outside the ARBOR in the Watershed – ineffective and unacceptable.** This measure was eliminated because it did not address the objectives and is outside the USACE’s authority for aquatic ecosystem restoration. However, it is a “best management practice” that would facilitate long-term watershed health and expanded ecosystem restoration and could be implemented by other projects.

**7. Tujunga Channel System Modification -- ineffective.** The Tujunga is a tributary located upstream and outside of the study reach. Much is already being done to restore this stream’s ecosystem including a project built by the USACE. This measure suggested modifications on the Tujunga
Channel System to divert storm flows and slowly return water to the river system. It was eliminated because it is over 6 miles upstream, which is too far upstream to be effective.

8. **Relocate/Bury Railroads or Other Utilities – not a measure.** This measure was eliminated as a stand-alone measure because it is a design consideration rather than a restoration measure but would be employed as part of LERRD if the subject facilities could not be avoided.

9. **Deepen Entire Channel to Gain Capacity – ineffective.** This measure would remove concrete within the entire project area and deepen the channel to carry the design flows. It requires modifications to over 20 bridges, 3 confluences, and numerous storm drains. There are unknown quantities of utilities that run directly beneath or cross the existing channel. The depth of the channel would have to more than double to convey the same design flow with concrete removed and vegetation included. The trapezoidal sections could not be deepened enough and would require conversion to vertical wall configuration. It would require a gradual deepening as it approached the restored areas and a gradual return to the invert grade at the downstream end of the project area. For these reasons, this measure was determined to be ineffective.

10. **Modify Upstream Dams – ineffective, unacceptable, and incomplete.** Three types of modifications were considered.

   a) **Deepening or raising dams to modify capacity.** Sepulveda Dam and Hansen Dam are the only two possible dams to consider for modifications. USACE believes that these dams are too far upstream of the study reach to have a significant impact on flow reduction. The amount of storage required greatly exceeds the amount that can reasonably be acquired. There is a significant cost issues regarding raising dams, which include modifications to unrated outlets, spillway gates, and other pertinent structural features. Modifications to increase storage raise a number of other significant issues that include impacts on past, current, and future restoration projects within the reservoir as well as recreation uses within the reservoir (incomplete). This measure would also require mitigation for other approved uses within the reservoir (ineffective and unacceptable).

   b) **Modification to dam operations.** Re-operation to reduce downstream discharges is not a viable option. Sepulveda Dam currently does not provide the authorized level of protection. There is insufficient storage in both reservoirs to accommodate the volume of water necessary to reduce downstream releases sufficiently (unacceptable and ineffective). **Re-operation** to provide water through the dryer months of the year is not necessary. There is enough water flowing into the project reach in the Los Angeles River to sustain any proposed ecosystem restoration configurations (ineffective).

11. **Modify Pool Riffle Complex in Existing Soft-Bottom Channel Restoration - ineffective.** This measure would have reshaped existing soft bottom channel for pool riffle complexes. The soft-bottom beds in the ARBOR study reach are in good geomorphic health and behave like a natural river. The natural geomorphic character of the river bed within soft bottom reaches does not need restoration. Removal of this measure does not mean that bank restoration, invasive species removal, and trash removal are eliminated.

4.4.5 **Retained Ecosystem Restoration Management Measures**

As noted above management measures for alternative formulation consisted of ecosystem restoration measures to address Objectives 1 and 2, and recreation measures will address Objective 3. Ecosystem restoration measures were formulated based on input from the USACE technical team, the City, the general public outreach, and local expertise from Federal, state, and local agencies, other cities within the
study area, academic experts, non-governmental organizations, and consultants. Ecosystem restoration management measures retained for inclusion in alternatives are described below.

The environmental restoration measures identified consist of one or more actions or features in a particular location that are intended to solve specific problems or help reach particular planning objectives. Measures are broken out into six major categories as described below:

1. **Adjacent or off channel modifications.** These include restoration measures both immediately adjacent to and **separated** from the main river channel. Features include establishment of riparian, wetland, or open water areas.

   a) **Major tributary channels/widen channel (Objectives 1, 2).** Widening tributary channels removes a significant amount of concrete and overlaps with concrete removal measures on the mainstem (see Section V). It consists of removal of existing structures, including on properties adjacent to the channel, and excavation/grading to expand the tributary channel and tie into adjacent lands. Bank modifications include terraces and gradual slopes to allow creation of habitat.

   b) **Restore riparian and marsh by daylighting streams (Objectives 1, 2).** River systems naturally have a large number of small channel tributaries as well as large tributaries contributing flow. In urban areas, many of the river’s smaller tributaries are now in underground pipes or storm drains. Daylighting in this instance is defined as opening these underground pipes and storm drains near their confluence with the River to restore them to a natural stream channel. This would include opening and daylighting storm drains and developing riparian and marsh habitat within the new channel. Existing storm drains are gated and would likely need to remain gated after modification, except where wildlife passage is designed (see Section 3). Design of the outlet and adjacent wetlands are site specific and depend on sizing, discharge, and available right-of-way. For the purpose of cost and habitat analysis, it was assumed that at least 1 acre of aquatic wetland would be created at the mouth of each of these daylighted storm drains.

   c) **Create a more natural geomorphic character and plant for freshwater marsh in adjacent side channel (Objectives 1, 2).** Side channels would be created in River-adjacent areas to allow flows to meander off of the river channel mimicking a more natural braided river system. Shallow water (less than 6 feet deep) will be required for freshwater marsh. Freshwater marsh will be interspersed with open water and riparian vegetation. Modifications include removal of concrete, excavation to create uneven riverbed bottom with pools and shallow zones, stabilization of the off-channel area with boulders or weirs, and planting of wetland and riparian vegetation. The existing River soft bottom reaches that include wetlands and pools/riffles, such as those found within Reach 4, will be a prototype for what can be created in remaining reaches. Water quality is sufficient to support vegetation. The wetland plant palette will include plants from Table 4-1 below.

### Table 4-1 Wetland Plant Palette for Freshwater Marsh

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carex praegracilis</td>
<td>clustered field sedge</td>
</tr>
<tr>
<td>Cyperus odoratus</td>
<td>fragrant flatsedge</td>
</tr>
<tr>
<td>Eleocharis parishii</td>
<td>Parish’s spikerush</td>
</tr>
<tr>
<td>Juncus effusus</td>
<td>common rush</td>
</tr>
<tr>
<td>Mimulus cardinalis</td>
<td>scarlet monkeyflower</td>
</tr>
<tr>
<td>Schoenoplectus californicus</td>
<td>California bulrush</td>
</tr>
<tr>
<td>Typha angustifolia</td>
<td>narrow leaved cattail</td>
</tr>
<tr>
<td>Typha latifolia</td>
<td>common cattail</td>
</tr>
</tbody>
</table>
d) **Grade areas adjacent to the channel to lower elevation for habitat, floodplain reconnection, and offline detention (Objectives 1, 2).** This measure includes lowering of sites adjacent to the channel to allow for retention of water and habitat creation. It would include excavation to create basins or terraces that tie into the channel and adjacent topography. These would be terraced or have slopes at a 3 to 1 transition ratio or more gradual and be interspersed with freshwater marsh (retention basins) and riparian vegetation.

e) **Create a more natural geomorphic character for open water adjacent to the channel (combined with measure 3) (Objectives 1, 2).** Water deeper than 6 feet would remain open water and not allow for vegetation growth. Modifications to accomplish this measure could include removal of concrete, excavation to restore uneven bottoms, bank stabilization, and creation of pool and riffle habitat through installation of boulders or weirs.

f) **Rebuild a more natural geomorphic character for historic wash (Objectives 1, 2).** A wash is an intermittent or ephemeral stream subject to flashy flows during seasonal rains associated with riparian dependent upon groundwater or seasonal wetland vegetation dependent upon groundwater. This measure restores historic washes through grading and excavation. Detailed channel design will depend on any discharge expected within the wash. The restored historic wash would likely be a shallow channel with gradual (3:1 or less) slopes and terraces with both riparian and buffer vegetation. It would reconnect with its upstream areas as well as the River channel. It is different from daylighting streams (measure 2) because these historic washes were not necessarily put into the storm drain system. Development has occurred around them, and the historic washes have been directed to other parts of the drainage system.

2. **Attenuation.** These measures include capture of flows from the main channel, storm drains, and tributaries into side channels or detention basins.

a) **Creation of attenuation basin with wetlands (Objectives 1, 2).** This measure includes slowing input of storm flows, restoring wetlands, and creating a confluence with the River (overlaps with off channel measures in Section 1). This measure would require connection to the River. Wetland attenuation basins would be sized to capture runoff from the local area (not the main channel) and would include a basin surrounded by terraced slopes. The basin would slow down flows before they enter the mainstem of the River system and would provide seasonal wetland habitat. There would be a trade-off between the wetland and attenuation. This measure would provide some incidental water quality and recharge benefits. Preliminary design includes excavation of a basin that would have an impermeable layer of either geotextile or fine materials installed. The basin would then be planted with wetland vegetation. Average depth of the basin is assumed to be 3 feet and there would be some deeper areas up to 10 feet deep. It was assumed that this measure would provide 25 percent riparian habitat and 75 percent wetland habitat, resulting in one to two structural layers.

3. **Wildlife access.** These measures provide access and crossings for wildlife between the River and adjacent landscape. They include bridges, undercrossings, access slopes, or tunnels. This measure was later determined as one that would be common to all alternatives and added where possible and reasonable. The basis for design will be based on the wildlife expected to benefit in that location.

a) **Bridge undercrossing for wildlife (Objectives 2).** Paved bridge undercrossings act as an impediment to some wildlife movement. To reduce this impediment, modify or install corridors along the bank, which would allow wildlife to cross below bridges within the river.

b) **Wildlife access from River to bank (Objectives 2).** Create slopes suitable for ingress/egress of wildlife (generally 3:1 or more gradual slopes) in areas with vertical banks (this would include access to safety ramps in vertical walled channel areas).
c) **Wildlife passage (Objectives 2).** Modify storm drains and culverts to allow wildlife passage from existing and created natural habitat areas into the river. For example, daylighted storm drain culverts that pass through the levee would be widened to accommodate wildlife passage. They would also be modified to create appropriate side slope angles for wildlife passage and to remove storm drain grates to allow passage between the river and daylighted streams. The team assumed wildlife passage would only be created to connect wildlife to habitat areas; this measure should not connect wildlife to urban areas that would not be beneficial to their survival.

4. **Planting** Planting includes measures to restore vegetation within various locations throughout the study area. Measures included revegetation of wetland, riparian, and buffer zones including bioengineering of channel walls where possible. Valley foothill riparian and freshwater marsh habitat will be planted in the following ways: restructuring and planting walls, planting in overbank corridors, planting alongside channels, planting in concrete terraces, and planting on natural terraces and slopes. Planting efforts would include invasives removal.

a) **Restructure/vegetate River concrete channel walls (Objectives 1, 2).** This measure includes modification of the concrete channel walls to allow the growth of vegetation. This herbaceous layer is one component of a riparian/wetland habitat complex. Its addition as a stand-alone element in the form of overhanging vines between larger, multi-canopy restoration areas will provide several important functions. As the vines and other herbaceous vegetation mature, this feature will provide shading, cover, potential nesting habitat, and foraging opportunities in areas that are now bare concrete. The habitat would attract and be utilized by many species, including insects (key food source for other wildlife), amphibians, lizards, birds, and small mammals. This vegetation could also provide visual cues and extended segments of greenway that would encourage wildlife movement toward larger restored parcels, downstream or upstream of these reaches. The team assumed the composition would be 50 percent herbaceous riparian (i.e., vines) and 50 percent concrete, resulting in one structural layer of vegetation. Geotextile fabric has been proposed for design of this measure at this time. The fabric, which can be planted with vegetation (grasses and forbs), is reported to withstand velocities of up to 25 ft/s and shear stress of up to 15 lb/ft². Depending on the site specific conditions this measure could be accomplished using a range of features including:

- Notching,
- Vegetated terraces with hardened erosion protection,
- Vegetated sidewalls,
- Vegetation hanging from the top of bank, or
- Plantings in or at the tops of channel walls (requiring supplemental irrigation for drought conditions).

Detailed analyses of the Selected Plan will take place during final design phase (PED). Channel protection products will be evaluated to ensure they meet Corps specifications and surpass all hydraulic, geotechnical, and structural criteria. For the plans, Taylor Yard offers the only opportunity within the existing channel to employ High-Performance Turf Reinforcement Mats (HPTMRs), or alternate channel protection products. HPTMRs present higher uncertainties with respect to maintenance, repair, and/or replacement and may need to be augmented by more traditional channel protection measures. Features of the plans located adjacent or outside the existing channel offer greater opportunities for HPTMRs. The work will follow Corps guidance and regulations and utilize existing information including any available testing results.

The plans call for the use of HPTMRs to resist the effect of erosion. This soft approach is highly compatible with the ecosystem restoration concept, but its inability to resist erosion in the same manner as a hard protection system such as concrete or grouted rock is obvious. At some level, a
soft armored slope bank, which may be compatible with ecosystem restoration, will not be
effective in resisting erosion. The ability of HPTRMs or other soft methods to resist erosion will
need to be fully evaluated before they are incorporated in a final design. It is anticipated that site-
specific data that includes results of subsurface investigation and engineering analysis will be
necessary to complete this evaluation. As such, this work is anticipated to be completed during
PED.

During PED, if it is determined that HPTRMs alone will not meet the Corps requirements,
additional measures will be evaluated. These additional structural elements are likely to consist of
hardened elements such as riprap, soil cement, sheet pile walls, secant walls, stone or other slope
protection materials buried behind a soil slope that is soft armored with HPTRMs or other soft
erosion protection methods. The remedial methods utilized must be integrated with the minimal
grades and channel configurations required for hydraulic capacity.

b) **Habitat corridors/riparian planting on overbanks of the main channel or tributaries**

(Objec}: 1, 2). This measure includes planting riparian vegetation on the overbanks of the
River to establish habitat corridors. Species lists proposed for riparian and transitional zones are
provided below in Table 4-2. The team assumed that this measure would restore 50 percent
riparian trees and 50 percent riparian shrubs, resulting in two to three structural layers.
Development of a detailed site specific planting plan will be completed during the design phase
(species and densities). Temporary irrigation of overbank areas will be used for establishment
period and in cases of extreme drought. The City is committed to providing necessary water for
the project.

### Table 4-2 Riparian and Buffer/Transitional Plant Palette

<table>
<thead>
<tr>
<th>Riparian Tree &amp; Shrub</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambrosia psilostachya</td>
<td>western ragweed</td>
</tr>
<tr>
<td>Artemisia douglasioides</td>
<td>mugwort</td>
</tr>
<tr>
<td>Baccharis salicifolia</td>
<td>mulefat</td>
</tr>
<tr>
<td>Mimulus cardinalis</td>
<td>scarlet monkeyflower</td>
</tr>
<tr>
<td>Platanus racemosa</td>
<td>western sycamore</td>
</tr>
<tr>
<td>Populus fremontii</td>
<td>Fremont’s cottonwood</td>
</tr>
<tr>
<td>Salix laevigata</td>
<td>red willow</td>
</tr>
<tr>
<td>Salix lasiolepis</td>
<td>Arroyo willow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Buffer/Transitional (minimal acreage)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Artemisia californica</td>
<td>California sagebrush</td>
</tr>
<tr>
<td>Eriogonum fasciculatum</td>
<td>California buckwheat</td>
</tr>
<tr>
<td>Eschscholzia californica</td>
<td>California poppy</td>
</tr>
<tr>
<td>Helianthus annuus</td>
<td>sunflower</td>
</tr>
<tr>
<td>Leymus condensatus</td>
<td>giant wild rye</td>
</tr>
<tr>
<td>Lotus scoparius</td>
<td>deerweed</td>
</tr>
<tr>
<td>Malacothamnus fasciculatus</td>
<td>chaparral mallow</td>
</tr>
<tr>
<td>Malosma laurina</td>
<td>laurel sumac</td>
</tr>
<tr>
<td>Rhus integrifolia</td>
<td>lemonade berry</td>
</tr>
<tr>
<td>Salvia apiana</td>
<td>white sage</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Vines</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marah macrocarpa</td>
<td>wild cucumber</td>
</tr>
<tr>
<td>Vitis girdiana</td>
<td>Southern California grape/desert grape</td>
</tr>
<tr>
<td>Vitis Californica</td>
<td>California wild grape</td>
</tr>
<tr>
<td>Cuscuta californica</td>
<td>California dodder</td>
</tr>
<tr>
<td>Calystegia macrostegia</td>
<td>Island morning glory</td>
</tr>
<tr>
<td>Rubus ursinus</td>
<td>California blackberry</td>
</tr>
</tbody>
</table>
c) **Terrace concrete banks/planting built into modified channel walls (Objectives 1, 2).** This measure modifies existing concrete walls by adding structures able to support vegetation. It includes planting vegetation in the structures. This could include terraces with erosion protection such as concrete liners, or openings in the concrete where vegetation is planted on terraces or slopes. Terrace dimensions and/or types and density of vegetation would be refined to accommodate wildlife habitat where appropriate with available space. Vegetation is assumed to be riparian with two to three structural layers.

d) **Invasives Removal and Replanting (Objectives 1, 2).** An initial removal of 90 percent of invasives and trash in soft bottom reaches, and replanting of native vegetation (if needed and if the reach is included within the selected alternative).

e) **Buffer Zone (Objective 1).** A buffer zone between human activities area and restored areas would be provided with native vegetation consistent with the surrounding ecosystem.

5. **Remove concrete or naturalize channel bed and/or banks.** Concrete removal measures include modifying the channel by removing concrete and/or grouted stone. Erosion control would accompany removal and removal would include modifications to the channel bed, terracing of the banks, etc.

a) **Lower channel banks (Objectives 1, 2).** This measure lowers the channel banks to connect with adjacent areas, setting back levees or providing berms as needed per site to avoid inducing flood damages.

b) **Widen channel banks (Objectives 1, 2).** This measure widens the channel, removing concrete and reconstructing channel banks with site-appropriate erosion control to create more capacity, support more habitats and natural river processes, as well as tying into adjacent areas.

c) **Lowering banks and widening the channel (Objectives 1, 2).** The measure includes lowering channel walls and widening the channel, linking the River to adjacent areas. These combined measures could involve construction of levees or berms to contain flood flows; this is assumed to be limited and will require hydraulic modeling to determine if necessary.

d) **Channel bed deepening (Objective 1).** This measure excavates the channel to create more capacity and allow for additional aquatic habitat in the channel where concrete currently exists. It would require removal of concrete or grouted rock substrate and excavation of the channel to desired depth. The channel would need to be stabilized either by replacing the grouted rock/concrete bed or grade control structures or both to maintain channel integrity.

e) **Terraces with earthen banks (Objective 1, 2).** This measure requires site-specific measurement of available space and dimensions adjusted accordingly. Channel banks would be terraced to provide a gradual slope and transition between the channel and top of bank. Terraces would be earthen and stabilized for flood flows and safety. Dimension of the terraces will need to consider wildlife movement with gentler slopes sufficient for transit by wildlife. It is similar to measure the design providing for concrete lined terraces in the banks, without the use of concrete stabilization.

f) **Create a more natural geomorphic character and plant for freshwater marsh in main River channel (Objective 1).** This measure includes modification of the existing concrete River channel to allow suitable bed conditions for restoration of freshwater marsh. Shallow water (less than 6 feet) will be required for freshwater marsh, which will be interspersed with open water and riparian vegetation. Modifications to the channel include removal of concrete, excavation to create an uneven riverbed with pools and shallow zones, stabilization of the channel with boulders or weirs, and planting of wetland and riparian vegetation. Native fish such as Santa Ana sucker and arroyo chub, although currently extirpated from the project area, could be reintroduced into restored areas with appropriate habitat such as freshwater marsh in combination with existing open water. These species are supported on tributaries to the LA River in the most upstream reaches (FoLAR 2008). Rainbow trout (non-anadromous steelhead), which are also present in upstream reaches may also be reintroduced into appropriate habitat.
4.4.6 Recreation Management Measures

ER 1105-2-100 lists recreation measures, which may be cost shared in recreation developments as Ecosystem Restoration Projects. These measures address Objective 3:

- Access and Circulation: Roads, turnarounds, trails (multiple-use), parking, footbridges, and culverts;
- Structures: Sanitation – (e.g., toilets, comfort stations, shelters for picnicking and trail-related uses);
- Utilities: Water supply – (e.g., municipal system, drinking fountains and faucets, sewage and waste water disposal – storm drainage, public telephone);
- Site Preparation/Restoration: Clearing and grubbing, grading and land form;
- Park Furniture: Picnic tables, trash and recycling receptacles/holders, bicycle racks;
- Signs: Entrance directional markers, traffic control (vehicular and pedestrian), instructional (includes fire danger notices), wayfinding;
- Interpretive Guidance and Media: Display boards, interpretive markers (natural, historical, archeological, etc.), bulletin board; and
- Protection, Control, Health and Safety: Gates and barricades, walls and fencing, guardrails, entrance stations, lighting, and handrails.

This list of recreation measures assumes the following:

- Facilities to be cost shared are limited to standard designs consistent with the natural environment of the surrounding area, but should not include embellishments, elaborate designs, or be ostentatious.
- Footbridges are to be austere and used only when other crossings methods are impractical.
- Footbridges that are the central recreation experience are to be a non-Federal cost. Pedestrian bridges at highways or railroads are normally a non-Federal cost; however, if they are integral to the recreation feature and the most cost effective alternative, they may be cost shared.
- Connections to an existing municipal system for water supply and sanitation needed. Recreation measures suited only to rural settings (e.g. vault toilets) are excluded.

4.5 DEVELOPMENT OF ALTERNATIVES

During the planning charrettes, alternatives were developed based on expertise from Federal, state, and local agencies, university and environmental organizations, the USACE, and the Sponsor. These are referred to as the preliminary array of alternatives. The alternatives were formulated for the entire study area during the planning charrette with additional alternatives formulated during public outreach, and individual team efforts including the USACE design team, City design team, and the habitat team, which was formed to work together on the habitat evaluation.

4.5.1 Real Estate Considerations

The selection of the areas of land in the study area where ecosystem restoration alternatives might reasonably and appropriately be implemented was accomplished through an iterative process by the project team composed of USACE personnel, the non-Federal Sponsor, and their respective technical specialists and consultants. The team considered advice of local non-profits with an interest in River restoration, City Council representatives, and agencies including U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and the California Regional Water Quality Board (CRWQB). Geographic Information System (GIS) mapping resources, recent aerial photographs, field inspections, and the local knowledge base and professional opinion were the tools applied in the delineation of a rational area within which alternatives could be formulated.
The team presumed that the River channel, confluences with major tributaries, and areas of open space adjacent to these watercourses within the study area would be available for restoration features. Lands within associated historic floodplains were considered for the restoration alternatives. Vacant parcels located within the historic floodplain and close to existing watercourses were evaluated on a case-by-case basis. If portions of privately owned lands could be acquired without impact to residential structures, they were considered. The following strategy assisted in identifying the area for alternatives formulation:

- Publicly owned lands were favored over privately held lands.
- Existing residential buildings, commercial and institutional developments, and currently utilized freeway, street and road rights of way were avoided as potential areas for implementation of a project unless plan objectives could not be met within the reach without those lands and there was potential for acquisition. Vacant lands presently zoned for residential or commercial development were considered available for the project.
- Some known utility corridors were included because they tended to follow the tributaries and were unavoidable. The project would not relocate the utility lines themselves unless there were unavoidable access or engineering requirements directing the need for a particular location.

This delineated area included the land most suitable for ecosystem restoration within the River study area. The area included selected portions of the channel itself, the river right-of-way, the confluence and some area upstream on major tributaries, and open space areas along the channel. Table 4-3 provides a summary of land ownership in those areas considered for inclusion in the project. While over 3,000 acres were considered in the initial potential project area, evaluation of the location and availability for river restoration resulted in a smaller potential project area of 973 acres.

A total of 316 parcels within the study area were included in the preliminary array of alternatives. Of those parcels, 81 were found to be improved with buildings. Prelimarily, 188 parcels are government owned, at least 22 parcels are owned by railroad companies, and the remaining parcels are privately owned.

<table>
<thead>
<tr>
<th>Zoning</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown (misc) District Plan</td>
<td>23</td>
</tr>
<tr>
<td>Agricultural (A2)</td>
<td>13</td>
</tr>
<tr>
<td>Commercial Manufacturing (CM)</td>
<td>36</td>
</tr>
<tr>
<td>Industrial (M1-M3, MR2)</td>
<td>235</td>
</tr>
<tr>
<td>Open Space &amp; Public Facilities (OS, PF)</td>
<td>2,788</td>
</tr>
<tr>
<td>Residential (All Rs)</td>
<td>33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,128</td>
</tr>
</tbody>
</table>

4.5.2 Publicly Owned Lands Screened from the Potential Project Area

The team continued to consider plan efficiency as it related to land availability, costs, and other lands, easements, rights-of-way, relocations, and disposal sites (LERRD). Under the ecosystem restoration project authority, cost sharing for such projects is 65 percent Federal to 35 percent non-Federal. Although permissible under law, land costs above the Sponsor’s share are disfavored under USACE policy, which provides a 25 percent target for maximum percentage of land value for a restoration project. This is, in part, to ensure that the USACE is engaging in a true restoration project, increasing habitat functions and
services rather than serving as an avenue for land acquisition. The USACE’s Planning Guidance Notebook states the policy:

“Land acquisition in ecosystem restoration plans must be kept to a minimum. Project proposals that consist primarily of land acquisition are not appropriate. As a target, land value should not exceed 25 percent of total project costs. Projects with land costs exceeding this target level are not likely to be given a high priority for budgetary purposes” (ER 1105-2-100, Appendix E, para. E-30f).

Real estate and potential relocation costs are known to be exceptionally high in the Los Angeles area and these costs will likely compose a substantial portion of the potential restoration alternative costs. Mindful that real estate costs would be high for any alternative that involved urban Los Angeles lands, the study examined, as described above, lands already included in the river right of way (LACDA project boundary), open space lands adjacent to the existing LACDA boundary, and other parcels that would support restoration goals such as connectivity.

Other lands considered for inclusion in the project (in addition to being located within or adjacent to the river right of way) would preferably be in Federal or local government ownership wherever possible. Private lands were included only if restoration benefits in that reach could not be accomplished any other way. In some cases, inclusion of an entire identified site was considered infeasible in the highly urban context because very few other appropriate areas are available for relocation of the current uses, but in some cases, a portion of the site can be utilized. Appendix H includes a list of lands considered for the project.

4.5.3 Preliminary Array of Alternatives

As described above, the charrette teams, the USACE, and other habitat team members initially assembled alternative plans composed of the measures above (including measures later eliminated). In the discussion below, the preliminary array of 19 alternatives is ordered by the number of acres included within each and range from Alternative 1 Comprehensive with 621 acres to Alternative 19 Taylor Yard with 102, not including the main channel. These are described briefly in the table below (Table 4-4) and further detailed in the Alternative Matrix (Table 4-5) with sub-reaches described in the following section. Elimination of the tunnel measure, as identified above, resulted in elimination of all but three complete preliminary alternatives to carry forward for further analysis: Preliminary Alternative 16 “Side Channels Only,” Preliminary Alternative 18 “Comprehensive Pockets,” and Preliminary Alternative 19 “Taylor Yard.” However, the other alternatives’ reach plans that did not require a tunnel were also carried forward and recombined to create additional alternatives as described below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Action</td>
<td>Future Without-Project Conditions</td>
</tr>
<tr>
<td>1</td>
<td>Comprehensive A</td>
<td>Includes development of freshwater marsh, open water ponds, fish refugia, and riparian corridors, exposing storm drain outlets and converting to natural stream confluences, diversion of flow into side channels lined with habitat, underground basins and culverts to attenuate flow, bioengineering of channel walls, channel modification to increase width by terracing, channel widening, and/or modification of channel walls, connections to green streets, modification along tributary confluences to more natural habitat, and wildlife crossings.</td>
</tr>
<tr>
<td>2</td>
<td>Atwater to Cornfields</td>
<td>Implements all of the above within the Atwater to Cornfields part of the reach.</td>
</tr>
<tr>
<td>3</td>
<td>Banks &amp; Tributaries Only</td>
<td>Leaves the flood risk management channel bed primarily “as is” and restores floodplain by creating side channels in open areas along the river with freshwater marsh and riparian corridors and restoring tributary confluences. Includes modification of storm discharge structures.</td>
</tr>
</tbody>
</table>

Table 4-4 Preliminary Array of 19 Alternatives
<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Comprehensive B</td>
<td>Includes most of measures included in Alt 1 Comprehensive A with fewer locations, less terracing and side channels, and omits elevating railroads on trestles, bioengineering walls, open water, and modifying trap channel to vertical.</td>
</tr>
<tr>
<td>5</td>
<td>Los Feliz to Arroyo Seco</td>
<td>Implements all measures within Los Feliz to Arroyo Seco reach.</td>
</tr>
<tr>
<td>6</td>
<td>Comprehensive C</td>
<td>Includes most of measures included in Alt 1 Comprehensive A with fewer locations and omits railroad elevation, bioengineering walls, open water, and modifying trap channel to vertical. Includes more terracing and storm drain modifications and different locations for wildlife crossings than Alt 4 Comprehensive B.</td>
</tr>
<tr>
<td>7</td>
<td>Channel Reshaping A</td>
<td>Focus is on channel reshaping and attenuation of flow – detention, bypass and widening. Using culverts and underground basins to attenuate flows, the channel is geomorphically changed to a wider, softer channel, naturalized storm drain outlets, and some restored riparian corridors.</td>
</tr>
<tr>
<td>8</td>
<td>Habitat Variation</td>
<td>Maximizing habitat restoration for a species diversity, including fish, motivated formulation of alternative. Attenuation or reduction in flow is included in each reach as well as freshwater marsh, riparian and aquatic habitat measures.</td>
</tr>
<tr>
<td>9</td>
<td>Soft Bottom Channel &amp; Associated Banks</td>
<td>This alternative focuses restoration in reaches that already have a soft riverbed. Where open areas are adjacent to the river, the river will be widened rather than terraced. Storm drains are converted to natural stream confluences and restored with vegetation. Habitats include aquatic, freshwater marsh and riparian areas.</td>
</tr>
<tr>
<td>10</td>
<td>Channel Modifications with least structural and engineering impacts and public acceptability</td>
<td>This alternative implements measures in locations with the least impact to infrastructure and engineering challenges, while still including measures in all reaches to attenuate flow, restore riparian and freshwater marsh habitat and tributary confluence restoration.</td>
</tr>
<tr>
<td>11</td>
<td>Habitat Connectivity</td>
<td>This alternative focuses on bank to bank and upstream to downstream connections for wildlife, linkages to wildlife areas, channel widening and terracing.</td>
</tr>
<tr>
<td>12</td>
<td>Hydrologic Connection Improvements</td>
<td>This alternative focuses on lowering grade for adjacent large open areas, improved hydrologic connections between the banks, storm drains and the river. It also intends to increase wildlife movement between the river and adjacent open areas.</td>
</tr>
<tr>
<td>13</td>
<td>Channel Reshaping B</td>
<td>Using culverts to attenuate flows, the channel is geomorphically changed to a wider, softer channel, naturalized storm drain outlets, and restored riparian corridors. Includes bioengineering of channel walls, side channels and has more riparian and freshwater marsh replanting than Channel Reshaping A.</td>
</tr>
<tr>
<td>14</td>
<td>Channel Widening</td>
<td>This alternative focuses on widening the channel. Attenuation is accomplished with culvert bypasses. Includes planting of freshwater marsh and riparian corridors.</td>
</tr>
<tr>
<td>15</td>
<td>Bypass with Bank and Tributary Confluence Restoration</td>
<td>Reduces flow using culvert bypass to allow for terracing and channel bank softening. Improves freshwater marsh habitat in soft bottom area and adds riparian habitat to downstream locations on the river overbank. Emphasizes widening and restoration at tributary confluences.</td>
</tr>
<tr>
<td>16</td>
<td>Side Channels Only</td>
<td>Leaves the flood risk management channel bed and banks primarily “as is,” and restores floodplain by creating side channels in open areas along the river with freshwater marsh and riparian corridors and restoring tributary confluences.</td>
</tr>
<tr>
<td>17</td>
<td>Opportunity area restoration with channel widening at tributaries</td>
<td>Restores wetlands on the overbank and major tributaries at River Glen - Verdugo Wash confluence, Griffith Park, Bowtie/Taylor Yard, Arroyo Seco confluence, Burbank Western Channel, Cornfields (Los Angeles Historical Park) and the LATC (Mission Yard). Widens the river at Verdugo, Arroyo Seco and Burbank Western Channel.</td>
</tr>
<tr>
<td>18</td>
<td>Opportunity area restoration to large open areas</td>
<td>Leaves flood risk management channel bed and banks “as is” and restores wetlands on the overbank and major tributaries at River Glen - Verdugo Wash confluence, Bowtie/Taylor Yard, Arroyo Seco confluence, and Cornfields (Los Angeles Historic Park).</td>
</tr>
<tr>
<td>19</td>
<td>Taylor Yard</td>
<td>Restores wetlands on the overbank and widens the river at this single key location on the river (includes the Bowtie parcel).</td>
</tr>
</tbody>
</table>
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### Table 4-5 Preliminary and Sub-Reach Plans

<table>
<thead>
<tr>
<th>Reach</th>
<th>Measure Type</th>
<th>Sub-measure</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1. Pollywog Park</td>
<td>I. Adjacent or off channel...</td>
<td>x</td>
<td>x</td>
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<td></td>
<td></td>
<td>x</td>
<td></td>
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<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>II. Attenuation</td>
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<td></td>
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4.6 DESIGNS

Conceptual designs were developed based on the measures described and existing channel geometries in the ARBOR reach. These designs were developed to have enough detail to estimate quantities and costs only and do not account for scour analysis, geotechnical investigation, or other more detailed analysis to be completed during design. Additional information, including figures, is found in Appendix A, Design. The project team made several assumptions pertaining to the designs, including the following:

- Daylighting streams would result in a riparian area and freshwater marshes at their confluences.
- Grade control structures would be used to stabilize the bed of the river when concrete was removed.
- Erosion control would be included where banks were modified to allow for planting.
- Invasives removal and management would be included throughout the project area.
- Levees would be modified with protection maintained as necessary.
- Maintenance requirements for levees, riverbed, and banks would be met.

4.7 COSTS

Cost estimates were developed based on the conceptual designs developed for the measures, as described above. Appendix C, Cost, describes assumptions, unit costs, and price levels developed for the measures and alternatives.

Cost estimates for the Preliminary Array ranged from a high of $3.9 billion dollars for Preliminary Alternative 1: Comprehensive, which included $1.5 billion in estimated tunneling costs (the tunneling estimate did not include LERRD for tunneling) to $211 million for Alternative Preliminary 19: Taylor Yard. These estimates were done for each preliminary alternative and each reach. They included construction, mobilization (7.5 percent), tunneling costs if any (without associated LERRD), a 25 percent contingency for construction, preliminary engineering, and design with engineering during construction estimated at 11 percent, and supervision and administration costs of 6.5 percent. The real estate cost estimate was based on the GIS mapping for each alternative and included business relocations cost for Verdugo Wash and LATC and a 20 percent contingency. Operations and maintenance costs were estimated and annualized for each alternative and reach. A matrix displaying the costs of each of the 19 preliminary alternatives by reach is shown in the Cost appendix.

4.8 FORMULATION OF SUB-REACH PLANS

Once the preliminary array of alternatives was formulated, the team used the geomorphic reaches within the study area to divide each of the alternatives in the preliminary array into sub-reach plans. Each of the 19 preliminary alternatives incorporated combinations of measures that varied substantially by location from upstream to downstream, based upon existing geomorphic character and opportunities and constraints within these sub-area reaches. Hence, each alternative represented a combination of alternative features, which varied from reach to reach, to ensure that the best possible combination of features was identified, based upon cost effectiveness and incremental cost analysis criteria. While not all of these 19 alternatives included features in all eight reaches, they were connected between reaches. Sub-reach plans would consist of the measures included in each geomorphic reach of each alternative in the preliminary array. This allowed recombination of the sub-reach plans and comparison of those newly formed hybrid plans to the preliminary plans in the economic analysis to ensure that the most efficient plans were carried forward into the final array.
Table 4-5 above summarizes the sub-reach plans and shows their relationship to the preliminary array. Measures common to all alternatives are not included, but assumed and were considered for costs and benefits. Each of the 19 preliminary plans are shown with an “x” indicating included measures by reach or sub-reach plan.

4.9 HABITAT ANALYSIS

USACE guidance requires that the ecosystem related benefits of proposed alternatives be subjected to detailed economic analysis, allowing an explicit comparison of the costs and benefits associated with the alternatives. Consequently, it is necessary that the environmental benefits of the alternatives be based on some quantifiable unit of value. Since restoration value is difficult to monetize, instead of calculating benefits in monetary terms, USACE ecosystem restoration projects calculate the value and benefits of restored habitat using established habitat assessment methodologies. Comparing the alternatives in this manner facilitates the determination of the most cost-effective restoration alternative that meets restoration goals (USACE 2000).

For this study, benefits (or outputs) have been quantified using the Combined Habitat Assessment Protocols (CHAP) approach for the existing, future without project, and future with project conditions. The CHAP has been approved for single use on this study (21 June 2013).

The CHAP output is in the form of Habitat Units (HUs). HUs are derived from the U.S. Fish and Wildlife Service’s (USFWS) methodology known as the Habitat Evaluation Procedures (USFWS, 1980). The preliminary output of the HEP model is a habitat suitability index (HSI), which ranges from 0 (poor habitat quality) to 1.0 (optimum habitat quality). Habitat value is finally calculated in terms of HUs by multiplying the HSI by site acreage.

Unlike HEP, where the preliminary output (HSI) ranges from 0 to 1, CHAP’s per-acre values are not limited to this range. In this way, where the HUs in HEP are dependent on acreage (HSI x acreage = HU; i.e., more acreage = more HUs), the HUs generated by CHAP are not dependent on acreage and reflect the value of a particular habitat type as based on species, functions, and habitat. Average Annual HUs are ultimately used in an economic analysis to generate cost effective and best buy restoration alternatives.

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4 HEP assumes a linear relationship between habitat suitability and species response. In other words, HEP assumes that as HSI increases the wildlife population should also increase. This implies that the model has the ability to predict population response without errors (NHI 2007).

Furthermore, the single species method assumes that an entire community is represented by that species, which may result in a narrow representation of habitat quality (NHI 2007). The single species method does not account for substantial benefits that are afforded by the ecosystem as a whole, which includes multiple species and multiple habitats. Furthermore, it does not account for all functions or habitat components potentially present at a site.

Throughout the U.S. there is a shift towards assessing restoration and other conservation activities at the ecosystem level (Perkins 2002). Determining habitat structure and functional integrity of an area for all species potentially using it is more supportive of an ecosystem management approach. A habitat assessment methodology that measures functionality, which is critical to the success of many restoration projects, should incorporate multiple components such as vegetation, structure, surrounding landscape, and habitat size and shape (Breaux et al. 2005; Store and Jokimaki 2003).
4.9.1 Methods

The CHAP method quantifies habitat value and generates HUs based on an assessment of multiple species, habitat features, and functions by habitat type. CHAP incorporates the HAB methodology, developed by the Northwest Habitat Institute (NHI). HAB involves a triad assessment of species, habitat, and functions (O’Neil et al. 2005), and includes an inventory of habitat components and their relationship to ecological functions performed by species.

In the HAB approach, fish and wildlife species with the potential to occur at a given site are identified. Potential species are determined using range maps in conjunction with information on vegetation types and habitat types, structural conditions, and habitat elements, also known as Key Ecological Correlates (KECs). KECs represent habitat elements (physical and biological) that are known to most influence a species distribution, abundance, fitness, and viability. KECs include habitat elements such as down wood, snags, litter layer, shrub layer, flowers, burrows, boulders, or riffles and pools. For the Master list of CHAP KECs see Appendix G.

Habitat is defined as “the place, including physical and biotic conditions, where a plant or animal usually occurs” (Johnson and O’Neil 2001). Habitat types are often characterized by a dominant plant form or physical characteristic. Structural conditions of the habitat are also considered.

Function refers to the principal way organisms influence the environment, also known as Key Ecological Functions (KEF) (NHI 2007). KEFs refer to the principal set of ecological roles performed by each species in its ecosystem (NHI 2007). More specifically, KEFs refer to the main ways organisms use, influence, and alter their biotic and abiotic environments. KEFs include functions that organisms perform in the environment, such as a grazer, sap feeder, carrion feeder, seed disperser, nest parasite, primary cavity excavator, or impounds water by creating dams. For the Master list of CHAP KEFs see Appendix G. While other methods consider few to many habitat components, the HAB approach considers over 350 different KECs and over 100 KEFs.

Over 175 species were evaluated in CHAP for the study including fish, amphibians, reptiles, birds, and mammals. Approximately 140 bird species were evaluated. With project, restored riparian habitat could support the Federally endangered least Bell’s vireo, yellow-breasted chat, and yellow warbler (State Species of Concern). Many other charismatic bird species were evaluated including the hooded and Bullock’s oriole, lazuli bunting, blue grosbeak, western tanager, several species of woodpeckers, owls, many species of ducks (cinnamon teal, ring-necked duck, northern pintail), hawks (sharp shinned hawk, osprey), and shorebirds (great blue heron, spotted sandpiper, black necked stilt). The evaluation also included top predators such as bobcat and coyote, among other small mammals. For a complete list of species evaluated in CHAP, see Appendix G.

The HAB approach, which is largely spatially based, uses Geographic Information Systems (GIS) to delineate habitat polygons and map habitat types (cross-walked with associated vegetation types) within the Study area. These habitat type classifications are based on the California Wildlife Habitat Relationships (CWHR) habitat classification scheme, derived from the CDFG publication titled “A Guide to Wildlife Habitats of California” (Mayer and Laudenslayer 1988). For each habitat polygon, wildlife

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5 In GIS, a polygon is a map feature that bounds an area at a given scale, such as a county on a world map or a district on a city map. In habitat mapping, the polygon bounds a specific habitat type.
species associated with these CWHR habitat types are linked to key environmental correlates (KECs) (i.e., habitat elements) and key ecological functions (KEFs) (i.e., functions performed by species), which are derived from NHI’s Interactive Habitat and Biodiversity Information System (IBIS) database.\(^\text{6}\) (Johnson and O’Neil 2001).

The accounts for species, habitat, and function are combined to generate a quantitative per-acre HAB value. This HAB value is then combined with elements of HEP (i.e., multiplication by acres) to generate HUs as the output (Per Acre HAB Value x Acres = HUs). This combined approach (HAB + HEP) is referred to as CHAP (Combined Habitat Assessment Protocol) (NHI 2007). The detailed steps of the CHAP analysis and calculations are outlined in Appendix G.

HUs were generated for existing, future without project, and future with project conditions for the 19 preliminary alternatives. HUs were calculated for the base year, 25-year, and 50-year time horizons (for summary of HUs see Appendix G). HUs capture the habitat value of a given polygon based on the elements that compose the habitats (KECs), the species that inhabit them, and the functions that those species provide in the ecosystem (KEFs). In this way, the HU output provides a quantitative means of comparison of habitat value. The gain in HUs for the future with project is compared to the future without project, in order to determine the increase in habitat value of a given alternative over the habitat value resulting from taking no action.

For this study, the HUs generated by CHAP does not capture all benefits associated with restoration of an ecosystem. No model captures every element for consideration. The HU output for this study measured habitat value as described above, but did not give greater weight to the value of in-channel habitat and hydrologic connectivity or habitat connectivity for wildlife movement. In-channel habitat and natural hydrologic connections are more sustainable, supporting sediment and nutrient exchange with floodplain habitats, however in-channel habitat was given equal weight to habitat on the overbanks that is supported by assisted watering (such as pipes or pumps). The level of such connectivity was not captured in the CHAP output for this study, as higher levels of connectivity were not given weighted benefits. Restoration of habitat patches and vegetated corridors to link them improves connectivity for the movement of wildlife within the study area and to nearby ecological areas. The CHAP assessment was used to identify the final array of alternatives. Additional comparisons were made to assess restoration of hydrologic and hydraulic function and nodal and regional habitat connectivity. A comparison of attainment of hydrologic function and habitat connectivity for the final array was performed to assess how the alternatives met the hydrologic component of Objective 1 and the habitat connectivity objective (Objective 2). This comparison is provided in Section 6.3.

### 4.9.2 Results

Habitat types currently existing in the potential project area include eucalyptus, open water riverine, agriculture, perennial grassland, valley foothill riparian, and urban. Mapping of habitat types for baseline existing conditions shows that approximately 67 percent of the study area (564.85 acres) is urban (including low density and golf course), providing an average 4.64 HUs per acre. Existing riparian habitat accounts for only 7 percent of the study area (62.42 acres); however, it provides 16.84 HUs per acre.

These riparian areas occupy nine times fewer acres than the urban areas, yet provide almost four times

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\(^{6}\) The datasets for KECs and KEFs have been developed through a multiple expert panel process. IBIS is an extensively peer reviewed system that contains current ecological information on more than 1,000 fish and wildlife species, organized in searchable databases.
more HUs per acre. The open water areas also provide substantial HUs per acre, totaling 22 percent of the study area (182.21 acres) and providing 11.89 HUs per acre. Other habitat types account for less than 4 percent of the study area.

Total baseline HUs equaled 6,119. For the 50-year future without project condition HUs fell to 5,291, (Figure 4-1). This reflects a 14 percent decrease in value without project in this already degraded environment. The gain in HUs over the 50-year future without project was calculated for the 19 preliminary alternatives. The detailed CHAP calculations for the preliminary alternatives are described in detail in Appendix G.

![Graph: Without Project Conditions](image)

**Figure 4-1 Baseline to Future HU Comparison**

These total HUs for the preliminary alternatives were then annualized to inform the economic analysis and to generate the final array of cost effective and “best buy” plans as described in detail on the following pages. These results quantify the overall value of the restored habitat, based on species, habitat, and functions being provided by each alternative as compared to the future without project condition. Results show that riparian and riverine restoration has the potential to provide restored habitat function and value in the urban setting of Los Angeles. Maximizing acreage of these habitats would benefit ecosystem functioning and species diversity in the highly urbanized, degraded study area.

### 4.10 FLOODING RISK AND TUNNEL DEPENDENCIES

Consideration was given to the potential for alternatives and individual measures to increase flood risk. Several alternatives included removal of the concrete channel, or large portions of it. This would require diversion of flood flows around the study area to avoid damaging infrastructure and inducing flooding. To that end, the preliminary array of alternatives was reviewed, by reach, to determine if the features would require a diversion tunnel.
Diversion tunnel costs were developed as a separate measure. Reaches and alternatives dependent on the diversion tunnel are indicated in grey cells and with an X in Table 4-6 below. The costs and benefits of these alternatives were compared, although the high tunnel cost, $1.5 billion, was considered excessive and meant that they were not cost effective and they were not evaluated further.

Table 4-6 Tunnel Dependencies by Reach and Alternative

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</table>

Note: Gray shaded cells indicate reaches dependent on a diversion tunnel that were dismissed from further consideration due to excessive cost. White cells indicated reaches that were not dependent on a diversion tunnel and were therefore carried forward for further analysis. Black cells indicate no reach plan was included in the relevant preliminary alternative.

### 4.10.1 Other Alternatives Considered

Two additional alternatives that were considered in concept were to: (1) limit the project area to the LACDA right-of-way, and (2) widen the entire river channel. Both of these were removed from further consideration due to the reasons described below.

### Limiting Project Area to LACDA Right-of-Way

The LACDA alternative involved consideration of whether an alternative situated wholly within the existing LACDA boundary could meet objectives. The LACDA boundary includes the river channel bottom and sides with very limited right-of-way on either side, much of which is occupied by bicycle paths on the west/south side of the river. The team concluded that a LACDA-footprint-limited alternative would not meet objectives because it would fail Objective 2, restoring regional connectivity, and it would also likely fail Objective 1 because flow velocities would not be sufficiently reduced to support restored...
habitat. Therefore, LACDA lands will be included in alternatives, but it was determined that they are not sufficient in themselves to support restoration objectives.

Channel Widening to accommodate natural riparian river system

The team considered an alternative that involved channel widening sufficient to accommodate a natural riparian river system within the channel. This would require increasing the channel’s width by 3 to 5 times (900 feet to 1,500 feet) based on the volume and velocity of water flowing through the channel during high flow scenarios. A rough estimate of the potential real estate acquisition cost was done assuming $50 to $120 per square foot depending upon the development on the parcels. The estimated real estate acquisition cost would be at least $7.6 billion. This would not include utility, infrastructure, business and residential relocation costs, or first costs of construction, which would greatly increase costs. Due to this incredibly high and excessive cost and the unlikelihood of acquiring, assembling, and preparing the parcels necessary in the study timeframe, channel widening to this extent was eliminated. If best management practices are adopted throughout the entire watershed to increase permeability and accomplish substantial peak flow reduction, and if a floodplain buy-back program is instituted, this measure may become more viable in the future.

4.11 COST EFFECTIVENESS/INCREMENTAL COST ANALYSIS

USACE does not consider monetary benefits or the generation of benefit to cost ratios when evaluating restoration projects. Rather than putting a monetary value on habitat benefits, the focus of the final evaluation is on the relationship of habitat benefits to project costs to ensure cost-effective and justified plans are put forth for recommendation for implementation. This process is summarized below and described in more detail in Appendix B, Economics.

Cost-effectiveness and incremental cost analyses were performed using the certified IWR Planning Suite software version 1.0.11.0. The CE/ICA is an evaluation tool that considers and identifies the relationship between changes in cost and changes in quantified, but not monetized, habitat benefits. The evaluation is used to identify the most cost-effective alternative plans to reach various levels of restoration output and to provide information about whether increasing levels of restoration are worth the added cost.

Functionally, the CE/ICA provides a framework for combining individual measures and sub-measures (scales) into alternative plans. The software expedites this effort of testing each combination of measures and tabulating the resulting costs and environmental benefits.

4.11.1 Cost Effectiveness Analysis

The cost effectiveness analysis seeks to answer the question: given an adequately described objective, what is the least costly way of attaining the objective? A plan is considered cost effective if it provides a given level of output for the least cost. Cost effectiveness analysis shall be used to identify the least cost solution for each level of environmental output being considered.

The cost effectiveness analysis is the first step in the CE/ICA. It compares the Average Annual Habitat Units (AAHUs) potentially achieved by each alternative to the cost of each alternative to generate a cost per AAHU. This cost provides a means to compare the cost-effectiveness of each plan. The three criteria used for identifying non-cost-effective plans or combinations include: (1) the same level of output could be produced by another plan at less cost; (2) a larger output level could be produced at the same cost; or (3) a larger output level could be produced at the least cost. Cost-effectiveness is one of the criteria by which all plans are judged and plays a role in the selection of the NER plan. Non-cost-effective combinations of plans are dropped from further consideration.
### 4.11.2 Incremental Cost Analysis

Incremental cost analysis compares the additional costs to the additional outputs of an alternative. It is a tool that can assist in the plan formulation and evaluation process, rather than a dictum that drives that process. The analysis consists of examining increments of plans or project features to determine their incremental costs and benefits. Increments of plans continue to be added and evaluated as long as the incremental benefits exceed the incremental costs. When the incremental costs exceed the incremental benefits, no further increments are added. Incremental analysis helps to identify and display variations in costs among different restoration measures and alternative plans. Thus, it helps decision makers determine the most desirable level of output relative to costs and other decision criteria.

The incremental cost analysis portion of the CE/ICA compares the incremental costs for each additional unit of output from one cost effective plan to the next to identify “best buy” plans. The first step in developing best buy plans is to determine the incremental cost per unit. The plan with the lowest incremental cost per unit over the No Action Alternative is the first incremental best buy plan. Plans that have a higher incremental cost per unit for a lower level of output are eliminated. The next step is to recalculate the incremental cost per unit for the remaining plans. This process is reiterated until the lowest incremental cost per unit for the next level of output is determined. The intent of the incremental analysis is to identify the most efficient plans based upon incremental benefits relative to incremental costs.

### 4.11.3 Identification of the Final Array

The CE/ICA allows comparison of successive levels of output and their incremental costs between alternatives. Results of the CE/ICA then inform the selection of an alternative. The results do not provide the discrete decision; rather they are a tool to help inform a decision. The CE/ICA provides an array of alternatives that undergo a separate tradeoff analysis, which may result in alternatives being screened out or selected based on considerations external to the CE/ICA.

For ecosystem restoration, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, is identified as the NER plan. The selected plan should be cost effective and justified in achieving the desired level of output. Thus, the NER plan is selected from the suite of cost effective plans identified in the CE/ICA. While the NER plan is not required to be a best buy plan, this is often the case.

Each sub-plan from the 19 preliminary alternatives was input as a measure into the CE/ICA software (IWR Plan) to compare with costs of implementing each combination of measures for each reach. The preliminary alternatives were also entered as a whole. The program then combined the sub-reach plans (geomorphic reach plans) into recombined plans for comparison and evaluation with the preliminary plans. This produced an array of 171 cost effective plans, which included 21 best buy plans. A best buy plan is one that is both cost effective combination and the most efficient plan for providing different levels of habitat value for the cost. Figure 4-2 shows how recombining the management measures produced much more cost effective and efficient plans than the preliminary alternatives originally formulated at the charrettes. Also note that the first best buy plan that includes all reaches is Alternative 10. The provision contiguous restoration throughout all of the study area reaches is important to achieving connectivity benefits and is one of the key restoration objectives (as noted in Section 4.2.1 Specific Planning Objectives, and Section 4.2.2 Objectives Performance Criteria). The Best Buy Plans (1-21) are not the same as the Preliminary Alternatives (1-19), but rather are recombinations of the reach-based plans that comprised the Preliminary Alternatives. The Preliminary Alternatives are depicted with the red circles on Figure 4-2.
The recombination of plans by reach provided a more cost effective combination of measures for the least overall cost. The annual cost and output of each of the cost effective plans is shown in Figure 4-2. The red dots show the original 19 alternatives, which were not cost effective as formulated. These do not account for tunnel costs. The sub-reach plan combinations that were cost effective are shown as green boxes and the best buy plans area shown as blue triangles when only some reaches are included and purple diamonds where all reaches are included.

The CE/ICA analysis outputs showed that cost effective, best buy alternatives should be grouped and considered for inclusion in the final array based on the incremental increases in costs and benefits. These groupings are Alternatives 1-5, Alternatives 6-9, Alternatives 10-13, and Alternatives 14-16. Alternatives 17-21 begin to show higher incremental jumps in cost with fewer added benefits until you reach Alternative 21 (Figure 4-3). Figure 4-3 shows that significant increases in benefits are gained with the addition of Reach 6 (added in Best Buy Plan 7) and Reach 8 (added in Best Buy Plan 8). The best buy alternatives are composed of sub-reach plans, with the average annual costs and benefits shown in Table 4-7. The Plan Components for the Best Buy Plans, as listed in Table 4-7, represent the reach-based plans from the Preliminary Alternatives. The list is a result of the screening process displayed in Table 4-6. The Plan Components (Reach/Alternative) column includes the reach number (R2 for example meaning Reach 2), and the Plan number (A11 meaning the reach-based plan found in Preliminary Alternative 11). The Plan Components (Name) column represents the theme of the plan, or, most cases, by which Charrette Team the reach plan was developed. Bold reach numbers in Table 4-7 display when a reach is added to the Best Buy plans.
Figure 4-2 Best Buy Scatter Plot – Average Annual Habitat Output – All Plans AA Cost/AAHU Summary

(Preliminary Alternatives Shown as Red Dots Do Not include Tunnel Costs)
Figure 4-3 Box Plots of Annualized Costs vs. Benefits – All Best Buys
Table 4-7 Detailed Best Buy Plan Summary (Price Level April 2013, Interest Rate 3.75 Percent)

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<th>Best Buy Plan No.</th>
<th>Plan Components (Reach/Alternative)</th>
<th>Plan Components (Name)</th>
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<th>Average Annual Habitat Unit</th>
<th>Total Cost (No O&amp;M)</th>
<th>Real Estate Percentage of Total Cost</th>
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<td>R5 – A9 OR R5 – A16</td>
<td>Reach 5 – (Soft Bot. Ch. &amp; Assoc. Banks) or (Side Channels Only)</td>
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<td></td>
<td>R8 – A15</td>
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<td>Reach 5 – (Soft Bot. Ch. &amp; Assoc. Banks) or (Side Channels Only)</td>
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<td></td>
<td>R7 – A12</td>
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<td>R8 – A15</td>
<td>Reach 8 – Charrette Team 2</td>
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<td>Reach 2 – Charrette Team 4</td>
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<tr>
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<td>R5 – A9 OR R5 – A16</td>
<td>Reach 5 – (Soft Bot. Ch. &amp; Assoc. Banks) or (Side Channels Only)</td>
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<td>Reach 6 – Charrette Team 1</td>
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<td>R7 – A12</td>
<td>Reach 7 – Charrette Team 3</td>
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<tr>
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<td>R8 – A15</td>
<td>Reach 8 – Charrette Team 2</td>
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<tr>
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<td>Plan Components (Reach/Alternative)</td>
<td>Plan Components (Name)</td>
<td>Average Annual Cost</td>
<td>Average Annual Habitat Unit</td>
<td>Total Cost (No O&amp;M)</td>
<td>Real Estate Percentage of Total Cost</td>
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<td>15</td>
<td>R1 – A11</td>
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<td>$29,930,469</td>
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<td>R6 – A8</td>
<td>Reach 6 – Charrette Team 1</td>
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<td>Reach 7 – Charrette Team 3</td>
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<tr>
<td>R8 – A3</td>
<td>Reach 8 – Banks &amp; Tribs Only</td>
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<td>16</td>
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<td>R3 – A16</td>
<td>Reach 3 – Side Channels Only</td>
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<tr>
<td>R4 – A16</td>
<td>Reach 4 – Side Channels Only</td>
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<td>Reach 5 – City: Los Feliz to Arroyo Seco</td>
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<td>R6 – A8</td>
<td>Reach 6 – Charrette Team 1</td>
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<td>R7 – A12</td>
<td>Reach 7 – Charrette Team 3</td>
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<td>Reach 3 – Side Channels Only</td>
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<td>Reach 4 – Side Channels Only</td>
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<td>Reach 5 – City: Los Feliz to Arroyo Seco</td>
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<td>R6 – A8</td>
<td>Reach 6 – Charrette Team 1</td>
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<td>R7 – A12</td>
<td>Reach 7 – Charrette Team 3</td>
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<td>R8 – A3</td>
<td>Reach 8 – Banks &amp; Tribs Only</td>
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<td>Reach 3 – Side Channels Only</td>
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<td>Reach 4 – Side Channels Only</td>
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<td>Reach 5 – City: Los Feliz to Arroyo Seco</td>
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<td>R6 – A8</td>
<td>Reach 6 – Charrette Team 1</td>
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<td>R7 – A16</td>
<td>Reach 7 – Side Channels Only</td>
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<tr>
<td>R8 – A3</td>
<td>Reach 8 – Banks &amp; Tribs Only</td>
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<td>Reach 3 – Side Channels Only</td>
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<td>R5 – A5</td>
<td>Reach 5 – City: Los Feliz to Arroyo Seco</td>
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<td>R6 – A8</td>
<td>Reach 6 – Charrette Team 1</td>
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<td>R7 – A16</td>
<td>Reach 7 – Side Channels Only</td>
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<td>R8 – A3</td>
<td>Reach 8 – Banks &amp; Tribs Only</td>
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<tr>
<td>Best Buy Plan No.</td>
<td>Plan Components (Reach/Alternative)</td>
<td>Plan Components (Name)</td>
<td>Average Annual Cost</td>
<td>Average Annual Habitat Unit</td>
<td>Total Cost (No O&amp;M)</td>
<td>Real Estate Percentage of Total Cost</td>
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<td>R1 – A11 Reach 1 – Charrette Team 4</td>
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<td>R2 – A13 Reach 2 – Charrette Team 6</td>
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<tr>
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<td>R3 – A18 <em>Reach 3 – Comprehensive Pockets</em></td>
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<td>R6 – A8 Reach 6 – Charrette Team 1</td>
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<td>R7 – A16 Reach 7 – Side Channels Only</td>
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<td></td>
<td>R8 – A3 Reach 8 – Banks &amp; Tribs Only</td>
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<td>R3 – A18 Reach 3 – Comprehensive Pockets</td>
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<td>R5 – A5 Reach 5 – City: Los Feliz to Arroyo Seco</td>
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<td>R6 – A8 Reach 6 – Charrette Team 1</td>
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<td>R7 – A16 Reach 7 – Side Channels Only</td>
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<td>R8 – A3 Reach 8 – Banks &amp; Tribs Only</td>
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<td></td>
<td><strong>Total:</strong> $53,616,857</td>
<td>6,901</td>
<td><strong>$1,142,415,672</strong></td>
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</table>
4.12 SELECTION OF THE FINAL ARRAY

This section describes how the final array was identified and the elements of each plan. A final array was selected from the best buy plans for further analysis. Selection of the final array was also based on the output from the CE/ICA analysis and the performance criteria for objectives. The final array provides a reasonable range of alternatives and at least minimally meets project objectives.

4.12.1 Objectives Performance Targets

The objective performance targets for ecosystem restoration were met, or not met, by the best buy alternatives as shown in Table 4-8 and Table 4-9 below.

Table 4-8 Targets Met by Best Buy Plans under Objective 1

| OBJECTIVE 1: RESTORE VALLEY FOOTHILL RIPARIAN AND FRESHWATER MARSH HABITAT |
|---|---|
| Target | Alternatives Analysis |
| Removal and management of invasives to less than 10 percent within 5 to 7 years post-construction of each feature. Includes both existing habitat in soft bottom reaches and proposed in channel habitat. | Each of the best buy Alternatives 2 to 21 would meet this part of the objective. |

For Valley Foothill Riparian Habitat:

<table>
<thead>
<tr>
<th>Target</th>
<th>Alternatives Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restore structurally diverse riparian habitat consisting of herbaceous (e.g., herbaceous vine cover), shrub (e.g., shrubby willow thicket), and tree (e.g., mature cottonwood-willow trees) layers in a minimum of five reaches resulting in 3 contiguous reaches. Restore riparian habitats with a varying number of structural layers (one, two, and three layers) to support survival and reproductive requirements for riparian obligate and transient wildlife species, including food, water, shelter, breeding, migration, and dispersal (Krueper, 1995).</td>
<td>This is accomplished beginning with Alternative 6, which restores overbanks in Reaches 1 and 2 and daylights streams in Reaches 3 to 5 (4 and 5 being soft bottom reaches). An additional reach and increasing area of restoration is added in Alternatives 7 to 21 to incrementally greater degrees.</td>
</tr>
<tr>
<td>Restore a minimum of 2 aquatic habitat nodes with a natural hydrologic connection to the river and riparian communities with a minimum distance of 150 meters from the water’s edge to create areas capable of functioning as core habitat and refuge for native reptiles and amphibians (Semlitsch and Bodie 2003) and to minimize the risk of localized extinction due to natural disasters (IE flood, fire, drought) (Schippers et al. 1996; Dunning et al. 1995).</td>
<td>Habitat nodes are added in all alternatives in increasing degrees, but is not accomplished as described here for nodal core habitat and refuge until Reach 6 is added in Alternative 7 and is not accomplished in a second node until Alternative 8 adds Reach 8, with an additional large node added in Alternative 20.</td>
</tr>
<tr>
<td>Within 5-10 years of construction, restore and maintain dense, structurally diverse riparian habitat sufficient to maintain survival and reproductive needs of wildlife. Restore a minimum of one habitat node with a minimum width of 250 meters (820 feet) to support high frequencies of the Federally endangered least Bell’s vireo (Kus 2002).</td>
<td>A riparian strand with a width greater than 250 meters can only be achieved at the LATC site, where these river adjacent parcels can support larger scale restoration and sustain enough riparian habitat to support high frequencies of least Bell’s vireo. This is accomplished only by Alternatives 8 to 21 that include Reach 8 measures at LATC.</td>
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</tbody>
</table>
### OBJECTIVE 1: RESTORE VALLEY FOOTHILL RIPARIAN AND FRESHWATER MARSH HABITAT

<table>
<thead>
<tr>
<th>Target</th>
<th>Alternatives Analysis</th>
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</thead>
<tbody>
<tr>
<td>For Freshwater Marsh and Fish Habitat:</td>
<td></td>
</tr>
<tr>
<td>Restore functioning freshwater marsh habitat consisting of emergent herbaceous vegetation (i.e., cattails, rushes, sedges) adapted to saturated soil conditions.</td>
<td>There is minimal restoration of freshwater marsh in Alternatives 2 to 12 through daylighted streams. There is a significant increase in freshwater marsh restoration added in Reach 6 in Alternatives 13 to 15. There is an incremental increase in marsh restoration in Alternatives 16 to 21, with restoration of marsh in the Los Angeles River State Historic Park in Reach 7 beginning in Alternatives 18 to 21 and at LATC beginning with Alternatives 16 to 21.</td>
</tr>
<tr>
<td>Restore aquatic habitat to support survival and reproductive requirements for fish and wildlife species, including food, water, shelter, breeding, migration, and dispersal.</td>
<td>Freshwater marsh adds refugia for fish and supports requirements for survival and reproduction for fish and other aquatic wildlife. There is some potential increase in freshwater marsh beginning with widening in Reach 6 in Alternative 7. There is a significant increase in freshwater marsh restoration added in Reach 6 in Alternatives 13 to 15, and an incremental increase in this restoration in Alternatives 16 to 21 that meets the needs for resting, nesting, and escape.</td>
</tr>
<tr>
<td>For a More Natural Hydrologic and Hydraulic Regime:</td>
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<tr>
<td>Expansion of the River into at least one large, contiguous river adjacent area within the study area that promotes hydrologic connections to the floodplain and overbank areas.</td>
<td>This can only occur with inclusion of Taylor Yard or LATC. Taylor Yard is first added with expansion of the river in Alternatives 7 to 12 with an incremental increase in this reach in Alternative 13. LATC is first added in Alternatives 8 to 15 with diversion of flows and then greatly increased hydrologic/hydraulic connection is added in Alternatives 16 to 21.</td>
</tr>
<tr>
<td>Widen channel to accommodate meandering of the River in at least one reach</td>
<td>This can occur with inclusion of Taylor Yard or LATC. Taylor Yard is first added with expansion of the river in Alternatives 7 to 12 with an incremental increase in this reach in Alternative 13. LATC is first added in Alternatives 8 to 15 with diversion of flows and then greatly increased hydrologic/hydraulic connection is added in Alternatives 16 to 21. Further widening occurs in Alternatives 15 to 21 in Reach 5 with widening of the river from trap to vertical banks in Reach 5, and in Alternatives 17 to 21 with widening of the river from trap to vertical banks in Reach 2.</td>
</tr>
<tr>
<td>Connect river hydrologically (assisted or naturally) to overbank with at least one such connection per reach</td>
<td>The river is connected hydrologically to the overbank in each reach in Alternatives 10 to 21 through daylighting streams, using stormwater capture to sustain riparian vegetation on the overbank and then letting overbank flows enter the river, reconnection of the floodplain through widening, terracing and creating side channels. And by slowing any overbank flooding with riparian overbank habitat areas.</td>
</tr>
<tr>
<td>Within the main stem of the river, when increasing vegetation, target velocity should be less than 12 ft/s and ideally 8 ft/s</td>
<td>In channel vegetation is increased beginning with Alternative 7 when Reach 6 is added and with incremental increases at Alternatives 15, 16, and 17.</td>
</tr>
<tr>
<td>Restore seasonal overbank flooding to river adjacent areas for sustainability of habitat and natural ecological, hydrologic processes</td>
<td>This is accomplished by best buy Alternatives 7 to 21 in Reach 6 in Taylor Yard and 16 to 21 in Reach 8 in LATC. It is minimally accomplished with side channels in Reach 3 in 12 to 21 and in Reach 4 in 9 to 21.</td>
</tr>
</tbody>
</table>
Table 4-9 Targets Met by Best Buy Plans under Objective 2

<table>
<thead>
<tr>
<th>OBJECTIVE 2: INCREASE HABITAT CONNECTIVITY</th>
<th>Alternatives Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restoration of riparian and wetland aquatic wildlife habitat at tributary confluences to create connectivity to similar upstream habitats on the tributaries with ultimate nodal connection to the aquatic habitats in the San Gabriel and Verdugo Mountains (at least one major tributary connection should be restored.)</td>
<td>Reconnection hydrologically with at least one main tributary is first added in Alternative 11 with connection to the San Gabriels. Hydrologic reconnection with a second major tributary is added in Alternative 20 with added connection to the Verdugo Mountains.</td>
</tr>
<tr>
<td>Restore habitat corridors between large nodes in the ARBOR area to maximize connectivity for wildlife movement and dispersal on the local scale and minimize the risk of habitat sinks in an urban environment (Hilty et al. 2006, Hanski &amp; Thomas 1994, Rudd 2002, Noss 1983), and to provide opportunities for regional wildlife movement</td>
<td>Large nodes that can be restored are at Taylor Yard, LATC and Verdugo Confluence. Existing habitat nodes adjacent to the river with connection to the Santa Monica Mountains are through Headworks in Reach 1 and Griffith Park in Reach 4. Reach 1 is first added in Alternative 3 with a connection through Headworks, Reach 6 is first added creating a large nodal connection to the river in Alternative 7, a second large nodal connection in Reach 8 is added in Alternative 8, Reach 4 with a side channel connection into Griffith Park is added in Alternative 9, a second connection to Griffith Park with a side channel in Ferraro Fields is added in Reach 3, Alternative 12, and a third large nodal connection is added in Verdugo Wash in Reach 3 in Alternative 20.</td>
</tr>
<tr>
<td>Restoration of wildlife habitat on channel banks</td>
<td>This is accomplished in Alternative 1 and is increased incrementally through Alternative 21. Restoration on the channel bank increases with inclusion of Taylor Yard in 7, and jumps again with inclusion of LATC in Alternative 7. Further reconnection is made with banks to Los Angeles River State Historic Park (Cornfields) in Reach 7 in Alternative 18.</td>
</tr>
<tr>
<td>Improved connectivity within the ARBOR area through restoration of habitat nodes with wetland and riparian habitat that are naturally hydrologically connected to the river corridor upstream and downstream of the Glendale Narrows.</td>
<td>The first natural hydrological connection to restored habitat nodes connected to the river corridor is added in Alternative 4 with a daylighted stream in Reach 5, and each larger alternative adds incrementally increased hydrologic connections with the most significant jumps in connections added with Alternatives 9, 11, 13, 16 and 20.</td>
</tr>
<tr>
<td>Lengthen the extent of contiguous vegetated pathways for reptile and small/medium mammal movement (currently limited to Reaches 4 to 6), to achieve upstream and/or downstream connections to at least one additional tributary or open space area that is currently isolated from the soft-bottom reach. This may be achieved by either in-channel or side-channel vegetated corridors.</td>
<td>Upstream riparian restoration connections in contiguous reaches begin with Alternative 2. However, downstream contiguous vegetated pathways are not wholly achieved. Downstream pathways are increased incrementally beginning with Alternative 10 and incrementally increase through Alternative 21. Alternatives 11 to 21 have the greatest amount of contiguous vegetated pathways.</td>
</tr>
<tr>
<td><strong>Ideally, the alternatives will also achieve the following:</strong></td>
<td>This occurs in alternatives that include Taylor Yard, LATC, or the Griffith Park or Ferraro Fields side channels. The Griffith Park side channel is first added in Alternative 9, Taylor Yard is first added in Alternative 8, LATC is first added in Alternative 8, and Ferraro Fields side channel is first added in Alternative 12.</td>
</tr>
<tr>
<td>Expansion of riparian and wetland wildlife habitat into large, contiguous river adjacent lands within the study area to support higher abundance of wildlife and more significant nodal connections to nearby ecological zones.</td>
<td>Upstream riparian restoration connections in contiguous reaches begin with Alternative 2. However, downstream contiguous vegetated pathways are not wholly achieved. Downstream pathways are increased incrementally beginning with Alternative 10 and incrementally increase through Alternative 21.</td>
</tr>
<tr>
<td>Provide connectivity (via contiguous or near-contiguous vegetated movement pathways) between all of the reaches within the study area.</td>
<td>This occurs in alternatives that include Taylor Yard, LATC, or the Griffith Park or Ferraro Fields side channels. The Griffith Park side channel is first added in Alternative 9, Taylor Yard is first added in Alternative 8, LATC is first added in Alternative 8, and Ferraro Fields side channel is first added in Alternative 12.</td>
</tr>
<tr>
<td>Include Reach 7 to provide nodal connections to San Gabriel Mountains via Arroyo Seco confluence and/or other smaller tributaries and to provide potential for future direct connections to the mountains via other projects upstream on Arroyo Seco</td>
<td>Reach 7 with restoration of the Arroyo Seco confluence is first added in Alternative 11. Smaller daylighted streams are added in Reach 5 in Alternative 4 with additional small streams added in Reach 4 in Alternative 5, Reach 3 in Alternative 6, Reach 6 in Alternative 7, Reach 8 in Alternative 8, and Reach 7 in Alternative 10. A second major tributary (Verdugo Wash) is connected in Alternative 20.</td>
</tr>
</tbody>
</table>
4.12.2 Comparisons

Using the results of the CE/ICA analysis, the design team and Sponsor closely examined the CE/ICA box plots, descriptions, and cost data. Costs are the preliminary costs for the Final Array Plans included in the Draft IFR. As explained in Chapter 6, following the public review period for the Draft IFR, USACE performed further analysis that included a more detailed cost analysis and made further cost updates. The updated costs based on the more detailed analysis, compared with the cost estimates included in the Draft IFR, are presented in section 6.6.3. Based on performance targets for objectives and CE/ICA analysis, best buy alternatives were screened or retained for inclusion in the final array as follows:

- All alternatives met targets for their included reaches for invasives removal and management.
- Alternatives 2 to 6 range in incremental benefits from $108 million to $330 million and incremental benefits increase from 2,761 to 5,292 AAHU’s. Alternatives 8 and 9 meet performance targets for valley foothill riparian restoration, Alternatives 7-9 partially meet criteria for 3 out of 5 targets for restoring to a more natural hydrologic regime, and hydraulics meet 1 out of 2 criteria for restoration of freshwater marsh and fish habitat; and minimally meet criteria in 4 out of 8 targets for connectivity. Therefore, they were not carried forward.
- The extent of upstream to downstream habitat connectivity is important for restoration of wildlife movement within the study areas and in the region. The Glendale Narrows (Reaches 4, 5, and 6) currently support riparian vegetation with concrete slopes, but upstream and downstream areas (Reaches 1, 3, 7 and 8) have a fully concrete channel. Alternatives 2 to 9 do not significantly meet connectivity criteria for connections between upstream and downstream areas.
- Alternative 10 first costs are $345 million, adds the additional Reach (7) connecting the entire study area, and provides 5,321 AAHU’s. This is the first alternative that includes restoration in all reaches. Alternative 10 meets targets for valley foothill riparian by restoring a structurally diverse habitat, in contiguous reaches, with varying structural layers, supports wildlife survival requirements, and includes riparian nodes of sufficient width to support wildlife requirements. It minimally meets targets for a more natural hydrologic and hydraulic regime by inclusion of Taylor Yard widening. Overbank connections are made with daylighted streams, stormwater capture, widening, terracing, and side channels. It restores seasonal and overbank flows in Reach 6 and increases naturalized areas in the river mainstem in Reach 6. It minimally meets all conditions for Objective 1 except it does not meet all criteria for hydrologic connections.
- Restoration of tributary confluences was included to begin to improve hydrologic and habitat connectivity in the watershed and improve wildlife corridors to other significant ecological areas such as the Verdugo and San Gabriel Mountains. Ultimately, other in-progress restoration efforts on the tributaries (beyond the study area boundaries) would provide further improvements to these connections. Measures that address these criteria were daylighting storm drains, adding side channels, and restoration work on tributaries to address Objective 2. Alternative 10 increases hydrologic and hydraulic connections by daylighting streams, reconnecting floodplains, and reconnecting wildlife habitat to overbanks. It connects not only to upstream but downstream through Reach 8 but does not restore connections to a major tributary. Alternative 10 provides the lowest cost ($347 million) opportunity to meet objectives for connectivity and changes in hydrologic regime, and is therefore carried forward into the final array.
- The group of Alternatives 10 to 13 range in total costs from $347 million to $444 million (Alternative 13). Habitat benefits increase from 5,321 units to 5,902 (Alternative 13). Within this grouping there are significant changes within Alternatives 10 to 13. Reaches 3, 6, and 7 are changed. Alternative 13 accomplishes all that Alternative 10 does, and adds freshwater marsh...
habitat to better meet Objective 1. Connectivity is increased with additional contiguous pathways and restoration of the confluence at Arroyo Seco, the most significant tributary in the ARBOR reach with potential to connect to future restoration planning on that tributary. **Alternative 13 is the second alternative to be carried forward into the final array for further comparison, providing 5,902 AAHU’s and costing $442 million.**

- The next incrementally grouped alternatives are 14 to 16. These alternatives range in benefits from 6,003 to 6,610 AAHU’s with a total cost range from $495 million to $825 million. These all meet targets for performance on Objective 1 with Alternative 16 showing an incremental jump in restoration of freshwater marsh, riffle-pool complexes, and conditions for native fish survival, greater hydrologic/hydraulic connections, and other related conditions. **Alternative 16 is the third alternative carried forward into the final array, providing benefits of 6,610 AAHUs and a cost of $774 million.**

- The remaining Alternatives 17 to 21 incrementally increase the habitat value from 6,643 to 6,901 AAHUs and have significantly increased total costs ranging from $845 million to $1.1 billion. In addition to the benefits and measures included in the other alternatives, these alternatives include widening and increased habitat in the river bed in Reach 2, and connection to the Los Angeles River State Historic Park (Cornfields) in Alternatives 18 to 21. Alternative 20 shows the greatest single increase in habitat value in this group with the addition of restoration of the confluence of a second major tributary (Verdugo Wash), increasing natural hydraulic conditions and regional connectivity. **This is the fourth alternative carried forward into the final array with benefits of 6,883 AAHUs and a cost of $1.04 billion.**

**4.12.3 Final Array of Alternatives***

The CE/ICA analysis yielded 21 Best Buy plans with a very wide range of both cost and output. The cost of the Best Buy Plans ranged from approximately $3 million to $1.2 billion. Output, measured by the CHAP analysis in terms of increased average annual habitat units (AAHUs), ranged from 392 AAHUs to 6,901 AAHUs. The wide range of plans represented a challenge in terms of identifying a subset of final array plans that best met planning objectives while also providing a distinct tradeoff between cost and output necessary for the ultimate identification of the National Ecosystem Restoration (NER) Plan. As described in the ER 1105-2-100 the NER Plan is the alternative and scale having the maximum excess of monetary and nonmonetary beneficial effects over monetary and nonmonetary costs. This plan occurs where the incremental beneficial effects just equal the incremental costs, or alternatively stated where the extra environmental value is just worth the extra costs. The PGN also notes that in all but the most unusual cases, the NER Plan should be derived from the final set of Best Buy solutions.

Key considerations in the determination of the final array alternatives to carry forward included not only the results of efficiency, as measured by the CE/ICA, but the extent to which plans met key planning objectives, the significance of plan outputs, and plan acceptability, completeness and effectiveness. The table below summarizes cost and output data for the final array plans (Table 4-10) included in the Draft IFR. Costs presented in Table 4-10 are the preliminary costs for the Final Array Plans included in the Draft Report. Costs were subsequently refined and updated. Detailed, updated costs for both the NER Plan and Locally Preferred Plan are presented in Chapter 7.
Table 4-10 Final Array Costs and Outputs (Price Level April 2013)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>No Action</th>
<th>Alt 10 ART</th>
<th>Alt 13 ACE</th>
<th>Alt 16 AND</th>
<th>Alt 20 RIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>NER Costs &amp; Benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total First Cost</td>
<td>$0</td>
<td>$346 million</td>
<td>$442 million</td>
<td>$757 million</td>
<td>$1.04 billion</td>
</tr>
<tr>
<td>Total Investment Cost</td>
<td>$0</td>
<td>$347 million</td>
<td>$444 million</td>
<td>$774 million</td>
<td>$1.06 billion</td>
</tr>
<tr>
<td>Average Annual Project Cost</td>
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<td>$16.06 million</td>
<td>$20.67 million</td>
<td>$36.61 million</td>
<td>$49.76 million</td>
</tr>
<tr>
<td>Incremental Annual Cost</td>
<td>$0</td>
<td>$16.06 million</td>
<td>$4.61 million</td>
<td>$15.93 million</td>
<td>$13.15 million</td>
</tr>
<tr>
<td>Net Average Annual Habitat Output</td>
<td>0</td>
<td>5,321</td>
<td>5,902</td>
<td>6,509</td>
<td>6,782</td>
</tr>
<tr>
<td>% Increase versus No Action</td>
<td>0%</td>
<td>93%</td>
<td>104%</td>
<td>114%</td>
<td>119%</td>
</tr>
<tr>
<td>Incremental Output</td>
<td>0</td>
<td>5,321</td>
<td>581</td>
<td>607</td>
<td>273</td>
</tr>
<tr>
<td>Inc. Cost per Unit Output *</td>
<td>$0</td>
<td>$3,019</td>
<td>$7,936</td>
<td>$26,249</td>
<td>$48,186</td>
</tr>
</tbody>
</table>

* Costs presented in Table 4-10 are the preliminary costs for the Final Array Plans included in the Draft IFR. As explained in Chapter 6, following the public review period for the Draft IFR, USACE performed further analysis that included a more detailed cost analysis and made further cost updates. The updated costs based on the more detailed analysis, compared with the cost estimates included in the Draft IFR, are presented in section 6.6.3.

Alternative 10 was identified as the minimally acceptable plan to include in the final array as meeting objectives and the purpose and need. Although incremental output, based upon the AAHUs quantified by the CHAP analysis, for Alternative 10 was not significantly greater than Alternative 9, Alternative 10 is the first alternative that includes restoration in all 8 reaches, which is a key objective (Objective 2) to support restoration of nodal and regional connectivity for wildlife. This was one of the most important considerations in the assessment of plan effectiveness and acceptability. The importance of habitat connectivity is described in Section 2.2.4.

Alternatives 13, 16 and 20 represented key break points in the CE/ICA curve. As shown in Figure 4-4, incremental costs increase substantially for larger scale Best Buy plans. These are logical plans to carry forward for the final array, since they represent potential decision points for focusing the “Is it worth it?” questioning process. As shown in the table above, the final array plans vary substantially in terms of cost, output, and incremental costs per unit of output. Figure 4-4 depicts the CE/ICA graph, focusing exclusively on the final array plans.
Substitution – For the Final Array Plans to be carried forward for more detailed analysis, the Study Team modified the composition of Best Buy Plans 16 and 20 as identified through the CE/ICA analysis to substitute a smaller best buy alternative within Reach 6. Based upon the CE/ICA analysis, Best buy Alternative 13 included preliminary Alternative 13 in Reach 6, but Best Buy Plans 16 and 20 included Preliminary Alternative 8 instead. Preliminary Alternative 13 in Reach 6 includes freshwater marsh and widens the riverbed more than the reach sub-plan from Preliminary Alternative 8. Preliminary Alternative 13 also represents a cost savings of $51 million dollars versus Preliminary Alternative 8. Alternatives 16 and 20 remain cost effective and efficient plans with this substitution of including the smaller scale best buy alternative for Reach 6, since they are both comprised of best buy alternatives for all reaches. In particular, preliminary Alternative 13 for Reach 6 has a lower average cost per habitat unit than preliminary Alternative 8, while only having a minor reduction in AAHUs (1448 AAHUs vs. 1548 AAHUs). For these reasons, Reach 6 Alternative 13 was carried forward as a component of Final Array Plans 16 and 20.

4.13 NO ACTION ALTERNATIVE
The USACE is required to consider “No Action” as one of the alternatives to comply with the requirements of NEPA. The No Action Alternative is synonymous with the “without project condition” and is the basis against which all other alternative plans are measured. It assumes that no new project(s) will be implemented by the Federal government to achieve the planning objectives. Future development in the ARBOR reach would occur in accordance with currently adopted plans. This alternative has already been considered in the without project condition. For CEQA purposes, the City is required to consider the No Project Alternative. For purposes of this analysis, it is assumed that the No Action Alternative and No Project Alternative are the same.

Under the No Action Alternative, the identified problems would continue during the period of analysis. Continued human intervention and activities associated with urban development would further degrade
habitat in the study area, and possibly prevent any future restoration from being practical, feasible, or cost-effective. The habitat team assumed that there would be an increase in the presence of invasive plant species in riparian areas on the river and on the tributaries, urban influences from future planned developments, and a reduction in the number of species present within the study area overtime. A 25- and 50-year planning horizon was used to evaluate these assumed changes. These assumptions are described in further detail in Appendix G. Baseline habitat units were based on 842 acres. Baseline habitat value was 6,119 habitat units with a reduction in habitat value over the next 50 years to 5,291 habitat units. This represents a 14 percent reduction in habitat value in an already severely degraded habitat. Most of this reduction is expected to occur because of an increase in invasive vegetation with some increased effects of urbanization.

4.14 ACTION ALTERNATIVES

4.14.1 Summary

The Corps is required to consider a reasonable range of alternatives in the IFR. Where alternatives are considered but dismissed from further consideration, the reasons for their dismissal are briefly provided. The formulation strategy and dismissal of alternatives initially considered is discussed earlier in this chapter.

Four action alternatives composed the final array in the Draft IFR. The alternatives were named to assist the team, reviewers, and the public. The no action alternative is a part of the final array and provided a fifth alternative. In this Final IFR, a variation on Alternative 13, substituting the Reach 7 plan from Alternative 20, is also evaluated. This variation is within the spectrum of alternatives analyzed in the Draft IFR, as further discussed below.

The following alternatives were identified in the Draft IFR. These alternatives include construction of restoration features in and along the river in specific locations as well as removal of non-native vegetation throughout the channel bottom of the river and lower tributaries within the ARBOR reach, particularly in soft-bottom channel areas. The influence of restoration features extend beyond their immediate footprint to adjacent in-channel areas, increasing functions through additional shading, inputs of leaf litter and small woody debris, and foraging opportunities as discussed in Section 5.5. These elements, along with proposed improvements for wildlife access in certain areas, and new nodal connections provided by the active restoration features, make the entire river channel within the study area more conducive for wildlife movement. All alternatives described below include the channel bottom throughout the ARBOR reach in the restoration plan for that alternative.

Alternative 10

Alternative 10 is called the ART (for ARBOR Riparian Transitions) as it provides some restoration in all reaches and provides transitions or connections between existing riparian corridors and concrete lined river reaches. This basic restoration plan includes only minimal restoration at Taylor Yard and excludes restoration at both major confluence areas at the Arroyo Seco and Verdugo Wash. In Reach 1, it establishes riparian corridors along the overbanks of both sides of the River channel, improving potential wildlife connections from the river to the Headworks study site and the Santa Monica Mountains. It also restores riparian habitat at the Pollywog Park Area of Griffith Park and along the left overbank of the Burbank Western Channel. In Reach 2, the plan continues the establishment of the riparian corridor along the overbank on both sides of the River, with habitat connections to the Santa Monica Mountains. In Reach 3, it continues the riparian corridor on the right side of the River along Zoo Drive and daylights and restores riparian and freshwater marsh habitat at three streams currently encased in culverts, two on the east side of the River and one on the west side. In Reach 4, it establishes a riparian corridor on the left...
overbank, creates a side channel at the edge of Griffith Park Golf Course with inlet and outlet to the River under I-5 on the right bank, lowers a portion of the Los Feliz Golf Course on the left bank of the River to allow seasonal flooding through existing culverts, and daylights eight streams. In Reach 5, this alternative continues the riparian corridor on the left overbank and includes a daylit stream at the downstream end. In Reach 6, it widens the channel, approximately 80 feet along Taylor Yard, restores riparian habitat in the widened area and overbank, and creates a small terraced area in the Bowtie parcel. Restoration is continued in Reach 7 with three daylit streams. In Reach 8, at the LATC site, it restores a historic wash and riparian habitat. This restoration would allow flows from the ephemeral wash to enter the River through existing culverts under the railroad lines. In addition to the specific features outlined above, this alternative removes invasive vegetation throughout the project footprint including river and tributary channel bottom areas. Alternative 10 addresses 528 acres, including approximately 105 acres of hard-bottom channel that benefits indirectly from the restoration measures, as described above. Alternative 10 minimally meets objectives, providing an increase in habitat of 93 percent over without-project conditions, and produces 5,321 habitat units (AAHUs). It increases habitat connectivity through restoration and creation of riparian corridors and increases hydrologic connectivity through daylighted streams.

Alternative 13

Alternative 13 is named ACE (for ARBOR Corridor Extension). Alternative 13 has the same restoration features as Alternative 10 in Reaches 1, 2, 4, 5, and 8 and provides additional restoration in Reaches 3, 6, and 7. In Reach 3, in addition to the measures identified in Alternative 10, this alternative would create a side channel entering upstream from the River behind Ferraro Fields and re-entering the River at the downstream end of the reach. In Reach 6, this alternative widens the river channel by over 300 feet into Taylor Yard with restoration of the floodplain and freshwater marsh in the widened channel. It also creates a backwater wetland at the Bowtie parcel, and it restructures the left bank upstream of the backwater wetland and downstream of Taylor Yard, as well as the entirety of the right bank, in this reach with implanted vegetation. In Reach 7, this alternative restores a portion of the Arroyo Seco tributary and makes nodal connections on the left side of the River to the Arroyo Seco watershed. This is accomplished through softening of the bed and banks with development of a riparian corridor in the tributary confluence and for one half mile upstream. The Arroyo Seco restoration supports connections through the River from the Santa Monica Mountains to the San Gabriel Mountains. Instead of the daylighted streams included in this reach in Alternative 10, this alternative lines the banks of the River downstream from the Arroyo Seco with overhanging vines and implanted vegetation. In addition to the specific features outlined above, this alternative removes invasive vegetation throughout the project footprint including river and tributary channel bottom areas. Alternative 13 addresses 588 acres, including approximately 105 acres of hard-bottom channel that benefits indirectly from the restoration measures, as described above. Alternative 13 increases restored habitat by 104 percent over without-project conditions and by 11 percent over Alternative 10. Alternative 13 delivers 581 more AAHUs than Alternative 10. Nodal connections for wildlife are increased by 309 percent over Alternative 10. Alternative 13 meets objectives in all reaches.

Alternative 16

Alternative 16 is called AND (for ARBOR Narrows to Downtown). This alternative includes the same features as Alternative 13 in Reaches 1-4 and 6-7 and includes greater restoration in Reaches 5 and 8. In Reach 5, this alternative widens the River channel by modifying the right bank from a trapezoidal bank to a vertical wall and modifies the left bank from trapezoidal to a terraced vegetated bank. At the downstream end of this reach, the River channel will also be widened by modifying the left bank. The daylighted stream in Alternatives 10 and 13 is also included in this reach. In Reach 8, the alternative includes additional restoration by terracing upstream of LATC on the right bank of the River, terracing downstream on the left bank, and removing the left bank and the concrete bed adjacent to LATC. The channel bed will be naturalized to support freshwater marsh in the River. This alternative widens the
River into the LATC site by 500 feet on a low terrace and another 1000 feet on a second terrace. The restoration features at the LATC site would also include the restoration of the historic wash, along with wetland habitat. In addition to the specific features outlined above, this alternative removes invasive vegetation throughout the project footprint, including river and tributary channel bottom areas. Alternative 16 addresses 659 acres, including approximately 91 acres of hard-bottom channel that benefits indirectly from the restoration measures, as described above. The features in Alternative 16 provide an increase in habitat of 114 percent over without project conditions and 10 percent over Alternative 13. This alternative provides 607 more AAHUs than Alternative 13. Nodal connections are increased above that provided in Alternative 13 by 85 percent. This alternative meets all objectives.

Alternative 20

Alternative 20 is called RIVER (for Riparian Integration via Varied Ecological Reintroduction) as it includes the same features as Alternative 16 in Reaches 1, 4, 5, 6, and 8 and includes greater restoration in Reaches 2, 3 and 7. In Reach 2, this alternative widens the River channel by modifying the right bank from a trapezoidal bank to a vertical wall. In Reach 3, the alternative restores the confluence with Verdugo Wash by softening the bed of the stream and significantly widening the mouth of the wash, thus providing riparian habitat and an additional connection to the San Gabriel Mountains through the Verdugo Hills. In Reach 7, this alternative includes the same Arroyo Seco restoration as Alternative 13, and in addition, reintroduces the daylighted streams included in Alternative 10 in lieu of the channel bank vegetation features that were in Alternatives 13 and 16. Also in Reach 7, this alternative restores freshwater marsh at the Los Angeles State Historic Park and creates a terraced bank connection to the River. In addition to the specific features outlined above, this alternative removes invasive vegetation throughout the project footprint, including river and tributary channel bottom areas. Alternative 20 most fully meets planning objectives, with inclusion of some degree of channel naturalization and restoration in nearly all reaches, restoration of two major confluences, and restoration of a connection between the River and the Los Angeles State Historic Park. Alternative 20 addresses 719 acres, including approximately 91 acres of hard-bottom channel that benefits indirectly from the restoration measures, as described above. Habitat is increased by 119 percent over without project conditions and 5 percent over Alternative 16. This alternative provides 273 more AAHUs than Alternative 16. Nodal connectivity is increased over Alternative 16 by 120 percent.

Identified Variation on Alternative 13

As explained in the Draft IFR, the four alternatives that were presented for detailed consideration in the Draft IFR were composed of various reach plans. The four alternatives identified in the Draft IFR represent the spectrum of reasonable alternatives that substantially respond to the purpose and need statement. Agencies are obligated to evaluate a reasonable range of alternatives in enough detail so that a reader can compare and contrast the environmental effects of the various alternatives. The EIS portion of the IFR evaluates the impacts associated with each alternative and discloses the impacts by reach or major feature where appropriate.

As described in the Draft IFR, comments received could indicate that a reasonable alternative should be modified somewhat. If the modification is reasonable, the Corps should discuss it in the final IFR. If a comment indicates a variation on an alternative that was not considered by the agency, the Corps will also consider whether that variation is reasonable and if it is reasonable, will consider it in the final IFR. If the Corps does not view the modification or variation to be reasonable, the Corps will explain why it does not warrant further response. If it is qualitatively within the spectrum of alternatives that were discussed in the draft, a supplemental draft will not be needed. (Memorandum to Agencies: Forty Most Asked Questions Concerning Council on Environmental Quality’s NEPA Regulations, 46 Fed. Reg. 18026 (1981)) If a reasonable variation is suggested by a comment that is qualitatively beyond the spectrum of alternatives already discussed, then a supplemental draft would be needed to consider and solicit
comment on that new and substantially different plan. The alternatives considered in detail provide a range of restoration efforts, with Alternative 10 including the lowest level of restoration and Alternative 20 the most intensive and largest footprint of restoration. Therefore, identification of variations or alternatives within this spectrum generally does not require a supplemental IFR.

Ultimately, this process is intended to result in an informed recommendation of a project for authorization. As described in the Draft IFR, the recommended project could be any of the four action alternatives and one no-action alternative analyzed in the Draft IFR, or a plan that modifies one of the four action alternatives to add features present in another alternative, substitutes one or more reach plans from a larger alternative, or is any other plan within the spectrum analyzed in the final IFR. The Draft IFR notified agencies, stakeholders, and the public that the plan ultimately selected may be an alternative within the spectrum of the final array alternatives fully analyzed in this draft IFR.

Following the public review period for the Draft IFR, the Corps performed further analysis that included a more detailed cost analysis, real estate cost updates, and further modified contingencies based upon a full cost risk summary analysis. This analysis identified a more cost effective variation on Alternative 13 that is identical to Alternative 13 except for Reach 7, where it includes the reach plan included in Alternative 20. This variation is within the spectrum of reasonable alternatives identified in the Draft IFR, and the reach plans composing it were analyzed in detail. The Reach 7 substitution provides greater benefits than Alternative 13 at lower cost. This variation was thus identified for inclusion in this Final IFR.

Alternative 13v (for variation) includes all the features of Alternative 13 with the exception of Reach 7, in which the Reach 7 plan from Alternative 20 is used. Like the other alternatives, this alternative includes invasives vegetation removal throughout the project footprint, including river and tributary channel bottom areas. Alternative 13v addresses 598 acres, including approximately 105 acres of hard-bottom channel that benefits indirectly from the restoration measures, as described above. Alternative 13v delivers 89 more AAHUs than Alternative 13, increases habitat by 106% over without project conditions, and increases nodal connectivity over Alternative 13 by 33%. It meets objectives in all reaches.

Summary of Restoration Differences Among Alternatives

While Alternative 10 includes restoration measures in each reach, the subsequent alternatives provide a greater extent of restoration. Alternative 13 adds major tributary restoration with inclusion of one half mile of the Arroyo Seco, while Alternative 20 adds another major tributary with restoration of the Verdugo Wash confluence. Alternative 10 has some channel widening in Reach 6, but the increased widening of Reach 6 in Alternative 13 is much more significant. Alternatives 16 and 20 include increasingly more extensive restoration that includes removal of concrete with naturalization of the channel bed and removal of the channel wall barrier in Reach 8, channel widening in Reaches 5 and 8 in Alternatives 16 and 20 with added widening in Reach 2 in Alternative 20. Alternative 13v provides the benefits of Alternative 13 in Reaches 1-6 and 8, and the Reach 7 benefits of Alternative 20.

Table 4-11 includes a matrix of the measures, in addition to invasives removal in each alternative in the final array. These measures are described in more detail in each alternative description. As described earlier the final array alternatives were formulated by recombining reaches from the original 19 alternatives to identify the most cost effective plans that met the planning objectives. This formulation process resulted in alternatives having some reach plans in common. Detailed plates showing the placement of measures can be found in Appendix A, Design.
### Table 4-11 Final Alternatives Measure Matrix

<table>
<thead>
<tr>
<th>Reach</th>
<th>Submeasure</th>
<th>Alternative</th>
<th>10</th>
<th>13</th>
<th>13v</th>
<th>16</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pollywog Park area of Griffith Park</td>
<td>Riparian habitat corridors</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2. Bette Davis Park area of Griffith Park</td>
<td>Restructure top of bank to support vines</td>
<td></td>
<td></td>
<td></td>
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<td>x</td>
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<tr>
<td></td>
<td>Riparian habitat corridors</td>
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<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
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<td></td>
<td>Modify trap channel to vertical banks</td>
<td></td>
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<td>x</td>
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<tr>
<td>3. Ferraro Fields area of Griffith Park</td>
<td>Create pool &amp; riffle system and plant for freshwater marsh</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td></td>
<td>Daylight streams plant with riparian fringe and freshwater marsh</td>
<td></td>
<td>x</td>
<td>x</td>
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<td></td>
<td>Divert flow into side channels with riparian fringe and return to the river</td>
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<td></td>
<td>Riparian habitat corridors</td>
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<td>x</td>
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<td></td>
<td>Open water habitat</td>
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<tr>
<td></td>
<td>Widen mainstem</td>
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<tr>
<td></td>
<td>Widen tributaries</td>
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<td></td>
<td>x</td>
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<tr>
<td>4. Griffith Park</td>
<td>Create pool &amp; riffle system and plant for freshwater marsh</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td></td>
<td>Daylight streams plant with riparian fringe and freshwater marsh</td>
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<td></td>
<td>Divert flow into side channels with riparian fringe and return to the river</td>
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<td></td>
<td>Riparian habitat corridors</td>
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<tr>
<td>5. Riverside Drive</td>
<td>Create pool &amp; riffle system and plant for freshwater marsh</td>
<td></td>
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<td></td>
<td>Daylight streams plant with riparian fringe and freshwater marsh</td>
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<tr>
<td></td>
<td>Wildlife access from river to bank (in daylighted streams)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Restructure channel walls to support vines</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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<td></td>
<td>Riparian habitat corridors</td>
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<td></td>
<td>Terrace banks</td>
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<tr>
<td></td>
<td>Modify trap channel to vertical banks</td>
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<tr>
<td>6. Taylor Yard</td>
<td>Create pool &amp; riffle system and plant for freshwater marsh</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td></td>
<td>Restructure channel walls to support vegetation</td>
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<td>x</td>
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<tr>
<td>Reach</td>
<td>Submeasure</td>
<td>Alternative</td>
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<td>13</td>
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<tr>
<td>Riparian habitat corridors</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Restructure top of bank to support vines and other vegetation</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td>Widen channel mainstem</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td>Widen channel sloping or terracing back to overbank levels</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Create pool &amp; riffle system and plant for freshwater marsh</td>
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<td>x</td>
<td>x</td>
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<tr>
<td>Daylight streams plant with riparian fringe and freshwater marsh</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Divert flow into side channels with riparian fringe and return to the river</td>
<td>x</td>
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<td>Riparian habitat corridors</td>
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<tr>
<td>Restructure channel walls to support vegetation, plantings.</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Widen channel (Arroyo Seco) sloping or terracing back to overbank levels</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Create pool &amp; riffle system and plant for freshwater marsh</td>
<td>x</td>
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<tr>
<td>Restore historic wash with riparian habitat</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Divert flow into side channels with riparian fringe and return to the river</td>
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<td>x</td>
<td>x</td>
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<tr>
<td>Wildlife access from river to bank</td>
<td>x</td>
<td>x</td>
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<td>Riparian habitat corridors</td>
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<td>x</td>
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<tr>
<td>Widen channel</td>
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<td>x</td>
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<tr>
<td>Terrace banks</td>
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</table>

**4.14.2 Alternative 10 (ART) Description by Reach**

In the ARBOR Riparian Transitions or ART plan, reaches would be restored to increase connections between upstream and downstream riparian areas and restore lost riparian strands on the overbank. This alternative restores/benefits a total of 528 acres, and each reach is described below. Figure 4-5 through Figure 4-8 at the end of this section display mapping of this alternative. In addition to removal of invasives species throughout the project footprint, this alternative includes the following specific restoration features.

**8. LATC**

- **Reach 1 Pollywog Park Area of Griffith Park**
  - Reach 1 sub-plan for all alternatives in the final array would implement a habitat corridor with riparian planting on the overbanks of both sides of the River and other nearby locations. Overbanks are those areas.
adjacent to the river where overland flow in flood events could occur in a natural river environment. Areas of restoration include the left overbank across the River from the Headworks Study Site, the Pollywog Park area of Griffith Park, the open area directly downstream of Headworks on the right overbank, and the left overbank of Burbank Western Channel (tributary from the north/west).

Riparian corridor restoration would involve planting a riparian community of cottonwood/willow, sycamore, mugwort, mulefat, and scarlet monkeyflower with a buffer of sagebrush, buckwheat, and native herbaceous plants. It would include irrigation for establishment and water harvesting features to sustain plants, including micro-grading and/or swales to capture and infiltrate water. Water sources could include reclaimed water, harvesting of stormwater and street runoff (with small wetland features at the end of adjacent streets), and/or highway runoff. Where stormwater or street runoff is excessive during storm events, a connection to the River would allow it to overflow into the channel. Establishment and drought management for this vegetation would utilize irrigation, either through flood irrigation (simulating a natural riparian regime) or drip irrigation, dependent upon the availability of water. In Pollywog Park, the water from an existing storm drain will spread/meander into the park, and during big storms may then flow back into the river at the downstream end through an existing culvert. There would be no substantial channel modifications within this reach. While there is a levee at the downstream end of this reach, any planting in that area would comply with all levee regulations. The set of measures in this reach sub plan was the most incrementally cost effective and with the most benefits for all alternatives in the final array. Figure 4-21 includes a rendering of Pollywog Park with restoration.

Reach 2 Bette Davis Park Area of Griffith Park

This reach sub-plan continues establishment of habitat corridors/riparian planting along the overbanks of both sides of the River. This includes restoration of riparian habitat in the Bette Davis Park area of Griffith Park on the left bank and the area between Zoo Drive and SR-134, with connections under the highway to a restored linear riparian planting along the River extending into Reach 3. There would be no channel modifications within this reach. Modifications to levees would comply with levee regulations. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 10, 13, 13v and 16.

Reach 3 Ferraro Fields/Verdugo Wash Area of Griffith Park

This reach sub-plan continues establishment of the riparian corridor along Zoo Drive on the right side of the River. It also daylights a stream currently confined in a large culvert just downstream of Ferraro Fields on the right bank in the Zoo Drive area and daylights two smaller streams on the left bank. Depending upon the length of the daylighted stream, it would be planted with riparian vegetation and end at the confluence with the River in a small freshwater marsh. If it is not possible to design an efficient confluence, the connection to the River would remain gated. Freshwater marsh vegetation would include clustered field sedge, fragrant flatsedge, Parish’s spikerush and common rush, scarlet monkey flower, California bulrush, narrow leaved cattail, and common cattail. There would be no modifications to the channel itself. Levee protection would remain. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternative 10.

Reach 4 Griffith Park

This reach sub-plan would restore riparian and wetland habitat by establishing a riparian corridor on the left bank of the River, daylighting eight streams, creating a side channel diverting river flows through the Griffith Park (Harding) Golf Course on the right bank, and lowering the Los Feliz Golf Course on the left bank to allow seasonal flooding through existing culverts.
The riparian corridor on the left overbank would be implemented as continuously as possible within the requirements of levee regulations. There would be no channel modifications within this reach. The side stream through Griffith Park would enter the park from the River under the I-5 Freeway (or farther upstream if necessary) and exit the park to reenter the River downstream under the I-5 as well. A riparian fringe of trees and marsh vegetation would line the new side channel. The Los Feliz Golf Course would be lowered, rebuilt, and allowed to seasonally flood (with no changes to the River channel walls) in order to establish a riparian habitat interspersed with the golf course greens. Figure 4-25 is a rendering of restoration at Los Feliz.

There are eight streams currently encased in culverts that would be opened and naturalized as tributaries as far upstream as possible (at a minimum opening up the stream within the River right-of-way). Depending upon the length of the daylighted stream, it would be planted with riparian vegetation and end at the confluence with the river in a small freshwater marsh. If it is not possible to design an efficient confluence, the connection to the River would remain gated.

This reach sub-plan was the most incrementally cost effective with the most benefits for all alternatives in the final array.

Reach 5 Riverside Drive

This reach sub-plan would continue implementation of the habitat corridor restoration in a narrow strip along the left overbank to avoid interference with the existing levee system (in compliance with current USACE guidance for vegetation on levees), and would daylight and restore one stream currently encased in a culvert with a riparian fringe and freshwater marsh. The stream would be opened and naturalized as far upstream as possible (at a minimum, this would open up a confluence within the River right-of-way). Depending upon the length of the daylighted stream, it would be planted with riparian vegetation and end at the confluence with the River in a small freshwater marsh of approximately 1 acre. If it is not possible to design an efficient confluence due to the levee, the connection to the river would remain gated. Examples can be found in Los Angeles at North Atwater Park.

This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 10, 13 and 13v.

Reach 6 Taylor Yard

Restoration measures in this reach sub-plan include increasing riparian habitat within the Bowtie site and at Taylor Yard. This would include widening the channel bed on the left side of the river by a minimum of 80 feet and connecting this new channel bed to the existing level of the overbank with a sloped bank vegetated with riparian plants. The length of this widening would extend through the beginning of the bend in the Bowtie site downstream for 700 feet through the G-2 Taylor Yard parcel and beyond, for a maximum of about 1,000 feet. Widening would include removal of concrete and excavation followed by reconstruction of the channel structure to stabilize the bank using grade control, rock walls with toe-ins (an extension of the wall below the bed), and/or geotextiles, and would provide for a gradual, undulating four-to-one (4:1) slope up to current grade. There is limited terracing at the downstream end of the Bowtie site as it transitions into the widened Taylor Yard. In the widened area, the riparian area on the overbank would be similar to that described for Reach 1 and the bank would be vegetated with plants that would survive seasonal inundation and would lay down in flood events.

At the upstream end of the Bowtie site, the channel banks would be lowered in an approximate 100-foot-wide by 600-foot-long riparian area by creating a setback in the channel wall with a terrace planted with riparian and marsh habitat. The terrace would be 10 feet above the channel invert transitioning from upstream and downstream ends. The left overbank along the Bowtie site would be planted with a riparian
corridor, irrigated for establishment, and water harvested from stormwater drainages. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternative 10.

**Reach 7 Arroyo Seco/Los Angeles State Historic Park**

This reach sub-plan would daylight three streams currently confined in storm drains/culverts. One is just upstream of Arroyo Seco on the opposite bank (right bank), and the others are downstream of Arroyo Seco. The second is on the right bank upstream of Los Angeles State Historic Park, and the third is on the left bank. Both streams on the right bank connect to the hills in Elysian Park. A freshwater marsh would be located in the daylighted area outside of the mainstem of the River channel. The streams would be opened and naturalized as tributaries as far upstream as possible (at a minimum opening up the stream within the River right-of-way). Depending on the length of the daylighted stream, it would be planted with riparian vegetation and end at the confluence with the River in a small freshwater marsh. If it is not possible to design an efficient confluence, the connection to the River would remain gated. There would be no modifications to the channel itself. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternative 10.

**Reach 8 LATC**

In this Reach 8 sub-plan, the LATC site would be restored with riparian habitat. Micro-grading would slope the site to restore the historical wash that once ran through this area. The restored historical wash would meander through the property and would be connected to the existing River channel through a wide culvert or designed confluence, if possible. The wash location would be determined by the USACE’s hydrology and hydraulic analysis and would be located in the most appropriate place. This reach sub-plan also establishes riparian habitat within the site.

There would be no channel modifications within this reach as water entering the River from the historical wash would be routed through existing storm drains in the channel wall. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 10, 13 and 13v.

### 4.14.3 Alternative 13 (ACE) Description by Reach

ARBOR Corridor Extension (ACE) Alternative 13 restores/benefits a total of 588 acres. In addition to removal of invasives species throughout the project footprint, this alternative includes the following specific restoration features. Restoration features are shown in Figure 4-9 through Figure 4-12 at the end of this section.

**Reach 1 Pollywog Park Area of Griffith Park**

This reach sub-plan is the same as described for Alternative 10. This Reach 1 sub-plan was the most incrementally cost effective with the most benefits for all alternatives in the final array.

**Reach 2 Bette Davis Park Area of Griffith Park**

This reach sub-plan is the same as described for Alternative 10. This Reach 2 sub-plan was the most incrementally cost effective with the most benefits for Alternatives 10, 13, and 16.

**Reach 3 Ferraro Fields/Verdugo Wash area of Griffith Park**

This reach sub-plan includes the three daylighted streams from the reach sub-plan for Alternative 10. In addition, using water diverted from the River, it creates a side channel that would flow along the west side of Ferraro Fields and reenter the River through the daylighted stream on the right bank. The side channel is depicted in Figure 4-23. The side channel would support a riparian fringe, and open water and freshwater marsh would be located in the daylighted area outside of the mainstem of the River channel.
This reach sub-plan continues and expands the riparian corridor from the reach plan for Alternative 10. Riparian areas would be located on the right overbank along Zoo Drive, along the River’s edge at Ferraro Fields, and between the daylighted streams on the left overbank. There would be no modifications to the channel itself. Levee protection would remain and levee vegetation policy would be followed. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 13, 13v, and 16.

**Reach 4 Griffith Park**

This reach sub-plan is the same as described for Alternative 10. This reach sub-plan was the most incrementally cost effective with the most benefits for all alternatives in the final array.

**Reach 5 Riverside Drive**

This reach sub-plan is the same as described for Alternative 10. It was the most incrementally cost effective with the most benefits for Alternatives 10, 13, and 13v.

**Reach 6 Taylor Yard**

The Reach 6 sub-plan in Alternative 13 restores riparian corridors and widens the soft bottom bed of the River by over 300 feet with additional slope back to the overbank elevation along the reach for a length of approximately 1,000 feet. At the upstream end of the reach, a back water wetland would be developed at river level, and there would be a small terraced area at the downstream end of the Bowtie parcel to facilitate the transition into the widened area at Taylor Yard. Aquatic riverine habitats including freshwater marsh would dominate the new river bed. The banks of the River, upstream of the Bowtie backwater wetland and downstream of Taylor Yard on the left bank and the entirety of the right bank, would be restructured to support overhanging vines and other vegetation. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternative 13, 13v, 16, and 20. Restoration at Taylor Yard is depicted in Figure 4-27 at the end of this section.

**Reach 7 Arroyo Seco/Los Angeles River State Historic Park**

In this Reach 7 sub-plan, the Arroyo Seco tributary would be restored with riparian habitat. This stream would have its banks and bed softened by removing concrete for approximately one-half mile upstream and planning riparian vegetation on its banks. It would be stabilized with erosion control elements to maintain the existing protection. At the confluence on the upstream edge of the River, a backwater riparian wetland would be established. Within the River channel itself, the banks would be restructured to support vegetation on the banks. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 13 and 16 in the Draft IFR. However, after more detailed cost analysis, it was concluded that this reach sub-plan was not cost effective compared to the sub-plan in Alternatives 13v and 20. Figure 4-28 is a rendering of a restored Arroyo Seco.

**Reach 8 LATC**

This reach sub-plan is the same as for Alternative 10. It was the most incrementally cost effective with the most benefits for Alternatives 10, 13, and 13v.

**4.14.4 Alternative 13v Description by Reach**

Alternative 13v restores/benefits a total of 598 acres and is a variation of Alternative 13. In addition to removal of invasives species throughout the project footprint, this alternative includes the following specific restoration features. It includes the same reach sub-plans as Alternative 13 except in Reach 7, where it includes the sub-plan from Alternative 20.
Reach 1 Pollywog Park Area of Griffith Park

Alternative 13v restores/benefits a total of 598 acres and is a variation of Alternative 13. It includes the same reach sub-plans as Alternative 13 except in Reach 7, where it includes the sub-plan from Alternative 20.

Reach 2 Bette Davis Park Area of Griffith Park

This reach sub-plan is the same as described for Alternative 10. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 10, 13, 13v, and 16.

Reach 3 Ferraro Fields/Verdugo Wash area of Griffith Park

This reach sub-plan is the same as described for Alternative 13. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 13, 13v, and 16.

Reach 4 Griffith Park

This reach sub-plan is the same as described for Alternative 10. It was the most incrementally cost effective with most benefits for all alternatives in the final array.

Reach 5 Riverside Drive

This reach sub-plan is the same as described for Alternative 10. It was the most incrementally cost effective with the most benefits for Alternatives 10, 13, and 13v.

Reach 6 Taylor Yard

This reach sub-plan is the same as described for Alternative 13. It was the most incrementally cost effective with the most benefits for Alternatives 13, 13v, 16 and 20.

Reach 7 Arroyo Seco/Los Angeles River State Historic Park

This reach sub-plan is the same as described for Alternative 20. It was the most incrementally cost effective with the most benefits for Alternatives 13v and 20.

Reach 8 LATC

This reach sub-plan is the same as for Alternative 10. It was the most incrementally cost effective with the most benefits for Alternatives 10, 13, and 13v.

4.14.5 Alternative 16 (AND) Description by Reach

ARBOR Narrows to Downtown Alternative 16 (AND), would restore/benefit a total of 659 acres. In addition to removal of invasives species throughout the project footprint, this alternative includes the following specific restoration features. Specific restoration features are shown in Figure 4-13 through Figure 4-16 at the end of this section.

Reach 1 Pollywog Park Area of Griffith Park

This reach sub-plan is the same as described for Alternative 10. This Reach 1 sub-plan was the most incrementally cost effective with the most benefits for all alternatives in the final array.
Reach 2 Bette Davis Park Area of Griffith Park
This reach sub-plan is the same as described for Alternative 10. This Reach 2 sub-plan was the most incrementally cost effective with the most benefits for Alternatives 10, 13, 13v, and 16.

Reach 3 Ferraro Fields/Verdugo Wash Area of Griffith Park
This reach sub-plan is the same as described for Alternative 13. It was the most incrementally cost effective with the most benefits for Alternatives 13, 13v, and 16.

Reach 4 Griffith Park
This reach sub-plan is the same as described for Alternative 10. It was the most incrementally cost effective with the most benefits for all alternatives in the final array.

Reach 5 Riverside Drive
In Reach 5, the right bank would be modified from a trapezoidal bank to a vertical bank. This would increase the width of the soft bottom bed of the River by over 100 feet. The top of the bank would be notched and planted with overhanging vines. The left bank would be modified from trapezoidal to terraced and planted with riparian herbaceous vegetation and would include any necessary erosion measures, which would consist of concrete-lined beds. The land side of the bank would be planted with riparian herbaceous vegetation. At the downstream end of this reach, the River will also be widened on the left bank with appropriate erosion control measures in place. This would further increase the natural river bottom area. The daylighted stream in the sub-plan for Alternatives 10 and 13 is also included in this reach sub-plan. All of these measures would comply with levee vegetation regulations. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 16 and 20.

Reach 6 Taylor Yard
This reach sub-plan is the same as for Alternative 13. It was the most incrementally cost effective with the most benefits for Alternative 13 and 13v, and substituted by the team for Alternatives 16 and 20.

Reach 7 Arroyo Seco/Los Angeles River State Historic Park
This reach sub-plan is the same as for Alternative 13. It was the most incrementally cost effective with the most benefits for Alternatives 13 and 16 in the Draft IFR. However, after more detailed cost analysis, it was concluded that this reach sub-plan was not cost effective compared to the sub-plan in Alternatives 13v and 20.

Reach 8 LATC
In this sub-plan, Reach 8 would be modified with terracing on the right bank upstream of LATC and on the left bank downstream of LATC. This terracing would be planted with riparian vegetation. The channel would be modified from concrete to soft bottom to support aquatic habitat including freshwater marsh, and the reach would be widened. The marsh would extend into the LATC site 500 feet, with riparian area extending another 1,000 feet into the LATC site, gradually sloping up to existing bank elevations. The historic wash would be restored through the property with a riparian fringe as well as other side channels, and river flows would be diverted out of the River into the LATC site creating a large wetland area. A railroad trestle would be included with this alternative to allow the connection of the River channel and the adjacent restored areas. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternatives 16 and 20. This is displayed on Figure 4-30 at the end of this section.
4.14.6 Alternative 20 (RIVER) Description by Reach

Riparian Integration via Varied Ecological Reintroduction (RIVER) Alternative 20 would restore/benefit a total of 719 acres. In addition to removal of invasives species throughout the project footprint, this alternative includes the following specific restoration features. Restoration features are shown in
Reach 1 Pollywog Park Area of Griffith Park

This reach sub-plan is the same as described for Alternative 10. This Reach 1 sub-plan was the most incrementally cost effective with the most benefits for all alternatives in the final array.

Reach 2 Bette Davis Park Area of Griffith Park

The reach sub-plan for this alternative includes the habitat corridors/riparian planting included in the reach sub-plan for Alternative 10. In addition, this alternative modifies the right bank of the channel from trapezoidal to a vertical bank with overhanging vines, creating 80 feet of additional soft bottom width in the channel. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternative 20. Figure 4-22 at the end of this section includes a rendering of modified River banks in this reach.

Reach 3 Ferraro Fields/Verdugo Wash area of Griffith Park

This reach sub-plan would include the riparian corridor along the right bank, the side channel and one of the daylighted streams included in the reach sub-plan for Alternative 13, and it would also restore the Verdugo Wash confluence. The side channel would be established on the west side (right bank) at Ferraro Fields with water diverted from the River. The stream currently confined in a large culvert just downstream of Ferraro Fields in the Zoo Drive area would be daylighted. The side channel would support a riparian fringe. The daylighted stream would include a riparian fringe with freshwater marsh at the confluence. Riparian areas are located on the right bank along Zoo Drive and on the River’s edge at Ferraro Fields. These features would not modify the channel. In the Verdugo Wash confluence, the channel mouth will be widened, and the left bank of the wash would be sloped back to the existing overbank elevation, as depicted in Figure 4-24 at the end of this section. One potential design would use riparian vegetation to stabilize the south bank and a combined riparian and marsh community in the widened channel. Riparian habitat will be planted along the overbank of the widened Verdugo Wash. Levee protection would be tied in to the bank, and other levee protection will remain. Levee vegetation policy will be followed. Details for the confluence area will be determined during the detailed design phase. This reach sub-plan was the most incrementally cost effective with the most benefits for Alternative 20.

Reach 4 Griffith Park

This reach sub-plan is the same as described for Alternative 10, 13, 13v, and 16. It was the most incrementally cost effective with most benefits across for all alternatives in the final array.

Reach 5 Riverside Drive

This reach sub-plan is the same as described for Alternative 16. It was the most incrementally cost effective with the most benefits for Alternatives 16 and 20.

Reach 6 Taylor Yard

This reach sub-plan is the same as described for Alternative 13, 13v, and 16. It was the most incrementally cost effective with the most benefits for Alternative 13, and substituted by the team for Alternatives 16 and 20.
Reach 7 Arroyo Seco/Los Angeles State Historic Park

This Reach 7 sub-plan includes the three daylighted streams restored in the Alternative 10 sub-plan and the restoration of the Arroyo Seco tributary included in the Alternative 13 sub-plan. In addition, this Reach 7 sub-plan restores freshwater marsh at the Los Angeles State Historic Park and terraces the adjacent right River bank to include riparian vegetation and connect the marsh area to the river. To facilitate the terracing, the existing railroad track would be trestled at grade as shown in Figure 4-29. It was the most incrementally cost effective with the most benefits for Alternatives 13v and 20.

Reach 8 LATC

This reach sub-plan is the same as for Alternative 16. It was the most incrementally cost effective with the most benefits for Alternatives 16 and 20.

4.14.7 Water Budget

As described in Section 3.4.5, a water budget was calculated. It quantified the amount of available water in the study area at approximately 211,000 af/year. In addition to the estimated inputs the potential consumptive use of that water was estimated in Appendix E for each of Alternatives 10, 13, 16, and 20. This includes estimates of infiltration, evaporation, and evapotranspiration. The total water demand for these alternatives is between 65,000 and 69,000 af/year. Alternative 13v would have a similar demand to Alternative 13. That is compared to the annual sources of approximately 211,000 af/year.

4.15 OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION

Operation, maintenance, repair, replacement, and rehabilitation activities (OMRRR) would occur after the project is constructed in order to keep project features functioning as designed. Activities would be similar among the alternatives and vary in scale consistent with each alternative. This will include annual inspections and maintenance, periodic repair and/or replacement of project features, management of invasives throughout the constructed restoration features and channel bottom areas within the restoration footprint, and provision of irrigation to constructed features during drought. Costs are based on a percentage of the initial construction cost of items anticipated to require maintenance over the life of the project, as well as estimates for inspection and maintenance and invasives management and are listed in Appendix C Cost. A detailed OMRRR Plan will be developed during implementation and will be coordinated with the current OMRRR Plan for the existing LACDA flood risk management project.

USACE has identified that a modification to the LACDA OMRRR plan would be needed to avoid contradictory maintenance requirements for the areas of restoration features. The LACDA OMRRR plan would thus be modified to accommodate the restoration, with maintenance for restoration a City responsibility under the restoration OMRRR plan.

At the same time, the USACE would modify the LACDA OMRRR plan for the rest of the ARBOR reach to preserve flood risk management function while complementing the restoration project. These modifications would allow some native vegetation to remain in the rest of the reach to the extent that design conveyance capacities would be met or would experience only minimal changes from the design conditions. Such OMRRR would remain contingent on funding and would be anticipated to be phased in over time. These OMRRR modifications would be refined during design of the restoration project.

4.16 RECREATION PLAN

As described above one of the study objectives is to increase passive recreation that is compatible with the restored environment. To that end, USACE and the non-Federal sponsor cooperatively formulated recreation plans with features integrated into the ecosystem restoration plan; however, these features are
evaluated as separable components of the plan. The features of the recreation plan are designed to capitalize on the areas where substantial ecosystem restoration is proposed. As such, it is assumed that the ecosystem restoration will have taken place when considering the effects of the recreation plan features. Recreation development at ecosystem restoration projects is intended to be compatible with, but also enhance the visitation experience by taking advantage of natural values. The recreation experience is intended to build upon ecosystem restoration and take advantage of restored values and not detract from them as described by EP 1162-2-502 (USACE, 1999). The formulation of recreation plans were informed by that guiding principle and designed with the intent to be operated in a manner consistent with the primary project purpose or ecosystem restoration.

The formulation for recreation is conducted ancillary to ecosystem restoration at an appropriate scope and scale compatible with the restoration features. As a function of our formulation process, a corresponding recreation plan is formulated after identification of the final array and in the case of this study, after the identification of the NER Plan and Tentatively Selected Plan. The recreation plan developed for the NER and TSP was commensurate with the scope and scale of the proposed restoration in a manner that do not impair the restoration outputs. While plans are not specifically formulated for plans other than the NER and LPP, recreational features for other plans are assumed to be similar in features and proportionate in scope and scale. Although no specific recreation plan was formulated to correspond to Alternative 10 or 16, if one of these restoration alternatives were to be selected for implementation, associated recreation facilities compatible with the restoration features would be anticipated to be implemented at similar but slightly reduced scale to those described for the NER and the LPP, respectively. Proposed recreation features described in the following sections would be included at the appropriate scale in all plans.

More detailed description of the recreation analysis can be found in Appendix B, Economics and Chapter 6, with potential impacts included in Chapter 5.

4.16.1 Proposed Recreation Features

Two recreation plans were formulated, both containing the same components but to a different extent. One recreation plan was developed to be consistent with and take full advantage of the restoration features found within the (Alternative 13. The recreation plan option corresponding to Alternative 13v, the NER Plan, includes all the features in the plan for Alternative 13 and is essentially identical. A larger plan variation consistent with the most extensive of the Final Array of Alternatives (Alternative 20) was also developed, consistent with public desire for additional recreation and open space access opportunities. Both recreation plans include the modification, upgrade, or creation of multi-use trails and related basic amenities (access points, wildlife viewpoints, parking lots, restrooms, and signage). The plan also includes non-motorized multi-use bridges across the River and smaller pedestrian bridges across tributaries or within large restored areas. At the current level of design, trails are assumed to be multiple-use, 12 feet wide, with a decomposed granite surface. Safety ramps will be a part of project design and will be multi-use for maintenance, safety exits, and potential access by kayakers and canoeists.

Specifically, the plans call for:

The recreation plan option corresponding to ecosystem restoration Alternative 13 and 13 v includes the following specific features:

- 5.89 miles of new unpaved non-motorized multi-use trail (to include decomposed granite surface and trail signage)
- 0.3 miles of new paved multi-use trail (short extension of current southern end of LA River Bike Path)
- 1 small bridge/crossing within Taylor Yard
- 1 medium bridge within LATC
- 2 paved parking lots, one at Taylor Yard and one at LATC (each about 15,000 square feet)
- 4 restrooms, one at Bette Davis Park, two at Taylor Yard, and one at LATC
- 1 pedestrian underpass at the south end of Taylor Yard
- 24 trail access points throughout the study area (access points would include grading and planting, signage, stairs, benches, gating, and trash receptacles to provide quality trail access)
- 6 wildlife viewing points throughout the study area (viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)
- 4 pedestrian underpasses under bridges along the river to support trail connectivity

The recreation plan option corresponding to ecosystem restoration Alternative 20 includes the following specific features:
- 7.98 miles of new unpaved non-motorized multi-use trail (to include decomposed granite surface and trail signage)
- 1.26 miles of new paved multi-use trail (extension of current southern end of LA River Bike Path)
- 2 bridges spanning the River
- 1 smaller bridge/crossing within Taylor Yard
- 4 small/medium bridges within LATC
- 2 paved parking lots, one at Taylor Yard and one at LATC (each about 15,000 square feet)
- 4 restrooms, one at Bette Davis Park, two at Taylor Yard, and one at LATC
- 1 pedestrian underpass at the south end of Taylor Yard
- 28 trail access points throughout the study area (access points would include grading and planting, signage, stairs, benches, gating, and trash receptacles to provide quality trail access)
- 11 wildlife viewing points throughout the study area (viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)
- 6 pedestrian underpasses along the river to support trail connectivity

4.16.2 Benefits of the Recreation Plan

The proposed recreation features would provide both direct and indirect benefits to recreation participants as well as the communities surrounding the ARBOR reach. Direct benefits of the recreation plan would include:

- Improved quality and quantity of trails for multiple user groups along the river
- Increased connectivity of each side of the river’s recreation resources
- Increased public safety through better signage and trail development along the river
- Improved viewing and lines of sight along the river, especially in areas of substantial restoration via the ecosystem restoration plan
- Opportunity for interpretive signage and environmental education
- Improved public health by providing opportunities for exercise and psychological respite

In addition to these direct benefits, communities along the ARBOR reach will receive benefits in the form of increased quantity and quality of neighborhood parks. The addition of trails and amenities in the restored LATC will benefit the surrounding historically underserved communities along the downstream end of the ARBOR reach, providing substantial open space in highly developed neighborhoods, which are currently considered park-deficient. The recreation plan will also help support the projected RED benefits related to redevelopment in the study area.
4.16.3 Expected Recreation Benefits

Visitation estimates generated utilizing a unit day value method described in the Economic Appendix generated recreation values for the without and with project conditions were calculated. Taking the difference between the with-project and the without project, net recreation benefits were estimated. Table 4-12 summarizes expected recreation benefits. Amortization over the period of analysis uses the FY2015 Federal discount rate of 3.375 percent over a 50-year period of analysis. The analysis estimates amortized annual benefits of $2,479,128 for the Alternative 13 and 13v recreation plan option and $3,509,832 for the Alternative 20 recreation plan option. Recreation benefits are shown at 2015 price levels, in accordance with Economic Guidance Memorandum 15-03.

Table 4-12 Summary of Recreation Value Calculation (Price Level FY 2015)

<table>
<thead>
<tr>
<th></th>
<th>Without Project</th>
<th>With Alt 13 and 13v</th>
<th>With Alt 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Visitation</td>
<td>437,879</td>
<td>662,106</td>
<td>730,701</td>
</tr>
<tr>
<td>Value per Visit</td>
<td>$6.44</td>
<td>$8.01</td>
<td>$8.67</td>
</tr>
<tr>
<td>Average Annual Recreation Value</td>
<td>$2,82,1692</td>
<td>$5,300,821</td>
<td>$6,331,524</td>
</tr>
</tbody>
</table>

Recreation value based upon UDV EGM 15-03

4.16.4 Benefit Cost Analysis

Construction costs were developed for the proposed recreation features. Costs and benefits of the two recreation plans are described in more detail in Appendix B as well as Chapter 6. The construction cost of the Alternative 13 and 13v recreation option is estimated as $10,353,000, and Alternative 20 option as $18,054,000. Based on this analysis the benefits of both alternative recreation plans exceed their costs. (Table 4-13). Values in the table are the most current results and based upon October 2015 price levels.

Table 4-13 Benefit-to-Cost Ratio by Alternative (Price Level October 2015, Interest Rate FY15-3.375 Percent)

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Annual Benefits ($)</th>
<th>Annual Costs ($)</th>
<th>Net Benefits</th>
<th>BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>$0</td>
<td>$0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Alternative 13 Recreation Plan Option</td>
<td>$2,479,000</td>
<td>$606,000</td>
<td>$1,873,000</td>
<td>4.09</td>
</tr>
<tr>
<td>Alternative 20 Recreation Plan Option</td>
<td>$3,510,000</td>
<td>$978,000</td>
<td>$2,532,000</td>
<td>3.59</td>
</tr>
</tbody>
</table>
Figure 4-5 Alternative 10, ARBOR Riparian Transitions (ART)
Los Angeles River Ecosystem Restoration (Feb, 2013)
Figure 4-6 Alternative 10, ARBOR Riparian Transitions (ART)
Los Angeles River Ecosystem Restoration (Feb, 2013)
Figure 4-7 Alternative 10, ARBOR Riparian Transitions (ART)
Los Angeles River Ecosystem Restoration (Feb, 2013)
Figure 4-9 Alternative 13, ARBOR Corridor Extension (ACE)
Figure 4-11 Alternative 13, ARBOR Corridor Extension (ACE)
Los Angeles River Ecosystem Restoration (Feb, 2013)
Figure 4-12: Alternative 13, ARBOR Corridor Extension (ACE)

Los Angeles River Ecosystem Restoration
Formulation of Alternative Plans
Final Integrated Feasibility Report
September 2015

LEGEND
Sub-Measures

6. Rebuild geomorphology for historic wash
16. Bioengineer channel walls
17. Habitat corridors/riparian planting on banks
19. Planting built into channel walls
29. Invasive management

Potential Temporary Construction Staging Areas
Figure 4-14: Alternative 16, ARBOR Narrows to Downtown (AND) Los Angeles River Ecosystem Restoration (Feb. 2013)
Figure 4-15: Alternative 16, ARBOUR Narrows to Downtown (WMU) Los Angeles River Ecosystem Restoration (WMU, 2015)
Figure 4-16. Alternative 16, ARBOR Narrows to Downtown (AND) Los Angeles River Ecosystem Restoration (Tab. 2013)

LEGEND
Sub-Measures

1. Elevate railroads on trestles
3/5. Create geomorphology and plant for freshwater marsh
6. Rebuild geomorphology for historic wash
10. Divert tributary & river flow into side channels
16. Bioengineer channel walls
17. Habitat corridors/riparian planting on banks
19. Planting built into channel walls
21. Lower channel banks and provide setback levees or vegetated berms
22. Channel banks mainstem/widen channel with concrete removal
26. Terrace banks
29. Invasive management

Potential Temporary Construction Staging Areas
Figure 4.17: Alternative 20, ARBOR: Riparian Integration
via Varied Ecological Restoration (RIVER)

Los Angeles River Ecosystem Restoration (Feb. 2013)

LEGEND
Sub-Measures

2. Expose storm drain outlets; convert to natural stream confluence
3/5. Create geomorphology and plant for freshwater marsh
10. Divert tributary & river flow into side channels
16. Bioengineer channel walls
17. Habitat corridors/riparian planting on banks
21. Lower channel banks and provide setback levees or vegetated berms
25. Tributary channels/widen channel with concrete removal
27. Modify trap channel to vertical sides
29. Invasive management

Potential Temporary Construction Staging Areas
Figure 4-19 Alternative 20, ARBOR, Riparian Integration via Varied Ecological Restoration (RIVER)
Los Angeles River Ecosystem Restoration (Feb, 2013)
Figure 4-20 Alternative 22, RP/IRR: Riparian Integration
Los Angeles River Ecosystem Restoration (RERC)
Los Angeles River Ecosystem Restoration (RERC)

Legend
Sub-Measures
1. Elevate railroads on trestles
2. Expose stream outlets; connect to natural stream confluence
3/5. Create geomorphology and plant for freshwater marsh
6. Rebuild geomorphology for historic wash
10. Divert tributary & river flow into side channels
16. Bioengineer channel walls
17. Habitat corridors/riparian planting on banks
19. Planting built into channel walls
21. Lower channel banks and provide setback levees or vegetated berms
22. Channel banks maintain/widen channel with concrete removal
26. Terrace banks
29. Invasive management
Potential Temporary Construction Staging Areas

Miles
0
0.2
0.4
Figure 4-21 Reach 1. Pollywog Park, looking Southeast (Existing and Rendering of Proposed Restoration and Recreation Features)\(^7\)

\(^7\) Associated with all alternatives
Figure 4-22 Reach 2. Looking Upstream from Riverside Drive Bridge (Existing Channel and Rendering of Proposed Terraced Banks/Vegetated Channel Walls) 

Associated with Alternative 20
Figure 4-23 Reach 3. Ferraro Fields. Looking Westward/Upstream (Existing and Rendering of Proposed Side Channel with Daylighted Stream)\(^9\)

\(^9\) Associated with Alt. 13,13v,16, and 20
Figure 4-24 Reach 3, Verdugo Wash. Looking Downstream (Existing and Rendering of Proposed Restoration Measures)\textsuperscript{10}

\textsuperscript{10} Associated with Alt. 20
Figure 4-25 Reach 4. Los Feliz Golf Course. Looking Westward (Existing and Rendering of Proposed Restoration Measures)\textsuperscript{11}

\textsuperscript{11} Associated with All Alternatives
Figure 4-26 Reach 6. Looking West, with the Bowtie Parcel in the Foreground and Marsh Park in the Background (Existing Channel and Rendering of Proposed Daylighted Stream and Vegetated Walls)\textsuperscript{12}

\textsuperscript{12} Daylighted Streams and Vegetated walls associated with all Alternatives
Figure 4-27 Reach 6. Taylor Yard, Looking Downstream (Existing and Rendering of Proposed Restored Reach)\textsuperscript{13}

\textsuperscript{13} Associated with All Alternatives
Figure 4-28 Reach 7. Arroyo Seco Channel, Looking Westward (Existing and Rendering of Proposed Restored Arroyo Seco Tributary)\(^{14}\)

\(^{14}\) Associated with all Alternatives
Figure 4-29 Reach 7. Cornfields, Looking Downstream (Existing and Rendering of Proposed Restoration: Measures at the River Channel and the Los Angeles State Historic Park)  

15 Associated with Alt 13v & 20
Figure 4-30 Reach 8. LATC, Looking Southeastward (Existing and Rendering of Proposed Restoration Measures)\textsuperscript{16}

\textsuperscript{16} Associated with Alt. 20
5 EVALUATION OF ALTERNATIVE PLANS AND ENVIRONMENTAL CONSEQUENCES

This section evaluates the environmental impacts of the no action alternative and the action alternatives. The environmental conditions for each resource are compared with future conditions for each alternative plan. Both beneficial and adverse effects are considered, including direct effects during construction and operation and indirect effects of restoration under each of the proposed alternatives along with related actions. A short description of relevant regulations is given for each resource area; additional information on specific regulations that may require permits or consultation is given in Section 10 of this report.

The basis of significance for each resource is used to evaluate the significance of any adverse effects, and measures are proposed to avoid, minimize, or mitigate any significant adverse effects for each resource. The USACE has integrated NEPA requirements into its regulations, policies, and guidance. Engineering Regulation (ER) 1105-2-100, “Planning Guidance Notebook,” April 2000, provides the following for identifying significant effects:

- Significance based on institutional recognition means that the importance of the effect is acknowledged in the laws, adopted plans, and other policy statements of public agencies and private groups. Institutional recognition is often in the form of specific criteria.
- Significance based on public recognition means that some segment of the general public recognized the importance of the effect. Public recognition may take the form of controversy, support, conflict, or opposition expressed formally or informally.
- Significance based on technical recognition means that the importance of an effect is based on the technical or scientific criteria related to critical resource characteristics.

For this EIS/EIR, the NEPA analysis typically adopts the CEQA thresholds of significance stated for each resource to address significance. However, for some resources, the NEPA analysis identifies significance thresholds in addition to the CEQA thresholds. In the case of the air quality and greenhouse gas analysis, the NEPA analysis does not adopt the CEQA thresholds and instead applies separate significance criteria in accordance with the Clean Air Act. In the case of environmental justice, the NEPA analysis adopts significance criteria aligned with the Executive Order on environmental justice. In the case of cultural resources, the NEPA and CEQA analyses identify different significance criteria.

The following alternatives were analyzed in detail in the Draft IFR:

- No Action Alternative.
- Alternative 10 or ART (for ARBOR Riparian Transitions) provides restoration in all reaches and provides transitions or connections between existing riparian corridors and concrete lined river reaches.
- Alternative 13 or ACE (for ARBOR Corridor Extension) adds additional restoration in the soft bottom reaches of the Glendale Narrows, increased widening in Taylor Yard, and restoration at the Arroyo Seco confluence.
- Alternative 16 or AND (for ARBOR Narrows to Downtown) widens and adds terracing in Reach 5, and adds terracing, widening, softening of the bed and restored wetlands in LATC.
- Alternative 20 or RIVER (for Riparian Integration via Varied Ecological Reintroduction) widens Reach 2, restores the confluence with Verdugo Wash in Reach 3, and restores wetlands at the Los Angeles State Historic Park with a terraced connection to the mainstem in Reach 7.

As discussed in Chapter 4, the Draft IFR identified that alternatives within the spectrum of the final array of alternatives fully analyzed in the Draft IFR could be considered in the Final IFR. Following public review, further analysis was performed that included a more detailed cost analysis using Mii software,
real estate cost updates, and further modified contingencies based upon a full cost risk summary analysis. This analysis identified a more cost effective variation on Alternative 13 (referred to in this IFR as “Alternative 13v”) that is identical to Alternative 13 except for Reach 7, where it includes the reach plan included in Alternative 20. In that Reach 7 plan, in addition to the Arroyo Seco restoration included in Alternative 13, this Alternative includes the three daylighted streams included in the reach plan for Alternative 10 and it also restores freshwater marsh at the Los Angeles State Historic Park and terraces the existing channel bank adjacent to the Los Angeles State Historic Park, where the railroad line along the overbank would be trestled at grade to facilitate the terracing. It excludes the restructuring of channel banks in the Alternative 13 plan for Reach 7.

Because the impacts analysis in the Draft IFR included all of the components of Alt 13v, no separate or additional impacts analysis is necessary. For the impacts of Alternative 13v for Reaches 1-6 and 8, see the Alternative 13 narrative analysis by resource area below. For the impacts of Alternative 13v for Reach 7, see the Alternative 20 narrative analysis by resource area below. For the analysis of air quality in Section 5.2 below, Alternative 13v is displayed separately for clarity. As discussed in Chapter 4, the recreation plan associated with 13v is the same as the recreation plan associated with 13 described in Chapter 4 and Chapter 5.9.3.

Where appropriate, descriptions of potential impacts for each alternative have been identified by geomorphic reach grouping (Reaches 1-3, 4-6, and 7-8). For other resources, impacts have been provided for individual reaches or by study area as appropriate. A summary of potential effects by alternative is shown in Table 5-1. The table has been updated to include the Alternative 13v variation. All impacts identified in the table apply to both CEQA and NEPA unless otherwise stated.
### Table 5-1 Comparison of Potential Impacts

<table>
<thead>
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</thead>
<tbody>
<tr>
<td><strong>GEOLOGY, SEISMOLOGY, SOILS, AND MINERALS</strong></td>
<td>Construction Impacts None. Operation Impacts None.</td>
<td>Construction Impacts Soil erosion resulting from heavy equipment would be controlled through BMPs and would be temporary. Impacts would be less than significant.</td>
<td>Construction Impacts Potential impacted area increases from Alt 10 as do type of demolition and construction. Protection of soils would occur through BMPs and construction impacts would be temporary. Impacts would be less than significant.</td>
<td>Construction Impacts Impacts similar to Alt. 13 except that potential impacted area increases from Alt 13 as does type of demolition and construction in Reach 7. Protection of soils would occur through BMPs and construction impacts would be temporary. Impacts would be less than significant.</td>
<td>Construction Impacts Impacts Alt. 16 construction is larger in scale and duration than Alt 10 and 13, yet employs the same methods. Protection of soils would occur through BMPs and construction impacts would be temporary. Impacts would be less than significant.</td>
<td>Construction Impacts Alt. 20 construction is larger in scale and duration than other alternatives, yet employs the same methods. Protection of soils would occur through BMPs and construction impacts would be temporary. Impacts would be less than significant.</td>
</tr>
<tr>
<td><strong>AIR QUALITY AND GREENHOUSE GASES</strong></td>
<td>Construction Impacts None. Operation Impacts Emissions associated with existing operational practices and daily visitations to the project area would remain largely unchanged.</td>
<td>Construction Impacts: Estimated construction emissions would not exceed General Conformity de Minimis Thresholds (NEPA) or Regional Significance Thresholds (NEPA &amp; CEQA). Emissions for NOx would exceed Localized Significance Thresholds (CEQA) during construction in 2018 and 2019. Emissions of greenhouse gases would not exceed the CEQA significance thresholds. Impacts would be less than significant under NEPA. Due to exceedance of Localized Significance Thresholds (CEQA), impacts under CEQA would be significant and unavoidable.</td>
<td>Construction Impacts: Estimated construction emissions would not exceed General Conformity de Minimis Thresholds (NEPA) or Regional Significance Thresholds (NEPA &amp; CEQA). Emissions for NOx would exceed Localized Significance Thresholds (CEQA) during construction in 2018 and 2019. Emissions of greenhouse gases would not exceed the CEQA significance thresholds. Impacts would be less than significant under NEPA. Due to exceedance of Localized Significance Thresholds (CEQA), impacts under CEQA would be significant and unavoidable.</td>
<td>Construction Impacts: Estimated construction emissions would not exceed General Conformity de Minimis Thresholds (NEPA), Regional Significance Thresholds (NEPA &amp; CEQA), or Localized Significance Thresholds (CEQA). Emissions of greenhouse gases would not exceed the CEQA significance thresholds. Impacts would be less than significant under NEPA &amp; CEQA.</td>
<td>Construction Impacts: Estimated construction emissions would not exceed General Conformity de Minimis Thresholds (NEPA) or Regional Significance Thresholds (NEPA &amp; CEQA). Emissions for NOx would exceed Localized Significance Thresholds (CEQA) during construction in 2020, 2022, and 2023. Emissions of greenhouse gases would not exceed the CEQA significance thresholds. Impacts would be less than significant under NEPA. Due to exceedance of Localized Significance Thresholds (CEQA), impacts under CEQA would be significant and unavoidable.</td>
<td>Construction Impacts: Estimated construction emissions would not exceed General Conformity de Minimis Thresholds (NEPA) or Regional Significance Thresholds (NEPA &amp; CEQA). Emissions for NOx would exceed Localized Significance Thresholds (CEQA) during construction in 2022, 2023, and 2024. Emissions of greenhouse gases would not exceed the CEQA significance thresholds. Impacts would be less than significant under NEPA. Due to exceedance of Localized Significance Thresholds (CEQA), impacts under CEQA would be significant and unavoidable.</td>
</tr>
<tr>
<td><strong>LAND USE</strong></td>
<td>Construction Impacts None. Operation Impacts There would be no change in operations or operational impacts. Improved land use conditions adjacent to the river would not</td>
<td>Construction Impacts Restoration in Reach 8 would conflict with the Industrial and Light Industrial land use designation, as well as specific goals and policies concerning industrial land uses in local plans. This would result in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA. Operation Impacts Significant impacts associated with changes in land use would be permanent and will continue during operation.</td>
<td>Construction Impacts Same as Alt 10. This would result in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA. Operation Impacts Significant impacts associated with changes in land use would be permanent and will continue during operation.</td>
<td>Construction Impacts Same as Alt 10. This would result in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA. Operation Impacts Significant impacts associated with changes in land use would be permanent and will continue during operation.</td>
<td>Construction Impacts Same as Alt 10. In addition Reach 3 conflicts with industrial land use designation which would result in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA Operation Impacts Significant impacts associated with changes in land use would be permanent and will continue during operation.</td>
<td>Construction Impacts Same as Alt 10. In addition Reach 3 and Reach 7 conflict with industrial land use designation which would result in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA Operation Impacts Significant impacts associated with changes in land use would be permanent and will continue during operation.</td>
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</table>
### Evaluation of Alternative Plans and Environmental Consequences

#### Los Angeles River Ecosystem Restoration

**Final Integrated Feasibility Report**

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<tr>
<th>Table 5-1 Comparison of Potential Impacts</th>
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<tr>
<td><strong>Resource</strong></td>
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<tr>
<td><strong>WATER RESOURCES</strong></td>
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**Los Angeles River Ecosystem Restoration**

**Final Integrated Feasibility Report**

**Evaluation of Alternative Plans and Environmental Consequences**

**September 2015**
### Table 5-1 Comparison of Potential Impacts

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<tr>
<td><strong>TRAFFIC AND CIRCULATION</strong></td>
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<tr>
<td>Construction Impacts</td>
<td>None.</td>
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<tr>
<td>Operation Impacts</td>
<td>No adverse impacts.</td>
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<tr>
<td>Construction Impacts</td>
<td>Construction activities would occur over a period of 9 years. For all alternatives, a construction traffic management plan would be prepared and submitted to LA DOT for review and approval prior to project implementation to ensure impacts to railroads, bike lanes, and roadways are minimized. A traffic management plan, traffic control plans, and appropriate BMPs would be implemented. Closures and diversions would be temporary. LATC capacity would be removed but replaced elsewhere in the Los Angeles Basin. Impacts would be less than significant.</td>
<td>Construction activities would occur over a period of 10 years, but for the same reasons noted in Alt 10. Impacts would be less than significant.</td>
<td>Construction activities would occur over a period of 10 years, with slightly more worker commute trips than Alt 13 for construction in Reach 7. Rail line in Reach 7 would be trestle at grade. Impacts would be less than significant.</td>
<td>Construction activities would occur over a period of 15 years and the number of daily worker commute trips would be higher than for all other alternatives. Rail lines in Reach 7 and 8 would be trestle at grade. Impacts would be less than significant.</td>
<td>Construction activities would occur over a period of 15 years and the number of daily worker commute trips would be higher than for all other alternatives. Rail lines in Reach 7 and 8 would be trestle at grade. Impacts would be less than significant.</td>
<td></td>
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<tr>
<td>Operation Impacts</td>
<td>The project would not alter the existing roadway network, introduce new hazards, change the roadway capacity or negatively impact emergency access. The project would indirectly result in vehicle trips to area roads because it would make portions of the River a recreational destination, but these trips would be unlikely affect the performance of the roadway network. Impacts will be less than significant. Improved appearance and access would provide benefits to non-motorized trail users.</td>
<td>Operation Impacts Operational impacts on traffic and transportation would be similar to those described for Alternative 10.</td>
<td>Construction Impacts Operational impacts on traffic and transportation would be similar to those described for Alternative 13.</td>
<td>Operation Impacts Operational impacts on traffic and transportation would be similar to those described for Alternative 10 and 13.</td>
<td>Operation Impacts Operational impacts on traffic and transportation would be similar to those described for Alternative 10, 13 and 16.</td>
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<tr>
<td><strong>NOISE</strong></td>
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<tr>
<td>Construction Impacts</td>
<td>None.</td>
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<tr>
<td>Operation Impacts</td>
<td>No adverse impacts.</td>
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<tr>
<td>Construction Impacts</td>
<td>Construction at Reaches 5 and 6 would temporarily increase noise levels near residential structures. Impacts would be less than significant with incorporation of best management practices and avoidance measures. Construction at Reaches 1-4 and Reaches 7-8 would not result in significant noise impacts.</td>
<td>Construction Impacts Overall duration of construction would be longer than Alt 10.</td>
<td>Construction Impacts Overall duration of construction would be longer than Alt 13. Construction at Reaches 5 and 6 would temporarily increase noise levels near residential structures. Impacts would be less than significant with incorporation of best management practices and avoidance measures. Construction at Reaches 1-4 and Reaches 7-8 would not result in significant noise impacts.</td>
<td>Construction Impacts Overall duration of construction would be longer than Alt 13. Construction at Reaches 5 and 6 would temporarily increase noise levels near residential structures. Impacts would be less than significant with incorporation of best management practices and avoidance measures. Construction at Reaches 1-4 and Reaches 7-8 would not result in significant noise impacts.</td>
<td>Construction Impacts Overall duration of construction would be longer than Alt 16. Construction at Reaches 5 and 6 would temporarily increase noise levels near residential structures. Impacts would be less than significant with incorporation of best management practices and avoidance measures. Construction at Reaches 1-4 and Reaches 7-8 would not result in significant noise impacts.</td>
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<tr>
<td>Operation Impacts</td>
<td>Occasional use of heavy trucks and machinery may be necessary during routine operations and maintenance activities. Noise impacts would be periodic and temporary. Best management practices would be implemented. Impacts would be less than significant.</td>
<td>Operation Impacts Same as Alt 10.</td>
<td>Construction Impacts Operational impacts on traffic and transportation would be similar to those described for Alternative 13.</td>
<td>Operation Impacts Same as Alt 10.</td>
<td>Operation Impacts Same as Alt 10.</td>
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<tr>
<td><strong>RECREATION</strong></td>
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<tr>
<td>Construction Impacts</td>
<td>None.</td>
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<tr>
<td>Operation Impacts</td>
<td>No adverse impacts.</td>
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<tr>
<td>Construction Impacts</td>
<td>Construction Impacts Less than significant, temporary adverse effects would be similar to Alternative 10 with the addition of potential access impacts for playing fields at Ferraro Fields. Operation Impacts Additional beneficial effects to recreational areas would not be affected.</td>
<td>Construction Impacts Less than significant, temporary adverse effects would be similar to Alternative 13 with the addition of temporary impacts to access to construction area at Los Angeles State Historic Park. Operation Impacts Additional</td>
<td>Construction Impacts Less than significant, temporary adverse effects would be similar to Alternative 13 with the addition of temporary impacts to access to construction area at Los Angeles State Historic Park. Operation Impacts Additional</td>
<td>Construction Impacts Less than significant, temporary adverse effects would be similar to Alternative 13 with the addition of potential access impacts for playing fields at Ferraro Fields. Operation Impacts Additional</td>
<td>Construction Impacts Less than significant, temporary adverse effects would be similar to Alternative 13 with the addition of potential access impacts for playing fields at Ferraro Fields. Operation Impacts Additional</td>
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</table>
AESTHETICS

Construction Impacts
None.
Operation Impacts
No adverse impacts. Benefits to aesthetic value would not be realized through plantings, creation of new habitats, and greening of channel.

Construction Impacts Components of this alternative would result in temporary, less than significant impacts to aesthetic condition during construction. However, many of these areas are already in industrial use and therefore visually degraded. In areas regularly utilized for recreation, where aesthetic appeal is particularly desirable, construction efforts would be streamlined to occur quickly, to avoid interfering with recreational opportunities, and to affect as small an area as possible in order to minimize impacts.

Operation Impacts Aesthetics would be greatly improved as a result of the restoration through riparian plantings along daylighted culverts, side channels, and overbank areas. As vegetation matures and flourishes, it will also serve to green and soften the channel. Operation activities that require the presence of trucks will not significantly interfere with visual appeal.

PUBLIC HEALTH AND SAFETY/ HTRW

Construction Impacts
None.
Operation Impacts
No adverse impacts. Benefits to well-being of local residents through biological, recreational, and aesthetic improvements would not be realized.

Construction Impacts OSHA and USACE safety standards, and BMPs addressing each of these risks during construction will be implemented, and construction will be in compliance with all applicable laws, regulations and ordinances. The sponsor would remediate or ensure remediation of HTRW contaminated soils on project lands prior to construction at those sites. The sponsor would also be responsible for addressing any HTRW contaminated groundwater during dewatering activities necessary for construction. Potential impacts would be less than significant.

Operation Impacts Improved access could increase water-related injuries and bring people in proximity to HTRW areas. River channel designs would maximize safety, however, and vector control agencies will be coordinated with to ensure that related issues are addressed. Impacts are anticipated to be less than significant.

UTILITIES AND PUBLIC SERVICES

Construction Impacts
Utility and stormwater management plans would be prepared prior to the start of construction. The amount of debris generated would not exceed landfill capacity. No additional public services are anticipated to be needed during construction. Utility relocations would occur in Reaches 6 and 7. Impacts would be less than significant.

Construction Impacts Though construction activities would occur over a longer time period than for Alt 10, impacts would remain less than significant. Utility relocations would be the same as Alt 10. Debris generated would not exceed landfill.

Construction Impacts Though construction activities would occur over a longer time period than for Alt 10, impacts would remain less than significant. Utility relocations would be the same as Alt 13. Debris generated would not exceed landfill.

Construction Impacts Though construction activities would remain less than significant. Utility relocations would be the same as Alt 13 except in Reach 8, where more utilities generated would not exceed landfill.

Table 5-1 Comparison of Potential Impacts

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<tr>
<td>Facilities, uses, access, opportunities and experiences would be expected for Alternative 13 due to the increased level of restoration.</td>
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<tr>
<td>beneficial effects to recreational facilities, uses, access, opportunities and experiences would be expected for Alternative 13v due to the increased level of restoration and connection to Los Angeles State Historic Park.</td>
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<tr>
<td>RESTORATION FEATURES</td>
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<tr>
<td>Though Alternative 10 would have no significant impacts on recreation and public access resources in the study area.</td>
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<tr>
<td>No adverse impacts during construction. Utility relocations would be the same as Alt 13 except in Reach 8, where more utilities generated would not exceed landfill.</td>
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<tr>
<td><strong>SocioEconomics and Environmental Justice</strong></td>
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<tr>
<td>Construction Impacts</td>
<td>None.</td>
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<tr>
<td>Construction Impacts</td>
<td>Closures or reduced access to recreational facilities would be temporary and coordinated with appropriate entities. LATC site functions would be relocated. Impacts would be less than significant.</td>
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<tr>
<td>Construction Impacts</td>
<td>Generally the same as Alt 10 (less than significant), or slightly amplified.</td>
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<tr>
<td>Construction Impacts</td>
<td>Generally the same as Alt 10 (less than significant).</td>
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<tr>
<td>Construction Impacts</td>
<td>Generally the same as Alt 13 (but slightly amplified). In addition, requires temporary partial closure of Los Angeles State Historic Park. Closure would be temporary and substitute recreation areas in the vicinity would be available. Impacts would be less than significant.</td>
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<tr>
<td>Construction Impacts</td>
<td>Generally the same as Alt 13 (less than significant).</td>
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<tr>
<td>Construction Impacts</td>
<td>Generally the same as Alt 16, or slightly amplified (less than significant).</td>
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<tr>
<td>Construction Impacts</td>
<td>Generally the same as Alt 16, less than significant.</td>
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<tr>
<td>Construction Impacts</td>
<td>Similar to Alt 16 less than significant.</td>
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**Cumulative Impacts** | None. | | | | | |

Significant adverse long-term cumulative impacts have been identified for Land Use. Significant adverse short-term cumulative impacts under CEQA have been identified for Air Quality. Substantial beneficial long-term cumulative impacts have been identified for Biological Resources. Beneficial cumulative impacts have been identified for Water Resources, Recreation, and Aesthetics. Cumulative Impacts would be similar to those described for Alternative 10, although this alternative would result in greater benefits to biological and water resources, recreation and aesthetics. Cumulative Impacts would be similar to those described for Alternatives 10 and 13, except that short-term adverse air quality impacts would not be significant under CEQA, and this alternative would result in greater benefits to biological and water resources, recreation and aesthetics. Cumulative Impacts would be similar to those described for Alternative 10, 13 and 13v (except that short-term adverse air quality impacts would be less under 13v). This alternative would result in greater benefits to biological and water resources, recreation and aesthetics. Cumulative Impacts would be similar to those described for Alternative 10, 13, 13v and 16, with the following exceptions. Short-term adverse air quality impacts would be less under 13v. Also, land use impacts would be greatest with Alternative 20 because of the additional acquisition of industrial properties at the Verdugo Wash and Cornfields sites. This alternative would result in greater benefits to biological and water resources, recreation and aesthetics.
5.1 GEOLOGY, SEISMOLOGY, SOILS, AND MINERALS

5.1.1 Regulatory Framework

Numerous environmental laws and regulations govern the geologic and seismic resources in the study area. An overview of some of the more pertinent regulations and responsible agencies is presented below.

The United States Geologic Survey (USGS) of the U.S. Department of the Interior provides reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life. The USGS does not have regulatory authority/jurisdiction, but rather it provide scientific information that can be used to help mitigate impacts from natural disasters such as earthquakes, landslides, and volcanoes.

California has promulgated a number of regulations regarding geology and soils. The International Building Code regulates construction practices including sections pertinent to design and construction to avoid geotechnical hazards. The codes include design standards and general design parameters for seismic design. The State Building Standards Commission is responsible for administering California’s building codes, including adopting, approving, publishing, and implementing codes and standards.

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to address the hazards of surface faulting to buildings. This state law was a direct result of the 1971 San Fernando Earthquake. The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. This act only addresses the hazard of surface fault rupture. Other earthquake hazards are addressed by the Seismic Hazards Mapping Act passed in 1990, which addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

The Seismic Hazards Mapping Act requires the mapping of seismic hazard zones to mitigate hazards to help protect public health and safety. Included are shaking hazards, liquefaction, and landslides. Amplified shaking hazard zones are areas where historic occurrence of amplified ground shaking or local geological and geotechnical conditions indicate a potential for ground shaking to be amplified to such a level that mitigation would be required. Liquefaction hazard zones are areas where historic occurrences of liquefaction, or local geological, geotechnical, and groundwater conditions, indicate a potential for permanent ground displacement. Earthquake-induced landslide hazard zones are areas where Holocene occurrence of landslide movement, or local slope of terrain, and geological, geotechnical and ground moisture conditions indicate a potential for permanent ground displacements.

A number of local building permits and programs regulate development and construction of facilities in the City and Los Angeles County. The Los Angeles Building Code provides requirements for construction, grading, excavation, use of fill, and foundation work including types of materials and design, so as to minimize the likelihood and severity of consequences from geologic hazards. The Los Angeles Department of Building and Safety regulates construction and development in hillside areas.

5.1.2 Significance Criteria

Significance criteria for this resource are based primarily on the environmental checklist in the California Environmental Quality Act (2005) and City of Los Angeles CEQA Guidelines (City of Los Angeles 2006). Restoration measures would be considered to have a significant impact to geologic and soil resources or topography if any of the following were to occur:
• They increased exposure of people or structures to risk of loss, injury, or death resulting from earthquakes, liquefaction, or landslides.
• They resulted in substantial soil erosion loss or loss of topsoil.
• They were constructed within a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landside, lateral spreading, subsidence, liquefaction, or collapse.
• They were constructed on expansive soil, as defined in the Uniform Building Code (1994), creating substantial risks to life or property.
• They would result in loss of a known valuable mineral resource or in the loss of availability of a locally important mineral resource identified in an approved land use plan.
• One or more distinct and prominent geologic or topographic features were destroyed, permanently covered, or materially and adversely modified. Such features may include, but are not limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, waterbodies, streambeds, and wetlands.

5.1.3 Environmental Impacts

No Action Alternative

Construction Impacts

Under the No Action Alternative, topography and geology, soils, and seismic hazards would not be significantly affected by construction activities, since no construction would occur under this alternative. Topographic and geologic features, which include, but are not limited to, mountain range shifting, crustal spreading, subsidence, seismic ocean floor uplift, and basin sediment in-fill and subsequent aggradation would persist indefinitely, subject to weathering and possibly by other effects.

Soils would continue to be eroded and deposited from fluvial processes. Soil erosion in the headwaters of the watershed would continue to result in the transport and deposition of sediment along the soft bed channel sections of the study area.

Seismicity in Southern California is highly active and would continue to cause damages to people and structures in the study area and surrounding area, dependent upon the frequency and magnitude of seismic events. Threats to property and life where soils, topography, and climate are favorable for landslides along the foothills and slopes of the Santa Monica Mountains and the Repetto and Elysian Hills would continue. Areas identified as potential locations for liquefaction along the base of the Santa Monica Mountains, the Elysian and Repetto Hills, and along the Los Angeles River would remain hazards.

Operation Impacts

Under the No Action Alternative restoration measures would not be constructed; and operation and maintenance would continue under the current LACDA operation manual, subject to funding availability. Operation impacts would not have a significant effect on topography and geology, soils, and seismic hazards.

Alternative 10 (ART)

Construction Impacts

Implementation of Alternative 10 would not have a significant impact on study area topography and geology, soils, or seismic hazards in the study area. Construction would be designed to code, as applicable for structural stability during earthquakes.
Alternative 10 would not have a significant impact on study area topography or underlying geology. Restoration measures under this alternative do not propose to alter or modify distinct topographic or geologic landforms in the study area. Terracing of channel banks would result in slight changes in topography, but these changes are within the already modified topography of the River channel.

Ground-disturbing activities during construction could result in soil erosion, or loss of top soil in areas both within the channel itself and on upland areas above the channel. Under Alternative 10, ground-disturbing activities that may occur include:

- Demolition and excavation of concrete and earthen material for the construction of side channels,
- Demolition of channel walls and excavation of overbank areas at storm drain outlets for daylighting and wetland habitat creation,
- Demolition of concrete paved and or grouted rock channel bed and side slope protection,
- Widening of channel bed and top of banks via excavation and grading of earthen material,
- Excavation of channel bed and side slopes for riprap structures and terraced and in-channel planters,
- Use of heavy equipment for hauling away of concrete debris and excavated material, and
- Excavation for topsoil fill and vegetation establishment on side slopes of maintenance roads and channel.

Disturbances to soil in all areas would be controlled through a suite of erosion control measures designed for construction activities. The extent of ground disturbance would be minimized prior to construction by identifying the minimum required area for staging and access routes. Staging areas and access routes would consider existing conditions, and would be located where soils are not already exposed or where disturbance has already occurred. Industrial districts, parking lots, and undeveloped ruderal areas would provide the best locations. Some lands intended for ecosystem restoration would also be used for staging areas prior to construction of features on those sites. Areas that have aesthetic, recreational, open space or habitat value would be avoided to the extent possible.

During construction, areas that would be disturbed within the project footprint, at staging locations, and along hauling routes would be evaluated to determine where erosion control measures would be necessary. These controls would include BMPs such as (1) the placement of straw bales or other filters that prevent soils from moving off-site during precipitation events, (2) placement of mulch or chemical stabilizers, and/or use of watering trucks where dry conditions could result in creation of fugitive dust, (3) identification of suitable locations for deposit of excavation spoils, and (4) minimization of number of truck trips or hauling distances, among others. Following construction efforts, disturbed ground would be restored with native plantings to stabilize exposed areas and return the site to aesthetically suitable conditions.

Other than the relocation and reconstruction of existing channel walls to widen the channel in Reach 6, the proposed measures are limited to habitat restoration; no major structures that could incur damages or pose a threat to the safety of persons in the event of failure would be built under the proposed alternative. Implementation of measures under this alternative would not cause or increase the risk of exposure of any person or structure to an active fault in the study area, and therefore would result in a less than significant impact.

The California Department of Conservation's Seismic Hazards and Zonation Program has classified all reaches of the study area as susceptible to liquefaction (CADC 2012b). Measures proposed under this alternative include the removal of channel concrete in Reach 6, widening of the channel banks in Reach 6, vegetation of channel side slopes in Reach 6, and the naturalization of overbank areas in Reach 1, 2, 4, 5,
These measures would not be significant alterations in comparison to the existing channel’s original construction nearly 70 years ago; as a conservative estimate and worst case scenario, it is assumed that measures would only slightly increase the chance of liquefaction due to minimal disturbance of the underlying soils and geology. This would not increase the hazard for liquefaction enough to be considered significant.

The California Department of Conservation’s Seismic Hazards and Zonation Program has classified and mapped areas susceptible to landslides. These areas include the foothills and mountainous slopes of the Santa Monica Mountains and the Elysian and Repetto Hills (CADC 2012b). These areas do not overlap with the study area and the proposed restoration measures. As a result, proposed measures would not cause or increase the risk of landslides in the study area.

**Operation Impacts**

Operation impacts to topography, geology, soils, and seismicity post-construction are expected to be minimal and non-significant. Operation impacts would be similar in nature to the channel’s current operation and maintenance activities. During the establishment of riparian and in-channel vegetation, topsoil erosion could occur due to high flows and may need to be replaced and/or replanted. Maintenance of restoration features would need to either follow existing, or develop new, channel maintenance BMP guidelines to prevent impacts to restoration measures and the project area during maintenance activities. Beneficial impacts from operations would include increased maintenance of substrate for vegetation establishment and stabilization of project area soils.

**Indirect Effects of and Related Actions to Construction and Operation**

Indirect effects of Alternative 10 on topography, geology, soils and seismicity are not anticipated to be significant. Following completion of restoration measures, areas planted with native species would incur beneficial impacts. Restored riparian zones would provide native plant cover to reduce erosion, while removal of impervious surfaces and daylighting of enclosed tributaries and storm drains would allow for increased nutrient exchange and groundwater percolation.

Like the other action alternatives, construction would require that the existing use at the LATC site be discontinued because a portion of the site would be converted to riparian habitat. The existing site functions are anticipated to be relocated at a new site or through expansion of an existing rail yard. The relocation of LATC site functions could result in minor and temporary impacts to geology, seismology, soils and minerals at the new site. The site functions would be anticipated to be located within the Los Angeles Basin in an area that was already zoned for industrial use, having the existing condition of typically industrialized lands. Construction of a new site or expansion of an already existing site may have temporary impacts on soils. The use of heavy equipment, trucks, and excavation of the site could potentially result in loss of topsoils, changes to existing soil composition, and erosion. However, lands within industrial zones typically already have altered soils and impacts to soils would be temporary during the construction of the new facility. Once construction is completed, the operation of the new facility is not expected to impact soils, geology, or mineral resources. These effects are the same for all action alternatives. Prior to site selection, the CEQA lead agency will conduct a detailed CEQA analysis of the relocation of LATC site functions, including effects on geologic resources. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency.

These impacts are expected to be the same for each of the action alternatives.
Alternative 13 (ACE)

Construction Impacts

Restoration measures in this alternative would include the measures in Alternative 10 in Reaches 1, 2, 4, 5, and 8 and provides additional restoration in Reaches 3, 6, and 7. In Reach 3, in addition to the measures identified in Alternative 10, this alternative would create a side channel at Ferraro Fields. In Reach 6, this alternative creates a backwater wetland at the Bowtie parcel and restructures the left bank upstream of the backwater wetland and downstream of Taylor Yard, as well as the entirety of the right bank, with implanted vegetation, and widens the River more than in Alternative 10. In Reach 7, this alternative restores a portion of the Arroyo Seco tributary through softening of the bed and banks with development of a riparian corridor in the tributary confluence and for one half mile upstream. Instead of the daylighted streams included in this reach in Alternative 10, this alternative lines the banks of the River downstream from the Arroyo Seco with overhanging vines and implanted vegetation. While this alternative would include more construction work for implementation of the additional features, the nature and type of impacts are similar to those in Alternative 10, and erosion control procedures and post-construction restoration of disturbed sites are anticipated to occur in all project areas, as described under Alternative 10. As a result, implementation of Alternative 13 is not expected to result in significant adverse impacts to topography and geology, soils, and seismic hazards in the study area, nor would it increase the potential for liquefaction or landslides.

Operation Impacts

Operation impacts would be similar to Alternative 10, but may be slightly more extensive due to the larger area of restoration.

Indirect Effects of and Related Actions to Construction and Operation

In addition to the impacts identified for Alternative 10, beneficial impacts to soils in the long term would occur over a larger area due to the greater extent of riparian restoration.

Alternative 16 (AND)

Construction Impacts

Alternative 16 proposes restoration measures that would cover a larger portion of the study area in comparison to Alternative 10. In comparison to Alternatives 10 and 13, measures under Alternative 16 would also include the relocation of existing railroad tracks to trestles, construction of planting built into channel walls, and channel bed deepening. Construction impacts would be similar to those occurring under Alternative 10 and 13, but would include larger footprints of disturbance at the LATC site in Reach 8, and the following additional impacts:

- Demolition and excavation of channel walls to construct vegetated plantings,
- Demolition and excavation to deepen channel bed, and
- Demolition and excavation of old railroad features and construction of trestles at grade in Reach 8 to allow restoration of the river and historic floodplain below the rail lines.

As summarized in Alternative 10 and 13, all project area ground disturbances under Alternative 16 would be similarly treated for erosion control, and post-construction restoration would return disturbed areas to their original, or better, condition. As a result, implementation of Alternative 16 is not expected to have significant adverse impacts on topography and geology, soils, and seismic hazards in the study area, nor would it increase the potential for liquefaction or landslides. Instead, this alternative would provide benefits to soils in restored riparian zones that cover 19 additional acres compared to Alternative 10.
Operation Impacts

Operation impacts would not be significant and would be similar to Alternative 10 and 13, but with the potential for additional maintenance of topsoil and vegetation in proposed channel plantings and the more extensive footprint of restored riparian zones. Benefits to the stabilization of project area soils would be seen over an area 19 acres larger than under Alternative 10 due to more extensive restoration and revegetation efforts.

Indirect Effects of and Related Actions to Construction and Operation

In addition to the impacts identified for Alternative 13, beneficial impacts would increase to soils in the long term due to the larger restoration footprint.

Alternative 20 (RIVER)

Construction Impacts

In comparison to Alternatives 10, 13, and 16, Alternative 20 proposes the most extensive restoration measures over the largest area, including 37 more acres of restored riparian habitat than the next largest alternative (16) spread amongst all reaches. Restoration measures under Alternative 20 are comparable to Alternative 16, but additionally include the widening of Verdugo Wash confluence and more extensive channel reshaping activities. In Reach 7, this Alternative includes the three daylighted streams included in the reach plan for Alternative 10 and the Arroyo Seco restoration included in Alternative 13 and 16, with ground disturbance as discussed in those alternatives. Instead of the restructuring of channel banks included in Alternatives 13 and 16, it restores freshwater marsh at the Los Angeles State Historic Park and terraces the existing channel bank adjacent to the Los Angeles State Historic Park, and the railroad line along the overbank would be trestled at grade to facilitate the terracing. Construction impacts would be similar to Alternative 16, with the following additional effects:

• Demolition, excavation, and reshaping of existing channel walls to widen channel invert in Reach 2, and
• Demolition and excavation at the confluence area of Verdugo Wash.
• Terracing of channel walls in Reach 7, and installation of railroad trestle at grade.

As discussed in Alternatives 10, 13, and 16, construction activities resulting in project area ground disturbances in Alternative 20 would be similarly treated for erosion control, and post-construction restoration would return disturbed areas to their original, or better, condition. As a result, implementation of Alternative 20 is not expected to have significant adverse impacts on topography and geology, soils, and seismic hazards in the study area, nor would it increase the potential for liquefaction or landslides. Implemented restoration measures would benefit existing soil conditions in restored riparian areas by stabilizing them.

Operation Impacts

Operation impacts under Alternative 20 would not be significant and would be similar to Alternative 16, but would not include the needed maintenance of implanted vegetation topsoil and vegetation.

Indirect Effects of and Related Actions to Construction and Operation

In addition to the impacts identified for Alternative 16, beneficial impacts to soils in the long term would increase due to the larger restoration footprint.
5.1.4 **Best Management Practices and Impact Avoidance Measures**

For all action alternatives, BMPs would include, but not be limited to, the following:

- Minimizing the extent of areas to be cleared, graded, or recontoured,
- Erecting construction fencing in all areas that require clearing, grading, revegetation, or recontouring,
- Conducting all construction work in accordance with site-specific construction plans that minimize the potential for sediment to enter the stream,
- Applying mulch or chemical stabilizers to disturbed areas as needed, and/or using a water truck to reduce fugitive dust,
- Stabilizing and reseeding disturbed areas with native grasses after construction is complete,
- Grading spoil sites to minimize surface erosion and prevent sediment from entering water courses or the stream channel to the maximum extent feasible,
- Designing and implementing a dewatering plan to avoid operating equipment in flowing water by using temporary cofferdams or some other suitable diversion to divert channel flow around the channel and bank construction area, and
- Limiting certain aspects of in-channel construction to the low-flow period between April 15 and October 31 (non-flood season) to minimize soil erosion.
- In-channel work would be isolated from existing flows by the use of dewatering structures such as cofferdams constructed from k-rails and other suitable materials.

  - Cofferdam construction will be adequate to prevent seepage into or from the work area.
  - Cofferdams may be constructed from sand bags, concrete k-rails, sheet piles or other appropriate materials that would not leach contaminants into the water column or increase downstream turbidity.
  - Ensure that dewatering structures and coffer dams are in place and functional prior to in-water work.
  - Visually inspect all cofferdam components on a regular basis.
  - Check for water seepage under the dam and general integrity of the dam.
  - Fix all leaks immediately.
  - If turbid water is discharged from the work area despite the cofferdam, place wattles, filter fabric, silt fencing across the flow stream downstream of the work area as appropriate.
  - All cofferdams and associated structures will be removed upon completion of work.

- Prepare a storm water pollution prevention plan (SWPPP) consistent with Regional Water Quality Control Board policy and guidelines. At a minimum, the SWPPP would include the following elements:
Work areas, staging areas, or stockpile areas that could be subject to erosion during storm events would be stabilized with erosion control measures as appropriate. These measures could typically include silt fencing, straw bales, sand bags, filter fabric, coir rolls or wattles.

Erosion control methods used to prevent siltation would be monitored weekly and maintained as needed.

Stabilize and reseed disturbed upland areas with native grasses, shrubs, and trees upon completion of construction.

Stationary equipment such as motors, pumps, generators and welders located within or adjacent to the channel or basin will be positioned over drip pans.

Any equipment or vehicles driven and/or operated within or adjacent to the channel or basin should be checked and maintained daily, to prevent leaks. All maintenance will occur in a designated offsite area. The designated area will include a drain pan or drop cloth and absorbent material to clean up spills.

Fueling and equipment maintenance will be done in a designated area removed from the area of the channel or basin such that no petroleum products or other pollutants from the equipment may enter these areas via rainfall or runoff. The designated area will include a drain pan or drop cloth and absorbent materials to clean up spills.

Materials for the containment of spills (i.e., absorbent materials, silt fencing, filter fabric, coir rolls) will be identified and be available onsite prior to commencement of construction or maintenance activities.

Any accidental spill of hydrocarbons or coolant that may occur within the work area will be cleaned immediately. Absorbent materials will be maintained within the work area for this purpose.

No wet concrete product will come into contact with any flowing or standing water at any time. Areas where raw cement or grout are applied or where concrete curing or finishing operations are conducted will be separated from any ponded or diverted water flows by a cofferdam or silt-free, exclusionary fencing. All equipment involved with the concrete or grouting operations will be located within a contained area while using any slurry or concrete product. A protective berm or other structure will be in place prior to maintenance and/or repair activities.

Any spill of the grout, concrete, concrete curing or wash water adjacent to or within the work area will be removed immediately.
5.2 AIR QUALITY AND GREENHOUSE GASES

5.2.1 Regulatory Framework

Sources of air emissions in the SCAB are regulated by the USEPA, CARB, and SCAQMD. In addition, regional and local jurisdictions play a role in air quality management. The role of each regulatory agency is discussed below.

Federal Regulations

The Federal Clean Air Act (CAA) of 1963 and its subsequent amendments form the basis for the nation’s air pollution control effort. The USEPA is responsible for implementing most aspects of the CAA. Basic elements of the act include the NAAQS for major air pollutants, hazardous air pollutant standards, attainment plans, motor vehicle emission standards, stationary source emission standards and permits, acid rain control measures, stratospheric ozone protection, and enforcement provisions.

The CAA delegates the enforcement of the Federal standards to the states. In California, the CARB is responsible for enforcing air pollution regulations. In the SCAB, the SCAQMD has this responsibility.

General Conformity Rule

Section 176(c) of the CAA states that a Federal agency cannot issue a permit for, or support an activity within, a nonattainment or maintenance area unless the agency determines it will conform to the most recent USEPA-approved State Implementation Plan (SIP). This means that projects using Federal funds or requiring Federal approval must not: (1) cause or contribute to any new violation of a NAAQS; (2) increase the frequency or severity of any existing violation; or (3) delay the timely attainment of any standard, interim emission reduction, or other milestone.

A conformity determination is required for each criteria pollutant or precursor where the total of direct and indirect emissions of the criteria pollutant or precursor in a nonattainment or maintenance area caused by the Federal action would equal or exceed rates specified in 40 C.F.R. 93.153. See Table 5-2, below. The SCAB, as noted in Table 3-2, is currently in extreme nonattainment for ozone (precursors: VOC or NOx); nonattainment for PM2.5; maintenance for PM10; maintenance for NO2; and maintenance for CO; and nonattainment for lead. Based on the present attainment designation for the SCAB, a Federal action would conform to the SIP if annual emissions are below 100 tons of CO, PM2.5,PM10, or NO2, 10 tons of NOx or VOC, or 25 tons of lead.

State Implementation Plan

For areas that do not attain the NAAQS, the CAA requires the preparation of a SIP, detailing how the State will attain the NAAQS within mandated timeframes. In response to this requirement, the SCAQMD and Southern California Association of Governments (SCAG) developed the 2003 Air Quality Management Plan (2003 AQMP) (SCAQMD 2003a). The focus of the 2003 AQMP was to demonstrate attainment of the Federal PM10 standard by 2006 and the Federal one-hour O3 standard by 2010, while making expeditious progress toward attainment of State standards. The 2003 AQMP also includes a NO2 maintenance plan.

The SCAQMD and SCAG, in cooperation with the CARB and the USEPA, have developed the 2007 AQMP for the primary purposes of demonstrating compliance with the new PM2.5 and 8-hour O3 NAAQS. This plan also provides additional measures beyond the 2003 AQMP for the attainment of the PM10 standard that was not attained by 2006, the one-hour O3 NAAQS (the standard was revoked by the USEPA, but the SCAQMD is still tracking progress towards attainment of this standard), and other planning requirements. The SCAQMD Governing Board adopted the Final 2007 AQMP on June 1, 2007.
USEPA approved the 2007 8-hour O3 plan in March 2012, and approved nearly all elements of the 2007 PM2.5 plan in September 2012. However, in August 2012 USEPA proposed to withdraw approval of parts of the approved ozone planning requirements (VMT emissions offset demonstration), and proposed to find that the 1 hour O3 plan is inadequate for meeting the standard, which would require a new attainment plan be submitted as part of a revised SIP within 12 months of approval of this proposed inadequacy finding. The SCAQMD is currently in the process of preparing the 2012 AQMP and published the Draft 2012 AQMP in July 2012, a revised Draft 2012 AQMP in September 2012, and a Draft Final 2012 AQMP in November 2012.

On June 11, 2007, the USEPA re-designated the SCAB from nonattainment to attainment for the CO one-hour and eight-hour NAAQS. The USEPA also approved a SIP revision for the SCAB nonattainment area in California as meeting the CAA requirements for maintenance plans for CO. The USEPA made an adequacy finding and approved motor vehicle emission budgets, which are included in the maintenance plan. The USEPA also approved the California motor vehicle inspection and maintenance (I/M) program as meeting the low enhanced I/M requirements for CO in the South Coast region (USEPA 2007).

**Non-Road Diesel Fuel Rule**

In May 2004, the USEPA set sulfur limits for non-road diesel fuel. Under this rule, starting January 1, 2012 (USEPA 2004), diesel fuel used by all non-road equipment (not including marine and aircraft fuel) would be limited to 15 ppm sulfur, which would be equivalent to the sulfur content restrictions of the California Diesel Fuel Regulations.

**Emission Standards for On-Road Trucks**

To reduce emissions from on-road, heavy-duty diesel trucks, the USEPA established a series of cleaner emission standards for new engines, starting in 1988. These emission standards regulations have been revised over time and the latest effective regulation, the 2007 Heavy-Duty Highway Rule, provides for reductions in PM, NOx, and non-methane hydrocarbon emissions that were phased in during the model years 2007 through 2010 (USEPA 2000).

**Environmental Protection Agency Diesel Fuel Rule**

This EPA rule limited the sulfur content in on-road diesel fuel to 15 ppm starting June 1, 2006 (EPA 2006a).

**Off-Road Diesel Engine Rule**

To reduce emissions from off-road diesel equipment, the EPA established a series of increasingly strict emission standards for new engines. Locomotives and marine vessels are exempt from this rule. Manufacturers of off-road diesel engines would be required to produce engines with certain emission standards under the following compliance schedule:

- Tier 1 standards were phased in from 1996 to 2000 (year of manufacture), depending on the engine horsepower category.
- Tier 2 standards were phased in from 2001 to 2006.
- Tier 3 standards were phased in from 2006 to 2008.
• Tier 4 standards, which likely will require add-on emissions control equipment to attain them, will be phased in from 2008 to 2015.

**Greenhouse Gases**

Under the provisions of the CAA, the USEPA has the authority to regulate GHGs should a finding be made that GHGs have the potential to create adverse impacts. In April 2007, the U.S. Supreme Court held that GHG emissions are pollutants within the meaning of the CAA. In reaching its decision, the Court also acknowledged that climate change results, in part, from anthropomorphic causes (Massachusetts et al. v. Environmental Protection Agency 549 U.S. 497, 2007). The Supreme Court’s ruling paved the way for the regulation of GHG emissions by USEPA under the CAA. In response to this Supreme Court decision, on December 7, 2009 the USEPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the CAA:

- **Endangerment Finding:** That the current and projected concentrations of the GHGs in the atmosphere threaten the public health and welfare of current and future generations; and,
- **Cause or Contribute Finding:** That the combined emissions of GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

USEPA has enacted a number of GHG regulations and other environmental regulations that will impact GHG emissions, including:

- Mandatory GHG Reporting
- GHG Tailoring Rule for PSD Permits
- GHG Vehicle Emissions Standards
- Corporate Average Fuel Economy Standards
- Renewables Fuel Standard

On December 18, 2014, the Council for Environmental Quality (CEQ) released its “Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts.” The guidance sets 25,000 metric tons of annual carbon dioxide equivalent emissions as a reference point below which a quantitative analysis of greenhouse gas is not recommended unless it is easily accomplished based on available tools and data. The reference level is for purposes of disclosure and not a substitute for an agency’s determination of significance under NEPA.

**State Regulations**

**California Clean Air Act**

In California, the CARB is designated as the responsible agency for all air quality regulations. The CARB, which became part of the California Environmental Protection Agency (Cal/EPA) in 1991, is responsible for implementing the requirements of the Federal CAA, regulating emissions from motor vehicles and consumer products, and implementing the California Clean Air Act of 1988 (CCAA). The CCAA outlines a program to attain the CAAQS for O3, NO2, SO2, and CO by the earliest practical date. Since the CAAQS are often more stringent than the NAAQS, attainment of these more stringent CAAQS will require more emission reductions than what will be required to show attainment of the NAAQS. Similar to the Federal system, the State requirements and compliance dates are based on the severity of the ambient air quality standard violation within a region.
Assembly Bill (AB) 1807 – Air Toxics Program

AB 1807 established California’s Air Toxics Program in 1983. The Air Toxics Program is a two-phased program for the identification and control of air toxics. During the first phase (identification), the CARB and the Office of Environmental Health Hazard Assessment (OEHHA) prepare draft reports on exposure assessment and health assessment. The draft reports are distributed for public review and comment. Comments can be made in writing or at public workshops. The report is then submitted to the independent scientific review panel (SRP), which reviews the reports for scientific accuracy and submits its findings to the CARB. The SRP is a nine-member group of professionals with backgrounds in disciplines such as medicine, atmospheric science, statistics, and toxicology. The SRP members are appointed by the Governor or the State legislature. At a public hearing, the Board decides whether to list the substance as a TAC.

Once the CARB identifies a substance as a TAC, it begins the second phase (control) of California’s TAC program. In this phase, an assessment is conducted to determine the need for, and degree of, further controls. As in the identification phase, public outreach is an essential element in the development of a control plan and any control measures. The CARB works with districts and holds numerous public workshops and individual meetings with stakeholders in an open public process. If appropriate, each air toxic control measure is then adopted by the CARB at a public hearing.

AB 2588 – Air Toxics “Hot Spots” Information and Assessment Act

AB 2588, enacted in 1987, is designed to provide information to State and local agencies and to the general public on the extent of airborne emissions from stationary sources and the potential public health impact of those emissions. The “Hot Spots” Act requires that OEHHA develop risk assessment guidelines for the “Hot Spots” Program (Health and Safety Code Section 44360[b][2]). In addition, the “Hot Spots” Act specifically requires OEHHA to develop a “likelihood of risks” approach to health risk assessment. The “Hot Spots” Act requires stationary sources of TACs to prepare facility-wide health risk assessments in accordance with OEHHA guidelines, and to notify the public in the event of a potential health risk. The “Hot Spots” Act also establishes criteria for requiring implementation of risk reduction measures for high-risk facilities.

Heavy Duty Diesel Truck Idling Regulation

This CARB rule became effective February 1, 2005 and prohibits heavy-duty diesel trucks from idling for longer than five minutes at a time, unless they are queuing, provided the queue is located beyond 100 feet from any homes or schools (CARB 2006a).

CARB Drayage Truck Regulation

This CARB rule became effective December 3, 2009. The regulation requires trucks to meet engine emission requirements by a certain date. Under Phase 1, by December 31, 2012, all trucks must reduce PM emissions by 85 percent and must meet 2007 engine emission standards. The Drayage Truck Regulation also requires trucks to be registered in the Drayage Truck Registry.

California Diesel Fuel Regulations

In 2004, the CARB set limits on the sulfur content of diesel fuel sold in California for use in on-road and off-road motor vehicles (CARB 2004). Under this rule, diesel fuel used in motor vehicles except harbor craft and intrastate locomotives has been limited to 500 ppm sulfur since 1993. The sulfur limit was reduced to 15 ppm beginning on September 1, 2006. Diesel fuel used in harbor craft in the SCAB also was limited to 500 ppm sulfur starting January 1, 2006 and was lowered to 15 ppm sulfur on September 1, 2006.
Statewide Portable Equipment Registration Program (PERP)

The PERP establishes a uniform program to regulate portable engines and portable engine–driven equipment units (CARB 2005b). Once registered in the PERP, engines and equipment units may operate throughout California without the need to obtain individual permits from local air districts, as long as the equipment is located at a single location for no more than 12 months. There may be construction equipment that would be required to be PERP registered, but there are no known operating emissions sources that would be subject to this regulation.

Heavy-Duty Diesel Truck Idling Regulation

This CARB rule affected heavy-duty diesel trucks in California beginning in 2008. The rule requires that heavy-duty trucks be equipped with a non-programmable engine system that shuts down the engine after 5 minutes to prevent long idling times or, as an alternative, meet a stringent NO\textsubscript{X} idling emission standard.

On-Road Heavy-Duty Diesel Vehicles (In Use) Regulation

On December 12, 2008, CARB approved the on-road heavy-duty diesel vehicle (in use) regulation to significantly reduce PM and NO\textsubscript{X} emissions from existing diesel vehicles operating in California. The regulation applies to nearly all diesel-fueled trucks and buses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds that are privately or Federally owned and for privately and publicly owned school buses.

Starting January 1, 2012, the regulation would phase-in requirements for heavier trucks to reduce PM emissions with exhaust retrofit filters that capture pollutants before they are emitted to the air or by replacing vehicles with newer vehicles that are originally equipped with PM filters. Starting on January 1, 2015, lighter trucks with a GVWR of 14,001 to 26,000 pounds with engines that are 20 years or older would need to be replaced with newer trucks. Starting January 1, 2020, all remaining trucks and buses would need to be replaced so that they would all have 2010 model year engines or equivalent emissions by 2023.

Greenhouse Gas Emissions

Responding to growing scientific and political concern regarding global climate change, California has recently adopted a series of laws to reduce the level of GHGs in the atmosphere and emissions of GHGs from commercial and private activities within the state. Assembly Bill (AB) 1493 requires the development and adoption of regulations to achieve “the maximum feasible reduction of greenhouse gases” emitted by noncommercial passenger vehicles, light-duty trucks, and other vehicles used primarily for personal transportation. It also requires CARB to design and implement emission limits, regulations, and other measures to reduce GHG emissions to 1990 levels by 2020.

Local Regulations and Agreements

The SCAQMD is primarily responsible for planning, implementing, and enforcing Federal and State ambient standards within this portion of the SCAB. As part of its planning responsibilities SCAQMD prepares Air Quality Management Plans and Attainment Plans as necessary based on the attainment status of the air basins within its jurisdiction. The SCAQMD is also responsible for permitting and controlling stationary source criteria and air toxic pollutants as delegated by the USEPA.

Through the attainment planning process, the SCAQMD develops the SCAQMD Rules and Regulations to regulate sources of air pollution in the SCAB (SCAQMD 2012b). The applicable SCAQMD rules to the Project are listed below.
SCAQMD Rule 401 – Visible Emissions
This rule prohibits discharge of air contaminants or other material, which are as dark or darker in shade as that designated No. 1 on the Ringelmann Chart or obscure an observer’s view.

SCAQMD Rule 402 – Nuisance
This rule prohibits discharge of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or that endanger the comfort, repose, health, or safety of any such persons or the public; or that cause, or have a natural tendency to cause, injury or damage to business or property.

SCAQMD Rule 403 – Fugitive Dust
The purpose of this rule is to control the amount of PM entrained in the atmosphere from man-made sources of fugitive dust. Under Rule 403, no person shall conduct active operations without utilizing the applicable best available control measures to minimize fugitive dust emissions. Construction and operation fugitive dust emission sources are subject to this rule, which covers all fugitive dust emissions sources, such as unpaved and paved roads, storage piles, and earthmoving operations.

Additional requirements apply to operations on a property with 50 or more acres of disturbed surface area, or for any earth-moving operation with a daily earth-moving or throughput volume of 5,000 cy or more three times during the most recent 365-day period. These requirements include submittal of a dust control plan, maintaining dust control records, and designating a SCAQMD-certified dust control supervisor.

SCAQMD Rule 1113 – Architectural Coatings
This rule requires manufacturers, distributors, and end-users of architectural and industrial maintenance coatings to reduce VOC emissions from the use of these coatings, primarily by placing limits on the VOC content of various coating categories.

SCAQMD Rule 1901 – Adoption of General Conformity Rule
This rule adopts the guidelines for the General Conformity Rule within SCAQMD.

SCAQMD Regulation XI – Source Specific Standards
This regulation is composed of several dozen individual rules, most of which are not applicable to the project.

SCAQMD Regulation XIII – New Source Review
This regulation requires the permitting of new stationary sources and requires the use of BACT to control criteria pollutant emissions and requires offsetting emissions, other than CO, if they are over four tons per year.

5.2.2 Assessment Methodology
Air pollutant emissions associated with each alternative were estimated using CalEEMod Version 13.2.2, an air emissions modeling software developed by the SCAQMD in collaboration with other air districts in California, to estimate criteria air pollutant and greenhouse gas emissions from various land use development projects. The emission modeling software is used by air districts within California.

For construction emissions an equipment inventory was developed for specific tasks required to implement management measures listed in Section 4.4.5. Equipment information included off-road and
on-road equipment types, quantity of equipment, hours of off-road equipment operation, and on-road transportation distances. For Alternatives 13, 13v and 20, a general multi-year construction schedule and detailed construction phasing for each management measure were entered into CalEEMod. Each measure entered into CalEEMod was correlated with information from the equipment inventory. Detailed construction schedules for Alternative 16 and 10 were not developed. However, Alternative 16 is a truncated variation of Alternative 20. Likewise, Alternative 10 is a truncated variation of Alternative 13. As a result, appropriate construction phases entered into CalEEMod for Alternative 20 were deleted to estimate emissions for Alternative 16. Likewise, appropriate construction phases entered into CalEEMod for Alternative 13 were deleted to estimate emissions for Alternative 10. See the Air Quality Technical Appendix (Appendix F) for additional information on deleted construction phases.

Maximum daily and annual emissions were estimated for each construction year for all alternatives. Results were compared to applicable regulatory thresholds to determine significant impacts.

Operational emissions would include maintenance activities and as well as increased visitation by the public to the project area. Maintenance activities would likely entail annual vegetation maintenance activities over a 30 day period. Required equipment would include approximately five medium duty pickup trucks, two backhoes, two loaders, one excavator, two chippers, and two dump trucks. An increase of approximately 572 average daily visitors is projected with implementation of any action alternatives (See Recreational Analysis Appendix, Tables 3 and 4). In so far as all alternatives share many common restoration features, the scope, nature, and duration of maintenance activities are not expected to be notably different. Furthermore, the increase in visitation is projected with implementation of any action alternatives. Operational emissions are not expected to substantially change from year to year. As a result, maximum daily and annual emissions estimates were limited to one year.

Maintenance related emissions were estimated using CalEEMod. Emissions associated with increased visitations were estimated in Microsoft Excel using SCAQMD emissions factors for passenger vehicles (model years 1982-2026). Daily and annual CO2e emissions were calculated using U.S. Environmental Protection Agency’s CO2e calculator at http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results.

Estimates of lead emissions were not calculated for construction and operational phases. Lead emissions from mobile sources in California have significantly decreased due to the near elimination of lead in fuels. Thus, CalEEMod, the South Coast Air Quality Management District-approved emission modeling software, does not provide estimated emissions for lead. Little to no quantifiable and foreseeable lead emissions would be generated by the alternatives.

Greenhouse gas (GHG) emissions were estimated by amortizing the sum of construction-related GHG emissions for all construction years over a 30 year period. The resulting figure was added to annual estimates of operational GHG emissions. Operational emissions include emissions from maintenance and increased visitations. Unlike construction emissions, operational GHG emissions were assumed to remain the same from year to year. GHG emissions are reported as CO2 equivalents (CO2e).

The Air Quality Technical Appendix (Appendix F) presents more detailed analyses, including emissions calculation methodologies, assumption, input data and model run files.

5.2.3 Air Quality Significance Thresholds

Disclosure of environmental impacts under NEPA and CEQA typically include defining or selecting a level of significance for each potential impact. Once these significance thresholds have been established,
the estimated impacts can be compared to the thresholds to determine whether those impacts would be significant. The following thresholds were used to determine significance under NEPA, CEQA, or both.

In general, significance impact thresholds were based on current CEQA Guidelines, specifically the guidelines established by the SCAQMD for assessing air quality impacts. Air emissions would be significant if implementation of a proposed project or its alternatives would result in any of the following:

- **AQ-1 General Conformity Applicability Rates (NEPA):** Conflicts with or obstructs implementation of the applicable air quality plan (NEPA).
- **AQ-2 (CEQA & NEPA):** Violates any air quality standard or contributes substantially to an existing or projected air quality violation.
- **AQ-3 (CEQA & NEPA):** Results in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable Federal or state ambient air quality standard (including releasing emissions that exceed quantitative threshold for ozone precursors).
- **AQ-4 (CEQA):** Exposes sensitive receptors to substantial pollutant concentrations.
- **AQ-5 (CEQA & NEPA):** Creates objectionable odors affecting a substantial number of people.
- **AQ-6 (CEQA):** Results in greater than 10,000 MT per year of greenhouse gas emissions from the construction and operation of the alternative.

### AQ-1: General Conformity Applicability Rates (NEPA)

The General Conformity applicability rates are typically applied to the preferred alternative for the purpose of assessing General Conformity determinations under the Clean Air Act. However, under AQ-1, the General Conformity applicability rates are utilized for the purpose of comparison and disclosure of all alternatives under NEPA. Table 5-2 summarizes these thresholds.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Federal Attainment Designation</th>
<th>Rates (Tons/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (precursors: VOC or NOx)</td>
<td>Serious nonattainment</td>
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</tr>
<tr>
<td>Ozone (precursors: VOC or NOx)</td>
<td>Severe nonattainment</td>
<td>25</td>
</tr>
<tr>
<td>Ozone (precursors: VOC or NOx)</td>
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</tr>
<tr>
<td>Other areas outside of an ozone transport region</td>
<td>All nonattainment and maintenance areas</td>
<td>100</td>
</tr>
<tr>
<td>CO, SO₂, and NOₓ</td>
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<tr>
<td>PM₂.₅</td>
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<td>100</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>All nonattainment and maintenance areas</td>
<td>100</td>
</tr>
<tr>
<td>Pb (Lead)</td>
<td>All nonattainment and maintenance</td>
<td>25</td>
</tr>
</tbody>
</table>

(a) Source: 40 CFR 93.153
(b) Ozone precursors (NOx and VOCs): Gasoline and diesel engines do not directly emit ozone. Ozone is a product of NOx and VOCs reacting in the presence of sunlight. Since engines directly emit NOx and VOCs, their values function as surrogates for ozone emissions.

Appendix F contains the Clean Air Act Applicability Analysis for Alternative 13v, the NER Plan, and Alternative 20, the Locally Preferred Plan and Recommended Plan. Maintenance activities are considered exempt under 40 CFR 93.153(c)(2)(iv), and were not included in the total of direct and indirect emissions evaluated in the applicability analysis in Appendix F. Emissions from increased visitation by the public as a result of construction of the project cannot be practically controlled by the Corps and were therefore not
considered indirect emissions caused by the Federal action in the applicability analysis. However, operational emissions are evaluated under AQ-1 for purposes of NEPA.

Because all alternatives would convert the existing LATC site to restored habitat, a functionally equivalent facility is anticipated to be constructed elsewhere in the Los Angeles Basin. Emissions from relocation of site functions elsewhere in the basin cannot be practically controlled by the Corps, and the Corps does not have continuing program responsibility; therefore, such emissions are not considered indirect emissions caused by the Federal action in the applicability analysis. Construction of relocated site functions would result in temporary increases in emissions. Operation of relocated site functions may increase localized emissions in and around the relocation site. However, the relocation of the site functions within the Los Angeles Air Basin would not transfer the operational impacts of the site functions to a different air basin. Prior to site selection CEQA lead agency will conduct a detailed CEQA analysis in analyzing the relocation of LATC site functions, including air emissions. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

AQ-2: Regional Significance Thresholds (CEQA and NEPA)

AQ-2 was assessed using SCAQMD-developed Regional Significance Thresholds (RSTs) for mass daily emission rates of criteria pollutants for both construction and operational sources. RSTs represent the maximum emissions from a project that are not expected to cause or contribute to an exceedance of the most stringent applicable Federal or state ambient air quality standard in the SCAB. RSTs are presented in pounds per day. Thresholds for construction impacts are based on the maximum or peak daily emissions during the construction period, which provides a “worst-case” analysis of the construction emissions. Similarly, significance determinations for operational emissions are based on the maximum or peak daily allowable emissions during the operational phase. Table 5-3 summarizes the RSTs.

Table 5-3 Regional Air Quality Significance Thresholds

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Construction</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Oxide (NOx)</td>
<td>100 lbs/day</td>
<td>55 lbs/day</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOC)</td>
<td>75 lbs/day</td>
<td>55 lbs/day</td>
</tr>
<tr>
<td>Particle Pollution (PM10)</td>
<td>150 lbs/day</td>
<td>150 lbs/day</td>
</tr>
<tr>
<td>Particle Pollution (PM2.5)</td>
<td>55 lbs/day</td>
<td>55 lbs/day</td>
</tr>
<tr>
<td>Sulfur Oxides (SOx)</td>
<td>150 lbs/day</td>
<td>150 lbs/day</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>550 lbs/day</td>
<td>550 lbs/day</td>
</tr>
<tr>
<td>Lead</td>
<td>3 lbs/day</td>
<td>3 lbs/day</td>
</tr>
</tbody>
</table>

(a) Source: SCAQMD CEQA Handbook (SCAQMD, 1993)
(b) SCAQMD uses Reactive Organic Gasses (ROG) instead of VOC. The terms are interchangeable.

AQ-3: Cumulative Impacts (CEQA and NEPA)

AQ-3 was assessed using RSTs. The SCAQMD typically considers projects that exceed the RSTs to be cumulatively significant. Conversely, projects that do not exceed the thresholds are generally not considered to be cumulatively significant. This approach will be applied to impacts under CEQA and NEPA.
AQ-4: Localized Significance Thresholds (CEQA)

AQ-4 was assessed using SCAQMD-developed localized significant thresholds (LSTs) that identify daily emissions levels at a project construction site that could cause or contribute to adverse localized air quality impacts to the nearest sensitive receptors. For purposes of a CEQA analysis, the SCAQMD considers a sensitive receptor to be a receptor such as a residence, hospital, prison, and convalescent facility where it is possible that an individual could remain for 24 hours. Schools are also considered sensitive receptors. Commercial and industrial facilities are not considered sensitive receptors because employees do not typically remain on site for a full 24 hours. The applicable LSTs for the study area are shown in Table 5-4.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Construction (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Oxide (NOx)</td>
<td>46</td>
</tr>
<tr>
<td>Particle Pollution (PM_{10})</td>
<td>4</td>
</tr>
<tr>
<td>Particle Pollution (PM_{2.5})</td>
<td>3</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>231</td>
</tr>
</tbody>
</table>

AQ-5: Odors (CEQA and NEPA)

To assess AQ-5, the SCAQMD CEQA Air Quality Handbook indicates that land uses likely to result in odor nuisance complaints include: agriculture, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding. Since the project would not result in construction of the facilities listed above, it is assumed that odor impacts would be less than significant under both CEQA and NEPA. Brief, qualitative discussions of control orders associated with the alternative are included in Section 5.2.3.

AQ-6: Greenhouse Gas (CEQA)

The SCAQMD adopted a quantitative significance threshold of 10,000 metric tons (MT) per year for industrial (stationary source) projects. In the absence of applicable GHG thresholds for ecosystem restoration projects, the 10,000 metric ton threshold for GHG is adopted for use in this analysis. The SCAQMD recommends that the total construction emissions be amortized over the lifetime of the project and then added to annual operational emissions. If the lifetime of a project is not known, then a 30-year lifetime is assumed. AQ-6 is assessed pursuant to this method.

NEPA Greenhouse Gas Statement

There are currently no Federal GHG emission thresholds. Therefore, the USACE will not utilize the SCAQMD quantitative CEQA significance threshold for industrial projects, propose a new GHG threshold, or make a NEPA significance impact determination for GHG emissions anticipated to result from any of the alternatives. Rather, in compliance with NEPA implementing regulations, the anticipated emissions will be disclosed for each alternative without expressing a judgment as to their significance.
5.2.4 Environmental Impacts

No Action Alternative

Construction Impacts
There would be no construction related air emissions under the No Action Alternative since no construction would occur.

Operational Impacts
There would be no operational related air emissions under the No Action Alternative since no construction would occur.

Alternative 10
Alternative 10 would be constructed over a 10 year period starting in 2017 and ending in 2026. Table 5-5 and Table 5-6 show the annual and daily emission estimates, respectively.

Emissions estimates for Alternative 10 were not based on detailed construction schedules as was done for Alternatives 13, 13v, and 20. However, Alternative 10 is a truncated variation of Alternative 13. As a result, appropriate construction phases entered into CalEEMod for Alternative 13 were deleted to estimate emissions for Alternative 10. See the Air Quality Technical Appendix (Appendix F) for additional information on deleted construction phases.

Construction Impacts

• AQ-1: General Conformity Applicability Rates (NEPA)
As shown in Table 5-5, estimated annual emissions would not exceed the General Conformity Applicability Rates. As a result, construction activities associated with this alternative would result in less than significant impacts.

• AQ-2: Regional Significance Thresholds (CEQA and NEPA)
As shown in Table 5-6, estimated daily construction emissions would not exceed any RST. As a result, construction activities associated with this alternative would result in less than significant impacts.

• AQ-3: Cumulative Impacts (CEQA and NEPA)
The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects. The estimated daily construction and operational emissions would not exceed any RSTs. Therefore, impacts to cumulative impacts would be less than significant.

• AQ-4: Localized Significance Thresholds (CEQA)
As shown in Table 5-6, estimated daily construction emissions for NOx would exceed LST during construction in 2018 and 2019. Estimated emissions for CO, PM10, and PM2.5 would remain below LSTs for all construction years. Since, construction would
take place within an urbanized setting including sensitive receptors, exceedence of NOx LST in 2018 and 2019 would result in significant impacts.

- **AQ-5: Odors (CEQA and NEPA)**
  Potential sources that may emit odors during construction activities would include diesel emissions from on- and off-road equipment. However, construction would be limited to relatively small footprints interspersed throughout the project area, and the number of diesel powered equipment would be limited to those indicated in Appendix F. Furthermore, not all diesel equipment are expected to be operating simultaneously. Therefore, construction emissions would be transient and would result in less than significant impact to odors.

- **AQ-6: Greenhouse Gas Thresholds (CEQA)**
  As shown in Table 5-9, estimated GHG emissions would not exceed the 10,000 MT annual CO2e threshold for both raw values and the 30-year amortized values. Thus, the alternative would result in less than significant impacts.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (VOC)</td>
<td>10</td>
<td>0.12</td>
<td>0.12</td>
<td>0.06</td>
<td>0.11</td>
<td>0.05</td>
<td>0.07</td>
<td>0.07</td>
<td>0.00</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Ozone (NOX)</td>
<td>10</td>
<td>1.38</td>
<td>1.21</td>
<td>0.62</td>
<td>1.20</td>
<td>0.49</td>
<td>0.66</td>
<td>0.64</td>
<td>0.00</td>
<td>0.50</td>
<td>0.51</td>
</tr>
<tr>
<td>NO2</td>
<td>100</td>
<td>1.38</td>
<td>1.21</td>
<td>0.62</td>
<td>1.20</td>
<td>0.49</td>
<td>0.66</td>
<td>0.64</td>
<td>0.00</td>
<td>0.50</td>
<td>0.51</td>
</tr>
<tr>
<td>CO</td>
<td>100</td>
<td>0.81</td>
<td>0.80</td>
<td>0.41</td>
<td>0.77</td>
<td>0.36</td>
<td>0.62</td>
<td>0.63</td>
<td>0.00</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>PM10</td>
<td>100</td>
<td>0.07</td>
<td>0.07</td>
<td>0.03</td>
<td>0.06</td>
<td>0.03</td>
<td>0.04</td>
<td>0.03</td>
<td>0.00</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>PM2.5</td>
<td>100</td>
<td>0.06</td>
<td>0.06</td>
<td>0.03</td>
<td>0.05</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.00</td>
<td>0.02</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Operational Impacts

Operational emissions would include maintenance activities and as well as increased visits to the project area. Impacts are expected to remain similar from year to year. Maintenance activities would likely entail annual vegetation maintenance activities over a 30 day period. Required equipment would include approximately five medium duty pickup trucks, two backhoes, two loaders, one excavator, and two dump trucks. Maintenance would likely occur after September 15 of any year subsequent to the conclusion of bird nesting season. An increase of approximately 572 average daily visitors is projected with implementation of any build alternative (See Recreational Analysis Appendix, Tables 3 and 4). Maintenance activities are considered exempt under 40 CFR 93.153(c)(2)(iv), and were not included in the total of direct and indirect emissions evaluated in the applicability analysis in Appendix F. Emissions from increased visitation by the public as a result of construction of the project cannot be practically controlled by the Corps and were therefore not considered indirect emissions caused by the Federal action in the applicability analysis. However, these emissions were evaluated under AQ-1 for purposes of NEPA.

- **AQ-1: General Conformity Applicability Rates (NEPA)**
  As shown in Table 5-7, estimated annual operational emissions would not exceed the General Conformity Applicability Rates. As a result, operation activities associated with this alternative would result in less than significant impacts.

- **AQ-2: Regional Significance Thresholds (CEQA and NEPA)**
  As shown in Table 5-8, estimated daily operational emissions would not exceed any RST. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-3: Cumulative Impacts (CEQA and NEPA)**
  The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur...
in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects. The estimated daily construction and operational emissions would not exceed any RSTs. Therefore, impacts to cumulative impacts would be less than significant.

**AQ-4: Localized Significance Thresholds (CEQA)**
As shown in Table 5-8, estimated daily operational emissions would not exceed any LST. As a result, operational emissions associated with this alternative would result in less than significant impacts.

**AQ-5: Odors (CEQA and NEPA)**
Potential sources that may emit odors during maintenance activities would include diesel emissions from on- and off-road equipment. However, the scope of maintenance would be limited to relatively small footprints interspersed throughout the project area, and the number of diesel powered equipment would be limited to those indicated in Appendix F. Furthermore, not all diesel equipment are expected to be operating simultaneously. Emissions associated with maintenance activities would be transient. Emissions from increased daily visits would be associated with light passenger vehicles which have relatively less odors than diesel emissions. Based on the above, operational emissions associated with this alternative would result in less than significant impacts.

**AQ-6: Greenhouse Gas Thresholds (CEQA)**
As shown in Table 5-9, estimated GHG emissions would not exceed the 10,000 MT annual CO2e threshold. Thus, the alternative would result in less than significant impacts.

Table 5-7 Alternative 10 Estimated Annual Emissions (Operation)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>General Conformity Rates (tons/yr)</th>
<th>Estimated Emissions (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maintenance</td>
<td>Visitation</td>
</tr>
<tr>
<td>Ozone (VOC)</td>
<td>10</td>
<td>0.03</td>
</tr>
<tr>
<td>Ozone (NOX)</td>
<td>10</td>
<td>0.40</td>
</tr>
<tr>
<td>NO2</td>
<td>100</td>
<td>0.40</td>
</tr>
<tr>
<td>CO</td>
<td>100</td>
<td>0.28</td>
</tr>
<tr>
<td>PM10</td>
<td>100</td>
<td>0.02</td>
</tr>
<tr>
<td>PM2.5</td>
<td>100</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Table 5-8 Alternative 10 Estimated Daily Emissions (Operation)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Regional Significant Rates (lbs/day)</th>
<th>Local Significant Rates (lbs/day)</th>
<th>Estimated Emissions (lbs/day)</th>
<th>Estimated Emissions (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Maintenance</td>
<td>Visitations</td>
<td></td>
</tr>
<tr>
<td>VOC</td>
<td>55.00</td>
<td>n/a</td>
<td>2.40</td>
<td>4.80</td>
</tr>
<tr>
<td>NOX</td>
<td>55.00</td>
<td>46.00</td>
<td>26.60</td>
<td>3.10</td>
</tr>
<tr>
<td>CO</td>
<td>550.00</td>
<td>231.00</td>
<td>18.90</td>
<td>37.60</td>
</tr>
<tr>
<td>SO2</td>
<td>150.00</td>
<td>n/a</td>
<td>0.03</td>
<td>0.12</td>
</tr>
<tr>
<td>PM10</td>
<td>150.00</td>
<td>4.00</td>
<td>1.35</td>
<td>1.10</td>
</tr>
<tr>
<td>PM2.5</td>
<td>55.00</td>
<td>3.00</td>
<td>1.19</td>
<td>0.73</td>
</tr>
<tr>
<td>CO2e</td>
<td>n/a</td>
<td>n/a</td>
<td>3563.00</td>
<td>12720.00</td>
</tr>
</tbody>
</table>

Table 5-9 Alternative 10 Annual GHG Emissions (Construction and Operations)

<table>
<thead>
<tr>
<th>Annual CO2e Emissions Sources</th>
<th>SCAQMD GHG Rates (MT/yr)</th>
<th>Annual Estimated Emissions (MT/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>n/a</td>
<td>29</td>
</tr>
<tr>
<td>Maintenance</td>
<td>n/a</td>
<td>48</td>
</tr>
<tr>
<td>Visitations</td>
<td>n/a</td>
<td>2079</td>
</tr>
<tr>
<td>Total CO2e</td>
<td>10,000</td>
<td>2156</td>
</tr>
</tbody>
</table>
Alternative 13 would be constructed over a 10 year period starting in 2017 and ending in 2026. Table 5-10 and Table 5-11 show the annual and daily emission estimates, respectively.

Construction Impacts

- **AQ-1: General Conformity Applicability Rates (NEPA)**
  As shown in Table 5-10, estimated annual emissions would not exceed the General Conformity Applicability Rates. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-2: Regional Significance Thresholds (CEQA and NEPA)**
  As shown in Table 5-11, estimated daily construction emissions would not exceed any RST. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-3: Cumulative Impacts (CEQA and NEPA)**
  The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects. The estimated daily construction and operational emissions would not exceed any RSTs. Therefore, impacts to cumulative impacts would be less than significant.

- **AQ-4: Localized Significance Thresholds (CEQA)**
  As shown in Table 5-11, estimated daily construction emissions for NOx would exceed LST during construction in 2018 and 2019. Estimated emissions for CO, PM10, and PM2.5 would remain below LSTs for all construction years. Since, construction would take place within an urbanized setting including sensitive receptors, exceedence of NOx LST in 2018 and 2019 would result in significant impacts.

- **AQ-5: Odors (CEQA and NEPA)**
  Potential sources that may emit odors during construction activities would include diesel emissions from on- and off-road equipment. However, construction would be limited to relatively small footprints interspersed throughout the project area, and the number of diesel powered equipment would be limited to those indicated in Appendix F. Furthermore, not all diesel equipment are expected to be operating simultaneously. Therefore, construction emissions would be transient and would result in less than significant impact to odors.

- **AQ-6: Greenhouse Gas Thresholds (CEQA)**
  As shown in Table 5-12, estimated GHG emissions would not exceed the 10,000 MT annual CO2e threshold for both raw values and the 30-year amortized values. Thus, the alternative would result in less than significant impacts.
Operational Impacts

Operational emissions would be similar to those characterized under Alternative 10. Impacts to all air quality significance thresholds would be less than significant.

Table 5-10 Alternative 13 Estimated Annual Emissions (Construction)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (VOC)</td>
<td>10</td>
<td>0.22</td>
<td>0.16</td>
<td>0.11</td>
<td>0.10</td>
<td>0.07</td>
<td>0.07</td>
<td>0.09</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Ozone (NOx)</td>
<td>10</td>
<td>1.28</td>
<td>1.69</td>
<td>1.20</td>
<td>1.02</td>
<td>0.66</td>
<td>0.64</td>
<td>0.87</td>
<td>0.50</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>NO2</td>
<td>100</td>
<td>0.12</td>
<td>0.08</td>
<td>0.06</td>
<td>0.04</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>100</td>
<td>0.11</td>
<td>0.07</td>
<td>0.05</td>
<td>0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5-11 Alternative 13 Estimated Daily Emissions (Construction)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Regional Significance Thresholds (lbs/day)</th>
<th>Local Significant Thresholds (lbs/day)</th>
<th>2017 Estimated Emissions (lbs/day)</th>
<th>2018 Estimated Emissions (lbs/day)</th>
<th>2019 Estimated Emissions (lbs/day)</th>
<th>2020 Estimated Emissions (lbs/day)</th>
<th>2021 Estimated Emissions (lbs/day)</th>
<th>2022 Estimated Emissions (lbs/day)</th>
<th>2023 Estimated Emissions (lbs/day)</th>
<th>2024 Estimated Emissions (lbs/day)</th>
<th>2025 Estimated Emissions (lbs/day)</th>
<th>2026 Estimated Emissions (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC</td>
<td>75</td>
<td>n/a</td>
<td>2.90</td>
<td>7.45</td>
<td>5.68</td>
<td>2.53</td>
<td>4.57</td>
<td>2.50</td>
<td>1.74</td>
<td>3.31</td>
<td>1.72</td>
<td>1.87</td>
</tr>
<tr>
<td>NOx</td>
<td>100</td>
<td>46</td>
<td>32.47</td>
<td>77.96</td>
<td>58.18</td>
<td>26.89</td>
<td>45.97</td>
<td>23.89</td>
<td>16.69</td>
<td>30.75</td>
<td>14.95</td>
<td>16.90</td>
</tr>
<tr>
<td>CO</td>
<td>550</td>
<td>231</td>
<td>18.95</td>
<td>46.59</td>
<td>38.35</td>
<td>18.09</td>
<td>35.52</td>
<td>23.16</td>
<td>16.23</td>
<td>28.81</td>
<td>16.40</td>
<td>17.60</td>
</tr>
<tr>
<td>SO2</td>
<td>150</td>
<td>n/a</td>
<td>0.03</td>
<td>0.08</td>
<td>0.06</td>
<td>0.03</td>
<td>0.06</td>
<td>0.04</td>
<td>0.07</td>
<td>0.03</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>PM10</td>
<td>150</td>
<td>4</td>
<td>1.67</td>
<td>4.28</td>
<td>3.04</td>
<td>1.46</td>
<td>2.49</td>
<td>1.26</td>
<td>0.88</td>
<td>1.48</td>
<td>0.81</td>
<td>0.93</td>
</tr>
<tr>
<td>PM2.5</td>
<td>55</td>
<td>3</td>
<td>1.46</td>
<td>3.74</td>
<td>2.64</td>
<td>1.25</td>
<td>2.14</td>
<td>1.05</td>
<td>0.75</td>
<td>1.20</td>
<td>0.66</td>
<td>0.76</td>
</tr>
<tr>
<td>CO2e</td>
<td>n/a</td>
<td>n/a</td>
<td>3474</td>
<td>8142</td>
<td>5772</td>
<td>2844</td>
<td>5420</td>
<td>4153</td>
<td>3867</td>
<td>6841</td>
<td>2995</td>
<td>3217</td>
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</tbody>
</table>

Table 5-12 Alternative 13 Annual GHG Emissions (Construction and Operations)

<table>
<thead>
<tr>
<th>Annual CO2e Emissions Sources</th>
<th>SCAQMD GHG Rates (MT/yr)</th>
<th>Annual Estimated Emissions (MT/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>n/a</td>
<td>46</td>
</tr>
<tr>
<td>Maintenance</td>
<td>n/a</td>
<td>48</td>
</tr>
<tr>
<td>Visitations</td>
<td>n/a</td>
<td>2079</td>
</tr>
<tr>
<td>Total CO2e</td>
<td>10,000</td>
<td>2173</td>
</tr>
</tbody>
</table>
Alternative 13v

Alternative 13v would be constructed over a 10 year period starting in late 2017 and ending in mid 2027. Table 5-13 and Table 5-14 show the annual and daily emission estimates, respectively.

Construction Impacts

- **AQ-1: General Conformity Applicability Rates (NEPA)**
  
  As shown in Table 5-13, estimated annual emissions would not exceed the General Conformity Applicability Rates. As a result, construction activities associated with this alternative would result in less than significant impacts.

  Alternative 13v is the NER. Per the Clean Air Act Applicability Analysis in Appendix F, a General Conformity Determination would not be required for the implementation of this alternative.

- **AQ-2: Regional Significance Thresholds (CEQA and NEPA)**

  As shown in Table 5-14, estimated daily construction emissions would not exceed any RST. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-3: Cumulative Impacts (CEQA and NEPA)**

  The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects. The estimated daily construction and operational emissions would not exceed any RSTs. Therefore, impacts to cumulative impacts would be less than significant.

- **AQ-4: Localized Significance Thresholds (CEQA)**

  As shown in Table 5-14, estimated daily construction emissions would remain below LSTs for all construction years. Thus, impacts would be less than significant.

- **AQ-5: Odors (CEQA and NEPA)**

  Potential sources that may emit odors during construction activities would include diesel emissions from on- and off-road equipment. However, construction would be limited to relatively small footprints interspersed throughout the project area, and the number of diesel powered equipment would be limited to those indicated in Appendix F. Furthermore, not all diesel equipment are expected to be operating simultaneously. Therefore, construction emissions would be transient and would result in less than significant impact to odors.

- **AQ-6: Greenhouse Gas Thresholds (CEQA)**

  As shown in Table 5-15, estimated GHG emissions would not exceed the 10,000 MT annual CO2e threshold for both raw values and the 30-year amortized values. Thus, the alternative would result in less than significant impacts.
Operational Impacts

Operational emissions would be similar to those characterized under Alternative 10. Impacts to all air quality significance thresholds would be less than significant.

Table 5-13 Alternative 13v Estimated Annual Emissions (Construction)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (VOC)</td>
<td>10</td>
<td>0.007</td>
<td>0.11</td>
<td>0.07</td>
<td>0.10</td>
<td>0.11</td>
<td>0.09</td>
<td>0.04</td>
<td>0.08</td>
<td>0.06</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>Ozone (NOX)</td>
<td>10</td>
<td>0.08</td>
<td>1.32</td>
<td>0.78</td>
<td>1.09</td>
<td>1.18</td>
<td>0.98</td>
<td>0.44</td>
<td>0.80</td>
<td>0.08</td>
<td>0.21</td>
<td>0.14</td>
</tr>
<tr>
<td>NO2</td>
<td>100</td>
<td>0.08</td>
<td>1.32</td>
<td>0.78</td>
<td>1.09</td>
<td>1.18</td>
<td>0.98</td>
<td>0.44</td>
<td>0.80</td>
<td>0.08</td>
<td>0.21</td>
<td>0.14</td>
</tr>
<tr>
<td>CO</td>
<td>100</td>
<td>0.03</td>
<td>0.75</td>
<td>0.50</td>
<td>0.78</td>
<td>0.91</td>
<td>0.78</td>
<td>0.45</td>
<td>0.78</td>
<td>0.54</td>
<td>0.83</td>
<td>0.48</td>
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<tr>
<td>PM10</td>
<td>100</td>
<td>0.005</td>
<td>0.06</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td>0.04</td>
<td>0.02</td>
<td>0.04</td>
<td>0.02</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>PM2.5</td>
<td>100</td>
<td>&lt;0.005</td>
<td>0.05</td>
<td>0.03</td>
<td>0.04</td>
<td>0.05</td>
<td>0.03</td>
<td>0.01</td>
<td>0.03</td>
<td>0.02</td>
<td>0.04</td>
<td>0.02</td>
</tr>
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</table>

Table 5-14 Alternative 13v Estimated Annual Emissions (Construction)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Regional Significance Thresholds (lbs/day)</th>
<th>Local Significant Thresholds (lbs/day)</th>
<th>2017 Estimated Emissions (lbs/day)</th>
<th>2018 Estimated Emissions (lbs/day)</th>
<th>2019 Estimated Emissions (lbs/day)</th>
<th>2020 Estimated Emissions (lbs/day)</th>
<th>2021 Estimated Emissions (lbs/day)</th>
<th>2022 Estimated Emissions (lbs/day)</th>
<th>2023 Estimated Emissions (lbs/day)</th>
<th>2024 Estimated Emissions (lbs/day)</th>
<th>2025 Estimated Emissions (lbs/day)</th>
<th>2026 Estimated Emissions (lbs/day)</th>
<th>2027 Estimated Emissions (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC</td>
<td>75</td>
<td>n/a</td>
<td>0.67</td>
<td>1.56</td>
<td>1.04</td>
<td>2.27</td>
<td>2.26</td>
<td>1.58</td>
<td>1.47</td>
<td>3.80</td>
<td>0.09</td>
<td>2.34</td>
<td>1.44</td>
</tr>
<tr>
<td>NOX</td>
<td>100</td>
<td>46</td>
<td>7.75</td>
<td>19.22</td>
<td>11.15</td>
<td>23.56</td>
<td>22.88</td>
<td>16.21</td>
<td>14.65</td>
<td>36.33</td>
<td>8.15</td>
<td>20.93</td>
<td>12.76</td>
</tr>
<tr>
<td>CO</td>
<td>550</td>
<td>231</td>
<td>3.10</td>
<td>10.60</td>
<td>8.70</td>
<td>16.36</td>
<td>17.93</td>
<td>11.77</td>
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<td>20.09</td>
<td>13.09</td>
</tr>
<tr>
<td>SO2</td>
<td>150</td>
<td>n/a</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.05</td>
<td>0.02</td>
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<td>PM10</td>
<td>150</td>
<td>4</td>
<td>0.44</td>
<td>0.89</td>
<td>0.55</td>
<td>1.22</td>
<td>1.23</td>
<td>0.74</td>
<td>0.67</td>
<td>1.90</td>
<td>0.36</td>
<td>1.05</td>
<td>0.68</td>
</tr>
<tr>
<td>PM2.5</td>
<td>55</td>
<td>3</td>
<td>0.34</td>
<td>0.77</td>
<td>0.48</td>
<td>1.06</td>
<td>1.05</td>
<td>0.64</td>
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<td>1.60</td>
<td>0.30</td>
<td>0.80</td>
<td>0.56</td>
</tr>
<tr>
<td>CO2e</td>
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<td>n/a</td>
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<td>2187</td>
<td>1168</td>
<td>2449</td>
<td>2744</td>
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<td>2312</td>
<td>5141</td>
<td>2115</td>
<td>4529</td>
<td>2399</td>
</tr>
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</table>

Table 5-15 Alternative 13v Annual GHG Emissions (Construction and Operations)

<table>
<thead>
<tr>
<th>Annual CO2e Emissions Sources</th>
<th>SCAQMD GHG Rates (MT/yr)</th>
<th>Annual Estimated Emissions (MT/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>n/a</td>
<td>41</td>
</tr>
<tr>
<td>Maintenance</td>
<td>n/a</td>
<td>48</td>
</tr>
<tr>
<td>Visitations</td>
<td>n/a</td>
<td>2079</td>
</tr>
<tr>
<td>Total CO2e</td>
<td>10,000</td>
<td>2168</td>
</tr>
</tbody>
</table>
Alternative 16

Alternative 16 would be constructed over a 15 year period starting in 2018 and ending in 2032. Table 5-16 and Table 5-17 show the annual and daily emission estimates, respectively.

Emissions estimates for Alternative 16 were not based on detailed construction schedules as was done for Alternatives 13, 13v, and 20. However, Alternative 16 is a truncated variation of Alternative 20. As a result, appropriate construction phases entered into CalEEMod for Alternative 20 were deleted to estimate emissions for Alternative 16. See the Air Quality Technical Appendix (Appendix F) for additional information on deleted construction phases.

Construction Impacts

- **AQ-1: General Conformity Applicability Rates (NEPA)**
  As shown in Table 5-16, estimated annual emissions would not exceed the General Conformity Applicability Rates. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-2: Regional Significance Thresholds (CEQA and NEPA)**
  As shown in Table 5-17, estimated daily construction emissions would not exceed any RST. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-3: Cumulative Impacts (CEQA and NEPA)**
  The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects. The estimated daily construction and operational emissions would not exceed any RSTs. Therefore, impacts to cumulative impacts would be less than significant.

- **AQ-4: Localized Significance Thresholds (CEQA)**
  As shown in Table 5-17, estimated daily construction emissions for NOx would exceed LST during construction in 2020, 2022, and 2023. Estimated emissions for CO, PM10, and PM2.5 would remain below LSTs for all construction years. Since, construction would take place within an urbanized setting including sensitive receptors, exceedence of NOx LST in 2020, 2022, and 2023 would result in significant impacts.

- **AQ-5: Odors (CEQA and NEPA)**
  Potential sources that may emit odors during construction activities would include diesel emissions from on- and off-road equipment. However, construction would be limited to relatively small footprints interspersed throughout the project area, and the number of diesel powered equipment would be limited to those indicated in Appendix F. Furthermore, not all diesel equipment are expected to be operating simultaneously. Therefore, construction emissions would be transient and would result in less than significant impact to odors.
• **AQ-6: Greenhouse Gas Thresholds (CEQA)**

As shown in Table 5-18, estimated GHG emissions would not exceed the 10,000 MT annual CO2e threshold for both raw values and the 30-year amortized values. Thus, the alternative would result in less than significant impacts.

**Operational Impacts**

Operational emissions would be similar to those characterized under Alternative 10. Impacts to all air quality significance thresholds would be less than significant.
### Table 5-16 Alternative 16 Estimated Annual Emissions (Construction)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (VOC)</td>
<td>10</td>
<td>&lt;0.0005</td>
<td>0.13</td>
<td>0.01</td>
<td>0.01</td>
<td>0.22</td>
<td>0.21</td>
<td>0.10</td>
<td>0.10</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.10</td>
<td>0.07</td>
<td>0.08</td>
<td>0.14</td>
</tr>
<tr>
<td>Ozone (NOX)</td>
<td>10</td>
<td>&lt;0.0005</td>
<td>1.38</td>
<td>1.17</td>
<td>1.14</td>
<td>2.14</td>
<td>1.92</td>
<td>0.92</td>
<td>0.83</td>
<td>0.50</td>
<td>0.51</td>
<td>0.46</td>
<td>0.88</td>
<td>0.27</td>
<td>0.32</td>
<td>0.56</td>
</tr>
<tr>
<td>NO2</td>
<td>100</td>
<td>&lt;0.0005</td>
<td>1.38</td>
<td>1.17</td>
<td>1.14</td>
<td>2.14</td>
<td>1.92</td>
<td>0.92</td>
<td>0.83</td>
<td>0.50</td>
<td>0.51</td>
<td>0.46</td>
<td>0.88</td>
<td>0.27</td>
<td>0.32</td>
<td>0.56</td>
</tr>
<tr>
<td>CO</td>
<td>100</td>
<td>&lt;0.0005</td>
<td>0.85</td>
<td>0.80</td>
<td>0.84</td>
<td>1.77</td>
<td>1.82</td>
<td>0.90</td>
<td>0.92</td>
<td>0.66</td>
<td>0.64</td>
<td>0.50</td>
<td>0.96</td>
<td>0.64</td>
<td>0.54</td>
<td>0.87</td>
</tr>
<tr>
<td>PM10</td>
<td>100</td>
<td>&lt;0.0005</td>
<td>0.07</td>
<td>0.06</td>
<td>0.06</td>
<td>0.11</td>
<td>0.10</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
<td>0.03</td>
<td>0.05</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>PM2.5</td>
<td>100</td>
<td>&lt;0.0005</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.09</td>
<td>0.08</td>
<td>0.04</td>
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<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
</tr>
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### Table 5-17 Alternative 16 Estimated Daily Emissions (Construction)

<table>
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<tr>
<th>Pollutants</th>
<th>Regional Significant Thresholds (lbs/day)</th>
<th>Local Significant Thresholds (lbs/day)</th>
<th>2018 Estimated Emissions (lbs/day)</th>
<th>2019 Estimated Emissions (lbs/day)</th>
<th>2020 Estimated Emissions (lbs/day)</th>
<th>2021 Estimated Emissions (lbs/day)</th>
<th>2022 Estimated Emissions (lbs/day)</th>
<th>2023 Estimated Emissions (lbs/day)</th>
<th>2024 Estimated Emissions (lbs/day)</th>
<th>2025 Estimated Emissions (lbs/day)</th>
<th>2026 Estimated Emissions (lbs/day)</th>
<th>2027 Estimated Emissions (lbs/day)</th>
<th>2028 Estimated Emissions (lbs/day)</th>
<th>2029 Estimated Emissions (lbs/day)</th>
<th>2030 Estimated Emissions (lbs/day)</th>
<th>2031 Estimated Emissions (lbs/day)</th>
<th>2032 Estimated Emissions (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC</td>
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<td>n/a</td>
<td>0.01</td>
<td>3.83</td>
<td>8.21</td>
<td>3.59</td>
<td>5.00</td>
<td>5.05</td>
<td>3.25</td>
<td>2.98</td>
<td>2.53</td>
<td>4.36</td>
<td>3.67</td>
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<td>2.07</td>
<td>4.22</td>
</tr>
<tr>
<td>NOX</td>
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<td>38.52</td>
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<td>36.56</td>
<td>47.71</td>
<td>48.36</td>
<td>30.94</td>
<td>25.50</td>
<td>19.95</td>
<td>38.54</td>
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<td>25.72</td>
<td>7.81</td>
<td>8.36</td>
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<td>14.73</td>
<td>18.47</td>
<td>31.22</td>
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<tr>
<td>SO2</td>
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<td>&lt;0.0005</td>
<td>0.04</td>
<td>0.09</td>
<td>0.07</td>
<td>0.10</td>
<td>0.11</td>
<td>0.05</td>
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<td>0.08</td>
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<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>PM10</td>
<td>150</td>
<td>4</td>
<td>0.04</td>
<td>2.13</td>
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<td>1.76</td>
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<td>6545</td>
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**Table 5-18 Alternative 16 Annual GHG Emissions (Construction and Operations)**

<table>
<thead>
<tr>
<th>Annual CO2e Emissions Sources</th>
<th>SCAQMD GHG Rates (MT/yr)</th>
<th>Annual Estimated Emissions (MT/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>n/a</td>
<td>88</td>
</tr>
<tr>
<td>Maintenance</td>
<td>n/a</td>
<td>48</td>
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<tr>
<td>Visitations</td>
<td>n/a</td>
<td>2079</td>
</tr>
<tr>
<td>Total CO2e</td>
<td>10,000</td>
<td>2215</td>
</tr>
</tbody>
</table>

**Alternative 20**

Alternative 20 would be constructed over a 15 year period starting in 2018 and ending in 2032. Table 5-19 and Table 5-20 show the annual and daily emission estimates, respectively.

**Construction Impacts**

- **AQ-1: General Conformity Applicability Rates (NEPA)**
  As shown in Table 5-19, estimated annual emissions would not exceed the General Conformity Applicability Rates. As a result, construction activities associated with this alternative would result in less than significant impacts.

  Alternative 20 is the Recommended Plan and the Locally Preferred Plan. Per the Clean Air Act Applicability Analysis in Appendix F, a General Conformity Determination would not be required for the implementation of this alternative.

- **AQ-2: Regional Significance Thresholds (CEQA and NEPA)**
  As shown in Table 5-20, estimated daily construction emissions would not exceed any RST. As a result, construction activities associated with this alternative would result in less than significant impacts.

- **AQ-3: Cumulative Impacts (CEQA and NEPA)**
  The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects. The estimated daily construction and operational emissions would not exceed any RSTs. Therefore, impacts to cumulative impacts would be less than significant.

- **AQ-4: Localized Significance Thresholds (CEQA)**
  As shown in Table 5-20, estimated daily construction emissions for NOx would exceed LST during construction in 2022, 2023, and 2024. Estimated emissions for CO, PM10, and PM2.5 would remain below LSTs for all construction years. Since, construction would take place within an urbanized setting including sensitive receptors, exceedence of NOx LST in 2022, 2023, and 2024 would result in significant impacts.
• **AQ-5: Odors (CEQA and NEPA)**

Potential sources that may emit odors during construction activities would include diesel emissions from on- and off-road equipment. However, construction would be limited to relatively small footprints interspersed throughout the project area, and the number of diesel powered equipment would be limited to those indicated in Appendix F. Furthermore, not all diesel equipment are expected to be operating simultaneously. Therefore, construction emissions would be transient and would result in less than significant impact to odors.

• **AQ-6: Greenhouse Gas Thresholds (CEQA)**

As shown in Table 5-21, estimated GHG emissions would not exceed the 10,000 MT annual CO2e threshold for both raw values and the 30-year amortized values. Thus, the alternative would result in less than significant impacts.

**Operational Impacts**

Operational emissions would be similar to those characterized under Alternative 10. Impacts to all air quality significance thresholds would be less than significant.
### Table 5-19 Alternative 20 Estimated Annual Emissions (Construction)

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<tbody>
<tr>
<td>Ozone (VOC)</td>
<td>10 &lt;0.005 0.13 0.01 0.01 0.22 0.21 0.24 0.10 0.06 0.06 0.08 0.13 0.07 0.08 0.14</td>
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<tr>
<td>Ozone (NOX)</td>
<td>10 &lt;0.005 1.38 1.17 1.14 2.14 1.92 2.16 0.83 0.50 0.51 0.71 1.14 0.27 0.32 0.56</td>
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<tr>
<td>NO2</td>
<td>100 &lt;0.005 1.38 1.17 1.14 2.14 1.92 2.16 0.83 0.50 0.51 0.71 1.14 0.27 0.32 0.56</td>
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<tr>
<td>CO</td>
<td>100 &lt;0.005 0.07 0.06 0.01 0.10 0.12 0.04 0.03 0.03 0.04 0.06 0.02 0.02 0.03</td>
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<tr>
<td>PM2.5</td>
<td>100 &lt;0.005 0.06 0.05 0.05 0.08 0.09 0.03 0.02 0.02 0.03 0.05 0.01 0.01 0.02</td>
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### Table 5-20 Alternative 20 Estimated Daily Emissions (Construction)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Regional Significant Thresholds (lbs/day)</th>
<th>Local Significant Thresholds (lbs/day)</th>
<th>2018 Estimated Emissions (lbs/day)</th>
<th>2019 Estimated Emissions (lbs/day)</th>
<th>2020 Estimated Emissions (lbs/day)</th>
<th>2021 Estimated Emissions (lbs/day)</th>
<th>2022 Estimated Emissions (lbs/day)</th>
<th>2023 Estimated Emissions (lbs/day)</th>
<th>2024 Estimated Emissions (lbs/day)</th>
<th>2025 Estimated Emissions (lbs/day)</th>
<th>2026 Estimated Emissions (lbs/day)</th>
<th>2027 Estimated Emissions (lbs/day)</th>
<th>2028 Estimated Emissions (lbs/day)</th>
<th>2029 Estimated Emissions (lbs/day)</th>
<th>2030 Estimated Emissions (lbs/day)</th>
<th>2031 Estimated Emissions (lbs/day)</th>
<th>2032 Estimated Emissions (lbs/day)</th>
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<tbody>
<tr>
<td>VOC</td>
<td>75 n/a 0.01 3.83 8.21 3.59 5.00 5.05 6.77 2.98 2.53 4.36 1.99 3.80 1.70 2.07 4.22</td>
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<tr>
<td>NOX</td>
<td>100 46 0.04 38.52 83.67 36.56 47.71 48.36 59.25 25.50 19.95 38.54 18.02 32.50 7.81 8.86 17.39</td>
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<tr>
<td>CO</td>
<td>150 23 0.04 10.17 25.37 59.37 29.02 41.55 45.42 62.11 27.16 26.24 39.56 18.91 34.54 14.73 18.47 31.22</td>
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<td>NO2</td>
<td>150 n/a &lt;0.005 0.04 0.09 0.07 0.10 0.11 0.14 0.07 0.06 0.08 0.04 0.04 0.05 0.05 0.10</td>
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<tr>
<td>PM10</td>
<td>150 4 0.04 2.13 4.61 1.76 2.31 2.51 3.19 1.27 1.05 2.08 1.00 1.78 0.35 0.46 0.97</td>
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<tr>
<td>PM2.5</td>
<td>55 3 0.01 0.01 0.18 3.99 1.44 1.88 2.15 2.53 1.01 0.82 1.72 0.80 1.41 0.25 0.36 0.74</td>
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<tr>
<td>CO2e</td>
<td>n/a n/a 40 3970 9043 6545 9775 10471 13602 6837 5752 7224 3941 7928 3897 4706 9631</td>
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Table 5-21 Alternative 20 Annual GHG Emissions (Construction and Operations)

<table>
<thead>
<tr>
<th>Annual CO₂e Emissions Sources</th>
<th>SCAQMD GHG Rates (MT/yr)</th>
<th>Annual Estimated Emissions (MT/year)</th>
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<tbody>
<tr>
<td>Construction</td>
<td>n/a</td>
<td>100</td>
</tr>
<tr>
<td>Maintenance</td>
<td>n/a</td>
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<td>Visitations</td>
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<tr>
<td><strong>Total CO₂e</strong></td>
<td><strong>10,000</strong></td>
<td><strong>2227</strong></td>
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Best Management Practices and Impact Avoidance Measures

In a letter dated November 18, 2013, the SCAQMD provided a number of recommendations to attenuate air quality impacts. The recommendations, modified as appropriate, would be implemented.

- Tier 4 equipment and haul trucks no older than 2010 would be utilized to the extent practicable during construction years when emissions are expected to exceed Local Significance Thresholds.

- Mobile Emission Attenuating Measures:
  - Provide temporary traffic controls such as a flag person, during all phases of construction to maintain smooth traffic flow.
  - Provide dedicated turn lanes for movement of construction trucks and equipment on-and off-site.
  - Reroute construction trucks away from congested streets or sensitive receptor areas.
  - Utilize electricity from power poles rather than temporary diesel or gasoline power generators to the extent practicable.

- Fugitive Dust Attenuating Measures:
  - Appoint a construction relations officer to act as a community liaison concerning on-site construction activity including resolution of issues related to PM10 generation.
  - Suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 miles per hour.
  - Require frequent street sweeping surrounding the project site to minimize fugitive dust emissions from track-out. All street sweeping shall use alternatively fueled sweepers that are equivalent to those specified in SCAQMD Rules 1186 and 1186.1.
  - Install wheel washers where vehicles enter and exit the construction site onto paved roads or wash off trucks and any equipment leaving the site each trip.
  - Apply water three times daily, or non-toxic soil stabilizers according to manufacturer’s specifications, to all unpaved parking or staging areas or unpaved road surfaces.
  - Replace ground cover in disturbed areas as quickly as possible.
  - Apply non-toxic soil stabilizers according to manufacturers’ specifications to all inactive construction areas (previously graded areas inactive for ten days or more).
5.3 LAND USE

5.3.1 Regulatory Framework

Land use in the study area is managed according to Federal, state, regional, and local policies. Because these policies create land use patterns in the study area, they are described in detail in the Affected Environment section (Section 3.3).

The Cities of Los Angeles and Glendale adopted the State of California CEQA Guidelines (Title 14, California Code of Regulations, Sec. 15000 et seq.) as the CEQA Guidelines for their cities in 2002, and 2003, respectively (City of Los Angeles 2002, City of Glendale 2003). The significance criteria provide the thresholds to identify the impacts of land use actions, land use consistency, and land use compatibility. These criteria are identified in the environmental checklist from the CEQA Guidelines.

Although the City of Burbank has not formally adopted the state CEQA Guidelines, it has used the significance criteria from the state in recent CEQA analyses, including the EIR for the updated General Plan 2035 (City of Burbank 2013c). These criteria are applicable when determining the potential impacts of implementing any of the proposed project alternatives.

5.3.2 Significance Criteria

A significant adverse impact would be considered to occur if the following resulted per the CEQA guidelines:

- Permanent inconsistencies with the adopted land use/density designation in the General Plan, Community Plan, LA-RIO district, redevelopment plan, specific plan for the site, or adopted habitat conservation plan or natural community conservation plan, or

- The introduction of permanent features that would physically divide an existing neighborhood or community.

5.3.3 Environmental Impacts

No Action Alternative

Construction Impacts

Under the No Action Alternative, no construction efforts would be undertaken and there would be no impacts to land use. Future land use would be controlled through existing regulatory, community, and master planning efforts. Per the City’s General Plan (City of Los Angeles 2009), the study area is essentially built out, and future development would involve recycling of land. Furthermore, annual growth in population for the study area is projected to decline to less than 0.3% over the next 25 years (LAEDC 2012). No large-scale changes to land use patterns are anticipated under the No Action Alternative.

Operation Impacts

Under the No Action Alternative, land use would continue to be regulated and guided via Federal, state, regional, and local guidance, general plans, master planning, ordinances, and land use zoning plans. Land use zoning is expected to remain the same without implementation of restoration. Industrial, commercial, and residential areas would continue to occupy their current extent, or changes in zoning would be
controlled via jurisdictional guidance. Continued deterioration of land use conditions could occur if
parcels not utilized for restoration, such as abandoned buildings, vacant lots, and undeveloped parcels
along the River, are not rehabilitated or restored independently.

Land uses within the study area under future without-project conditions would be similar to existing
conditions in areas where the land uses in the vicinity of the River are primarily zoned for single-family
residential, parks and open space, and specific planned commercial uses; these include large areas of
Reaches 1-3 in Los Angeles and Burbank, and areas of Reaches 4-6 within and adjacent to Griffith and
Elysian Parks.

The Hollywood Community Plan was updated in June 2012, but no significant land use changes were
proposed within the study area; therefore, land uses would remain relatively stable. The City of Burbank’s
new general plan, referred to as the Burbank2035 General Plan was adopted in 2013 (City of Burbank
2013b) but does not include significant changes in land uses within the study area compared to the
previous general plan. The City of Glendale is continuing several master planning efforts within the study
area; these include the Bicycle Transportation Plan that contains areas within Reaches 1-3. These
improvements, designed to address non-motorized transportation, are applicable to the entire city as well
as the study area; these planning efforts would occur with or without the proposed project.

The City of Los Angeles has adopted new land use plans and use districts within the study area, such as
the Cornfield Arroyo Seco Specific Plan, Northeast Los Angeles Riverfront District, and LA-RIO
District, as described in Section 3.3, which may reasonably be anticipated to lead to land use,
landscaping, and design standard transitions within the study area in the absence of any Federal action.

The Boyle Heights Community Plan is currently being updated, and the community has dual goals of
preserving industrial uses and jobs while increasing parks, recreation and open space options in the
community. The Boyle Heights Community Plan is the effective Land Use Element for Boyle Heights in
the City of Los Angeles General Plan.

Open space, parks, and recreation would continue to be limited in the study area. Non-Federal actions to
introduce parks or conduct small scale restoration would incrementally increase recreational land use
value to the area, but would occur slowly, incurring only minimal benefits to land use.

**Alternative 10**

**Construction and Operational Impacts**

General plans, and community and specific plans, may include policies concerning the short term impacts
of noise, traffic, air quality, and other resource areas that result from construction and related temporary
project implementation activities. However, land use objectives, goals, and policies typically concern the
permanent use of the land; the general plans and applicable community plans within Reaches 1-8 do not
address land use impacts from construction activities. Establishment of staging sites for construction may
alter land uses within the reaches temporarily, but these impacts would be short term, and any adverse
land use impacts related to construction activities would be less than significant.

Implementation of any of the measures in Alternative 10 would result in changes to the environment and
would convert lands to restoration area.

None of the measures would construct permanent features that would divide an existing community.
Specific land use impacts of construction of restoration features and operation of the resulting restoration
are considered together by reach, below.
Reaches 1-3

The Hollywood Community Plan is the largest community plan of those that encompass the River channel. This plan contains Open Space and Public Facilities land use designations within Reaches 1-3, and was updated in June 2012. The Open Space designation allows for park and recreational uses, and includes Griffith Park and lands adjacent to and within the river channel. The Public Facilities designation reflects the public ownership, access and operation of infrastructure and primarily includes existing freeway right-of-way areas but also includes lands adjoining the channel that are subject to riparian and channel restoration and improvement measures. The measures implemented within Reaches 1-3 in this Alternative would be consistent with these land use designations. In addition, they would be consistent with policies in the Hollywood Community Plan for public improvements, including Public Improvements Policy 2 supporting the creation of a Los Angeles River Greenbelt to be integrated with existing and proposed parks, trails, and scenic routes. Therefore, no land use impacts from implementation of the measures within Reaches 1-3 would occur (City of Los Angeles 2012).

The City of Glendale borders portions of Reaches 2 and 3. Restoration measures in this Alternative would not extend into the City of Glendale; therefore no impacts to City of Glendale land use designations, including Single Family Residential and Industrial, would occur along these reaches. In addition, no impacts would occur to the goals and objectives in the Bicycle Transportation Plan since the proposed Class I bicycle trail would occur on the opposite side of the River channel from the restoration measures (City of Glendale 2012).

Operation of the measures in Reaches 1-3 would occur adjacent to or in the immediate vicinity of existing recreational and open space land uses, such as the Ferraro Sports Complex and the Los Angeles Zoo; however, the measures would not result in conflicts with these land uses nor affect their viability.

Reaches 4-6

Restoration measures would be consistent with the Open Space and Public Facilities land use designations in the Northeast Los Angeles and Silver Lake-Echo Park-Elysian Valley Community Plans where they would occur, and no land use impacts would result.

Measures in Reach 4 would include a side channel along the edge of the Harding Golf Course and a river diversion into the Los Feliz Golf Course as well as eight daylighted streams. The land area to be affected by implementation of these measures is designated for Open Space and Public Facilities. Implemented measures would be consistent with these uses; therefore potential adverse impacts to land use would be less than significant.

Restoration in Reach 5 would consist of a riparian corridor along the east bank and a daylighted stream. These measures would be implemented on lands designated as Open Space and Public Facilities in the Northeast Los Angeles Community Plan, and would not conflict with these uses. Therefore, potential adverse land use impacts would be less than significant.

Restoration measures in Reach 6 would include increasing riparian habitat by at least 80 acres in the channel, at the Bowtie site and through widening of the river at the Taylor Yard parcel. Although much of the Taylor Yard site has been converted into the Rio de Los Angeles State Park, a narrow band of industrial land remains between the western boundary of the park and the River channel. Although the land has been traditionally used for industrial purposes, it currently has a land use designation of Open Space and Public Facilities in the Northeast Los Angeles Community Plan. Use of this land for channel improvements and riparian restoration measures would be consistent with the Open Space and Public Facilities land use designations. In addition, the Northeast Los Angeles Community Plan includes specific
goals and policies, including Open Space Policy 4-2.1 and Recreation and Park Facilities Policy 5-2.1, to promote open space and recreation uses and increase public access along the River. Further, implementation of the measures would still allow for the operation of the active rail operations located between Reach 6 and the state park. On the western side of the River channel in Reach 6, within the Silver Lake-Echo Park-Elysian Valley Community Plan Area, restoration measures would not extend beyond the river channel. Therefore, land use impacts would be less than significant (City of Los Angeles 2007). Existing land uses within Reaches 4-6, including the rail operations adjacent to Taylor Yard, would also not be adversely impacted by operation of the measures in a manner that would render them obsolete. Therefore, land use impacts would be less than significant.

Reaches 7-8

In Reach 7, three streams currently encased in culverts/stormdrains would be daylighted. Two of these, located on the west side of the River, would occur in areas designated as Open Space and Public Facilities, and would be consistent with these land use designation. The third is located on the east side of the River in an area designated as Hybrid Industrial. Permitted uses in Hybrid Industrial zones include conservation and environmental uses. The proposed daylighted storm drain would be consistent with this land use designation. Land use impacts in Reach 7 would be less than significant.

Within Reach 8, a portion of the LATC site would be converted to riparian habitat. This site is located within the Boyle Heights Community Plan Area. According to this Plan, the land use designation within the site is Industrial, reflecting the current use of the site as a container transfer facility and rail yard. Conversion of the site to riparian habitat would conflict with the Industrial land use designation, as well as specific goals and policies concerning industrial land uses in the Plan. These include Industrial Objectives 1 and 2, which aim to preserve industrial lands for industrial uses to preserve employment and tax-base revenue, and Policy 4 which calls for industrial areas north of the I-10 and west of I-5 to be maintained and improved as a means of providing revenue for the City and employment opportunities for its residents (City of Los Angeles 2007). Because the conversion of the site would conflict with the Industrial land use designation, implementation of restoration measures within Reach 8 would result in a significant adverse impact to land use. In addition to impacts at the LATC site, an area zoned as Light Industrial would be affected by conversion to riparian habitat. This land is located adjacent to and north of LATC, and is currently occupied by four small businesses. Conversion of this land to riparian habitat would be inconsistent with this land use designation and would constitute a significant adverse impact to land use. Significant impacts associated with changes in land use would be permanent and will continue during operation.

Indirect Effects of and Related Actions to Construction and Operation

Under each of the action alternatives, the LATC site functions are anticipated to be relocated within the Los Angeles Basin. Siting is anticipated to occur where land is already zoned industrial and thus would not result in a change to land use; therefore, impacts to land use due to relocation of site functions are anticipated to be less than significant. The LATC site functions may be relocated at an existing facility that will be expanded, or at a new site, but in either case would be anticipated to be relocated within an industrial zone with reasonable access to UPRR rail lines. All applicable general plans and land use regulations would be considered for any future site prior to site selection. Any conflicts with surrounding land uses would be identified during project-specific CEQA analysis that would be performed to determine potential impacts resulting from relocation of the site functions. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.
Because the conversion to riparian habitat of a portion of the existing LATC site would likely preclude
the railroad from continuing its current use on the remainder of the parcel not required for the project, the
remainder would be anticipated to be utilized for other purposes by the City or sold for private use as
industrial, commercial, or residential. Use by the City for public purposes or by others for commercial or
residential use would result in conversion of land use on that portion of the site in addition to the portion
required for the project, with that conversion constituting a significant impact. However, the site would
have to be rezoned before such conversion could take place. These impacts are anticipated to be the same
for all action alternatives.

Alternative 13

Construction and Operational Impacts

Land use impacts from construction and operation would be similar to those under Alternative 10, with a
larger footprint.

In Reaches 1, 2, 4, 5, and 8, the measures and impacts would be the same as under Alternative 10. Impacts in Reach 8 would be significant due to the conflict with the Industrial land use designation.

Under this alternative in Reach 3, measures in addition to the 3 daylighted streams in Alternative 10
would include side channel creation with riparian habitat at Ferraro Fields and a freshwater marsh at the
confluence of the side channel with the river. These measures would occur in lands designated as Open
Space and Public Facilities in the Hollywood Community Plan. Measures would be consistent with these
uses; therefore implementing these measures would not constitute a significant adverse land use impact in
Reach 3. Restoration measures in Reach 3 in Alternative 13 would not extend into the City of Glendale,
therefore no impacts to City of Glendale land use designations, including Single Family Residential and
Industrial, would occur.

In Reach 6, relative to Alternative 10, this alternative would add reconfiguration and widening of the
channel into the westernmost portion of Taylor Yard, with the channel widened 300 feet instead of 80
feet. However, similar to Alternative 10, potential land use impacts would be less than significant since
these lands are designated for Open Space and Public Facilities uses and would not disrupt the railroad
operations between the Taylor Yard and the Rio de Los Angeles State Park.

Restoration measures within Reach 7 would be different than under Alternative 10, and would consist of
restructuring Los Angeles River channel walls to support vines and other vegetation, and softening the
bed and banks of the Arroyo Seco tributary for one-half mile upstream and restoring a backwater wetland
at the confluence with the River. Restoration at the Arroyo Seco confluence and on the main channel
banks would occur in areas designated as Open Space and Public Facilities in the Cornfield Arroyo Seco
Specific Plan. The proposed restoration at these locations would be consistent with these land use
designations. Implementing these restoration measures would not constitute a significant adverse land use
impact in Reach 7.

Alternative 16

Construction and Operational Impacts

Restoration measures in Reaches 1-4, 6 and 7 would be the same as Alternative 13; therefore, impacts in
these reaches would be the same.

Measures in Reach 5 would include additional channel widening and terracing. These measures would not
affect land uses differently than Alternatives 10 and 13, and would be consistent with the respective
community plans applicable to those reaches, because widening of Reach 5 occurs within the existing channel right of way, with only channel geometry changed. Therefore, potential adverse land use impacts would be less than significant.

In Reach 8, the measures would be more extensive than Alternatives 10 and 13, and would include the reconfiguration and widening of the main channel, including increasing the channel invert width up to 500 feet and construction of a 1,000-foot wide bench into the LATC, as well as modifications to the left bank downstream of LATC and the right bank upstream of LATC. Within the channel itself, the concrete would be removed and the bed would be naturalized. The additional channel wall modifications and in-channel work in Reach 8 would occur in areas designated as Open Space and would be consistent with that use, and would not constitute a significant impact. In Reach 8, existing rail lines along the LATC parcel would require trestling to facilitate project construction and operation. Existing rail lines are anticipated to be trestled at grade and would not result in a change in land use. As in Alternatives 10 and 13 conversion of the LATC site and adjacent lands from Industrial and Light Industrial uses to open space is inconsistent with community plans and constitutes a significant adverse impact on land use. Significant impacts associated with changes in land use would be permanent and will continue during operation.

**Alternative 20**

**Construction and Operational Impacts**

Restoration measures in Reaches 1-2 and 5-6 would be the same as Alternative 16; therefore, land use impacts in these reaches would be less than significant. Restoration measures in Reach 8 would be the same as Alternative 16; therefore, land use impacts in this reach would be significant and adverse. Significant impacts associated with changes in land use would be permanent and will continue during operation.

**Reach 3**

Restoration measures on the left bank of the River along the lower part of Reach 3 would be more extensive than those in Alternatives 10, 13, and 16, and would impact lands designated as Industrial in the Verdugo Wash area of the Northeast Los Angeles Community Plan and in the City of Glendale. Active industrial uses currently in operation within the proposed restoration area would not be able to continue to exist at the site with the restoration measures included in this alternative. Approximately 11 businesses in Reach 3 would be displaced by the project. Restoration measures in Reach 3 in this alternative would result in the permanent conversion of land designated as Industrial to a non-industrial use. This would conflict with the designated Industrial use definition for those lands, resulting in a significant adverse impact to land use.

**Reaches 7**

Measures in Reach 7 under Alternative 20 would include all measures in Alternative 10 (daylighted streams) and some of the measures in Alternative 13 (restoring the Arroyo Seco confluence) but would exclude the measures in Alternative 13 for restructuring of the channel walls to include overhanging vines. As discussed for those alternatives, the measures from Alternative 10 and 13 that are included in Alternative 20 would not result in significant adverse impacts, as the measures would be consistent with the land use designation. In addition, Alternative 20 would include restoration measures at and adjacent to the Los Angeles State Historic Park (Cornfields) site that would occur on lands designated as Open Space and Hybrid Industrial in the Cornfield Arroyo Seco Specific Plan. Approximately two businesses in Reach 7 would be displaced by construction; however, the restoration use would be consistent with the land use designation. Permitted uses in Hybrid Industrial zones include conservation and environmental uses. The proposed restoration activities would be consistent with this land use designation in the
Cornfield Arroyo Specific Plan. Reach 7 construction, similar to Reach 8 construction, also requires alteration of existing rail lines (trestling at grade) by the sponsor along the LA State Historic Park but would not discontinue the current rail use. Land use impacts in Reach 7 would therefore be less than significant. The effects of land use conversion will continue for the life of the project. There will be beneficial effects to lands designated as open space as the areas become restored.

5.3.4 **Best Management Practices and Impact Avoidance Measures**

BMPs for protection of land use may be provided through the application of community plans. Local communities will have the opportunity to evaluate land uses and this may assist in identifying the best measures for avoiding impacts to land use.

In Reach 3 under Alternative 20, the conversion of lands in the Verdugo Wash area for River restoration measures could displace existing industrial operations on land designated for industrial purposes, per the Northeast Los Angeles Community Plan. The Northeast Los Angeles Community Plan is the effective Land Use Element for the Northeast CPA. The City of Los Angeles, as part of its efforts to address changing land uses in the area, may conduct an analysis of the Industrial land designations adjacent to, and in the vicinity of, the River. The City of Los Angeles is developing a Vision Plan and Economic Development Strategy for the Northeast Los Angeles Riverfront District. The boundaries of this district contain the Verdugo Wash at the northermost point and the Los Angeles State Historic Park at the southernmost point. The Vision document aims to highlight the northeast Los Angeles River landscape by creating a continuous, linear, recreational experience. This analysis would examine the continued viability of industrial land uses near the River corridor, and suggest modifications of land use designations, goals, and policies, in the Northeast Los Angeles Community Plan where appropriate. This analysis would include potential impacts on current industrial land uses and suggest modifications of land use policies to ensure that these uses can continue as River restoration measures are implemented.

In Reach 8 under all the alternatives, the proposed River restoration measures occurring at LATC would displace the existing industrial container rail operations, thus potentially reducing the viability of other industrial uses within the Boyle Heights and Lincoln Heights communities. The Boyle Heights Community Plan is currently being updated, and the community has dual goals of preserving industrial uses and jobs while increasing parks, recreation and open space options in the community. The Boyle Heights Community Plan is the effective Land Use Element for Boyle Heights in the City of Los Angeles General Plan.

5.4 **WATER RESOURCES**

5.4.1 **Regulatory Framework**

**Clean Water Act**

The Clean Water Act (CWA) governs discharge of dredge or fill materials into the waters of the United States and it governs pollution control and water quality of waterways throughout the U.S. Its intent, in part, is to restore and maintain the biological integrity of the nation’s waters (33 U.S.C. 1251 et seq). It provides standards and enforcement, a number of regulatory programs with permits and licenses, grants, and revolving funds, as well as general provisions and provisions for research and related programs. Relevant sections are Sections 401, 402, and 404.

Section 401(a)(1) of the CWA, 33 U.S.C. § 1341(a)(1), provides that “[a]ny applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of
facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates or will originate… that any such discharge will comply with the applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of this title.” The State of California has authority to give such a certification, which it has delegated to the Regional Water Quality Control Boards. A Section 401 water quality certification will be required for the restoration measures. An application for a Section 401 water quality certification has been submitted to the Los Angeles Regional Water Quality Control Board.

Section 402 establishes the National Pollutant Discharge Elimination System (NPDES). Pursuant to Section 402 and the state General Construction Storm Water Permit, a NPDES permit would be required for any project construction activities that would result in the disturbance of one or more acres. Generally, the construction contractor would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP) which would be filed along with a Notice of Intent (NOI) and other compliance related documents with the State Water Resources Control Board (State Water Board). The SWPPP must be prepared by a Qualified SWPPP Developer (QSD) before construction commences. The SWPPP would contain a visual monitoring program, and a water quality monitoring program for non-visible pollutants to determine construction site BMP effectiveness. The SWPPP would list all BMPs to be implemented during construction activities.

Section 404 addresses discharges of dredged or fill material to waters of the United States. Waters of the U.S., defined at 33 Code of Federal Regulations (C.F.R.) Part 328, include coastal and inland waters, lakes, rivers, and streams, including adjacent wetlands and tributaries. The U.S. Environmental Protection Agency’s Section 404(b)(1) Guidelines (40 C.F.R. Part 230) are the substantive environmental criteria used by the Corps to evaluate project impacts to waters of the U.S. The Corps does not issue itself permits for Corps Civil Works projects but must comply with the 404(b)(1) guidelines. Unless exempt under section 404(r) of the Clean Water Act, the 404(b)(1) guidelines prohibit the Corps from undertaking a project unless it is the LEDPA. The LEDPA is the practicable alternative that is least damaging to the aquatic ecosystem. The term “practicable” is defined in 40 CFR 230.10(a)(2) as: “[a]n alternative … available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.” An analysis of impacts on waters of the United States is included at Appendix M of this IFR.

National Flood Insurance Act

This act established the Federal flood insurance program, prior to which, affordable private flood insurance was generally not available. Under the National Flood Insurance Program, Federally subsidized flood insurance is made available to owners of flood-prone property in participating communities. Administered by the Federal Insurance Administration of the Federal Emergency Management Agency (FEMA), participating communities are required to adopt certain minimum floodplain management standards, including restrictions on development in designated floodways, a requirement that new structures in the 100-year flood zone be elevated to or above the 100-year flood level (known as base flood elevation), and a requirement that subdivisions are designed to minimize exposure to flood hazards (NOAA 2006). Any work that may affect the flood elevations would be coordinated with FEMA.

Executive Orders

EO 11988, Floodplain Management, was issued on May 24, 1977, to avoid to the extent possible the long- and short-term adverse impacts of occupying and modifying floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. An analysis documenting compliance with EO 11988 is included in Chapter 10 of this IFR.
EO 11990, Protection of Wetlands, issued on May 24, 1977, helps avoid the long-term and short-term adverse impacts associated with destroying or modifying wetlands and avoiding direct or indirect support of new construction in wetlands when there is a practicable alternative.

**Porter-Cologne Water Quality Control Act**

The Porter-Cologne Water Quality Control Act established the State Water Board, which has the ultimate authority over state water rights and water quality policy. It also established nine regional boards to oversee water quality on a day-to-day basis at the local or regional level. The regional boards develop and update their respective basin plans, which are used to address beneficial uses, water quality standards for both surface water and groundwater, and measures necessary to control point and nonpoint sources. The regional boards regulate all pollutant or nuisance discharges that may affect either surface water or groundwater. The Porter-Cologne Act also applies to nonpoint as well as point source discharges. It establishes an administrative permitting authority, in the form of waste discharge requirements, waiver of these requirements, or basin plan prohibitions, to be used to control nonpoint source discharges (California Regional Water Quality Control Board 2004). Within the study area, stormwater management plans and authorizations are coordinated with the Los Angeles Regional Water Quality Control Board, along with the City and Los Angeles County.

**California Fish and Wildlife Code, Sections 1600-1607**

Sections 1600 through 1607 regulate work that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; that would substantially change the bed, channel, or bank of a river, stream, or lake; or that would use material from a streambed.

**Local Regulations**

In December 2012, the Los Angeles Regional Water Quality Control Board reissued a Municipal Separate Storm Sewer System (MS4) NPDES Permit (No. R4-2012-0175). The update of the previous NPDES permit, which was issued in 2001, focuses on permit governance structure, core stormwater management program requirements, and incorporation of TMDLs. It includes a program for developing Watershed Management Plans and Enhanced Watershed Management Plans, which will allow permittees to develop customized strategies, control measures, and BMPs to address watershed priorities, which include complying with receiving water limitations, TMDL provisions, prohibitions on non-storm water discharges, and minimum control measures.

**5.4.2 Significance Criteria**

The following thresholds of significance are based on CEQA guidelines. A project would be considered to have a significant impact if it would cause the following to occur:

- WQ Significance Criterion 1: Violation of any water quality standard or waste discharge requirements.
- WQ Significance Criterion 2: Substantial depletion of groundwater supplies or substantial interference with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
- WQ Significance Criterion 3: Substantial change to the existing drainage pattern of the study area, including the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.
• WQ Significance Criterion 4: Creation or contribution to runoff that exceeded the capacity of existing or planned stormwater drainage systems or introduced substantial additional sources of polluted runoff.

• WQ Significance Criterion 5: Located housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

• WQ Significance Criterion 6: Located structures where they would impede or redirect flood flows.

• WQ Significance Criterion 7: Resulted in greater exposure of people or structures to a significant risk of loss, injury or death involving flooding including flooding as a result of the failure of a levee or dam.

• WQ Significance Criterion 8: Increased the risk of inundation of the study area by seiche, tsunami or mudflow.

• WQ Significance Criterion 9: Increase in the water surface elevation of peak flows in the River.

• WQ Significance Criterion 10: Substantial changes to the amount of surface water in the River, including both diminished or increased flow.

• WQ Significance Criterion 11: Resulted in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow.

• WQ Significance Criterion 12: Created pollution, contamination, or nuisance, as defined in Section 13050 of the California Water Code.

• WQ Significance Criterion 13: Caused regulatory standards to be exceeded, as defined in the applicable NPDES permit or water quality standards in the Los Angeles Regional Water Quality Control Board’s Basin Plan.

• WQ Significance Criterion 14: Change potable water levels sufficiently to reduce the ability of a water utility to use the groundwater basin for public water supplies, conjunctive use purposes, imported water storage, summer/winter peaking, or to respond to emergencies and drought.

• WQ Significance Criterion 15: Reduction in yields of adjacent wells or well fields (public or private).

• WQ Significance Criterion 16: Adversely altered the rate or direction of flow of groundwater.

• WQ Significance Criterion 17: Resulted in demonstrable and sustained reduction of groundwater recharge capacity.

5.4.3 Environmental Impacts

No Action Alternative

Construction Impacts

No impacts to water resources would occur from construction under this alternative because construction would not occur.

Operational Impacts

Hydrologic, water quality, and groundwater conditions within the study area will continue changing based on population pressures, new and continuing regulations, and future climate conditions. The hydrologic regime in the study area will continue to be characteristic of urban environments with high peak flows and short durations, with resultant peaks in pollutants that quickly dissipate to normal levels. Although increased population density and impervious areas within the watershed, upstream of and on tributaries within the study area, could potentially increase these conditions, measures within the Los Angeles County MS4 Permit are designed to curtail this potential. New regulations that serve to implement development and redevelopment requirements for hydro-modification/low-impact development practices,
which are designed to capture on-site runoff primarily through infiltration and diversions, could decrease future impacts due to urbanization. Current climate change studies have indicated a likely increase in the frequency of extreme weather conditions in the future. These extreme weather events could compound and increase watershed peak flows.

Water quality impairments within the watershed are primarily being addressed through the TMDL process. TMDL implementation plans, which serve to identify best management practices (BMPs) to reduce water quality impairments and meet watershed beneficial uses have been developed and incorporated into the renewed Los Angeles County MS4 permit (Los Angeles County 2012a) for several reaches of the study area. Watershed water quality conditions have undergone extensive scrutiny and analysis in the past few decades due to public awareness and the participation of watershed stakeholder groups. Though increased urbanization within the watershed has been correlated with degraded water quality conditions, watershed stakeholders have helped to develop current regulations to improve these conditions. Newly required hydro-modification and low-impact development regulations are also contributing to the reduction of watershed contaminants through the containment and treatment of urban runoff.

Groundwater conditions within the watershed are impaired due to historic land use contaminants that have persisted in the water table. Treatment facilities have been established to treat groundwater contamination, which will improve conditions over time. Like surface water quality, public awareness and watershed stakeholder groups have helped develop regulations to protect groundwater from further degradation. If improperly managed, population growth within the study area has the potential to create higher demands for water use in the region and further degrade the basin’s ability to naturally recharge water. In recognition of the potential for higher water demand in the future the State Water Resources Control Board adopted a Recycled Water Policy (2009) promoting the increased use of recycled water from local municipal wastewater sources as well as the increased capture and use of storm water. The policy also requires that management measures be developed to protect groundwater basin water quality, which may be impacted by the increase in recycled water use.

Surface water quality pollution in the River channel and tributaries would be expected to continue to improve due to ongoing efforts to meet required regulatory pollutant reductions. Groundwater areas contaminated by persistent contaminants from historic land use activities would also continue to slowly improve over time due to implemented groundwater treatment BMPs. The majority of groundwater supply in the study area would continue to come from the Upper Los Angeles River Area groundwater basin. Groundwater basins would continue to be recharged and managed to support future water resource uses. Surface and groundwater water quality improvements due to management activities would continue to improve to the extent feasible under the No Action Alternative, or as water quality program funding permits. However, the Los Angeles River is a highly urbanized and degraded system. Due to pollution impacts traced to highly urbanized and industrial land use activities located in the watershed, water quality problems will likely persist at measurable levels.

Under the No Action Alternative, restoration measures would not be constructed; therefore, the potential for operation impacts would be non-existent.

Alternative 10 (ART)

Impacts to water resources may occur from construction efforts or from the operation of the completed project. Construction of Alternative 10 would consist of daylighting streams currently encased in culverts, restoring riparian corridors along River and tributary overbank areas, widening of the river channel in Reach 6 at Taylor Yard, and restoration of a historic wash and riparian habitat within the LATC site, along with removal of invasive vegetation throughout the project footprint.
Overall, temporary impacts incurred during the construction phase could be adverse although not significant, while greater beneficial impacts are anticipated once the project is complete. Potential impacts are described below for construction and operation of the project.

Clean Water Act Section 401 water quality certification and enrollment in the State of California’s General NPDES Permit for Discharges of Storm Water Associated with Construction Activity would be required for this alternative. Before land disturbance of one acre or greater occurs or less than one acre but part of a larger common plan of development, the construction contractor would need to complete and submit a NOI to the State Water Board to obtain coverage under the permit. The SWPPP would be required to be prepared by a QSD before construction commences. The SWPPP would contain a visual monitoring program, and a water quality monitoring program for non-visible pollutants to determine construction site BMP effectiveness. The SWPPP would list all BMPs to be implemented during construction activities.

Construction Impacts

WQ Significance Criterion 1: Violation of any water quality standard or waste discharge requirements.

As discussed under WQ Significance Criterion 12 and WQ Significance Criterion 13, construction would not violate any water quality standard or waste discharge requirements. Impacts would be less than significant.

WQ Significance Criterion 2: Substantial depletion of groundwater supplies or substantial interference with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

The alternative would discharge permanent fill material into existing waters of the U.S. However, the fill material would not result in an increase of impermeable surfaces. Excavated concrete would be replaced with either soil backfill or rocks. Furthermore, the alternative would create new, soft bottom waters of the U.S., resulting in an increase of permeable surface areas to enhance groundwater recharge functions. Furthermore, the alternative would not require installation of wells to pump groundwater. As a result there would be no substantial depletion of groundwater supplies or interference with groundwater recharge. Impacts would be less than significant.

WQ Significance Criterion 3: Substantial change to the existing drainage pattern of the study area, including the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.

The alternative would not result in changes in the number, size or capacity of drainages discharging into the River. The existing drainage area would remain unchanged. Thus, there would be no increase in base flow that could result in substantial erosion or siltation. Portions of the River would be widened. However, the modifications would not alter the course of the River since the majority of the River is fixed in place due to channelization. There would be no substantial change to the existing drainage pattern. Impacts would be less than significant.

WQ Significance Criterion 4: Creation or contribution to runoff that exceeded the capacity of existing or planned stormwater drainage systems or introduced substantial additional sources of polluted runoff. The study area is located within a fully developed urban area which drains into the River. The alternative would not entail construction on previously undeveloped areas that would increase the drainage area.
Furthermore, conversion of existing industrial areas to riparian areas would decrease additional sources of polluted runoff. Impacts would be less than significant.

WQ Significance Criterion 5: Located housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map. This alternative entails construction of ecosystem restoration features in the River and adjacent areas. No housing developments would be constructed. There would be no impact.

WQ Significance Criterion 6: Located structures where they would impede or redirect flood flows. The alternative would not result in placement of structures that would impede or redirect flood flows.

As discussed in WQ Significance Criterion 7, hydrologic features would not be significantly affected by measures proposed under Alternative 10. Modifications to the channel will not increase the maximum water surface elevation. Modifications to the channel are not expected to result in substantial changes to water velocity and circulation. Impacts would be less than significant.

WQ Significance Criterion 7: Resulted in greater exposure of people or structures to a significant risk of loss, injury or death involving flooding including flooding as a result of the failure of a levee or dam.

During construction, hydrologic features would not be adversely affected. It is assumed that instream construction and modification of the project reaches would be conducted primarily in dry weather months (April 15 – October 31) to avoid wet weather storm flows, or that work areas would be adequately protected and not affect flood conveyance. In areas where instream construction would occur, diversions would be implemented to bypass dry weather flows downstream. Some areas would require dewatering during construction. Base flows supportive of beneficial uses, which protect aquatic life and human uses, may be temporarily affected in the immediate construction zone, but would not be affected upstream or downstream of the study area (SWRCB 1994).

Under all alternatives, modifications to the channel will not increase the maximum water surface elevation. Under all alternatives, modifications to the channel are not expected to result in substantial changes to water velocity and circulation. During the next detailed design phase, restoration measures will be further designed to not impair flood risk management functions in any portion of the study area or areas downstream. While initial assessment identified that an increase in water surface elevation could occur at transition areas (areas where the channel has geometric changes (transitioning from trapezoidal to rectangular or from a widened section to a narrow section) or changes in construction material (transitioning between soft-bottom and concrete)) if no design refinements were made, the detailed design will ensure the maximum water surface elevations will not increase when compared to the existing conditions. Any change in water surface in the transition areas will be avoided through design refinements to the project modifications to channel geometry and/or avoidance of introduction of vegetation and enforcing existing operations and maintenance requirements limiting vegetation growth in those areas. The number of transition areas increases from Alternative 10 through Alternative 20. Additional hydraulic analysis will be conducted and design modifications will be implemented during the design phase to provide more detail on the channel hydraulics with the recommended plan in place. Under all the alternatives and with implementation of such design refinements, there will be no increase in flood damages through the study area as compared to existing conditions. Impacts would be less than significant.

Under all action alternatives, invasive species would be removed throughout the project area, including the River channel and tributary bottom, during construction. Removal of invasive vegetation from in-channel areas would facilitate conveyance of flows and would not increase flood risks.
WQ Significance Criterion 8: Increased the risk of inundation of the study area by seiche, tsunami or mudflow.

There would be no construction within low-lying coastal areas or hillsides. The study area is located within a fully developed urban area. Construction would occur within and adjacent to the River. As a result, there would be no risk of inundation by seiche, tsunami, or mudflow. There would be no impacts.

WQ Significance Criterion 9: Increase in the water surface elevation of peak flows in the River.

As discussed under WQ Significance Criterion 3, WQ Significance Criterion 4, and WQ Significance Criterion 7, the alternative would not result in an increase in water surface elevation of peak flows in the River. Impacts would be less than significant.

WQ Significance Criterion 10: Substantial changes to the amount of surface water in the River, including both diminished or increased flow.

As discussed under WQ Significance Criterion 3, WQ Significance Criterion 4, and WQ Significance Criterion 7, the alternative would not change the amount of surface water in the River. Impacts would be less than significant.

WQ Significance Criterion 11: Resulted in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow.

As discussed under WQ Significance Criterion 3, WQ Significance Criterion 4, and WQ Significance Criterion 7, the alternative would not change the movement of surface water sufficient to produce a substantial change in the current or direction of water flow. Impacts would be less than significant.

WQ Significance Criterion 12: Created pollution, contamination, or nuisance, as defined in Section 13050 of the California Water Code.

Section 13050 of the California Water Code defines pollution as alterations of the quality of the waters of the State by waste to a degree which unreasonably affects either the designated beneficial uses or facilities that serve these uses.

The Los Angeles Regional Water Quality Control Board has designated four Beneficial Uses for the project area:

- Warm Freshwater Habitat: Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

The project area supports nonnative fish species such as mosquito fish, catfish, and green sunfish, and carp throughout the study reach. Invertebrates are also present. Native fish species are not present. In-channel activities during construction will require dewatering. However, dewatering would only occur with phased construction designed to isolate areas for short periods of time. Impacts would be temporary. There would be no permanent adverse impacts. Upon completion of construction, additional vegetated waters of the U.S. would be available for use by aquatic organisms. This indirectly benefits the rest of the fish and wildlife assemblage in the area by creating more foraging habitat and refuge.
• Wetland Habitat: Uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.

Wetlands likely occur in the soft bottom areas in Reach 2 and Reaches 4-6. In-channel construction may require work in areas with wetlands or riffle and pool complexes, resulting in temporary adverse impacts to these resources. Prior to initiation of construction, the study area would be surveyed for these features. Construction would avoid and minimize impacts to these features to the maximum extent practicable. Impacts to wetlands during construction would be temporary. Due to the existing seed bank and perennial flow, affected wetland vegetation is expected to recover soon after completion of construction. Subsequent to construction, the additional soft bottom areas created by the project would facilitate growth of additional vegetation. A portion of these new waters are expected to exhibit wetland characteristics soon after completion of construction. The project would augment existing wetland functions and services.

• Wildlife Habitat: Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Vegetation is present within the project area especially in Reach 2 and Reaches 4-6. The assemblage is a mixture of native and non-native vegetation. Native vegetation includes mature willows and shrubs. Non-native vegetation is primarily present in the shrub layer with giant reed (Arundo donax) as the dominant species. Wildlife utilize the vegetation, although the existing degraded condition does not support resident or breeding populations of threatened or endangered species.

In general, species present in the study area are those that are opportunistic and/or habituated to human presence. These species are able to move to alternative locations if they are disturbed by construction activities and, therefore, are not anticipated to be impacted adversely. During construction activities, noise and presence of visual forms associated with an active construction site may discourage establishment of nests or foraging within the vicinity of the work area. However, construction would not occur simultaneously within the entire project area. The construction footprint would migrate from one location to another over a number of years through the project area. As a result, avian and wildlife species within the active construction zone should be able to relocate to and utilize unaffected areas. Upon completion of construction, additional riparian habitat would be available for wildlife utilization. The project would also restore regional habitat connectivity to the Santa Monica Mountains.

• Ground Water Recharge: Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

The project would discharge permanent fill within existing waters of the U.S. However, the fill would not result in an increase of impermeable surfaces. Therefore, there would be no loss of existing waters of the U.S. Furthermore, the project would create additional acres of new, soft bottom waters of the U.S. As a result, the project would augment existing groundwater recharge capacity upon completion of construction. See Appendix M for additional discussion on
Based on the above, construction activities under Alternative 10 would not result in alterations of the quality that would not be compatible with designated beneficial uses. Impacts would be less than significant.

WQ Significance Criterion 13: Caused regulatory standards to be exceeded, as defined in the applicable NPDES permit or water quality standards in the Los Angeles Regional Water Quality Control Board’s Basin Plan.

The alternative would require ground-disturbing work and use of construction equipment within the River. There would be temporary impacts to water quality during construction. However, there would be no long-term impairments of water quality.

During construction, k-rails would be temporarily discharged in the River on a periodic basis. Sandbags or plastic sheeting required to seal the work area from surrounding flows would also be temporarily discharged. The k-rails and associated materials would be removed from waters of U.S. upon completion of construction of each phase. Movement of vehicles across earthen substrate during the placement and removal of dewatering structures would temporarily elevate turbidity in the water column. When fully isolated from surrounding flows, work within the River would result in minimal or no increases in turbidity. During construction, permanent fill would be discharged into waters of the U.S. Upon completion of each phase, waters flowing across newly constructed areas would result in temporary increases in turbidity as flows mobilize unconsolidated soils and other loose particles. Turbidity would return to baseline levels in short order upon establishment of dynamic equilibrium within the water column. Use of construction vehicles increases the potential for accidental release of fuels, solvents, or other petroleum-based contaminants.

Discharge of fill materials are not expected to result in long-term introduction of contaminants into the water column. All temporary fill would be chemically inert and would consist of either concrete k-rails or sandbags comprised of clean sand obtained from a source that is certified in providing contaminant-free materials. Much of the permanent fill material would also be chemically inert, and would consist of materials such as concrete and rock from a certified source, none of which would leach contaminants into the water column. Topsoil would be acquired from a certified contaminant-free source, and would be free of most weed seeds; hazardous toxic, and radioactive wastes, or other contaminants.

The increase in soft bottom waters of the U.S. would likely increase the potential for turbidity beyond existing baseline levels. However, most of the newly created/restored soft bottom areas would be vegetated. The vegetation would attenuate turbidity levels. Furthermore, because most of the surfaces upstream and downstream the project area are hardened, channel modifications are not expected to result in water quality impacts due to excessive erosion, scour, and headcuts.

Under all alternatives, invasive vegetation within the River and tributary channel bottoms within the project footprint would be removed. Vegetation would typically be removed by hand tools. Thus, the activity would not result in discharges of fill material in most instances. In cases where limited earthmoving may be required, there would be discharges of earthen fill. However, impacts would be temporary.

Discharges within waters of the U.S. are subject to Section 401 of the Clean Water Act. An application for a Section 401 water quality certification has been submitted to the Los Angeles Regional Water
Quality Control Board. Based on the above and with the implementation of terms and conditions of the certification, the alternative would not exceed regulatory standards and would be in compliance with the Los Angeles Regional Water Quality Control Board’s Basin Plan. Impacts would be less than significant.

WQ Significance Criterion 14: Change potable water levels sufficiently to reduce the ability of a water utility to use the groundwater basin for public water supplies, conjunctive use purposes, imported water storage, summer/winter peaking, or to respond to emergencies and drought.

As discussed under WQ Significance Criterion 2, the alternative would not result in substantial depletion of groundwater supplies or interference with groundwater recharge. Thus, the ability to utilize the groundwater basin for public water supplies would not be affected. Impacts would be less than significant.

WQ Significance Criterion 15: Reduction in yields of adjacent wells or well fields (public or private).

As discussed under WQ Significance Criterion 2, the alternative would result in substantial depletion of groundwater supplies or interference with groundwater recharge. Thus, there would be no reduction in yields of public and private wells. Impacts would be less than significant.

WQ Significance Criterion 16: Adversely altered the rate or direction of flow of groundwater.

As discussed under WQ Significance Criterion 2, the alternative would not require permanent installation of wells to pump groundwater. Due to the high water table, groundwater may need to be dewatered within work areas during construction. The scale of dewatering operations would not alter the rate or direction of flow of groundwater. Furthermore, any impacts would be temporary since there would be no dewatering activities upon completion of construction. Thus, the rate and direction of flow of groundwater would be unaltered. Impacts would be less than significant.

WQ Significance Criterion 17: Resulted in demonstrable and sustained reduction of groundwater recharge capacity.

As discussed under WQ Significance Criterion 2, the alternative would not result in substantial depletion of groundwater supplies or interference with groundwater recharge. Impacts would be less than significant.

Operational Impacts

Maintenance of ecosystem restoration features would be conducted under this alternative by the City. Maintenance in general would include removal of invasive species throughout the project footprint, including the River and tributary channel bottom; repair and replacement of irrigation pipes and sprinklers; maintenance of constructed trails, terraces, and viewing areas; trimming of native vegetation; removal of trash and accumulated sediment; graffiti abatement; vector management; and like-for-like structural repair.

The Corps would continue to be responsible for maintaining all other aspects of the portion of the LACDA project that overlaps with the restoration project footprint. Within the channel areas outside the constructed restoration features, the operation and maintenance of the LACDA project would also be modified to allow native vegetation to remain in the channel to the extent it does not have more than minimal effect on conveyance. Detailed hydrologic and hydraulic analysis will be used during the design phase to further determine how much vegetation may be supported in the channel without affecting the
flood risk management function. Riparian areas planted through restoration will be preserved on overbank areas, where they will not inhibit flood conveyance.

Movement of vehicles within the channel and discharges of fill material within waters of U.S. associated with small-scale, routine maintenance activities would temporarily increase turbidity within the immediate work area. Dewatering structures such as coffer dams would be utilized for lengthy or complex maintenance activities. When fully isolated from surrounding flows, work within waters of the U.S. would result in minimal or no increases in turbidity. All temporary fill would be chemically inert and would consist of either concrete k-rails or sandbags comprised of clean sand. Much of the permanent fill would also be chemically inert, and would consist of materials such as concrete and rock. The fill will not leach contaminants into the water column. Since the discharges of permanent fill material would be associated with like-for-like repairs, there would be no increase in impermeable surfaces. As a result, groundwater recharge functions would remain unaffected. Temporary or permanent discharges of fill material would not change the design elevations or contours. Flood risks would not be increased.

Invasive species in the River and tributary channel bottom within the project area would typically be removed by hand tools. Thus, the activity would not result in discharges of fill material in most instances. In cases where limited earthmoving may be required, there would be discharges of earthen fill material. However, impacts would be temporary and there would be no loss of waters of the U.S. Removal of invasive vegetation from the project footprint would facilitate conveyance of flows and would not increase flood risks.

Indirect Effects of and Related Actions to Construction and Operation

Fill material used in construction would consist of materials such as concrete, rock from a certified source, or pre-seeded turf reinforcement matting, none of which would leach contaminants into the water column. Topsoil would be acquired from a certified contaminant-free source, and would be free of most weed seeds, and free of HTRW, or other contaminants. Thus, potential for long-term leaching of contaminants into the water column would be minimal. Although the increase in soft bottom waters of the US would likely increase the potential for turbidity beyond existing baseline levels, the restored areas would be vegetated. The vegetation would attenuate turbidity levels. Concrete, rocks, and soils discharged in waters of the US would not be substantially different from the existing concrete, rocks, and soils at the site, with minimal indirect effects on substrate.

Incidental benefits to water quality would occur in all reaches of the study area; these benefits would be realized in the short term due to the removal of impervious surfaces in the River and riparian overbank areas, but would not be fully realized until riverine habitat was established.

Water quality pollutant removal mechanisms incidental to the implementation of restoration measures include physical and biological components. Physical removal includes the removal of pollutants through adsorption, absorption, filtration, and ultraviolet disinfection. Adsorption allows for a pollutant to bind to another substance through adhesion and thereby be removed from the environment (ammonia, copper, cyanide, indicator bacteria, lead, nutrients, oil, and selenium). Absorption allows for uptake of a pollutant, when it is incorporated into vegetation (nutrients). Filtration is the removal of a pollutant by mechanical or physical means (trash). Ultraviolet disinfection occurs when ultraviolet rays are used to kill microorganisms (indicator bacteria).

Biological removal includes phytoremediation and bioremediation. Phytoremediation is the process of using plants to remove, transfer, stabilize, and destroy environmental contaminants (ammonia, copper, cyanide, indicator bacteria, lead, nutrients, oil, and selenium). Bioremediation is the process of using
organisms to remove, transfer, stabilize, and destroy environmental contaminants (ammonia, copper, cyanide, indicator bacteria, lead, nutrients, oil, and selenium).

The restored habitat could provide benefits by helping to provide biological and chemical removal of constituents that contribute to the River’s 303(d) listing, including ammonia, copper, cyanide, indicator bacteria, lead, nutrients (algae), oil, selenium, and trash (SWRCB 2010).

After construction is complete, new acres of riparian and wetland habitat would be present within the expanded River. Daylighting upland culverts will create riparian corridors which will provide additional filtration of stormwater entering the system. Riparian and wetland vegetation, along with bioengineered wall vegetation, will combine to increase shading of the river, which may reduce microclimate temperatures.

Groundwater benefits from construction would include increased groundwater infiltration and recharge for future water uses, though these benefits would likely not be significant.

Because this alternative would replace the existing LATC site functions with riparian habitat, the existing functions of the LATC site would be relocated to another site within the Los Angeles Basin. Both construction and operation have the potential to impact water resources at the future site, if present. However, it is expected that the future site would be selected based on its functional equivalence to the existing site, in an area that is already used for industrial activities. The future LATC site would be within an existing Los Angeles Basin industrial zone, ensuring continued regulation by the Regional Water Quality Control Board and minimal potential for impacts to water resources. Similarly, operation of the new site will include comparable functions to the existing site, including required stormwater runoff protections. Prior to site selection, the CEQA lead agency would conduct a detailed CEQA analysis of the effects of the relocation, including effects to water resources. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

**Alternative 13 (ACE)**

**Construction Impacts**

Impacts to water resources under Alternative 13 would be similar to those discussed in detail under Alternative 10. Construction under Alternative 13 would encompass a larger portion of the study area to include the Arroyo Seco confluence and restructuring of the channel banks in Reach 7 and increased widening at Taylor Yard in Reach 6, as well as an additional side channel in Reach 3. It would not include the three daylighted streams in Reach 7 of Alternative 10. Hydrologic features, water quality, and groundwater resources would not be significantly affected by restoration measures under Alternative 13. In comparison to Alternative 10, Alternative 13 would be implemented over a larger area, increasing the potential for construction impacts.

Similar to Alternative 10, there would be no permanent loss of waters of the U.S. Waters of the U.S. would be temporarily impacted by the construction of restoration features. New waters of the U.S. would be created by construction of this alternative. This alternative would require the Corps obtain water quality certification. Temporary and permanent impacts to waters of the U.S. are analyzed in Appendix M of this IFR. Similarly, no permanent loss of waters of the state regulated by the CDFW is anticipated.

Beneficial impacts under Alternative 13 would also be similar to Alternative 10, but would increase because of the slightly larger area of implementation. Beneficial impacts include increased riverine and riparian habitat, increased interaction between surface to groundwater by softening the channel bottom,
and increased natural “polishing” and removal of pollutants from surface water. In addition to the regional habitat connectivity restored under Alternative 10, this alternative would also restore regional habitat connectivity to the San Gabriel Mountains.

**Operational Impacts**

Operation impacts under Alternative 13 would not significantly affect hydrologic features, water quality, and groundwater resources. Impacts would be the same to those found under Alternative 10, but over a slightly larger area to include the additional constructed features.

**Alternative 16 (AND)**

**Construction Impacts**

Impacts to water resources under Alternative 16 would be similar to those discussed in detail under Alternative 10. In comparison to Alternative 10 and 13, Alternative 16 proposes additional substantial restoration measures over a larger area of implementation within the project area, with a larger footprint of disturbance at LATC. The additional measures include:

- Demolition and excavation of channel walls to restore the historic floodplain connection to the river channel, and removal of concrete bed of the river, in Reach 8, and
- Demolition and excavation to widen channel bed and create terraced banks in Reach 5

Hydrologic features, water quality, and groundwater resources would not be significantly affected by restoration measures under Alternative 16. In comparison to Alternatives 10 and 13, Alternative 16 would be implemented over a larger area, increasing the potential for construction impacts.

Beneficial impacts would be similar to those found under Alternative 10 and 13, but would also include increased riverine and riparian habitat, increased interaction between surface to groundwater by softening the channel bottom, and increased natural “polishing” and removal of pollutants from surface water.

Similar to Alternative 10, there would be no permanent loss of waters of the U.S. Waters of the U.S. would be temporarily impacted by the construction of restoration features. New waters of the U.S. would be created by construction of this alternative. Temporary and permanent impacts to waters of the U.S. are further analyzed in Appendix M of this IFR. Similarly, no permanent loss of waters of the state regulated by the CDFW is anticipated.

**Operational Impacts**

Operation impacts under Alternative 16 would not significantly affect hydrologic features, water quality, and groundwater resources and would be the same to those found under Alternative 13, but over a slightly larger area.

**Alternative 20 (RIVER)**

**Construction Impacts**

Restoration measures and associated construction and beneficial impacts to water resources within the project area under Alternative 20 would be similar in scope to those discussed in detail under Alternative 10, but would be implemented over a larger portion of the study area. Likewise, impacts to water quality and water resources under Alternative 20 would be similar to those discussed in detail under Alternative 10. Impacts would encompass a larger area due to the greater extent of restoration features.
In comparison to Alternatives 10, 13, and 16, Alternative 20 proposes restoration measures over the largest area. Restoration measures under Alternative 20 would be similar to Alternative 16, but would also include the widening of Verdugo Wash in Reach 3, and channel reshaping/widening restoration measures in Reach 2. In Reach 7, this Alternative includes the three daylighted streams included in the reach plan for Alternative 10 and the Arroyo Seco restoration included in Alternative 13 and 16, with the impacts as discussed in those alternatives. Instead of the restructuring of channel banks included in Alternatives 13 and 16, it restores freshwater marsh at the Los Angeles State Historic Park and terraces the existing channel bank adjacent to the Los Angeles State Historic Park, and the railroad line along the overbank would be trestled at grade to facilitate the terracing. Reach 2 and Reach 3 impacts are more extensive than Alternative 16 due to the increased area of restoration but are similar in nature and type. Reach 7 impacts are otherwise similar to those identified for Alternative 10 (daylighting streams outside the channel, in upland areas, and 13 (restoration of Arroyo Seco), but include terracing of the bank adjacent to the Los Angeles State Historic Park instead of the bank restructuring with implanted vegetation included in Alternative 13. The difference in the Reach 7 plan would involve less construction activity on the channel banks but would result in slightly more permanent and temporary impacts to waters of the U.S. than in Alternative 13 and 16 as discussed in Appendix M and below but no permanent loss of waters of the U.S., and other impacts to water resources associated with this Reach 7 plan are substantially similar to those identified for Alternative 13 and 16. In sum, construction impacts under Alternative 20, both adverse and beneficial, would be similar to Alternative 16, but would be more extensive due to the increased area over which the measures would be applied. In addition to the regional habitat connectivity restored under Alternatives 13 and 16, this alternative would also restore regional habitat connectivity to the Elysian Hills with the measures in Reach 7 and connectivity to the Verdugo Hills with the measures in Reach 3.

As part of the Corps’ coordination with the FWS under the FWCA for this alternative, additional opportunities for restoration of habitat connectivity as part of the project, particularly within the River channel, were identified. The Corps will further evaluate these opportunities during the design phase, as their implementation is likely to require hydrologic and hydraulic modeling data and more detailed design. Prior to implementation of the additional measures identified, the Corps will assess whether supplemental analysis is required to address new or different effects than those already assessed in this IFR. The following potential measures may affect water resources.

- The Corps would further assess incorporation of anchored boulders and potential modifications to the channel bed in concrete reaches to provide improvements for aquatic habitat connectivity and fish refugia.

- Considerations for segregation of “spring fed waters” from surface water flows would also be made during the detailed design phase. This segregation would be considered to support refugia for fish, where groundwater would feed the refugia while surface flows might bypass such areas. Parameters required for engineering design would include groundwater levels as well as anticipated local fluctuations in groundwater conditions.

Similar to Alternative 10, there would be no permanent loss of waters of the U.S. Waters of the U.S. would be temporarily impacted by the construction of restoration features. Permanent and temporary impacts to waters of the U.S. would be slightly greater with this alternative than in Alternative 16 in Reaches 2, 3, and 7. New waters of the U.S. would be created by construction of this alternative. Temporary and permanent impacts to waters of the U.S. are further analyzed in Appendix M of this IFR. Similar to Alternative 10, no permanent loss of waters of the state regulated by the CDFW is anticipated.
Operational Impacts

Operations under Alternative 20 would not significantly affect hydrologic features, water quality, and groundwater resources, and would be the same as those under Alternative 16, but would occur over a larger area.

5.4.4 Best Management Practices and Impact Avoidance Measures

Implementation of BMPs would be guided through permitting, certification, and plan development, and through recommendations provided in the CEQA guidelines. The proposed erosion control measures, also listed under Section 5.1. BMPs, would include, but not be limited to, the following:

- Limiting most in-channel construction to the low-flow period between April 15 and October 31 to minimize soil erosion.
- Soils and all materials used for backfilling or stabilization must be certified to be free of contaminants.
- All sites with known and suspected HTRW soil contamination will be investigated and remediated prior to project construction. All groundwater contamination that cannot be remediated prior to project construction will be subject to appropriate handling, treatment and disposal ensured by the non-Federal sponsor. All work shall be consistent with Engineering Regulations 1165-2-132.
- In-channel work would be isolated from existing flows by the use of dewatering structures such as cofferdams constructed from k-rails and other suitable materials.
  - Cofferdam construction will be adequate to prevent seepage into or from the work area.
  - Cofferdams may be constructed from sand bags, concrete k-rails, sheet piles or other appropriate materials that would not leach contaminants into the water column or increase downstream turbidity.
  - Ensure that dewatering structures and cofferdams are in place and functional prior to in-water work.
  - Visually inspect all cofferdam components on a regular basis.
  - Check for water seepage under the dam and general integrity of the dam.
  - Fix all leaks immediately.
  - If turbid water is discharged from the work area despite the cofferdam, place wattles, filter fabric, silt fencing across the flow stream downstream of the work area as appropriate.
  - All cofferdams and associated structures will be removed upon completion of work.
• Require the construction contractor to prepare a storm water pollution prevention plan (SWPPP) consistent with State Water Board policy and guidelines. At a minimum, the SWPPP would include the following elements:

  o Work areas, staging areas, or stockpile areas that could be subject to erosion during storm events would be stabilized with erosion control measures as appropriate. These measures could typically include silt fencing, straw bales, sand bags, filter fabric, coir rolls or wattles.

  o Erosion control methods used to prevent siltation would be monitored weekly and maintained as needed.

  o Stabilize and reseed disturbed upland areas with native grasses, shrubs, and trees upon completion of construction.

  o Stationary equipment such as motors, pumps, generators and welders located within or adjacent to the channel or basin will be positioned over drip pans.

  o Any equipment or vehicles driven and/or operated within or adjacent to the channel or basin should be checked and maintained daily, to prevent leaks. All maintenance will occur in a designated offsite area. The designated area will include a drain pan or drop cloth and absorbent material to clean up spills.

  o Fueling and equipment maintenance will be done in a designated area removed from the area of the channel or basin such that no petroleum products or other pollutants from the equipment may enter these areas via rainfall or runoff. The designated area will include a drain pan or drop cloth and absorbent materials to clean up spills.

  o Materials for the containment of spills (i.e., absorbent materials, silt fencing, filter fabric, coir rolls) will be identified and be available onsite prior to commencement of construction or maintenance activities.

  o Any accidental spill of hydrocarbons or coolant that may occur within the work area will be cleaned immediately. Absorbent materials will be maintained within the work area for this purpose.

  o No wet concrete product will come into contact with any flowing or standing water at any time. Areas where raw cement or grout are applied or where concrete curing or finishing operations are conducted will be separated from any ponded or diverted water flows by a cofferdam or silt-free, exclusionary fencing. All equipment involved with the concrete or grouting operations will be located within a contained area while using any slurry or concrete product. A protective berm or other structure will be in place prior to maintenance and/or repair activities.

  o Any spill of the grout, concrete, concrete curing or wash water adjacent to or within the work area will be removed immediately.
5.5 BIOLOGICAL RESOURCES

5.5.1 Regulatory Framework

Federal Laws and Regulations

Clean Water Act (CWA)

The CWA has provisions for protecting biological resources within the aquatic environment through identification of beneficial uses and prohibitions on fill of wetlands or other Waters of the U.S. (WoU.S.). The primary functions of the CWA in protecting biological resources in this instance are to ensure that any impacts to wetlands or WoU.S. are compensated for and to provide a framework for ensuring that water quality is maintained or improved.

Endangered Species Act (ESA)

The Endangered Species Act (ESA) protects threatened and endangered species by prohibiting Federal actions that would jeopardize the continued existence of such species or result in destruction or adverse modification of any critical habitat of such species. If effects to listed species are anticipated, Section 7 of the Act requires consultation regarding protection of such species be conducted with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) prior to project implementation. (16 USC 1531, 1536).

Fish And Wildlife Coordination Act (FWCA)

The purposes of the FWCA include recognizing the contribution of wildlife resources to the nation, acknowledging the increasing public interest and awareness of wildlife resources, and ensuring that wildlife conservation receives due consideration in water resources development programs (16 USC 661). Under the FWCA, the FWS provides its recommendations to the Corps to consider.

Migratory Bird Treaty Act (MBTA)

The MBTA implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and Russia for the protection of migratory birds. Under the act, taking, killing or possessing migratory birds, their nests, or eggs, is prohibited.

Several Executive Orders relating to biological resources would need to be complied with as future planning and implementation of any of the proposed restoration measures take place. Relevant EOs include the following:

- **Invasive Species**—EO 13112, issued on February 3, 1999, helps prevent the introduction of invasive species and provides for their control and minimizes the economic, ecological, and human health impacts that invasive species cause.
- **Protection of Wetlands**—EO 11990, issued on May 24, 1977, helps avoid the long-term and short-term adverse impacts associated with destroying or modifying wetlands and avoiding direct or indirect support of new construction in wetlands when there is a practicable alternative.
- **Migratory Birds**—EO 13186, issued on January 10, 2001, promotes the conservation of migratory birds and their habitats and directs Federal agencies to implement the Migratory Bird Treaty Act.
- **Protection and Enhancement of Environmental Quality**—EO 11514, issued on March 5, 1970, supports the purpose and policies of NEPA and directs Federal agencies to take measures to meet national environmental goals.
State Laws and Regulations

**California Endangered Species Act, Sections 1600-1607**

The California Endangered Species Act focuses on protecting all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation.

**California Fish and Wildlife Code, Sections 1600-1607**

Sections 1600 through 1607 which regulate work that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; that would substantially change the bed, channel, or bank of a river, stream, or lake; or that would use material from a streambed.

The Porter-Cologne Water Quality Control Act also applies to biological resource protections.

5.5.2 **Significance Criteria**

In evaluating the context and intensity of an environmental effect, a significance threshold provides a qualitative or quantitative benchmark for determining whether the impact is significant or less than significant. The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the CEQA (2006) guidelines.

These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The alternatives under consideration could result in a significant impact related to biological resources if they would:

- Have a substantial adverse effect, either directly or through habitat modification, on any species identified as endangered, threatened, candidate, rare, or of special concern in local or regional plans, policies, regulations, or on lists compiled by the CDFW, NOAA-Fisheries, or USFWS;
- Have a substantial adverse and unmitigated effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW, NOAA-Fisheries, or USFWS;
- Have a substantial adverse and unmitigated effect on Federal- and state-protected wetlands as defined by Section 404 of the CWA and as protected under the Porter-Cologne Water Quality Control Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native fish or wildlife migratory or dispersal corridors, or impede the use of native wildlife or fish nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

5.5.3 **Environmental Impacts**

Impacts to biological resources would result from temporary construction efforts and construction of new habitat features. Impacts may include those to vegetation or wildlife resulting from site preparation, grading, bank lowering, channel widening, daylighting of storm drains, removal of concrete, excavation of side channels, riverside plantings, removal or alteration of existing structures and water infrastructure, and construction of new connections to water sources. The magnitude of the disturbance would determine
the significance of the impact to biological resources. However, the majority of the effects from the
construction of the restoration measures proposed under the action alternatives would be highly beneficial
to biological resources over the long term.

In this section, beneficial impacts are qualitatively described for each alternative, while also providing the
quantitative measure of restoration benefits in terms of Habitat Units (HUs). Additional details regarding
the calculation of HUs are provided in Sections 4.9 and 4.11.

No Action Alternative

Construction Impacts

No construction impacts would occur under the No Action Alternative since there would be no
construction.

Operational Impacts

Current operations would be expected to continue into the future without the implementation of the
proposed project. Authorized maintenance includes clearing of all vegetation and removal of sediment as
needed within the channel to maintain the purpose of flood risk management, which may be implemented
in the future as funding allows. While availability of funding has not allowed for complete vegetation
removal since the river’s channelization, it remains an authorized maintenance activity. Due to the limited
funding, recent maintenance of vegetation in the study area has focused on removal of non-natives within
existing habitat in soft bottom reaches and removal of sediment and aquatic vegetation in concrete
reaches. Without implementation of the proposed project, removal of all vegetation in the channel would
remain an authorized maintenance activity, although maintenance funding would be anticipated to be
similar to existing levels. While non-natives are periodically removed when funding becomes available,
this maintenance would not be consistent or widespread throughout the study area.

Under the No Action Alternative, trash that accumulates within existing habitat will only be removed
occasionally under existing channel maintenance protocols, and will continue to degrade riparian and
wetland habitats. In addition, pressures on available water supply may lead to reduced flows in the river
channel. Under the No Action alternative, contaminant removal through adsorption, absorption and other
biochemical processes would be limited to existing vegetation areas, and would not be increased or
improved as no new plantings would be established.

Most dry season flow in the channel is due to wastewater releases from the upstream Tillman Treatment
Plant or runoff from irrigation or industrial practices. If the climate of Southern California becomes drier,
as some climate models predict, pressure on any available water supply will increase. Over time, this
could result in greater water conservation measures as well as reuse of treated wastewater, which would
reduce flows in the channel. Without the project, reduced flows could result in diminished aquatic and
riparian habitat. With degraded habitat conditions and invasion by non-natives, use of habitats by wildlife
species is also expected to decline. Although the CHAP evaluation (Appendix G) predicted that the same
species of wildlife may still occur within the fifty year period of analysis, it is reasonable to assume that
overall population numbers, as well as the ability of wildlife to successfully forage, reproduce and move
through the area will decline as the habitat continues to degrade.

Based on CHAP, habitat value is projected to substantially decline within the Study area assuming no
restoration activity is implemented over the next 50 years. Open water areas and urban areas mostly
comprised of impervious surfaces (including the concrete channel banks) showed no change from the
current habitat value. The remainder of the Study area is projected to decline steadily in habitat value,
with an overall decline of 7 percent after 25 years and 14 percent after 50 years. In the absence of
restoration in the Study area, the existing riparian areas that currently provide the most habitat value per acre will continue to degrade. Ecosystem functions in the Study area will also continue to diminish.

Habitat connectivity within the study area would continue to be extremely limited, restricting movement of most wildlife to within the existing habitat corridor in the Glendale Narrows (Reaches 4-6) and in Reach 2. No restoration of habitat nodes would occur and there would be no improvement of local wildlife connectivity. The benefits of restoration of habitat nodes in the urban environment, including supporting source populations of wildlife and reduction of inbreeding depression, would not be attained. Opportunities for regional wildlife connectivity via tributary confluences to significant ecological areas such as the Santa Monica and San Gabriel Mountains could not be realized.

While limited habitat exists within the study area, supporting some native plants and wildlife, under the No Action Alternative it is anticipated that non-native species will continue to invade and that native habitat and wildlife diversity will decline. Due to the extensive urbanization in the study area, the existing habitat and ecological functions are extremely degraded. These degraded conditions would persist with implementation of the No Action Alternative.

Without consistent maintenance, native plant and wildlife diversity would continue to decline while existing habitats would be increasingly infested by non-native species. Non-native species do not provide adequate habitat to support a diverse population of fish and wildlife. Mechanical or chemical treatment would continue to be necessary, both as a means of maintaining native vegetation and to maintain the flood capacity of the channel to convey high flows, as funding allows.

**Alternative 10 (ART)**

Alternative 10 provides some restoration in all reaches and provides transitions or connections between existing riparian corridors and concrete lined river reaches. This alternative restores riparian, riverine, and other native aquatic habitats, including 251 acres of valley foothill riparian habitat. (Refer to Section 4.14 of this IFR for a detailed description of restoration measures associated with each alternative, per reach.) This alternative is expected to provide substantial benefits including the restoration of native habitat, expansion of habitats into overbank side channels and river adjacent areas, expansion of wildlife populations, and improved connectivity for local and regional wildlife movement. A total of 5,321 average annual HUs will be provided by this alternative. Restoration and expansion of native and structurally diverse riparian habitat will provide herbaceous, shrub, and tree layers needed to support existing wildlife species and potentially provide habitat for threatened and endangered species that have the potential to inhabit the area, such as the least Bell’s vireo. Following completion of restoration, the improved size and quality of habitat patches will substantially benefit biological resources. As analyzed below, this alternative would not have significant adverse impacts to biological resources, while it would have beneficial impacts to biological resources.

**Construction Impacts**

In Reach 1, this alternative establishes riparian corridors along both sides of the River channel, restores riparian area at the Pollywog Park area of Griffith Park, and restores riparian habitat along the east overbank of the Burbank Western Channel. In Reach 2, this alternative would extend the riparian corridor on both sides of the River overbank. In Reach 3, two streams would be daylighted (with riparian and freshwater marsh restoration) on the east side of the River, and a single stream would be daylighted on the west side of the River. Restoration in Reach 4 would include establishment of a riparian corridor on the east overbank, creation of a side channel at the edge of Griffith Park Golf Course with inlet and outlet to the River, lowering a portion of the Los Feliz Golf Course on the east bank of the River to allow seasonal flooding through existing culverts, and daylighting of eight streams. Restoration in Reach 5 would extend the riparian corridor on the east overbank and daylight a stream at the downstream end. In Reach 6, this
alternative would widen the channel by approximately 80 feet at Taylor Yard, expanding in-channel
habitat, and terrace a small area in the Bowtie parcel. In Reach 7, three streams would be daylighted. In
Reach 8, at the LATC site, a historic wash and riparian habitat would be restored. This restoration would
allow flows from the ephemeral wash to enter the river through existing culverts through the channel wall
that runs below the railroad lines. Under this alternative, a total of 15 streams that currently connect to the
river through culverts will be opened up and converted into wetland habitat. Beneficial impacts will result
from the addition of wetland and riparian habitat, as well as an incidental improvement in water quality
passing through wetlands at the daylighted streams. The creation of additional riparian and wetland habitat
in the overbank side channels and widened areas will provide benefits to fish and wildlife in the area by
expanding habitat and allowing for increased populations of wildlife in restored areas.

The impacts to biological resources during construction of the proposed restoration features could include
removal of non-native vegetation both in the specific restoration features and as a general measure
implemented throughout the project footprint, including in channel areas. Impacts may include
disturbance to existing native vegetation in channel due to the non-native removal. Impacts may also
include temporary displacement of wildlife species, temporary air and noise pollution, and temporary
sediment runoff into the River. Vegetation removal would occur outside of the breeding season to
minimize or avoid impacts to migratory bird species.

Although no specific recreation plan was formulated to correspond to Alternative 10, if this restoration
alternative were to be selected for implementation, associated recreation facilities compatible with the
restoration features would be anticipated to be implemented at similar but slightly reduced scale to those
described for Alternative 13, increasing the quantity of existing trails within the project footprint,
extending trails/paths, and connecting project features with pedestrian bridges. All recreation features
would be designed to avoid and minimize effects on biological resources during construction and to be
compatible with and not compromise the ecosystem restoration features.

**Vegetation**

During construction, existing native vegetation within the river channel would be left in place to the
extent practicable, with removal of invasives throughout the project footprint, including areas in which
restoration features are constructed and the existing channel and tributary bottom areas. Some existing
vegetation may be disturbed during construction of features adjacent to the vegetated river channel, such
as restructuring the channel walls and widening the channel in Reach 6.

Other portions of the study area, outside the vegetated river channel, are predominantly vegetated with
non-native invasive weeds and/or ornamental vegetation. These invasives may spread further where
construction efforts disturb soils. Increased presence of invasive weed species reduces ecological diversity
and minimizes habitat value. However, restoration designs specifically call for revegetation of disturbed
areas with native habitat, including those areas disturbed during the construction period. Non-native
infestations would be treated either mechanically or chemically after construction is complete.
Construction of the restoration features and invasives control would remove weedy and ornamental
vegetation and replace it with native riparian and wetland habitat, which would be a benefit to the river
ecosystem.

With the implementation of restoration measures, installation of native habitat, and control of invasives,
construction of the proposed project would not cause significant adverse impacts to vegetation. Any
impacts would be minimal, localized, and short term, and would ultimately be beneficial after native
habitats are restored.
Fish

Currently no native fish inhabit this portion of the river (LADWP 2004, FoLAR 2008). Santa Ana sucker and arroyo chub, in particular, have been extirpated from most of their historic ranges and are now found in only a handful of isolated areas. Construction activities in the river channel may result in disturbance to non-native fish through disturbance of habitat and invertebrate prey items, as well as through increased turbidity with potential sediment runoff into the river. Construction equipment working in close proximity to the river has the potential to introduce sediment or pollutants into the water, although BMPs will be implemented to minimize this potential.

Fish may be exposed to suspended sediment concentrations during construction, which may cause clogging to gills of fish in the immediate vicinity. It is expected that most fish would avoid the immediate construction area due to increased noise levels, turbidity, and oxygen depletion resulting from increased sediment load in the river. The proposed project will implement water quality BMPs during construction (BMPs are outlined at the end of each resource category within this chapter, such as 5.4.4 [for protection of water quality] and 5.5.4 [for protection of biological resources]) and will operate under applicable Federal and state permits, which would protect water quality and minimize impacts to fish. Any construction-related impacts to fish would be temporary and less than significant.

Birds

Construction activities may temporarily remove vegetation, degrade water quality in the river, and increase ambient noise levels, which could cause disturbances to some birds causing them to vacate the construction area. Increased levels of activity may decrease birds’ use of the study area for foraging, roosting, and nesting. Birds are expected to vacate the area and find alternate foraging, nesting, and roosting locations during the temporary construction activities. As there are no established populations of federally protected birds such as least Bell’s vireo currently nesting in the project area, no effect to these species will occur. Construction would take place only in limited portions of the study area at any given time, and resident bird species would likely find similar habitat nearby in other portions of the vegetated channel or adjacent habitat areas. Birds are also expected to acclimate to construction noise, as noise levels in the study area are generally high due to the adjacent freeway and urban uses. Vegetation removal activities would take place outside the breeding season for birds to avoid impacts to nesting.

Birds would benefit from the proposed project via planting and expansion of native riparian and wetland habitats, which would improve opportunities for foraging, roosting, and nesting. Removal of trash and incidental improvement of water quality would also benefit bird species in the study area. With the implementation of restoration measures, adverse impacts to birds would be avoided and impacts would be considered less than significant, with an overall benefit to bird species in the study area.

Wildlife

Construction activities may temporarily disturb wildlife within the study area by removing vegetation and sediment, increasing noise levels, and increasing vibration levels. Wildlife is expected to vacate the area and find alternate habitat nearby during construction. Construction would take place in phases, and only be performed in limited portions of the study area at any given time. Much of the wildlife inhabiting the study area are urban adapted species that are acclimated to human presence, generally higher noise levels, and some level of disturbance. These species may adapt more readily to the type of disruptions that occur during construction. Wildlife is expected to re-colonize the construction areas after construction is complete. No significant adverse effects are expected to impact these commonly occurring wildlife species as a result of construction activities included in this alternative. Restoration and expansion of native vegetation by the project would provide additional and improved wildlife habitat.
Wildlife Movement

Wildlife movement within the study area may be disrupted during construction activities due to disturbance of vegetation, increased noise levels, and increased vibrations. Disturbance would be temporary and movement opportunities would be restored after construction is complete.

Opportunities for wildlife movement would be marginally improved in this alternative. Restoration at Taylor Yard establishes a large node of historic riparian habitat adjacent to the river corridor. The habitat at Taylor Yard is then connected to other habitats currently existing within the river channel in the Glendale Narrows (Figure 6-2). Restoration at Taylor Yard also establishes a natural hydrologic connection between the River and the historic floodplain, which restores key ecological processes such as a more natural disturbance regime, scour and deposition of sediment and vegetation, nutrient cycling, biotic interactions, and colonization of new habitat areas (Stromberg et al. 2007), as well as improved wildlife movement between the river and floodplain. Connectivity to other restored habitat in the Study area is more limited by the overbank locations (i.e. Ferraro Fields, Los Feliz golf course) and assisted the hydrologic process in those areas. Increases in nodal connectivity and regional habitat connectivity are also analyzed in Chapter 6 of this IFR.

Impacts to wildlife movement would be temporary and not significant, and overall the project would be beneficial for wildlife species in the study area by restoring and expanding native habitat.

Wetlands

The Los Angeles River is a Traditional Navigable Water (TNW), a water of the United States pursuant to 33 C.F.R. § 328.3(a)(1). A jurisdictional delineation identified Ordinary High Water Mark as halfway up the embankment of the River. No permanent loss of waters of the United States would occur. Wetland habitat has been observed within the River in Reaches 4-6 and appears on NWI maps (USFWS 2012). Wetlands may also be present in Reach 2 due to the presence of riparian vegetation and perennial flows. Jurisdictional wetlands within the non-concrete bottom portions of the LAR are generally located on sand banks and are variable, prone to changes in size and location depending on the severity of storm flows. Colonies of giant reed (Arundo donax) are interspersed throughout all in-channel riparian areas. Furthermore, because the channel conveys storm flows from an urban environment, trash and debris are present throughout the riparian areas. Storm flows also affect the location and extent of wetlands due to shifting sandbars. Furthermore, the wetlands are physically isolated from other aquatic environments. Therefore, wetlands present within the project footprint are limited in aquatic functions and services. Pool/riffle complexes may also be present in Reaches 2 and 4-6 and are subject to the same existing conditions as wetlands.

A 404(b)(1) analysis for the project is included as Appendix M of this IFR. As indicated in that analysis, this alternative would not have a substantial adverse and unmitigated effect on Federal- and state-protected wetlands. This alternative would also restore and create wetlands and other special aquatic sites (pool/riffle complexes). Since this project is an aquatic habitat restoration project with creation or restoration of special aquatic sites that offset any impacts, no mitigation for wetland impacts is required or proposed.

Any wetlands present may be affected during construction of the widening of the River channel at Taylor Yard under this alternative. During construction, in-water work in Reach 6 may affect riparian vegetation, especially near the toe of levees where excavation and dewatering activities would be located. However, surveys prior to construction would be undertaken in the existing channel areas affected by construction to further identify, avoid, and minimize effects to wetlands and pool/riffle. Impacts to wetlands would generally be temporary, as due to the existing seed bank and perennial flow, wetland vegetation and...
hydric soils are expected to reestablish soon after completion of construction. Thus, there would be no permanent loss of wetlands under any build alternative. Areas disturbed by construction would be restored as needed. Moreover, invasive species will be removed during construction under each alternative, resulting in a more natural and functional plant community. Furthermore, construction of ecosystem restoration elements would increase connectivity to other riparian areas.

CDFW regulates waters of the State, and defines those waters as areas from top-of-bank to top-of-bank, as well as riparian areas that may be above the bank but still dependent on the waters within the bank. Although this is a substantial increase in area relative to Waters of the U.S., this larger area of regulated waters does not increase the potential for effects to wetlands since vegetated wetlands in the study reach are generally found only in the bottom of the river channel, while the increased regulated area is towards the top of the bank. Although waters of the State may be temporarily affected during construction similarly to waters of the U.S., impacts to wetlands would be temporary and avoided and minimized to the extent practicable. No mitigation is proposed since the project will result in a substantial increase in the amount and quality of Waters of the State.

**Threatened and Endangered Species**

Marginal habitat for the federally endangered least Bell’s vireo (*Vireo bellii pusillus*) exists within the vegetated portions of the channel within the study area in Reaches 2, 4, 5, and 6. Riparian vegetation in these reaches is linear and confined, and lacks suitable adjacent foraging habitat. Vireo were observed within the study area in 2007, however the most recent protocol surveys in 2009 did not detect vireo. An incidental observation of an unpaired male vireo near Taylor Yard was documented in April 2013 during a one-day nesting bird survey of the area. A similar one-day nesting survey of the area in May 2013 did not detect vireo (Cooper 2013a, 2013b).

The Corps has determined that this alternative will have no effect to least Bell’s vireo under ESA. Least Bell’s vireo are not expected to be present in the study area and are not known to nest in the study area due to the marginal, linear and confined nature of existing habitat. In the locations where vireos were observed during 2007 protocol surveys and from incidental observations in 2013 (Reach 6), the proposed construction will target removal only of existing non-native vegetation. In areas where marginal habitat for the least Bell’s vireo exists, non-native vegetation would be removed outside of the breeding season. Potential nesting habitat would be avoided.

Protocol level surveys for least Bell’s vireo would be performed during the detailed design phase and in the nesting season(s) immediately prior to construction of each feature within any potentially suitable areas to confirm presence or absence of this species within the study area. The Corps will continue to coordinate with USFWS and CDFW throughout the design and construction period, and consult under the Endangered Species Act if conditions change such that the Corps determines the project may affect the vireo or other listed species. With implementation of the alternative, riparian vegetation would be further expanded through widening and restoration of river adjacent areas, which could potentially support future populations of vireo.

No other special status species, including the southwestern willow flycatcher and coastal California gnatcatcher, are expected to occur due to the degraded conditions within the study area and lack of suitable habitat. Therefore, no impacts to threatened and endangered species are expected to occur. This assessment is the same for all action alternatives.

**Operational Impacts**

Following completion of the construction phase, the operation of the restoration project will begin, which will result in (1) the maintenance necessary to ensure success of restored components, and (2) the long-
term benefits of restoration that would support fish and wildlife. In addition, the LACDA operations and
maintenance plan would be modified to complement the restoration project.

Riparian areas planted through restoration activities will be preserved on overbank areas, where they will
not inhibit flood conveyance. Access to the river will be necessary for operation and maintenance
activities following completion of the restoration project.

Trucks and other heavy equipment will access the channel via established routes that cause the least
disturbance to soils or vegetation. Operation and maintenance activities will also be required to implement
similar BMPs used during construction (as applicable) to protect water quality, biological resources and
other aspects of the environment. BMPs and other environmental commitments are listed at the end of each
resource category within this chapter (such as 5.4.4 [for protection of water quality] and 5.5.4 [for
protection of biological resources]).

Restoration of riparian and wetland habitat in the study area will require maintenance to ensure the
establishment and survival of planted vegetation and to stay consistent with the constraints of the flood
risk management project. This includes the ongoing mechanical and/or chemical removal of non-native
species that become established after restoration, throughout the project footprint. Temporary irrigation
will be used to ensure survival of vegetation through the establishment period. Riparian areas planted
through restoration will be preserved on overbank areas, where they will not inhibit flood conveyance.
Constructed restoration features would be maintained consistent with the operations and maintenance
manual for the restoration project, which may include measures such as trimming or thinning of in-
channel vegetation outside the breeding season to avoid impacts to the flood risk management function.

Maintenance of the restored areas is anticipated to require minimal native vegetation removal or control
to avoid impacts to flood risk management, as features will be designed to avoid such impacts. In
addition, monitoring will be necessary to ensure that excessive scour or bank failures do not occur where
natural channel features are restored, to avoid compromising the flood risk management function and
adverse effects on water quality. These maintenance activities may result in minimal impacts due to entry
of restoration staff into vegetated areas to perform maintenance; however, these activities will ultimately
be beneficial for persistence of the restored habitats and are expected to be minimal and not significant.
The non-Federal sponsor would have a direct responsibility to ensure that adequate flow is maintained to
sustain habitat features.

Overall, operation and maintenance efforts will not have significant adverse impacts on the biological
resources in the area. The restoration measures in this alternative have been designed specifically to
improve the study area’s biological resources and ecological functioning.

The Corps has determined that there will be no effect to least Bell’s vireo from operations of the proposed
project. Removal of non-native vegetation and trimming of in-channel vegetation to maintain flood
conveyance would occur outside the breeding season. Overall, operations will support the establishment and
expansion of native riparian vegetation in the restored areas, which has the potential to support future
populations of vireo, and may support foraging and stop over habitat for southwestern willow flycatcher and
coastal California gnatcatcher. Presence/absence surveys for these species will be performed during operation
of the proposed project as part of the Monitoring and Adaptive Management Plan. The Corps and non-Federal
sponsor will continue to coordinate with the USFWS and the CDFW during operations of the proposed project.

During initial operation and maintenance of each feature, the Corps would conduct monitoring to assess
achievement of ecological success criteria (see Monitoring and Adaptive Management Plan, Appendix H
(Part 2)). If success criteria are not being met, the Corps and non-Federal sponsor would determine which
adaptive management measures should be implemented. Adaptive management measures could include
irrigation and supplemental watering, replanting, plant protection (e.g., cages or fencing), erosion control, importing of substrates, or regrading. Adaptive management measures would not be anticipated to have significant impacts on biological resources as impacts in most cases would be similar or less than those associated with similar activities during construction of the restoration features; however, prior to implementation, the Corps would determine whether supplemental analysis is required. Once ecological success has been documented by the District Engineer in consultation with the Federal and State resource agencies, and a determination has been made by the Division Commander that ecological success has been achieved, no further monitoring will be required.

The existing LACDA operations and maintenance would also be affected by implementation of the restoration project. Current LACDA operation and maintenance include those measures that are intended to ensure proper flood conveyance through the channel, such as clearing or thinning of vegetation or removing sediment or debris if necessary, and that maintain access into the channel and environs. The LACDA OMRRR plan would be modified to accommodate the restoration project, with maintenance of the restoration project a City responsibility under the restoration OMRRR plan. The LACDA OMRRR manual would be modified to exclude constructed restoration features and would exclude invasives management throughout the restoration project footprint. USACE would continue to be responsible for maintaining all other aspects of the portions of the LACDA project that overlap with the restoration project footprint. USACE would also modify the LACDA OMRRR plan for the ARBOR reach outside the specific constructed restoration features to preserve flood risk management function while complementing the restoration project. These modifications would allow native vegetation to remain in the rest of the reach to the extent that design conveyance capacities would be met or would experience only minimal changes from the design conditions. Detailed hydrologic and hydraulic analysis will be used during the design phase to further determine how much vegetation may be supported in the channel without affecting the flood risk management function. Such OMRRR would be contingent on funding and would be anticipated to be phased in over time.

Indirect Effects of and Related Actions to Construction and Operation

Once construction is complete and habitat meets success criteria, the project would be anticipated to result in greater diversity and intensity of use by a variety of species including birds, mammals and fish. With increased suitable habitat, least Bell’s vireo may nest in the project area. Restoration of wildlife corridors would be expected to result in greater use of the river corridor as a path for wildlife to travel between major habitat nodes and nearby regional habitat areas such as Griffith Park. Nodal connectivity and regional habitat connectivity are further discussed and evaluated in Chapter 6.

Indirect benefits to open water areas in hard bottom reaches may include additional shading, inputs of leaf litter and small woody debris, and increased foraging opportunities for wildlife due to restoration in channel adjacent areas. Additional shading may provide improved conditions and refuge for amphibians and shorebirds in the channel. Increased inputs of leaf litter and small woody debris may support macroinvertebrates that provide improved foraging for birds and amphibians, and may provide shelter for reptiles and amphibians in the channel. Restoration in areas adjacent to hard bottom reaches may also improve use as a dispersal corridor between soft bottom reaches, where leaf litter and small woody debris may provide cover and harbor moisture for use by reptiles and amphibians moving through the reach. These elements, along with proposed improvements for wildlife access in certain areas, and new nodal connections provided by the active restoration features, make the entire river channel within the study area more conducive for wildlife movement. The presence of edge habitat along the river channel may also improve use by neotropical migrants that nest near the edges of riparian habitats and forage in adjacent open spaces.
The proposed project could potentially support future populations of native fish species by restoring riparian/riverine habitat and riffle/pool complexes. Restoration of wetlands would incidentally improve water quality, which would also enhance conditions for native fish species.

The study area is large enough to support a self-sustaining, breeding population of historically occurring native fish. This would support recovery of the overall population of these species by providing new breeding grounds (which are extremely limited within all of the southern California watersheds), and establishing refuge populations that would enable the species to survive catastrophic events within existing territories. Fish are expected to re-colonize the proposed construction areas after construction is complete. Species such as the Santa Ana sucker and arroyo chub may naturally re-colonize the area from upstream tributary populations following restoration of appropriate habitat. After restoration of habitat suitable to support native fish, another agency or interested entity, separate from the restoration project, may also propose to reintroduce native fish directly into the restored project area and/or propose to remove non-native fish species to support successful establishment of native fish populations. The proponents and Federal and/or state agencies with jurisdiction over the reintroduction or removal of fish would conduct any necessary environmental reviews. The Corps and non-Federal sponsor would coordinate with the proponents and agencies with jurisdiction over removal or reintroduction of fish to ensure the compatibility of the program proposed with the restoration project function including operation and maintenance activities.

Due to enhanced habitat and additional recreational opportunities, human visitation to the study area is expected to increase. Increased human visitation to the site could lead to increased disturbance of habitat; however, designated trails, public use areas, educational signage and exclusionary fencing, as necessary, would be installed to minimize impacts from human intrusion into restored habitat areas. Although occasional adverse impacts of this nature are expected, they are expected to be minimal in comparison to the habitat benefits that would occur as a result of the project. Restoration features would be monitored and maintained to repair any damage that may occur from human visitation and recreation activities. Because the relocation of LATC site functions is anticipated to occur in an industrial area, effects to biological resources would be expected to be minimal. The impacts to biological resources from relocating LATC could include disturbance and/or removal of vegetation, temporary displacement of disturbance to wildlife species, temporary air and noise pollution, temporary sediment runoff into a water body or storm drain, and temporary disturbance of wildlife movement pathways. However, a functionally equivalent site within an industrial zone would be unlikely to contain significant biological resources, and therefore any associated impacts would likely be minimal. Prior to site selection, the CEQA lead agency would conduct a detailed CEQA analysis, including analysis of potential effects on biological resources. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

**Alternative 13 (ACE)**

Alternative 13 is designed to restore riparian, and other native aquatic habitats, including 271 acres of valley foothill riparian communities throughout the study area, including overbank areas in all reaches except Reach 7 and within the expansive boundaries of LATC. This alternative also provides for the removal of invasives, similar to Alternative 10. Alternative 13 provides for daylighting a total of 12 streams entering the channel (three in Reach 3, eight in Reach 4, and one in Reach 5), where wetlands will be created, and includes 26 acres of freshwater marsh habitat in additional locations. Habitat will also be substantially increased from Alternative 10 with restoration of the confluence of Arroyo Seco, creation of side channel behind Ferraro Fields, and the expansion of the soft river bottom along Taylor Yard to a 300 foot width. This alternative is expected to provide substantial benefits including increased area of restoration of native habitat, expansion of habitats into overbank side channels and river adjacent areas,
expansion of wildlife populations, restoration of additional natural hydrologic connections, and further improved connectivity for local and regional wildlife movement. A total of 5,902 average annual HUs are provided by this alternative.

**Construction Impacts**

The nature of construction impacts will be the same as for Alternative 10. Alternative 13 would construct the same restoration features as Alternative 10 in Reaches 1, 2, 4, 5, and 8, and provides additional restoration in Reaches 3, 6, and 7. In Reach 3, in addition to the measures identified in Alternative 10, this alternative would create a side channel entering upstream from the LAR behind Ferraro Fields and re-entering the river at the downstream end of the reach. In Reach 6, this alternative would widen the River by 300 feet at Taylor Yard (instead of 80 feet in Alternative 10), restoring floodplain and freshwater marsh in the widened channel. In Reach 7, this alternative would restore the confluence of the River with the Arroyo Seco tributary through softening of the bed and banks with development of a riparian corridor in the tributary confluence and for one half mile upstream. The restoration of the Arroyo Seco confluence restores natural in-channel geomorphic character in the currently channelized tributary. Restoration of this natural hydrologic connection between the River and tributary also benefits the River ecosystem by restoring key ecological processes in this area (Stromberg et al. 2007).

Instead of the daylighted streams included in this reach for Alternative 10, the banks of the River downstream from the Arroyo Seco are lined with overhanging vines and implanted vegetation. Although the total area that will be affected by construction will increase for this alternative, these impacts will be temporary, and for each of the reasons noted above for Alternative 10, will not be significant to biological resources. This alternative would have the same effects to wetlands and other special aquatic sites as Alternative 10, as the greater restoration footprint will not include additional areas with wetlands and other special aquatic sites.

Alternative 13 is a restoration plan, but if this plan were to be selected for implementation, a plan formulated for passive recreation corresponding with Alternative 13 would provide new recreational features compatible with the restoration plan. The recreation plan associated with this alternative would provide trails, bridges, restrooms, trail access points and signage, benches, trash receptacles, several wildlife viewing points, and pedestrian underpasses under bridges along the river. Hard structures such as parking lots will be placed at the periphery of the restored area. All recreation features would be designed to avoid and minimize effects on biological resources during construction and to be compatible with and not compromise the ecosystem restoration features.

**Operational Impacts**

As with Alternative 10, beneficial as well as temporary adverse impacts could potentially result from maintaining the restoration elements. Beneficial impacts will result from the newly restored habitats. Typical operation and maintenance of the channel will be the same as in Alternative 10. However, because of the larger scale of restoration under this alternative, there will be increased maintenance efforts to ensure that restoration is successful. Protection of restored elements during maintenance will be ensured through proper use of best management practices and implementation of a management plan for the restored areas as part of an OMRRR manual for the restoration project. Furthermore, the increased attraction of the site to the public will be managed through placement of signage, configuration of trails and exclusion fences, as necessary, to protect restoration.

The benefits of the proposed alternative will be the same as for Alternative 10, with the exception of the expanded area of restoration and improved local and regional wildlife movement opportunities in Alternative 13.
Indirect Effects and Related Actions to Construction and Operations

In addition to the indirect effects listed under Alternative 10, wildlife movement would be further improved in Alternative 13 with the restoration of the Arroyo Seco confluence. The restored habitat at Arroyo Seco would improve local connectivity for wildlife by serving as a new habitat node, with a connection to Taylor Yard via the river channel as a vegetated corridor (Figure 6-5). Improved nodal habitat connectivity promotes wildlife movement within the study area and prevents inbreeding depression and local extinction of wildlife populations. On a regional scale, restoration at Arroyo Seco confluence provides future opportunities to restore habitat connectivity between the river at the Study area and the San Gabriel Mountains via the Arroyo Seco tributary (Figure 6-6). Additional opportunity for connection in this area exists via the Corps’ on-going Arroyo Seco Ecosystem Restoration Study. Additional neighborhood habitat in the communities of San Rafael Hills, Mount Washington, and Montecito Heights could also be incorporated into the movement corridor as regional habitat nodes. Increases in nodal connectivity and regional habitat connectivity are also analyzed in Chapter 6 of this IFR.

Alternative 16 (AND)

The benefits of the proposed alternative will be the same as for Alternative 10 and 13, with the exception of the expanded areas of restoration, removal of concrete in the channel bed and restoration of a natural hydrologic connection at the LATC site, and improved local wildlife movement within the study area via restoration of this connection. Though less valley foothill riparian habitat is established, greater areas of soft bottom channel, wetland, and side channels are created. Alternative 16 provides for the removal of culverts from 12 streams entering the channel, where wetlands will be created. Terraced areas are expanded, which provide for attenuation and habitat expansion. Restored area and vegetation in-channel are targeted for invasive plant removal and treatment.

Substantial benefits to biological resources will result from this alternative, including increased area of restoration of native habitat, expansion of habitats into overbank side channels and adjacent areas, removal of concrete from the channel bed, restoration of additional natural hydrologic connections, and further improved connectivity for local wildlife movement. A total of 6,610 average annual HUs are provided by this alternative.

Construction Impacts

Construction types and impacts are similar to those described above for Alternatives 10 and 13. However, the scale of construction would continue to increase with each alternative, resulting in greater earthwork requirements. This alternative includes the same features as Alternative 13 in Reaches 1-4 and 6-8 and includes greater restoration in Reaches 5 and 8. In Reach 5, this alternative widens the River channel by modifying the west bank from a trapezoidal bank to a vertical wall and adds vegetated terracing on the east bank. At the downstream end of this reach, the River channel will also be widened by modifying the east bank. The daylighted stream in Alternatives 10 and 13 is also included in this reach. In Reach 8, the alternative includes additional restoration by terracing upstream of LATC on the west bank of the River, terracing downstream on the east bank, and removing the east bank and the concrete bed adjacent to LATC. The channel bed will be naturalized to support freshwater marsh in the river. The river is widened in LATC by 500 feet on a low terrace and another 1000 feet on a second terrace. Another set of vegetated terraces are constructed along the downstream bank on the east side of the river. The restoration features at the LATC site would also include the restoration of the historic wash, along with wetland habitat.

Greater channel widening measures, additional side channels, and more extensive changes would require a longer construction period and would affect a larger area. However, for the same reasons described above, adverse impacts would not be significant. Impacts to wetlands and pool/riffle may occur over a larger area than in Alternatives 10 and 13 due to the widening of the existing river bed in Reach 5.
However, as in Alternatives 10 and 13, wetlands and pool/riffle would be surveyed prior to construction to avoid and minimize effects to the extent practicable, wetlands would be expected to reestablish naturally, disturbed areas would be restored as needed, and wetlands and pool/riffle created by this alternative would offset any impacts to such special aquatic sites.

Like Alternative 10, no specific recreation plan was formulated to correspond to this alternative; however, were this alternative to be selected for implementation, construction of recreation features associated with this alternative would be anticipated to be similar to those described for Alternative 20 but at reduced scale for areas not within the restoration footprint of this alternative. All recreation features would be designed to avoid and minimize effects on biological resources during construction and to be compatible with and not compromise the ecosystem restoration features.

**Operational Impacts**

Operation of the project area following implementation of Alternative 16 would require similar maintenance and operations activities as those previously mentioned for Alternative 10 and 13. Truck and heavy equipment access, if needed, would be limited to the perimeter and to designated access points identified during construction.

Protection of restored elements during maintenance will be ensured through proper use of best management practices and implementation of a management plan for the restored areas as part of the OMRRR manual. Additional restrictions to human usage (i.e., signage, trail placement and exclusionary fencing) may be required and implemented to ensure successful establishment of restored elements.

**Indirect Effects and Related Actions to Construction and Operations**

In addition to the indirect effects listed under Alternative 13, local wildlife movement within the study area would be additionally improved by restoration of a natural hydrologic connection at LATC, where concrete would be removed from the channel bank and the channel bed to reconnect the river to the historic floodplain. Due to the large size of the restored LATC habitat, the connection to the River in Alternative 16 would allow the site to serve as a source population for other restored habitat areas along the river and minimize the risk of local extinction in smaller areas. The restored channel bed at LATC in Alternative 16 also provides a habitat corridor that connects to other habitat areas in the study area, which promotes wildlife movement and prevents inbreeding depression. Opportunities for regional wildlife movement will be the same as in Alternative 13. Nodal connectivity and regional habitat connectivity are further discussed and evaluated in Chapter 6.

**Alternative 20 (RIVER)**

Overall, restoration in this alternative provides the largest proposed area of aquatic, wetland, and riparian habitat of any alternative. Substantial benefits to biological resources will result from this alternative including increased area of restoration of native habitat, expansion of habitats into overbank side channels and river adjacent areas, expansion of wildlife populations, additional removal of concrete from the channel bed, restoration of additional natural hydrologic connections, and further improved connectivity for local and regional wildlife movement. A total of 6,883 average annual HUs are provided by this alternative.

Under this alternative, restoration measures would result in a total of 288 acres of valley foothill riparian habitat. A total of approximately 46 acres of freshwater marsh would be created, in addition to the wetlands created at 13 daylighted streams (one in Reach 3, eight in Reach 4, one in Reach 5, and three in Reach 7). The area of soft river bottom would be expanded to its maximum potential along Reaches 5, 6, and 8, creating the most open water habitat of any alternative. Construction of Alternative 20 would include
more restoration features than Alternative 16. This alternative would remove concrete and widen the
confluence of the Verdugo Wash in order to support a more natural hydrologic regime and habitat, and to
reconnect the tributary to the historic floodplain. Restoration of the Verdugo Wash confluence would provide
an additional 34 acre habitat area, which would connect to the wildlife corridor in the Glendale Narrows
(Figure 6-11) and other habitat areas restored in the downstream reaches. Alternative 20 also adds restoration
at the Cornfields site in Reach 7. This provides an additional 10 acres of riparian habitat that is hydrologically
connected to the River, decreasing the distance between habitat areas in the resource-poor downtown area.
Future opportunities for widespread regional connectivity would be created via restoration of the Verdugo
Wash confluence, in addition to the connection at the Arroyo Seco tributary confluence (Figure 6-12).
Alternative 20 provides for the daylighting of a total of 13 streams entering the channel.

Construction Impacts

Construction impacts for this alternative would generally be the same as those described for the same
components that occur in Alternatives 10, 13, and 16 above. However, areas targeted for restoration
increase under Alternative 20. Alternative 20 would construct the same restoration features as Alternative
16 in Reaches 1, 4, 5, 6, and 8 and includes greater restoration in Reaches 2, 3 and 7. In Reach 2, this
alternative widens the River channel by modifying the west bank from a trapezoidal bank to a vertical
wall. In Reach 3, the alternative restores the confluence with Verdugo Wash by softening the bed of the
stream and significantly widening the mouth of the wash, thus providing riparian habitat and an additional
connection to the San Gabriels through the Verdugo Hills. In Reach 7, daylighted streams also included in
Alternative 10 are reintroduced. Also in Reach 7, freshwater marsh is restored at the Los Angeles State
Historic Park with a terraced bank connection to the River instead of the restructuring of the banks
included in Alternative 13 and 16. Although the total area of impact compared to Alternative 13 and 16
would be slightly more extensive due to the inclusion of the three daylighted streams also included in
Alternative 10 and the terracing of the bank adjacent to the Los Angeles State Historic Park instead of
restructuring of the banks with implanted vegetation, these impacts will be temporary, and for each of the
reasons noted above for Alternative 10, will not be significant to biological resources. The channel in the
reach has a hard bottom and no impact to wetlands would occur, nor would different negative effects to
wildlife, vegetation, fish, or birds be expected with the difference in measures. Impacts associated with
the daylighted streams would be the same as identified for Alternative 10, occurring in areas largely
disturbed or with non-native vegetation.

Construction impacts would be the most extensive in this alternative. However, for the same reasons
described for other alternatives, impacts are not anticipated to be significant. Benefits are generally
similar to Alternative 10, 13, and 16, but more extensive due to the expanded areas of restoration,
additional removal of concrete and restoration of a more natural hydrologic regime at the Verdugo Wash
tributary confluence, and improved local and regional habitat connectivity for wildlife within the study
area via restoration of the Verdugo Wash confluence and Cornfields sites.

Impacts to wetlands and pool/riffle may occur over a larger area than in Alternatives 10, 13, and 16 due to
the widening of the existing river bed in Reach 2. However, as in Alternatives 10 and 13, wetlands and
pool/riffle would be surveyed prior to construction to avoid and minimize effects to the extent practicable,
wetlands would be expected to reestablish naturally, disturbed areas would be restored as needed, and
wetlands and pool/riffle created by this alternative would offset any impacts to such special aquatic sites.

As part of the Corps’ coordination with the FWS under the FWCA for this alternative, additional
opportunities for restoration of habitat connectivity as part of the project, particularly within the River
channel, were identified, as well as more detailed design considerations. These opportunities and
considerations are summarized in part in Section 7.1.10 and included in the response to the FWS’
recommendations in Appendix N. The Corps will further evaluate these measures during the design
phase, as their implementation or placement is likely to require hydrologic and hydraulic modeling data and/or more detailed design. Prior to implementation of the measures identified, the Corps will assess whether supplemental analysis is required to address new or different effects than those already assessed in this IFR. The following measures may have effects on biological resources, with temporary adverse effects similar to those identified for the construction features above but long term beneficial effects for vegetation and wildlife.

Considerations for incorporation of anchored boulders and potential modifications to the channel bed in concrete reaches to provide improvements for aquatic habitat connectivity and fish refugia would also be made during the detailed design phase. Implementation of these measures would depend on the detailed design and hydraulic analysis developed during the detailed design phase, to ensure that they are not in conflict with flow conveyance requirements or other constraints on the project. These measures could require temporary impacts to waters of the United States but no permanent loss of waters is anticipated.

Specific placement of measures for wildlife access will be further considered during the detailed design stage, and would depend on the detailed design and hydraulic analysis developed during the design phase, to ensure that they are not in conflict with flood damage reduction and flow conveyance requirements or other constraints on the project. Placement of wildlife access measures may include access in Reach 1 from Pollywog Park into the river channel, as practicable. In this area, wildlife access may be achieved through the creation of a slope along the currently vertical bank, as described in measure 3b in Section 4.4.5. Such a design would allow wildlife moving from Griffith Park into the river channel access to the restored Pollywog Park site, which is currently disconnected from the River by a vertical wall. Implementation of specific methods and location of access would be dependent on the detailed hydrologic and hydraulic modeling developed during the design phase. The implementation of a slope or similar design element would have similar effects to those identified for other short channel modifications and design requirements, and significant impacts are not anticipated.

Other design features specific to certain species may be incorporated in the detailed design phase and accommodated where practicable and appropriate. It is expected that while these features could potentially be installed artificially during restoration activities, many of these features will also evolve naturally over time as vegetation matures and natural hydrologic forces continue to shape the hydrologic regime of the widened areas. Such features may include artificial structures for nesting such as nest cavities (which could be used by wood duck, barn owl, tree swallow, and western bluebird among other species), large hollow snags (used by swifts), and steep sandy banks (used by northern rough-winged swallow and belted kingfisher). Installation of these structures within the project footprint would be anticipated to have temporary insignificant effects during construction similar to those analyzed above.

Considerations for segregation of “spring fed waters” from surface water flows would also be made during the detailed design phase. This segregation would be considered to support refugia for fish, where groundwater would feed the refugia while surface flows might bypass such areas. Parameters required for engineering design would include groundwater levels as well as anticipated local fluctuations in groundwater conditions. No significant adverse effects are anticipated from this segregation.

**Operational Impacts**

Potential temporary adverse impacts to biological resources that may result from operation and maintenance of Alternative 20 would not be substantially different than those described above for the other alternatives. However, once construction is complete, additional maintenance may potentially be required to ensure that this extensive riparian and wetland restoration alternative becomes successfully established and persists through the life of the project.
Indirect Effects and Related Actions to Construction and Operations

In addition to the indirect effects listed under Alternative 16, local wildlife movement within the study area would be additionally improved by restoration of a habitat node and natural hydrologic connection at LATC and at Verdugo Wash, where concrete would be removed from the channel bank and the channel bed confluence to reconnect the river tributary to the historic floodplain. Due to the large size of the restored LATC habitat, the connection to the River. This restored habitat node created in Alternative 20 would allow the Verdugo Wash site to serve as a source population for other restored habitat areas along the river and minimize the risk of local extinction in smaller areas. The restored channel bed at LATC in Alternative 20 also provides a habitat corridor that connects to other habitat areas in the study area, which promotes wildlife movement and prevents inbreeding depression. Terracing at the LA River State Historic Park (Cornfields) would provide an additional connection between the river and a node of habitat in Reach 7.

Opportunities for regional wildlife movement will be improved by the addition of restoration at the Verdugo Wash tributary, which provides connectivity to the Verdugo Mountains. The addition of the LA River State Historic Park (Cornfields) would provide opportunity for a regional connection to Elysian Park. Nodal connectivity and regional habitat connectivity are further discussed and evaluated in Chapter 6.

5.5.4 Best Management Practices and Impact Avoidance Measures

To avoid impacts to biological resources, the following BMPs would be followed:

- To the maximum extent practicable, vegetation clearing activities would not occur during the breeding season, which generally runs from March 1-August 31.
- If vegetation removal must occur during the breeding season, a qualified biologist would perform nesting bird surveys following established protocol prior to construction. If nests are detected during these surveys, a 300-foot no construction buffer would be delineated around the nest (500-foot buffer for raptors).
- Construction would be monitored by a qualified biologist.
- Construction would be phased to minimize impacts to wildlife species, so that the entire study area would not be under construction at the same time.
- Pre-construction surveys for special-status plants and wildlife would be performed as needed in coordination with USFWS.
- Protocol level surveys for least Bell’s vireo would be performed during the detailed design phase and prior to construction to avoid impact to this species. If paired and potentially nesting vireo or other listed species are found, the Corps will coordinate with USFWS and consult as applicable, if it is determined that the project would affect the species.
- Trails and other recreational features will be designed and located to be compatible with restoration features and goals. For instance, trails may be placed around the perimeter, rather than through restored areas.

Operational impacts may be offset by implementing the following measures:

- Invasives control or maintenance of vegetation would be performed outside of the bird nesting season,
- Restored sensitive habitats would be avoided to the maximum extent practicable during maintenance. Designated access points for maintenance vehicles would be created to reduce impacts to restored areas.
Operational impacts may be offset by implementing the following measures:

- Maintenance for weed/invasives control or flood conveyance would be performed outside of the bird nesting season,
- Sensitive habitat types would be avoided to the maximum extent practicable during maintenance. Designated access points for maintenance vehicles would be created to reduce impacts to restored areas.

Informational signs would be installed to educate the public regarding the restored habitat, sensitive resources, and the impact that human intrusion may have.

5.6 CULTURAL RESOURCES

5.6.1 Regulatory Framework

This section describes the Federal and State regulatory requirements applicable to the proposed project.

Federal

Overview of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA, 54 U.S.C. § 300101 et seq.) requires Federal agencies to consider the effects of their undertaking on historic properties. Furthermore, it requires an agency to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on any of the agency’s undertakings that could affect historic properties. Federal undertakings include Federal projects, permits, grants, and loans. The purpose of section 106 is to avoid unnecessary impacts to historic properties from Federal undertakings. The section 106 review process is described in the ACHP regulations (36 C.F.R. Part 800, as amended August 5, 2004).

Historic properties include districts, archaeological sites, buildings, structures, and objects at least 50 years old that are eligible for inclusion, but not necessarily listed, on the National Register of Historic Places (NRHP) (36 C.F.R. §§ 60.4, 60.6; 40 C.F.R. § 1508.27, subd. (b)(8)). The NRHP is an inventory of historic resources in the United States maintained by the Secretary of the Interior. Section 106 applies to all properties already listed on the NRHP, to properties formally determined to be eligible for listing, and to properties not formally determined to be eligible but that meet specific eligibility criteria. The following criteria are used to evaluate properties for the NRHP:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
(b) that are associated with the lives of persons significant in our past; or
(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
(d) that have yielded, or may be likely to yield, information important in prehistory or history.

(36 C.F.R. § 60.4.)

The section 106 review process generally involves the following steps:

- **Step 1: Identify and Evaluate Historic Properties.** The Federal agency identifies and evaluates historic properties that could be affected by the Federal undertaking. Information is developed by literature review, consultation with the California State Historic Preservation Officer (SHPO), and field investigations (as necessary). The eligibility of potentially affected properties for inclusion on the NRHP is assessed.

- **Step 2: Assess Effects.** The effects of the undertaking are evaluated, resulting in a determination of either “no effect,” “no adverse effect,” or “adverse effect.” The SHPO is then consulted.

- **Step 3: Consultation.** If an adverse effect could occur, the SHPO is consulted in order to identify methods to reduce the impacts. Other entities may be consulted, including Native Americans, the public, local government, and the ACHP. Consultation results in the development of a Memorandum of Agreement (MOA) or Programmatic Agreement (PA) that describes agreed upon measures to mitigate adverse effects.

- **Step 4: Filing MOA or PA with ACHP.** Upon execution of the MOA or PA, the agreement is filed with the ACHP if the ACHP did not participate in developing the MOA or PA.

- **Step 5: Proceed with Undertaking.** The Federal agency proceeds with its undertaking under the terms of the MOA or PA.

**Programmatic Agreement**

Regulations in 36 CFR 800.14 allow Federal agencies to adopt program alternatives to 36 CFR 800 and to tailor the Section 106 process to better fit agency procedures. The most common program alternative is embodied in a PA negotiated between the agency, the SHPO, and the ACHP. Project-specific programmatic agreements are often recommended when the preferred alternative is complex, will consist of multiple undertakings, or when the alternatives under consideration consist of corridors or large land areas where access to properties is restricted.

For this study, the USACE, in consultation and coordination with the SHPO, the City of Los Angeles, the California Department of Parks and Recreation and affected tribal organizations has developed a PA in accordance with 36 C.F.R. § 800.14, to fulfill its obligations under Section 106 of the NHPA (Appendix O). The PA process is summarized here. During the next phase of the study, Pre-construction Engineering and Design or PED, the USACE shall ensure that the APE for cultural resources is reviewed and updated as necessary to reflect any evolving project designs. Based on the refined APE, the USACE will ensure that appropriate cultural resource investigations occur early in PED for each reach of the project so that avoidance and impact minimization measures for cultural resources can be incorporated into the project design. These identification efforts would include the recordation and evaluation of the flood risk management system along the Los Angeles River and lower tributaries; an updated literature
consultations would be conducted with Native American individuals, tribal organizations, and other ethnic communities to determine whether there are particular areas where there may be traditional cultural concerns. Any resources located during cultural resource investigations would be evaluated for inclusion on the NRHP. Additional investigations, such as test excavations may be needed to complete these evaluations. This work may occur in phases that correspond to the proposed sequence of development for the project, provided that analyses are ultimately prepared for the entirety of the APE.

The USACE would make every effort to avoid adversely affecting any cultural resources that were determined to be eligible for inclusion on the NRHP. If adverse effects cannot be completely avoided, the USACE will seek to minimize project effects and shall resolve adverse effects by implementing the prescriptions of a historic property treatment plan (HPTP). Treatment efforts will be tailored to the types and degree of anticipated project effects. Treatments may include data recovery, public outreach and interpretation, exhibits, publications, educational materials, and oral histories. Archaeological monitoring will likely be required during some phases of construction. As USACE continues through the PA process, the USACE will assess whether supplemental analysis is required under NEPA to address new or different effects than those already assessed or contemplated in the IFR.

State

Overview of the California Register of Historical Resources

In California, the term “historical resource” includes, but is not limited to, “any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.” (Pub. Resources Code, § 5020.1, subd. (j).) In 1992, the California legislature established the California Register of Historical Resources (CRHR) “to be used by state and local agencies, private groups, and citizens to identify the state’s historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change.” (Pub. Resources Code, § 5024.1, subd. (a).) A resource is eligible for listing in the CRHR if the State Historical Resources Commission determines that it is a significant resource and that it meets any of the following NRHP criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.
2. Is associated with the lives of persons important in our past.
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. Has yielded, or may be likely to yield, information important in prehistory or history.

(Pub. Resources Code, § 5024.1, subd. (c).) Resources less than 50 years old are not typically considered for listing in the CRHR, but may be considered if it can be demonstrated that sufficient time has passed to understand the historical importance of the resource. (Cal. Code Regs., tit. 14, § 4852, subd. (d)(2).)
Archaeological and Historic Resources Under CEQA

Under CEQA, a project may have a significant effect on the environment if it may cause “a substantial adverse change in the significance of an historical resource.” (Pub. Resources Code, § 21084.1; Cal. Code Regs., tit. 14, § 15064.5, subd. (b).) If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historic resources, it is a “historical resource” and is presumed to be historically or culturally significant for the purposes of CEQA. (Pub. Resources Code, § 21084.1; Cal. Code Regs., tit. 14, § 15064.5, subd. (a).) The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption. (Pub. Resources Code, § 21084.1; Cal. Code Regs., tit. 14, § 15064.5, subd. (a).)

A “substantial adverse change in the significance of an historical resource” reflecting a significant effect under CEQA means “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired.” (Cal. Code Regs., tit. 14, § 15064.5, subd. (b)(1); Pub. Resources Code, § 5020.1, subd. (q).)

In turn, the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

(Cal. Code Regs., tit. 14, § 15064.5, subd. (b)(2).) Pursuant to these sections, the CEQA inquiry begins with evaluating whether a project site contains any “historical resources,” then evaluates whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource’s historical significance is materially impaired.

Under CEQA, an EIR is also required to evaluate any impacts on unique archaeological resources. (Pub. Resources Code, § 21083.2.) A “unique archaeological resource” is defined as:

[A]n archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.
(Pub. Resources Code, § 21083.2, subd. (g).) An impact to a nonunique archaeological resource is not considered a significant environmental impact and such nonunique resources need not be further addressed in the EIR. (Pub. Resources Code, § 21083.2, subd. (a); Cal. Code Regs., tit. 14, § 15064.5, subd. (c)(4).)

State CEQA Guidelines section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. These procedures are detailed in Public Resources Code section 5097.98.

5.6.2 Significance Criteria

The CEQA Guidelines were used by the City to determine the significance of the impacts of the proposed alternatives on historical resources. Impacts would be significant under CEQA if implementation of an alternative would:

1. Cause a substantial adverse change in the significance of a historical resource as those terms are defined in State CEQA Guidelines section 15064.5.
2. Cause damage to a unique archaeological resource pursuant to State CEQA Guidelines section 15064.5 and Public Resources Code section 21083.2, subdivision (g).
3. Disturb any human remains, including those interred outside formal cemeteries.

Integrity is the ability of a property to convey its significance, based on its location, design, setting, materials, craftsmanship, feeling, and association. Adverse effects can be direct or indirect. They include reasonably foreseeable impacts that may occur later in time, be farther removed in distance, or be cumulative (ACHP, 2003). Examples of Adverse effects under 36 CFR 800.5 include:

- Physical destruction of or damage to all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary’s Standard for the Treatment of Historic Properties (36 4 CFR 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property’s use or of physical features within the property’s setting that contribute to its historic significance;
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property’s significant historic features;
- Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of Federal ownership of control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property’s historic significance.
Mitigation under Section 106 of the NHPA is defined as a measure to resolve specific adverse effects to historic properties. Resolution of adverse effects is referenced in the NEPA review and documented in the PA developed in consultation with the Section 106 consulting properties, which includes tribes, SHPO, City of Los Angeles, California Department of Parks and Recreation, and other interested parties.

The concept of adverse effect under the NHPA and significant impact under NEPA are similar in concept but are not equivalent terms. A broad range of impacts from very minor to major would be classified as an adverse effect but the context and intensity of these impacts may not meet the threshold of NEPA significance. NEPA requires us to consider the degree to which the action may adversely affect properties listed in or eligible for listing in the NRHP. For example, a farmhouse or TCP, that is eligible under Criterion A, may be adversely affected by the introduction of visual intrusions because these intrusions would diminish its integrity of location, setting, and feeling. This would be an adverse effect under NHPA but may not meet the threshold of significance under NEPA. The demolition of the property, however, would most likely constitute a significant impact because its destruction would preclude its eligibility for the NRHP.

An adverse effect would be considered a significant impact under NEPA if the following conditions are met:

1) Even after minimization and mitigation, the remaining impacts to the property would be substantial enough that implementation of the alternative would result in the loss of a property’s eligibility status under Criteria A-C.

2) The implementation of the alternative would result in the destruction of a site eligible under Criterion D with no mitigative data recovery.

3) The implementation of the alternative would result in a major modification of a National Historic Landmark or property meeting the criteria of a National Historic Landmark as defined in 36 CFR Part 65.

5.6.3 Environmental Impacts

Potential common sources of impacts on cultural resources associated with the construction of the proposed ecosystem restoration measures include ground disturbance, new construction, and structural alteration/removal of features.

Ground disturbance would result from site preparation, grading, bank lowering, channel widening, opening of storm drains, removal of concrete, excavation of side channels, riverside planting excavations, excavations for removal or alteration of existing structures and water infrastructure, and excavations for construction of new connections to water sources. If prehistoric or historic archaeological sites are present, ground disturbance can directly damage artifacts and features or alter the spatial relationship of artifacts, features, and other deposits and destroy their research potential. This can result in the permanent loss of information relevant to the site function, dates of use, plants and animals used, past environments, ethnicity and other important research questions. Ground disturbance can also damage unmarked burials or other sites that may be important to contemporary Native Americans as ancestral locations or for traditional cultural or religious purposes.

Proposed new construction may change the physical setting of historic buildings and structures. New construction for ecosystem restoration may also alter drainage patterns and channel morphology, exposing buried archaeological resources and causing impacts due to erosion.
The ecosystem restoration elements include the acquisition, removal or alteration of existing buildings and structures, including water control and conveyance infrastructure, and rail and other transportation facilities. Affected structures may be historic properties under the NHPA or historical resources under CEQA. If the proposed action of implementing the ecosystem restoration measures were to alter the characteristics of historic properties or historical resources that qualify them for inclusion on the NRHP or the CRHR, there would be an adverse effect if it diminishes the integrity of the property.

A potential cultural resource impact applicable to all of the proposed ecosystem restoration measures and reaches is the alteration of the River facilities. Although not formally documented or evaluated for historic significance, the containment and flood risk management facilities on the River and its tributaries appear eligible for listing on the NRHP because of their association with important events and their engineering innovations (Criteria A and C). The qualities of historic integrity typically considered for linear segments of water conveyance properties are integrity of location, design, feeling and association. Generally, modifications that maintain these qualities would not be seen as an adverse effect. Thus, modifications to facilities such as those proposed as ecosystem restoration measures involving removing portions of concrete structures, creating new structures and connections with the river and daylighting may not be considered an adverse effect on historic water conveyance facilities if the flood risk management function and location is maintained. Further evaluation and analysis during the next phase of the USACE planning process will clarify what features of the system contribute to its historic character and those qualities of integrity that are important to maintain. However, if integrity of design or other qualities are considered to contribute to the historic significance of the water conveyance facilities, there is potential for adverse effects under the NHPA and/or an adverse change under CEQA.

Under the terms of the PA (Appendix O) the Corps will work with the SHPO and the concurring parties to avoid, minimize and mitigate adverse effects to historic properties under the NHPA. Through the development and execution of a historic property treatment plan (HPTP) in accordance with the PA, it is likely that any impacts can be kept below the level of significance. This is especially true in the case of impacts to the river facilities where the proposed modifications would only impact focused sections of the facilities and leave the remaining system intact.

Through the same measures executed by the HPTP, it is anticipated that all the alternatives will also avoid a substantial adverse change under CEQA in the significance of a historic resource, a substantial adverse change in the significance of an archaeological resource, or disturbance to any human remains.

**No Action Alternative**

**Construction Impacts**

Under the No Action Alternative, impacts on cultural resources associated with the ecosystem restoration project would not occur in the study area. There would be no impacts resulting from the ground disturbing activities and altering of historic infrastructure that may occur under the proposed action. However, there would be no associated identification studies, monitoring, historic research, or other actions that would further define, afford protection to and increase the knowledge base, education and appreciation of the history associated with the River in Los Angeles, Burbank, and Glendale. Damage and loss of resources may occur from lack of knowledge or neglect. As infrastructure ages, many more building and structures may be considered historic and would need to be considered in future project planning. Cultural resource compliance actions would continue to be conducted for other projects that are Federal undertakings or that require NEPA or CEQA review. For these actions, surveys would be conducted, impacts would be assessed, and mitigation measures would be prescribed.
Operational Impacts

Under the No Action Alternative, there would be no change in potential impacts on cultural resources associated with the operations and maintenance of the containment and flood risk management facilities on the River and its tributaries. Ongoing O&M activities do not involve extensive ground disturbing activities or the removal or extensive alteration of existing structures including water control and conveyance infrastructure, and rail and other transportation facilities that may be historic. No significant impacts would be anticipated.

ALTERNATIVE 10 (ART)

Construction Impacts

Reaches 1-3

Impacts on cultural resources could occur from ground disturbance, new construction and structural alterations as a result of Alternative 10.

The immediate river corridor APE through Reaches 1, 2, and 3 has been minimally investigated for cultural resources. Pollywog Park and Bette Davis Park have not been inventoried. In Reaches 1 and 2 there have been small block surveys conducted that include portions of the approach to Pollywog Park at the River and a portion of the right bank between the Headworks Spreading Ground and Travel Town. Eligible NRHP and CRHR resources include the Riverside- Zoo Drive Bridge and portions of Griffith Park. No actions are proposed that would alter the setting or architectural qualities of the bridge that qualify it for inclusion in the NRHP. The small portions of Griffith Park in the APE have not been documented or evaluated and the current resource record focuses exclusively on historic structures elsewhere in the park. The Travel Town outdoor transportation museum, just outside the APE, is of historic age but has not been evaluated as a historic property. The containment and flood risk management facilities along the River and its tributaries are now of historic age, but have not been formally documented or evaluated for historic significance. Based on current information, modification of these structures to daylight storm drain outlets, create habitat corridors, restore open water habitat and construct River connections would likely impact historic structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to National Park Service (NPS) Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) Standards. If these mitigation measures are successfully applied, it is expected that these impacts can be mitigated below the threshold of NEPA and CEQA significance.

No specific past land uses other than open space, river channel and parkland are observed on historic quadrangle maps in the APE. There is a record of an adobe structure occupied in 1868 in the vicinity of the River at Polliwog Park, but the location is imprecise and no physical remains are visible. Given the proximity to the channelized river and the effects of freeway construction it is doubtful that any foundations or features could be located again for further investigation. Disturbance in this reach is extensive, the result of river channelization, freeway construction, utility installation and roadwork.

Based on the record search, no additional impacts beyond the flood risk management facilities have been identified. However, identification and evaluation of cultural resources in the APE is incomplete.

While there is always the possibility of encountering buried cultural resources during ground disturbing activities, the potential for undiscovered intact buried resources that would meet the criteria for eligibility for NRHP or CRHR listing or other sensitive cultural resources appears to be low. Adverse effects are not anticipated.
Reaches 4-6

Impacts on cultural resources could occur from ground disturbance, new construction and structural alterations and removals in these reaches under Alternative 10.

The river corridor through Reaches 4, 5 and 6 has been minimally investigated for cultural resources and there are no surveys that are adjacent to and/or directly follow the River. Bridges across the River have been inventoried and evaluated for historic significance. The Glendale-Hyperion Viaduct, Riverside-Figueroa Street Bridge and Fletcher Drive Bridge, Arroyo Seco Parkway and portions of Griffith Park are eligible for listing on the NRHP and the CRHR for their architectural qualities and/or historic associations. There have been cultural resource surface surveys on adjacent parcels and along the edge of the Taylor Yard study area for this project, but there has been no inventory of the study area or subsurface excavation reported associated with other developments at Taylor Yard.

No actions are proposed that would alter architectural qualities of the historic bridges and the other properties or their settings that qualify them for inclusion in the NRHP and the CRHR. Daylighted storm drains and the narrow habitat corridors in Reaches 4 and 5 on the edge of the river channel would be developed on highly disturbed lands that are unlikely to contain or impact any intact cultural resources. Likewise, changes in channel morphology to provide habitat features are unlikely to encounter or impact intact cultural resources. Modification to the concrete channel for daylighting the storm drains and flow diversions would likely impact historic River structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to National Park Service (NPS) Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) Standards. The excavation of the side channels through the two golf courses could encounter buried cultural resources. The potential for archaeological resources and the level of past disturbance of these locations is unknown.

Extensive ground disturbance is proposed for the Bowtie/Taylor Yard site. These sites are known to have HTRW contamination requiring remediation prior to construction of the Federal project. Remediation of identified known and suspected HTRW sites within the Bowtie and Taylor Yard would be conducted by the City prior to providing the lands to the restoration project for construction. Although it has not been inventoried for cultural resources, its history of past use as a rail facility dating back to 1925 would indicate a high likelihood for near surface and subsurface historic cultural resources including structural remains and foundations. Historic quadrangle maps show several structures, especially in the southern part of the restoration site. Because of the extent and depth of excavation, there is also the potential for encountering intact archaeological sites predating 1925, including those that may have been encapsulated by floods on this terrace before the River was controlled. It is highly likely that historic resources could be encountered during remediation and there is potential for impacts to historic archaeological resources associated with implementing this remediation. Any impacts to historic resources would be adequately resolved by the City under state law.

The degree of ground disturbance that the City’s remediation would entail is not known at this time; however, for the purposes of this analysis, we are assuming that some cultural resources would remain intact and will need to be addressed as part of the federal project. Based on our literature review, we do not expect to encounter any resources that would meet National Register Criteria A-C. There are no ethnographically known Native American sites, sites important for their association with major historical events, and as stated above no structures that meet the 50 year threshold for eligibility.

Following remediation, there is potential for adverse effects on historic and prehistoric archaeological sites that may be eligible under Criterion D. By completing the process in the PA to identify and evaluate...
potential adverse effects, adverse effects may be either avoided or minimized through data recovery and other documentation. We anticipate that these impacts can be mitigated below the level of NEPA significance.

Likewise extensive modifications to the river channel and river facilities at this location are proposed. Based on current information, modification of these structures would likely impact historic structures. If determined to be eligible, possible mitigation measures might include archival documentation and photo recordation according to NPS Historic Buildings Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscape Survey (HALS) standards. If these mitigation measures are successfully applied, it is expected that these impacts can be mitigated below the threshold of NEPA and CEQA significance.

Reaches 7-8

Impacts on cultural resources could occur from ground disturbance, new construction, and structural alterations and removals in these reaches under Alternative 10.

There have been previous cultural resource investigations at the Arroyo Seco confluence site, but no investigations of the LATC study area. Bridges across the River have been inventoried and evaluated for historic significance. The First Street Viaduct, North Broadway Bridge (Buena Vista Viaduct), Cesar Chavez-Macy Street Bridge, North Main Street Bridge, North Spring Street Bridge are all eligible for listing on the NRHP and the CRHR for their architectural qualities and/or historic association.

No actions are proposed that would alter architectural qualities of the historic bridges or their settings that qualify them for inclusion in the NRHP and the CRHR. The Arroyo Seco Parkway (Pasadena Freeway), also eligible for listing on the NRHP and the CRHR, would not be impacted by the proposed restoration. Two other historic properties, the Department of Water and Power complex and the Mission Tower, would not be impacted under this alternative.

Daylighting storm drain outlets and constructing marsh habitat on the overbank areas of the channel would occur on highly disturbed lands that are unlikely to contain any intact cultural resources. Impacts are not anticipated. Modification of the concrete structures at the confluence would likely impact River and Arroyo Seco channel historic structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to National Park Service (NPS) Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) Standards. If these mitigation measures are successfully applied, it is expected that these impacts can be mitigated below the threshold of NEPA and CEQA significance.

The LATC site is suspected of having contamination similar to that at Taylor Yard, and it is suspected that the City would either remediate or ensure the remediation of the site prior to providing lands for construction of the federal project. Investigation and remedial actions by the sponsor or others prior to construction of the restoration project may include the demolition of existing structures, removal of pavement, grading and excavation depending upon the extent of remedial actions. Any remaining structures and surface cover not required to be removed as part of the remediation or in relocating site functions would be part of the Federal project. The LATC is on the site of a Union Pacific rail facility that was established in the early 1900s. Historic quadrangle maps show several structures in the APE including a roundhouse and turntable. There is a high likelihood of near surface and subsurface historic cultural resources including historic debris concentrations and foundations. Based on the current plan, it is highly likely that historic archaeological resources could be encountered during investigation and remediation and there is potential for impacts to historic archaeological resources associated with
implementing remediation. Any impacts to historic resources would be adequately resolved by the City under state law.

As with the Taylor Yard in Reach 6, the extent of ground disturbance associated with remediation is not known. For the purposes of this analysis we are assuming that some cultural resources would remain intact and will need to be addressed as part of the federal project. Based on conceptual designs overlaid on aerial photography, there is one structure located along the very edge of the project boundary.

Because these are conceptual level designs and because the study intends to avoid as many relocations as possible, it is assumed that this structure will not be relocated to gain an additional foot of restoration. Currently there are trailers on the site but these have not been included in this analysis because they are movable.

The LATC site provides the largest acreage for restoration and also has a high likelihood of containing archaeological remains that are eligible for the NRHP for their ability to provide information about transportation, labor, and daily life in the early part of the 20th Century. Following remediation, there is potential for adverse effects on these archaeological sites (historic properties). By completing the process in the PA to identify and evaluate potential adverse effects, adverse effects may either be avoided or minimized through data recovery and other documentation. With proper mitigation, it is anticipated that the adverse effects can be kept below the level of CEQA or NEPA significance.

The connection and confluence of the restored wash with the River would likely impact historic River structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures might include archival documentation and photo recordation according to NPS Historic Building Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) standards. If these mitigation measures are successfully applied, it is expected that these impacts can be mitigated below the threshold of NEPA and CEQA significance.

**Operational Impacts**

Under Alternative 10, minimal impacts on cultural resources would be anticipated associated with the O&M of the restoration project areas and the containment and flood risk management facilities on the River and its tributaries. In areas where concrete is removed, erosion may reveal buried undiscovered cultural resources. Ongoing O&M activities, however, typically do not involve extensive ground disturbing activities or the removal or extensive alteration of existing structures including water control and conveyance infrastructure, and rail and other transportation facilities that may be historic. No significant impacts would be anticipated.

O&M activities under this alternative are not anticipated to result in a substantial adverse change under CEQA and the potential adverse effects under NHPA would likely be minor and unlikely to reach a level of NEPA significance.

**Indirect Effects and Related Actions to Construction and Operation**

There is potential for sites of historic or archeological value to be present anywhere within the Los Angeles Basin due to the long history of human occupation. Changes in channel capacity and morphology could lead to changes in rates of bank erosion and flooding, which have potential to impact archaeological sites, historic structures, or important aspects of TCPs. Additional hydraulic modeling will be conducted during the detailed design phase to inform design refinements. If the impacts identified in the next phase are different from those anticipated in this IFR, supplemental analysis would be conducted.

Relocation of the LATC site functions to a new site within the Los Angeles Basin would have the potential to disturb cultural resources protected under the NHPA. Though the potential for unearthing new...
sites would be low, because the new site would be situated where existing industrial development is already present and should have already undergone cultural evaluation, it would still be necessary to conduct all required analyses to ensure the protection of potentially occurring historic resources. Analysis of cultural resources in the area will be conducted pursuant to a site-specific EIR by the CEQA lead agency prior to final site selection. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

**Alternative 13 (ACE)**

**Construction Impacts**

**Reaches 1-3**

The ecosystem restoration measures proposed for Reaches 1 and 2 are the same as those for Alternative 10. Anticipated impacts on cultural resources would be the same as those described for these reaches under Alternative 10. In Reach 3, Alternative 13 adds narrow riparian corridors along the upstream edge of Ferraro Fields and along Zoo Drive. A side channel cutting diagonally behind Ferraro Fields to a freshwater marsh and then to the River would be established by daylighting a storm water culvert. Potential impacts on cultural resources could occur from ground disturbance, new construction and structural alterations as described above.

The APE adjacent to the channelized River and Zoo Drive has not been inventoried, but has been extensively disturbed. Ferraro Fields has been investigated for cultural resources. Although the athletic fields were built on a portion of an old airfield, no cultural resources have been recorded there. While there is always the possibility of encountering buried cultural resources during ground disturbing activities, the potential for undiscovered intact buried resources that would meet the criteria for eligibility for NRHP or CRHR listing or other sensitive cultural resources appears to be low. Adverse effects are not anticipated.

**Reaches 4-6**

The ecosystem restoration measures proposed for Reaches 4, 5 and 6 are similar to Alternative 10. Additional measures include more extensive work on channel geomorphic character to support in-stream habitat in Reach 4, additional modification on both banks of the channel walls to support herbaceous riparian vegetation in Reaches 5 and 6, and the daylighting of a large storm drain at the Bowtie site in Reach 6 to create a freshwater marsh. Anticipated impacts on cultural resources would be the same as described for these reaches under Alternative 10 and would include the potential for impacts to historic archaeological properties at the Bowtie/Taylor Yard site associated with implementing the ecosystem restoration project.

**Reaches 7-8**

Work in Reach 7 includes modifying the channel walls on both banks to support herbaceous riparian vegetation, removing concrete, reconfiguring the Arroyo Seco channel cross section, and planting to support riparian habitat restoration. No actions are proposed that would alter architectural and historic qualities or the settings of the NRHP- and the CRHR-eligible historic bridges, buildings or the Arroyo Seco Parkway. The narrow habitat corridors on the edge of the river channel and Arroyo Seco channel modifications would be developed on highly disturbed land that are unlikely to contain any intact cultural resources. Modification of the concrete structures at the confluence would likely impact River and Arroyo Seco channel historic infrastructure. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo
Ecosystem restoration measures proposed for Reach 8 are the same as those for Alternative 10. Anticipated impacts on cultural resources would be the same as those described for this reach under Alternative 10.

**Operational Impacts**

Under Alternative 13, minimal impacts on cultural resources would be anticipated associated with the O & M of the restoration project areas and the containment and flood risk management facilities on the River and its tributaries. In areas where concrete is removed, erosion may reveal buried undiscovered cultural resources. Ongoing O&M activities typically do not involve extensive ground disturbing activities or the removal or extensive alteration of existing structures including water control and conveyance infrastructure, and rail and other transportation facilities that may be historic. No significant impacts are anticipated.

O&M activities under this alternative are not anticipated to result in a substantial adverse change under CEQA and the potential adverse effects under NHPA would likely be minor and unlikely to reach a level of NEPA significance.

**Alternative 16 (AND)**

**Construction Impacts**

The ecosystem restoration measures proposed for Reaches 1, 2, 3, 4, 6, and 7 are the same as those for Alternative 13. Anticipated impacts on cultural resources would be the same as those described for these reaches under Alternative 13.

In addition to the restoration measures proposed for Reach 5 under Alternative 13, Alternative 16 adds reshaping of the right bank of the channel from trapezoidal to vertical configuration and widening the channel invert to provide additional in-stream habitat. A bioengineered notch along the top of right channel would be constructed for hanging vines. The left bank of the channel would be constructed to transition from trapezoidal to vegetated terraces. Modifications to the channel morphology are unlikely to encounter or impact intact buried archaeological resources, but modification to the concrete channel would likely impact historic River structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to NPS Historic Building Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) Standards. If these mitigation measures are successfully applied, it is expected that these impacts can be mitigated below the threshold of NEPA and CEQA significance.

**Reaches 7-8**

Additional restoration measures proposed for Reach 8 include riparian planting and restoration of riparian habitat corridors outside of the channel along the LATC site and channel alterations including terraces and widening provide habitat features supportive of in-stream biota. Modification to the concrete channels and channel wall would likely impact historic River structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to NPS Historic Building Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) Standards. If these mitigation measures are successfully applied, it is expected that these impacts can be mitigated below the threshold of NEPA and CEQA significance.
American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) standards. If
these mitigation measures are successfully applied, it is expected that these impacts can be mitigated
below the threshold of NEPA and CEQA significance.

There is also a high likelihood of near surface and subsurface historic cultural resources, including
historic debris scatters and foundations in the LATC site. Removing the channel wall and creating a
bench would require more extensive excavation and the potential for deeper erosion than the other
alternatives. This increases the likelihood of impacts by exposing archaeological sites from the historic
railroad uses and perhaps earlier periods. It is highly likely that historic properties could be encountered
during construction and there is potential for impacts on historic archaeological resources associated with
implementing this measure. Similar to Alternative 10, following remediation, there is potential for
adverse effects on remaining historic properties at the LATC site. Adverse effects may either be avoided
or minimized through data recovery and other documentation activities as laid out in the PA; therefore,
impacts are considered less than significant.

Operational Impacts

Under Alternative 16, minimal impacts on cultural resources would be anticipated associated with the
O&M of the restoration project areas and the containment and flood risk management facilities on the
River and its tributaries. In areas where concrete is removed, erosion may reveal buried undiscovered
archaeological sites. Ongoing O&M activities typically do not involve extensive ground disturbing
activities or the removal or extensive alteration of existing structures including water control and
conveyance infrastructure, and rail and other transportation facilities that may be historic. No significant
impacts would be anticipated.

O&M activities under this alternative are not anticipated to result in substantial adverse change under
CEQA and the potential adverse effects under NHPA would likely be minor and unlikely to reach a level
of NEPA significance.

Alternative 20 (RIVER)

Construction Impacts

The ecosystem restoration measures proposed for Reaches 1, 4, 5, 6, and 8 are the same as those for
Alternative 16. Anticipated impacts on cultural resources would be the same as those described for these
reaches under Alternative 16.

The additional measure for Reach 2 of reshaping the right bank of the channel from a trapezoidal to
vertical configuration and hanging vines from the top of the channel would likely impact historic River
structures. If determined eligible, this would result in an adverse effect to a historic property. Likely
mitigation measures would include archival documentation and photo recordation according to NPS
Historic Building Survey (HABS), Historic American Engineering Record (HAER), and Historic
American Landscapes Survey (HALS) standards.

The measures proposed for Reach 3 on the west side of the River for Ferraro Fields and along Zoo Drive
would be the same as Alternatives 13 and 16 with the same anticipated impacts on cultural resources. On
the east side of the River in Reach 3, the Verdugo Wash would be widened under the SR-134 Freeway
and a soft bed riverbed would be configured to support an open water marsh through removal of the
concrete bed. The downstream banks would be lowered and sloped adding riparian vegetation. Portions of
the study area above the River and wash level have been inventoried and no cultural resources have been
recorded. Reconfiguring the confluence and creating the sloped downstream banks could potentially
impact 20 structures and/or their surrounding features, however, only approximately 10 of these structures
would be removed. Much of the project will only intrude on parking lots or other external features of the remaining buildings. Based on the LA County Assessors’ database, the structures range in age from 1948 to 1977 but clustered from 1950-1953 and 1970-1973. Many of these buildings have been modified by later improvements. The area is heavily industrialized and almost all appear to be warehouses. It is unlikely that these properties will be found to be eligible for the NRHP.

Deep excavations would be needed to lower the banks. In the immediate vicinity of the Verdugo Wash and freeway supports and in the channel the soil is likely to be highly disturbed, but the potential for intact buried archaeological resources is unknown in other areas proposed for lowering. Modification to the concrete channels would likely impact historic River structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to NPS Historic Building Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) standards.

In addition to the restoration measures proposed for Reach 7 under Alternatives 13 and 16, under Alternative 20 three storm drains would be daylighted. Terraces on the right bank would be added adjacent to the Cornfields site and the western edge of the terrace would be sloped back up to the original ground elevation, creating a freshwater marsh. The daylighted storm drains are in disturbed areas where the potential for undiscovered intact buried resources would be low. Modification to the concrete channel for daylighting the storm drains and flow diversions would likely impact historic River structures. If determined eligible, this would result in an adverse effect to a historic property. Likely mitigation measures would include archival documentation and photo recordation according to NPS Historic Building Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscapes Survey (HALS) standards.

The Cornfields site is the former location of the Southern Pacific River Station and freight yard. Archaeological excavations at the Cornfields have confirmed the presence of significant historical cultural resources on the site. Impacts to historic archaeological properties would be possible from ground disturbing activities associated with creating the freshwater marsh at this site and connecting it with the River. According to the preliminary real estate analysis, two standing structures, built in 1982 and 1988 respectively, would be removed under this alternative. Due to the presence of historic archaeological properties and the level of ground disturbance proposed, there is potential for adverse effects on historic properties and adverse changes on historic resources at these locations. By completing the process in the PA, adverse effects may either be avoided or minimized through data recovery and other documentation activities as laid out in the PA. With early involvement of cultural resource professionals in the further development of project designs and with appropriate mitigation it is expected that significant impacts under NEPA and CEQA can be avoided. No actions are proposed that would alter architectural and historic qualities or the settings of the NRHP- and the CRHR- eligible historic bridges and buildings.

Operational Impacts

Under Alternative 20, little change in potential impacts on cultural resources would be anticipated associated with the O&M of the restoration project areas and the containment and flood risk management facilities on the River and its tributaries. In areas where concrete is removed, erosion may reveal buried undiscovered cultural resources. Ongoing O&M activities typically do not involve extensive ground disturbing activities or the removal or extensive alteration of existing structures including water control and conveyance infrastructure, and rail and other transportation facilities that may be historic. No significant impacts would be anticipated.
O&M activities under this alternative are not anticipated to result in substantial adverse change under CEQA and the potential adverse effects under NHPA would likely be minor and unlikely to reach a level of NEPA significance.

5.6.4 **Best Management Practices and Impact Avoidance Measures**

- **CR-1** - An archaeologist meeting the Secretary of the Interior’s Qualification Standards shall monitor all construction activities in areas where there is a potential for buried resources. The monitor shall immediately notify the USACE’s on-site construction supervisor of any discovery. The USACE on-site construction supervisor shall temporarily stop construction in the area of the discovery. The discovery area and a surrounding buffer zone shall then be clearly delineated. Ground disturbing activities can resume outside the delineated buffer zone. Should previously unknown historic or archaeological remains be discovered, the USACE would comply with 36 CFR 800.13. At the conclusion of monitoring activities, a detailed letter report shall be prepared. This report shall be submitted to the SHPO for review and comment.

- **CR-2** - When construction crews are working within 50 meters of an eligible or unevaluated cultural resource, the edge of the site, including a 25-meter site buffer will be fenced off, thus ensuring that no construction equipment inadvertently strays into the culturally sensitive area.

- **CR-3** - Cultural resource block inventories and evaluations shall be conducted early in the next design phase so that avoidance and impact minimization measures for cultural resources can be incorporated into project design.

- **CR-4** - Recordation and evaluation of the constructed features of the flood risk management system on the river and lower tributaries within the APE will be prioritized in PED. The recordation and evaluation shall be conducted in one effort and in reference to and in the context of the entirety of the flood risk management system constructed on the Los Angeles River and lower tributaries.

- **CR-5** - Comply with the terms and conditions of the PA executed by and between the Corps and SHPO, and any amendments thereto.

5.7 **TRAFFIC AND CIRCULATION**

5.7.1 **Regulatory Framework**

**Federal Regulations**

Federal management of transportation facilities in the area is under the authority of the Federal Highway Administration and the Federal Transit Administration. Federal programs related to roads and highways, mass transit, and pedestrian and bicycle facilities include Metropolitan and Statewide Planning (49 USC Sections 5303, 5304, 5305), Large Urban Cities (49 USC Section 5307), Rail and Fixed Guideway Modernization (49 USC Section 5309), Bus and Bus Facilities (49 USC Sections 5309, 5318), the Surface Transportation Program, and Congestion Mitigation and Air Quality Improvement Program. The Surface Transportation Board (STB) has jurisdiction over transportation by rail carriers, with respect to rates, rules, practices, routes, services and facilities. The STB has jurisdiction over the construction, acquisition, operation, abandonment, or discontinuance of spur, industrial team, switching, or side tracks or facilities. (49 USC 10501).
State Regulations

Coordination with Caltrans would be necessary where construction of restoration measures would involve highways, regulations, and standards under Caltrans jurisdiction. Where proposed projects would affect state highways and freeways, coordination with Caltrans would require developing traffic management plans and obtaining encroachment permits for work within state ROWs and permits to transport equipment or materials in oversized vehicles. Caltrans would also likely participate in decisions related to Federal transportation agency involvement.

Local Regulations

Local jurisdictions, including the Cities of Los Angeles, Glendale, and Burbank, and Los Angeles County, have primary responsibility for managing the various roadways that make up the area street network. The Los Angeles County Metropolitan Transportation Authority is responsible for preparing the Congestion Management Program for Los Angeles County. This program addresses the impact of local growth on the regional transportation system and monitors the operations of the designated Congestion Management Plan roadway network.

City of Los Angeles regulations include significance levels of construction-related activities, designated truck routes and hours of operation, noise restrictions from construction and excavation activities, and construction clearance requirements. These regulations are discussed below.

LADOT considers construction-related traffic to be an adverse impact, but not significant. This is because such impacts, while they are often inconvenient to local roadway users, are short-term. However, LADOT requires implementation of worksite traffic control plans for construction projects in order to ensure that construction-related impacts are minimized to the extent possible.

The City of Los Angeles allows major and secondary arterials to be used as truck routes. However, some local streets have weight limitations or other restrictions that would limit truck traffic. Typically, trucks would not travel on those streets except to obtain access to a specific project site. The City of Los Angeles policy is to allow trucks to travel in a “reasonable fashion” to and from a project site. The City of Los Angeles reviews each haul route permit application on a project basis and may adjust its general guidelines as appropriate for particular situations.

The City of Los Angeles also restricts the speed limit to 25 mph in construction areas. The city has the following construction clearance requirements:

- Five-foot clearance between a traffic lane and the nearest vertical obstruction, which can be reduced to three feet in certain circumstances with the approval of LADOT;
- Two-foot clearance to a raised curb, which can be reduced to zero in certain situations with the approval of LADOT;
- A minimum of 10-foot-wide traffic lanes must be maintained through construction zones; and
- The minimum taper requirement for channeling traffic flow lanes ranges from 25:1 to 30:1 (length to horizontal distance).

5.7.2 Significance Criteria

The City of Los Angeles CEQA Guidelines (2002) traffic significance thresholds have been used to determine the level of impacts. Although in some cases these thresholds are worded slightly differently than thresholds used by the City of Burbank to assess potential effects of implementing the recently-completed Burbank2035 General Plan (Burbank 2013c), they are still consistent with those thresholds.
Because the City of Glendale has not established CEQA significance criteria, the criteria from the City of Los Angeles’ CEQA Guidelines have been applied for the portions of the project in Glendale.

The project would have a significant impact on traffic, transportation, and the circulation system if it would:

- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system,
- Conflict with an applicable congestion management program, including, but not limited to level of service (LOS) standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways,
- Substantially increase hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment),
- Result in inadequate emergency access,
- Result in an increased demand for public transit, beyond the current transit capacity,
- Provide less parking than was needed for the project, as determined through a project-specific analysis of parking demand, or
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

### 5.7.3 Environmental Impacts

**No Action Alternative**

**Construction Impacts**

No impacts to transportation would occur from construction under this alternative because construction would not occur.

**Operational Impacts**

Under the No Action Alternative, the project would not be implemented and no construction would occur; therefore, the existing transportation network and travel demand would not be altered and there would be no impacts.

Population, employment, and goods movement are all projected to increase under the future without-study conditions (Wilbur Smith Associates 2008). This would result in increased pressure on the transportation system, including increased numbers of vehicles and vehicle miles traveled on Federal and state highways and local streets, increased demand for freight and passenger rail capacity, increased public transit ridership, increased parking demand, and increased numbers of pedestrians and bicyclists. Many of these systems, especially the road and rail networks, are already operating near capacity and increased use would be expected to reduce operating efficiency and cause increased delays.

A high-speed rail network is planned that would have three routes passing through Union Station that would accommodate a projected 14,100 riders. The study is currently undergoing a phased study planning and environmental review to determine the best route alignment and station locations, and assess the environmental impacts. Construction in the Central Valley may begin in early 2013 and will take several years to complete. In the Los Angeles area, high-speed rail would provide a new transportation alternative that would divert trips from existing road, passenger rail, and bus routes and serve California’s growing population (California High Speed Rail Authority 2012). High speed rail trains would pass through the study area.
Transportation stakeholders have developed plans to achieve an efficiently functioning transportation system such as the Transportation Element of the City of Los Angeles’s General Plan (City of Los Angeles 1997) and the Multi-County Goods Movement Action Plan (Metrolink 2007). The stakeholders, including governments, transportation planning agencies, and commercial businesses such as Union Pacific and BNSF would be expected to continue efforts to analyze the region’s transportation needs and implement projects to address growing demand and evolving needs. However, issues such as funding and land use conflicts may prevent or cause delays in implementing major changes or upgrades to the transportation network.

**Alternative 10 (ART)**

**Construction Impacts**

The project would add additional traffic to area roads during construction, which would occur over a period of 9 years under this alternative. Trips would involve construction equipment and materials being delivered to and removed from the site and workers commuting to and from the site. Construction vehicles would be scheduled and routed to minimize conflicts with other traffic. However, workers commuting to and from the site would travel during peak morning and afternoon commute periods, adding traffic to areas roads when they are busiest. Table 5-22 contains estimates for the number of worker commute trips and haul truck trips that would be generated by the action alternatives; the numbers are estimates and actual numbers may vary.

**Table 5-22 Construction and Demolition Debris Removal**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Average Daily Worker Round Trips (2 people per vehicle)</th>
<th>Daily Haul Truck Trips*</th>
<th>Estimated Number of Work Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-ART</td>
<td>24</td>
<td>12 cubic yard truck: 6</td>
<td>1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 cubic yard truck: 28</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total truck trips: 34</td>
<td></td>
</tr>
<tr>
<td>13-ACE</td>
<td>29</td>
<td>12 cubic yard truck: 11</td>
<td>2200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 cubic yard truck: 32</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total truck trips: 43</td>
<td></td>
</tr>
<tr>
<td>16-AND</td>
<td>90</td>
<td>12 cubic yard truck: 17</td>
<td>3300</td>
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<tr>
<td></td>
<td></td>
<td>16 cubic yard truck: 63</td>
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<td></td>
<td></td>
<td>Total truck trips: 80</td>
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<tr>
<td>20-RIVER</td>
<td>107</td>
<td>12 cubic yard truck: 18</td>
<td>3300</td>
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<td></td>
<td></td>
<td>16 cubic yard truck: 87</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total truck trips: 105</td>
<td></td>
</tr>
</tbody>
</table>

*Assumes 220 days/year construction

Construction activities could result in delays in traffic movements due to the presence of slow-moving construction trucks and vehicles delivering or removing equipment and supplies from construction sites, and from temporary closure of travel lanes or roads or from traffic detours. A construction traffic management plan would be prepared and submitted to LADOT for review and approval prior to project implementation to ensure that construction impacts are minimized. The plan would include:

- Designated routes and access points for construction vehicles and equipment,
- Any turning movement restrictions,
- Travel time restrictions to avoid peak travel periods on selected roadways, and
- Designated staging and parking areas for workers and equipment.
With implementation of a traffic management plan and traffic control plan, and the appropriate BMPs, additional construction traffic and temporary closures and diversions would have a minimal impact on affected roadways and intersections. LADOT considers temporary impacts to be less than significant.

If construction required temporary closures or partial closures of streets or traffic diversions to accommodate construction activities, public transit routes on the affected streets would also be temporarily disrupted. Transit vehicles could be routed, and riders could be delayed, resulting in short-term impacts. The construction traffic management plan and traffic control plan would describe impacts to public transit in detail and efforts would be made to minimize impacts. The project proponent would also coordinate with local transit providers prior to project implementation. In the unlikely event that a significant impact was identified, the project design or construction plan would be altered to reduce the impact to less than significant.

This alternative, like the other alternatives, would convert an existing railyard (LATC) to restored habitat and occur near railroad lines in Reach 8. The LATC is located in Reach 8, owned by Union Pacific, and used as a freight-forwarding area. The yard has multiple rail spurs running through it and rail lines on its north, west, and south perimeters. The passenger and freight rail lines along the west perimeter are owned by LA Metro and are referred to as the “East Bank” tracks. The tracks at the Yard’s northern perimeter consist of the “Yuma Main Line,” owned by Union Pacific, and one Amtrak track. The lines south of the Yard are Metrolink tracks owned by Metro, also known as the “San Gabriel Subdivision.” All of these tracks would remain in place and continue to operate; however, the spur lines in the Yard’s interior and the intermodal railyard storage capacity would be permanently removed. It is anticipated that the reduction in railyard capacity at LATC would be relocated within the Los Angeles Basin, as discussed in the indirect effects analysis below. Effects would be less than significant. There are not conversions of rail facilities anywhere else in the project, although construction is proposed in parcels adjacent to these facilities. Construction would also occur at a former railyard in Reach 6 at Taylor Yard west of Rio de Los Angeles State Park to provide area for habitat corridors and riparian plantings; these lines are not in use.

Construction would occur near rail lines in Reaches 6 and 7 and existing maintenance yard in Reach 7. The construction traffic management plan and traffic control plan would describe impacts to railroads in detail and coordination with railroad operators would be essential to determine methods for minimizing impacts. Proper coordination will ensure that impacts would be less than significant. Construction of features along the east bank of the river in Reach 6 would be designed to avoid or address maintenance access for relevant railroad facilities. Construction in Reach 7 will preserve access from Baker Street to the Gold Line maintenance yard in that reach during and after construction. Work performed adjacent to rails would maintain SCRRA published clearances from tracks during and after construction. The rail track that runs north from CMF to the south end of Taylor Yard would remain in place and continue to be used for emergency storage and switching of cars.

During construction, staging areas would provide parking for construction equipment and construction workers, so parking demand on surrounding roads would not increase. If road or lane closures were necessary to accommodate construction activities, on-street parking spaces in those areas could also be temporarily closed. The construction traffic management plan and traffic control plan would describe impacts to parking in detail and efforts would be made to minimize impacts. This impact would be less than significant.

Construction could have short-term adverse impacts on the Los Angeles River Bike Path. Sections of the path may be temporarily closed or rerouted to accommodate construction activities. If construction required closures or partial closures of streets to accommodate construction activities, bike lanes and
sidewalks on these streets would also be temporarily closed, resulting in short-term moderate adverse impacts. A construction traffic management plan would be prepared prior to project implementation. The plan would describe in detail any closures or rerouting of the bike path to accommodate construction activities. Efforts would be made to minimize any necessary closures. If closures were necessary, signs would be posted to alert users to the closure and fencing or other access restrictions would be used if necessary to ensure safety. This impact would be less than significant.

**Operational Impacts**

The project would not alter the roadway network. No existing roads, intersections, or bridges would be permanently closed and no new roadway features would be added. Because no new roadway features would be added during maintenance, the project would not introduce hazards due to design features such as sharp curves or dangerous intersections or incompatible uses such as farm equipment and there would be no impact related to this significance criterion. There would also be no change in roadway capacity. The project would not result in changes to emergency access. As previously stated, the project would not alter the roadway network, so existing emergency access routes would not be affected. Emergency access routes to the river for swiftwater rescue personnel and law enforcement may be improved by construction of maintenance ramps.

**Indirect Effects of and Related Actions to Construction and Operation**

The project would result in additional vehicle trips to area roads from increased visitation because it would make portions of the River a recreational destination. Estimated increases in recreational use at particular locations were compared to figures showing access points, point draws, and new or refurbished trails. With this data, estimates of increases in daily vehicle trips, reflecting seasonal variation, were developed to estimate the potential for impacts to traffic flow and parking. Although this analysis indicated the potential for minor increases in vehicle trips and parking needs at certain locations such as Pollywog Park in Glendale, many of these trips would likely occur during off-peak travel hours and therefore would not affect the performance of the roadway network when it is at its busiest. Therefore the project would not conflict with established measures of effectiveness for the performance of the roadway network and the area’s adopted congestion management program and impacts would be less than significant.

Parking demand on roads near the River would be expected to increase because more people would be expected to access the River for recreational purposes. Thus, the existing parking in the study area, which is primarily on-street parking on residential roads, would be more heavily used and would see more use by persons not living or working in the area. The project will provide two new parking areas at Taylor Yard and LATC, providing 30-50 parking spaces at each of these two sites. While visitors will be encouraged to use these locations to access the park, a project-specific analysis of parking demand within each reach will be prepared prior to project implementation and the final design will provide for adequate parking, resulting in a less than significant adverse impact. The need for additional parking beyond that identified in the recreation plan is not anticipated.

Ridership on public transit routes with stops near portions of the study area where public access is enhanced would increase because people would use public transit to access the River. However, the restored River is not expected to be a public draw to the extent that it causes overcrowding on public transit resources. Long-term ridership on commuter rail lines with stops near portions of the study area where public access is enhanced would increase because people would use commuter rail to access the River. Additional riders would likely travel during off-peak travel times since they would primarily be accessing the River for recreational purposes. Since they would generally travel during off-peak times, the additional riders would not likely cause ridership to exceed peak ridership and would not add...
substantially to demand for commuter rail service; thus, existing capacity should be sufficient to accommodate the increase. Therefore, impacts would be less than significant.

Because the restoration would result in aesthetic enhancement, new multi-use walking and biking paths would be constructed, and public access would increase, more people would be expected to use the River corridor for local and recreational trips. Travel on the existing Los Angeles River Bike Path would also increase. The capacity of the Los Angeles River Bike Path and the new multi-use paths that would be constructed as part of the project should be sufficient to accommodate demand.

Relocating the functions of the LATC facility may result in indirect effects to traffic and transportation in another part of the Los Angeles Basin during the process of transferring equipment and portable infrastructure from the old facility, during construction of the relocated facility, and as a result of operations at that site. Construction activities that require introduction of heavy equipment and numerous truck trips could result in temporary traffic closures or delays at the new location. Operation of the new site may require permanent changes to existing roadway or rail traffic patterns if truck or rail traffic increases as a result of its use. It is presumed that most of the impacts would be avoided or minimized through selecting a new site that is functionally equivalent to the old site with reasonable proximity to existing UPRR rail lines. The new site is anticipated to be in an industrial zone with adequate capacity for industrial traffic. The CEQA lead agency will conduct a detailed CEQA analysis in analyzing the relocation of LATC site functions, including assessment of traffic and transportation impacts. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

**Alternative 13 (ACE)**

**Construction Impacts**

Construction activities would occur over a period of 10 years, a longer time period compared to Alternative 10-ART, so the temporary effects of construction would last longer. As shown in Table 5-22, the number of daily worker commute trips would be slightly higher than under Alternative 10-ART but the number of round trip truck trips would be lower. Construction impacts would be less than significant since the inconvenience to vehicles and other types of traffic would be temporary.

**Operational Impacts**

Operational impacts on traffic and transportation would be similar to those described for Alternative 10-ART, but would be more extensive due to the larger footprint of the proposed project; however, impacts would still be less than significant. Under this alternative, existing railroad alignments would not be affected during construction or operation. Through coordination and implementation of BMPs, impacts are considered to remain less than significant for both construction and operation.

**Alternative 16 (AND)**

**Construction Impacts**

Construction activities would occur over 15 years, a longer time period compared to Alternatives 10-ART and 13-ACE, so the temporary effects of construction would last longer. As shown in Table 5-22, the number of daily worker commute trips would be approximately three times as many as Alternative 13-ACE due to the additional construction in Reaches 5 and 8. The number of round trip truck trips would also be higher; however, because the trucks would not travel the same routes, would not likely travel during peak commute hours, and would only last for the duration of construction, the additional trips would result in a less than significant impact. Most construction impacts to circulation and traffic would be less than significant since the inconvenience to vehicles and other types of traffic would be temporary.
Under this alternative, to accommodate construction, operation, and maintenance of the restoration features, existing railroad alignments would be kept at grade but placed onto trestles in Reach 8 on the left bank south of Main Street to Cesar Chavez Avenue through LATC, with excavation below the existing grade. The railroad would be trestled to provide right-of-way for additional channel capacity and space to implement other restoration measures. Uninterrupted service to rail traffic is a primary design criterion and temporary shoofly trestles or bypass lines are not currently anticipated to be needed to allow for uninterrupted service. However, the existing track alignments, construction of new trestle alignments, the configuration of the proposed ecosystem restoration features and existing and anticipated train traffic will be further evaluated during the design phase to verify that temporary shoofly trestles or bypass lines are not needed. If during the design phase, such temporary measures are identified as needed, supplemental analysis would be performed at that time.

Operational Impacts

Operational impacts on traffic and transportation would be similar to those described for Alternatives 10 and 13, but would be more extensive due to the larger footprint of the proposed project; however, impacts would still be less than significant. Once construction was complete, road and rail operations could return to a before-project state; thus, there would be no long-term operational impact on railroads. Through coordination and implementation of BMPs, impacts are considered to remain less than significant for operation.

Alternative 20 (RIVER)

Construction Impacts

Construction activities would occur over a period of 15 years, a longer time period compared to the other alternatives, so the temporary effects of construction would last longer. As shown in Table 5-22, the number of daily worker commute trips would be higher than the other alternatives, with the increase from Alternative 16 attributable to additional construction in Reaches 2 and 3 and additional construction and relocation work (trestling) in Reach 7. The number of round trip truck trips would also be higher; however, because the trucks would not travel the same routes, would not likely travel during peak commute hours, and would only last for the duration of construction, the additional trips would result in a less than significant impact. Construction impacts for vehicular commuting and traffic would be less than significant since the inconvenience to vehicles and other types of traffic would be temporary.

Construction of features along the east bank of the river in Reaches 6 and 7 would be designed to avoid or address maintenance access for relevant railroad facilities. Like Alternative 16, under this alternative, to accommodate construction, operation, and maintenance of the restoration features, existing railroad alignments would be kept at grade but put onto trestles in Reach 8 on the left bank south of Main Street to Cesar Chavez Avenue through LATC, with excavation below the existing grade. The rail line on the right bank in Reach 7 between North Spring Street and North Broadway would also be placed onto trestles to facilitate construction, operation and maintenance of the restoration features. The rail line would be trestled to provide right-of-way to implement terracing of the bank. Impacts to rail service would be avoided or minimized to less than significant under this alternative in a similar fashion as under Alternatives 16 by providing trestles that would be operational by the time the original rail lines were removed.

Operational Impacts

Operational impacts on traffic and transportation would be similar to those described for Alternatives 10, 13, and 16 but would be more extensive due to the larger footprint of the proposed project; however, impacts would still be less than significant. Once construction was complete, road and rail operations could return to a before-project state; thus, there would be no long-term operational impact on railroads.
Through coordination and implementation of BMPs, impacts are considered to remain less than
significant for operation.

**Indirect Effects of Construction and Operation**

To allow for construction of Alternative 20, the non-Federal sponsor will have to acquire all lands
required for the project, including some that currently have operating businesses. As businesses are
displaced during acquisition, it is anticipated business owners would relocate their operations elsewhere.
Transfer of existing equipment and fixtures to new business locations would involve some minor impacts
on the existing roadway system over the project implementation timeline. Their operation at new
locations would not be anticipated to have significant effects on traffic or transportation.

### 5.7.4 Best Management Practices and Impact Avoidance Measures

The following BMPs would be implemented to reduce transportation impacts:

- The location and duration of any lane or street closures, including impacts on public transit,
railroads, bicycle lanes, sidewalks, and parking would be fully coordinated with local cities and
nearby residents,
- Detour routes would be provided if needed (including detour routes for public transit, bicycles,
and pedestrians when effected),
- Local traffic and emergency vehicle access would be maintained or accommodated,
- Traffic protective devices and control measures would be implemented such as barricades, cones,
flaggers, lights, warning beacons, temporary turning restrictions, temporary traffic signals, and
warning signs,
- Advance notice would be provided to affected residents, businesses, emergency services
providers (police, fire, ambulance) and public transit providers,
- Temporary bus stops would be located within a reasonable walking distance of any displaced bus
stops when public transit stops are affected,
- Safety improvements would be made to existing at-grade street-rail crossings where traffic
increases would be expected, and
- The project would coordinate with railroad companies to ensure continuous operation and
appropiate safety measures.

### 5.8 NOISE

#### 5.8.1 Regulatory Setting

**Federal**

Federal law (Noise Control Act of 1972, 42 U.S.C. 4901 et seq., P.L. 92-574) legislates that each state
provide for the protection of its citizens from noise. The following sections describe each of the
regulations that have been developed at the state, county, and city level for noise control. Though each of
the regulations described in the following sections applies to the proposed project, some regulations are
stricter than others and would become the basis for significance criteria.
The State of California requires each local government to perform noise surveys and implement a noise element as part of its general plan as guided by the General Plan Guidelines (OPR 1998). The study area is located within the jurisdictions of the Los Angeles County, City of Los Angeles, City of Glendale, and City of Burbank, each of which have specific noise guidelines in place, as well as ordinances established as enforcement mechanisms for noise control.

Title 24 of the California Code of Regulations (CCR), Part 2, Chapter 12, Section 1208A.8.2 establishes the statewide regulations for allowable interior noise and states that interior noise levels attributable to exterior sources shall not exceed 45 decibels in any habitable room. This noise metric is to be measured as the day-night level (DNL) or the community noise equivalent level (CNEL), consistent with the Noise Element of the local General Plan. The CNEL is applicable for this analysis and adds a 5 dBA penalty to evening hours (7:00 p.m. to 10:00 p.m.) and a 10 dBA penalty to nighttime hours (10:00 p.m. to 7:00 a.m.).

Meaningful noise regulations come from average noise levels over the course of a 24-hour period referred to as the day-night average and denoted as DNL. These values are calculated from 24-hour averages in which nighttime values (10pm to 7am) are increased by 10 dB to account for the greater disturbance potential from nighttime noises. The community noise equivalent level (CNEL) is another measurement type that provides additional weighting for communities. It describes cumulative noise exposure over 24 hours, increased overnight by 10 dB to account for nighttime sensitivity, but also includes an additional increase by 5 dB for events between 7pm and 10pm.

Los Angeles County

The Los Angeles County Code (LACC) provides applicable noise regulations for exterior noises, specific guidelines for allowable noise in particular land use zones, allowable noise levels for construction activities and duration considerations for construction activities. The Los Angeles County General Plan reinforces the County Codes in its 2012 revised Noise Element. However, current ambient noise levels have not been updated in this document (Los Angeles County 2012b). The LACC provides noise level regulations for exterior, interior, and construction noise.

Exterior Noise

LACC Section 12.08.390 regulates exterior noise levels for four noise zones based on noise sensitivity as shown in Table 5-23. Section 12.08.390 limits apply to exterior operational noise levels caused by project-related on-site fixed sources such as industrial processing or manufacturing machinery. Unless a variance is allowed, these exterior noise levels apply to all receptor properties within a designated noise zone.

<table>
<thead>
<tr>
<th>Noise Zone</th>
<th>Designated Noise Zone Land Use (Receptor property)</th>
<th>Time Interval</th>
<th>Exterior Noise Level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Noise-sensitive area</td>
<td>Anytime</td>
<td>45</td>
</tr>
<tr>
<td>II</td>
<td>Residential properties</td>
<td>10:00 pm to 7:00 am (nighttime)</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7:00 am to 10:00 pm (daytime)</td>
<td>50</td>
</tr>
<tr>
<td>III</td>
<td>Commercial properties</td>
<td>10:00 pm to 7:00 am (nighttime)</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7:00 am to 10:00 pm (daytime)</td>
<td>60</td>
</tr>
<tr>
<td>IV</td>
<td>Industrial properties</td>
<td>Anytime</td>
<td>70</td>
</tr>
</tbody>
</table>
Table 5-24 lists the allowable noise levels for residential dwellings.

<table>
<thead>
<tr>
<th>Designated Land Use</th>
<th>Time Interval</th>
<th>Allowable Interior Noise Level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multifamily</td>
<td>10 pm—7 am</td>
<td>40</td>
</tr>
<tr>
<td>Residential</td>
<td>7 am—10 pm</td>
<td>45</td>
</tr>
</tbody>
</table>

Section 12.08.440 of the LACC restricts construction activity, where construction disturbs a commercial or residential property, to the hours between 7:00 a.m. and 7:00 p.m. Monday through Saturday and prohibits construction activity at any time on Sundays, or national holidays. Section 12.08.440 includes noise level limits at residential properties for mobile and stationary construction equipment (Table 5-25). Section 12.08.440 limits construction noise at commercial properties to a maximum of 85 dBA any time.

Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real-property line, except for emergency work of public service utilities or by variance issued by the health officer is prohibited.

Table 5-25 lists the allowable noise levels for mobile and stationary construction equipment.

<table>
<thead>
<tr>
<th>Designated Land Use</th>
<th>Time Interval</th>
<th>Allowable Interior Noise Level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Equipment</td>
<td>Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.</td>
<td>75dBA</td>
</tr>
<tr>
<td></td>
<td>Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays</td>
<td>60dBA</td>
</tr>
<tr>
<td>Stationary Equipment</td>
<td>Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.</td>
<td>60dBA</td>
</tr>
<tr>
<td></td>
<td>Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays</td>
<td>50dBA</td>
</tr>
</tbody>
</table>

In addition, the LACC states that all mobile or stationary internal-combustion-engine powered equipment or machinery shall be equipped with suitable exhaust and air-intake silencers in proper working order. In case of a conflict between this chapter and any other ordinance regulating construction activities, provisions of any specific ordinance regulating construction activities shall control. Variances from the requirements of this chapter may be granted by the health officer. Every applicant for a variance shall file with the health officer a written application on a form prescribed by the health officer. The application shall state the name and address of the applicant, the nature of the noise source involved, and such other information as the health officer may require.
The City of Los Angeles Municipal Code (LAMC) provides its own set of regulations for exterior noise and construction (City of Los Angeles 2012).

### Exterior Noise

The LAMC limits exterior noise from fixed equipment, Section 112.02. Section 112.02 limits noise increase from air conditioning, refrigeration or heating equipment for any residence or other structure or to operate any pumping, filtering or heating equipment for any pool or reservoir to no more than 5 dBA relative to the allowed ambient noise levels shown in in Table 5-26.

### Table 5-26 Presumed Ambient Noise Level by Zone within Los Angeles

<table>
<thead>
<tr>
<th>Zone</th>
<th>Day (7:00 a.m.–10:00 p.m.)</th>
<th>Night (10:00 p.m.–7:00 a.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural, Suburban, Residential including Single and Multiple Family Homes (A1, A2, RA, RE, RS, RD, RW1, RW2, R1, R2, R3, R4, and R5)</td>
<td>50 dBA</td>
<td>40 dBA</td>
</tr>
<tr>
<td>Parking Areas and Commercial (P, PB, CR, C1, C1.5, C2, C4, C5, and CM)</td>
<td>60 dBA</td>
<td>55 dBA</td>
</tr>
<tr>
<td>Limited and Restricted Light Industrial (M1, MR1, and MR2)</td>
<td>60 dBA</td>
<td>55 dBA</td>
</tr>
<tr>
<td>Light and Heavy Industrial (M2 and M3)</td>
<td>65 dBA</td>
<td>65 dBA</td>
</tr>
</tbody>
</table>

Source: City of Los Angeles 2012.

### Construction Noise

Construction activity is regulated in Section 40.41 of the LAMC, which restricts construction activity to occur between the hours of 7:00 a.m. and 9:00 p.m. Section 40.41 further restricts construction activities within 500 feet of residential properties to between the hours of 8:00 a.m. and 6:00 p.m. on Saturdays, or national holidays and prohibits construction at any time on Sundays. Section 112.05 further restricts construction equipment operating within 500 feet of residential uses between the hours of 7:00 a.m. and 10:00 p.m. to 75 dBA DNL. Section 112.05 states that construction and industrial machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is technically infeasible.

### City General Plans

Noise control objectives and guidelines have been prepared in the General Plan Noise Elements for each of the cities of Los Angeles, Burbank and Glendale. The most comprehensive noise planning is provided in the City of Los Angeles General Plan Noise Element; it provides noise and land use compatibility guidelines for exterior noise, reinforces the state and county regulations, provides an additional construction ordinance, and provides the basis for the Burbank and Glendale General Plan Noise Elements (City of Los Angeles 1998). No additional noise elements are found in the Glendale General Plan, and the noise elements are consistent with those of Burbank’s Burbank2035 General Plan (City of Burbank 2013b). City General Plans are required to indicate the extent of airport noise exposure, where those lands are subject to additional noise controls. The study area is not within an airport noise exposure contour of 65dB in any of the city jurisdictions.
Exterior Noise

The City of Los Angeles General Plan Noise Element guidance for noise and land use compatibility is provided in a matrix taken from the Governor’s General Plan Guidelines (OPR 1998). Land use categories are similar to state and county land uses. A range of dBA measurements is shown for each land use for normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable noise levels.

Table 5-27 City of Los Angeles Noise Element and Land Use Compatibility Matrix

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Normally Acceptable</th>
<th>Conditionally Acceptable</th>
<th>Normally Unacceptable</th>
<th>Clearly Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential – Low Density</td>
<td>50-60</td>
<td>60-70</td>
<td>70-75</td>
<td>75-85</td>
</tr>
<tr>
<td>Residential – Multiple Family</td>
<td>50-65</td>
<td>65-70</td>
<td>70-75</td>
<td>75-85</td>
</tr>
<tr>
<td>Transient Lodging – Motels, Hotels</td>
<td>50-65</td>
<td>65-70</td>
<td>70-80</td>
<td>80-85</td>
</tr>
<tr>
<td>Schools, Libraries, Churches, Hospitals, Nursing Homes</td>
<td>50-60</td>
<td>60-65</td>
<td>65-80</td>
<td>80-85</td>
</tr>
<tr>
<td>Auditoriums, Concert Halls, Amphitheaters</td>
<td>NA</td>
<td>50-70</td>
<td>NA</td>
<td>70-85</td>
</tr>
<tr>
<td>Sports Arenas, Outdoor Spectator Sports</td>
<td>NA</td>
<td>50-75</td>
<td>NA</td>
<td>75-85</td>
</tr>
<tr>
<td>Playgrounds, Neighborhood Parks</td>
<td>50-67.5</td>
<td>NA</td>
<td>67.5-75</td>
<td>75-85</td>
</tr>
<tr>
<td>Golf Courses, Riding Stables, Water Recreation, Cemeteries</td>
<td>50-70</td>
<td>NA</td>
<td>70-80</td>
<td>80-85</td>
</tr>
<tr>
<td>Office Buildings, Business Commercial and Professional</td>
<td>50-67.5</td>
<td>67.5-77.5</td>
<td>77.5-85</td>
<td>NA</td>
</tr>
<tr>
<td>Industrial, Manufacturing, Utilities, Agriculture</td>
<td>50-70</td>
<td>70-80</td>
<td>80-85</td>
<td>NA</td>
</tr>
</tbody>
</table>


Construction Noise

There are no additional construction noise regulations provided in the City General Plans.

Wildlife

There are no established regulations for controlling noise for protection of noise sensitive wildlife. However, through the NEPA/CEQA agency consultation process, the USFWS service may provide noise control measures to protect sensitive wildlife during implementation of the selected project. Previous studies have established a 60 dB limit during the nesting season for protecting sensitive bird species such as the least Bell’s vireo in relation to highway noise (AASHTO 2008).

5.8.2 Significance Criteria

The following thresholds of significance for noise impacts are derived from state, county, and city regulations and ordinances described in Section 5.8.1. Construction limits allow for some leeway in noise levels without a variance if the project complies with work windows and makes all feasible efforts to reduce noise impacts. Impacts to noise would be considered significant if an alternative results in:

- Noise Significance Criterion 1: Interior noise levels attributable to an exterior source exceeds 45 dB in any habitable room from 7 a.m. to 10 p.m. (Title 24), or exceeds 40 dB from 10 p.m. to 7 a.m. (LACC).
• **Noise Significance Criterion 2**: Exterior noise levels exceed those limits set by LACC for four noise zones shown in Table 5-23, or exceeds those set by the LAMC shown in Table 5-26 by 5 decibels or more. LACC Section 12.08.390 limits apply to exterior operational noise levels caused by project-related on-site fixed sources such as industrial processing or manufacturing machinery. LAMC Section 112.02 limits noise increase from air conditioning, refrigeration or heating equipment for any residence or other structure or to operate any pumping, filtering or heating equipment for any pool or reservoir to no more than 5 dB relative to the allowed ambient noise levels shown in Table 5-23.

• **Noise Significance Criterion 3**: Exterior noise levels increase by 3 decibels or more within the “normally unacceptable” or “clearly unacceptable” categories shown in Table 5-27.

• **Noise Significance Criterion 4**: A violation of LACC restrictions on construction activity, where construction disturbs a commercial or residential property, which must only occur between 7 a.m. and 7 p.m. Monday through Saturday, and must not occur anytime on Sundays or national holidays.

• **Noise Significance Criterion 5**: Exceeding any noise limits established by USFWS during consultation for sensitive wildlife species.

• **Noise Significance Criterion 6**: A violation of LAMC restrictions on construction activity, which must only occur between the hours of 7 a.m. and 9 p.m., and within 500 feet of residential properties between the hours of 8 a.m. and 6 p.m. on Saturdays and national holidays, and must not occur anytime on Sundays.

• **Noise Significance Criterion 7**: A violation of LAMC restrictions on construction equipment operating within 500 feet of residential uses to 75 dBA (Ldn).

• **Noise Significance Criterion 8**: A violation of LACC restrictions on construction noise levels at residential properties (see Table 5-25).

• **Noise Significance Criterion 9**: A violation of LAMC requirements that construction and industrial machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is technically infeasible.

### 5.8.3 Environmental Impacts

#### Methodology

Construction, although typically short-term, can be a significant source of noise. Construction noise levels are most notable when it takes place near sensitive land uses, occurs at night, and/or occurs in early morning hours. For most construction activities, the dominant noise source is usually an internal combustion engine. Mobile off-road equipment such as bulldozers and loaders would move around the construction site while on-road trucks and automobiles would transport equipment, material, and workers to and from the construction area. Noise generated by construction activities generally fluctuates depending on the construction phase, the quantity and type of equipment in use, and the duration of use. The impact of construction noise on a receptor would depend upon the level of construction activity on a given day and the related noise generated by that activity; the distance between construction activities and the noise-sensitive use; the presence or absence of barriers between the noise source and the receptor; and the ambient noise levels in the area.

Construction noise impacts were evaluated using the FHWA reference noise levels for various types of construction equipment and activities. This method references noise descriptors including:

- **Leq**: The equivalent sound level is the average noise exposure level over a specified time period of interest, typically one hour.

- **Lmax**: The instantaneous maximum noise level measured during the period of interest.
Ldn: The energy average of A-weighted sound levels over a 24-hour period, including a “penalty” to account for the greater sensitivity of most people to nighttime noise. Noise that occurs between 10 p.m. and 7 a.m. is weighted (penalized) by adding 10 dBA to account for the greater annoyance of such noise. The DNL is also referred to as L_{dn}.

Construction equipment that would be used for each action alternative is listed in Table 5-28 through 5-31. The FHWA \text{i}_{\text{max}} reference noise level is given for each piece at 50 feet away from the noise source. Estimated sound levels at incremental distances up to 400 feet are also listed. Since spherically radiating point sources of noise are atmospherically attenuated by a factor of 6 dB per doubling of the distance, sound levels incrementally decrease as distance from the sound source increases.

Impacts

Significance Criteria with No Impacts

No impacts are associated with the following significance criteria for all action alternatives. As the significance criteria will not be exceeded, no impacts are expected to occur:

Noise Significance Criterion 1: Interior noise levels attributable to an exterior source exceeds 45 dB in any habitable room from 7 a.m. to 10 p.m., or exceeds 40 dB from 10 p.m. to 7 a.m. This type of impact is associated with development of dwellings, which would not occur under the proposed action alternatives. Therefore, there will be no effects associated with this significance criterion.

Noise Significance Criterion 2: Exterior noise levels exceed those limits set by LACC for four zones shown in Table 5-23, or exceeds those set by the LAMC shown in Table 5-26 by 5 decibels or more. LACC Section 12.08.390 limits apply to exterior operational noise levels caused by project-related on-site fixed sources such as industrial processing or manufacturing machinery. LAMC Section 112.02 limits noise increase from air conditioning, refrigeration or heating equipment for any residence or other structure or to operate any pumping, filtering or heating equipment for any pool or reservoir to no more than 5 dB relative to the allowed ambient noise levels shown in Table 5-23.

There would not be any stationary noise sources permanently affixed to a specific location or structure under any alternative. Therefore, there will be no effects associated with this significance criterion.

Noise Significance Criterion 3: Exterior noise levels increase by 3 decibels or more within the “normally unacceptable” or “clearly unacceptable” categories shown in Table 5-27. This type of impact is associated with development of noise-generating land uses in areas with existing ambient noise levels in excess of Normally Acceptable, Conditionally Acceptable, Normally Unacceptable, or Clearly Unacceptable noise levels; or if operations of the proposed action alternatives causes the ambient noise levels measured at the property line at such land uses to increase by the levels stated above. Development of such land uses would not occur under any alternative. Therefore, there will be no effects associated with this significance criterion.

Noise Significance Criterion 4: A violation of LACC restrictions on construction activity, where construction disturbs a commercial or residential property, which must only occur between 7 a.m. and 7 p.m. Monday through Saturday, and must not occur anytime on Sundays or national holidays. Activities associated with construction and operations would generally occur between the hours of 8 a.m. and 6 p.m. Monday through Friday, and 8 a.m. and 5 p.m. Saturday. Construction and operations would not occur on Sunday or a national holiday. Therefore, there will be no impacts associated with this significance criterion.
Noise Significance Criterion 5: Exceeding any noise limits established by USFWS during consultation for sensitive wildlife species. Consultation with USFWS under the ESA was not considered necessary based on the existing conditions. Thus, noise limits were not placed on the project in consideration of possible impacts to listed species. Therefore, there will be no impacts associated with this significance criterion.

Noise Significance Criterion 6: A violation of LAMC restrictions on construction activity, which must only occur between the hours of 7 a.m. and 9 p.m., and within 500 feet of residential properties to the hours of 8 a.m. and 6 p.m. on Saturdays and national holidays, and must not occur anytime on Sundays. Construction and operations generally would occur between the hours of 8 a.m. and 6 p.m. Monday through Friday, and from 8:00 a.m. to 5:00 p.m. Saturday. Construction would not occur on Sundays or national holidays. Therefore, there will be no impacts associated with this significance criterion.

No Action Alternative

Construction Impacts

Under the No Action Alternative, no action would be taken and the project would not be constructed.

Noise Significance Criterion 7: A violation of LAMC restrictions on construction equipment operating within 500 feet of residential uses between the hours of 7 a.m. to 10 p.m. to 75 dBA (Ldn)

Construction equipment would not be used within 500 feet of residential structures. There would be no impacts under this significance criterion.

Noise Significance Criterion 8: A violation of LACC restrictions on construction noise levels at residential properties (see Table 5-25).

There would be no construction within the vicinity of single-family residential, multi-family residential, or semi residential/commercial structures. There would be no exceedence of construction noise limits. There would be no impacts under this significance criterion.

Noise Significance Criterion 9: A violation of LAMC requirements that construction and industrial machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is technically infeasible.

There would be no construction or industrial machinery within 50 feet of residential structures. There would be no impacts under this significance criterion.

Operational Impacts

Assuming that operations and maintenance continue at current levels, there would be no significant increase in noise levels. Noise would occur as a result of occasional use of work trucks and maintenance equipment but such effects would be occasional and temporary. Some gradual increases in operations and maintenance may be needed as facilities and structures age and require replacement or increased maintenance. In this instance, noise levels may increase but would still be less than significant under significance criteria 7-9.
Alternative 10 (ART)

Construction Impacts

Noise Significance Criterion 7: A violation of LAMC restrictions on construction equipment operating within 500 feet of residential uses between the hours of 7 a.m. to 10 p.m. to 75 dBA (Ldn).

The 75 dBA (Ldn) threshold in Noise Significance Criterion 7 is an average of sound levels over a 24-hour period. The sound levels associated with equipment in Table 5-28 are maximum sound levels. For the purpose of comparing these maximum sound values to an averaged regulatory threshold, the average sound level associated with each type of construction equipment is equated to the maximum values. Thus, the analysis is conservative since sound levels of equipment averaged over a work day would be less than their maximum sound levels.

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LAMC restrictions because equipment would not be located within 500 feet of residential structures.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. The Los Angeles River is a soft bottom trapezoidal channel with an average invert width of 200 feet through Reaches 5 and 6. Thus, most equipment would be near or within 100 feet of residential structures. Table 5-28 shows the estimated sound levels at various distances from the noise source. At 100 feet, the Lmax associated with most equipment would exceed 75 dBA during daytime hours. However, most construction work would occur within the invert, approximately 20 to 25 feet below grade. Thus, the sloped embankments would attenuate sound levels to varying degrees. Furthermore, since there would be no construction during the night, the potential for exceeding the 75 dBA (Ldn) is low. In cases where construction is expected to occur on the embankments, a temporary sound wall would be constructed. Sound walls can further attenuate sound levels by 5 dB. With implementation of sound walls as needed, sound levels would be sufficiently attenuated to below 75 dBA (Ldn). Impacts would be less than significant.

Noise Significance Criterion 8: A violation of LACC restrictions on construction noise levels at residential properties (see Table 5-25).

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LACC restrictions because equipment would not be located near residential structures such that the 75 dBA (Leq) restriction would be exceeded.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. Construction may require the use of mobile and stationary equipment within the vicinity of residential structures under or over a 10 day period. As listed in Table 5-28, the maximum sound levels associated with construction equipment at 50 feet from residential structures range from 73 dBA (Lmax) to 86 dBA (Lmax). Maximum sound levels associated with construction equipment at 100 feet from residential structures range from 67 dBA (Lmax) to 80 dBA (Lmax). However, the estimates are maximum sound levels associated with equipment operating under full power. It is unlikely that construction equipment will operate at full power for the duration of the work day. Thus, the maximum sound level for equipment operating at or under 100 feet from residential structures would likely be lower. Furthermore, temporary sound walls would be deployed when constructing within the vicinity of residential structures. In general, these structures reduce the
sound level by 5 dB. Based on the above, it is unlikely that the average sound level would exceed 75
dBA. In addition, other avoidance measures identified in section 5.8.4 would be employed, such as the
use of construction equipment with state-of-the-art noise shielding and muffling devices. Impacts would
be less than significant.

*Noise Significance Criterion 9: A violation of LAMC requirements that construction and industrial
machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is
technically infeasible.*

Construction in Reaches 5 through 8 could occur within 50 feet of residential, recreational, industrial, and
commercial land uses. Reaches 5 and 6 would primarily occur in residential land uses. Many residential
structures directly abut the channel embankments throughout these two reaches. Construction at Reach 7
and Reach 8 would primarily occur near industrial and commercial land uses. The Los Angeles River is a
trapezoidal channel with an average invert width of 200 feet from Reaches 5 through 8. Thus, most
equipment would be near or within 100 feet of residential, commercial, and industrial structures. Table 5-
28 shows the estimated sound levels at various distances from the noise source. At 50 feet, the $L_{max}$
associated with most equipment would range from 75 dBA to 85 dBA.

At 50 feet from these structures, most construction work would need to occur on the embankment. As a
result, the sloped embankments would attenuate sound levels to varying degrees. Temporary sound wall
would be constructed for such work. Sound walls can further attenuate sound levels by 5 dB. With
implementation of sound walls as needed as well as other measures at Section 5.8.4, such as using
construction equipment with state-of-the-art noise shielding and muffling devices, sound levels at 50 feet
could be attenuated below 75 dBA. Therefore, impacts would be less than significant.
Table 5-28 Alternative 10 (ART) Temporary Received Construction Noise Level

<table>
<thead>
<tr>
<th>Construction Phase</th>
<th>Equipment Type</th>
<th>Sound Level at 50 feet from Equipment (Lmax)</th>
<th>Sound Level at 100 feet from Equipment (Lmax)</th>
<th>Sound Level at 200 feet from Equipment (Lmax)</th>
<th>Sound Level at 400 feet from Equipment (Lmax)</th>
<th>Applicable Reach(es)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>1, 6</td>
</tr>
<tr>
<td></td>
<td>Loader</td>
<td>78</td>
<td>72</td>
<td>66</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Truck</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Place Storm Drain and Piping</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>3, 4, 5, 7</td>
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<tr>
<td></td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
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<tr>
<td></td>
<td>Crane</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
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<tr>
<td></td>
<td>Paver</td>
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<td>79</td>
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<td></td>
<td>Compactor</td>
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<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Excavation Grade Control</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>4</td>
</tr>
<tr>
<td>Grouted Riprap</td>
<td>Hydraulic Excavator</td>
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<td>79</td>
<td>73</td>
<td>67</td>
<td>4</td>
</tr>
<tr>
<td>Compacted Fill</td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>4</td>
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<tr>
<td></td>
<td>Loader</td>
<td>78</td>
<td>72</td>
<td>66</td>
<td>60</td>
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</tr>
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<td></td>
<td>Water Truck</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>62</td>
<td></td>
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<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
<td></td>
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<tr>
<td>Excavation Embankment</td>
<td>Scraper</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>4, 6, 8</td>
</tr>
<tr>
<td>Riprap</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>4, 8</td>
</tr>
<tr>
<td>Aggregate Base Course</td>
<td>Loader</td>
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<td>72</td>
<td>66</td>
<td>60</td>
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</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Asphalt Pavement</td>
<td>Paver</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>6</td>
</tr>
</tbody>
</table>

(a) Source: FHWA 2006.

**Operational Impacts**

Noise impacts during operations and maintenance would be slightly increased over existing conditions due to increased maintenance of vegetation. In general, maintenance of the restored areas would be performed with light trucks and equipment. Occasional use of heavy trucks and machinery may be necessary. During operations, maintenance crews will use equipment that uses the best available mufflers and other features to reduce noise. Maintenance will occur between the hours of 8 a.m. to 6 p.m. Monday through Friday, and between 8 a.m. and 5 p.m. on Saturdays. Occasional use of machinery within 500 feet of residences may be necessary on occasion, but this impact will be short-term (generally lasting less than 2 hours) and expected to be less than 75 dBA (Ldn) at distance of 50 feet. Therefore, operational impacts would be less than significant under significance criteria 7-9.

**Indirect Effects of and Actions Related to Construction and Operation**

Indirect effects of construction and operation on noise levels are not anticipated to be significant. Restoration of the project area may over time lead to changes to development type in the surrounding area with some changes to noise levels. Because the conversion to riparian habitat of a portion of the existing LATC site would likely preclude the railroad from continuing its current use on the remainder of the parcel not required for the project, the remainder would be anticipated to be utilized for other purposes by the City or sold for private use as industrial, commercial, or residential. Use by the City for public purposes or by others for commercial or residential use could result in changes in noise levels on that portion of the site in addition to the portion required for the project. However, such uses would require
rezoning before being implemented. Indirect effects associated with relocation of LATC site functions could include increases in noise at another location within the basin during construction of the relocated site functions. Temporary effects would be associated with construction of new facilities or alteration of existing facilities to accommodate the amount of freight moving through the facility. These temporary effects would come from use of construction machinery and haul trucks used to import construction materials and site equipment and fixtures and export construction debris. Permanent localized noise increases may occur as a result of increased train traffic and movement of freight from one train to another, although the site functions are anticipated to be relocated to an existing industrial area. Prior to relocation, the CEQA lead agency will conduct a detailed CEQA analysis of the relocation of LATC site functions, including assessment of noise effects. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

**Alternative 13 (ACE)**

**Construction Impacts**

Construction would be slightly increased under Alternative 13 as compared to Alternative 10 due to additional construction phases, a longer construction schedule. Larger scale modification of the channel at Arroyo Seco would also occur, but there are no residential structures near the construction area at that location. Construction would occur over a period of 10 years.

*Noise Significance Criterion 7: A violation of LAMC restrictions on construction equipment operating within 500 feet of residential uses between the hours of 7 a.m. to 10 p.m. to 75 dBA (Ldn).*

The 75 dBA (Ldn) threshold in Noise Significance Criterion 7 is an average of sound levels over a 24-hour period. The sound levels associated with equipment in Table 5-29 are maximum sound levels. For the purpose of comparing these maximum sound values to an averaged regulatory threshold, the average sound level associated with each type of construction equipment is equated to the maximum values. Thus, the analysis is conservative since sound levels of equipment averaged over a work day would be less than their maximum sound levels.

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LAMC restrictions because equipment would not be located within 500 feet of residential structures.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. The Los Angeles River is a soft bottom trapezoidal channel with an average invert width of 200 feet through Reaches 5 and 6. Thus, most equipment would be near or within 100 feet of residential structures. Table 5-29 shows the estimated sound levels at various distances from the noise source. At 100 feet, the Lmax associated with most equipment would exceed 75 dBA during daytime hours. However, most construction work would occur within the invert, approximately 20 to 25 feet below grade. Thus, the sloped embankments would attenuate sound levels to varying degrees. Furthermore, since there would be no construction during the night, the potential for exceeding the 75 dBA (Ldn) is low. In cases where construction is expected to occur on the embankments, a temporary sound wall would be constructed. Sound walls and other measures identified in Section 5.8.4 can further attenuate sound levels by 5 dB. With implementation of sound walls as needed, sound levels would be sufficiently attenuated to below 75 dBA (Ldn). Impacts would be less than significant.
Noise Significance Criterion 8: A violation of LACC restrictions on construction noise levels at residential properties (see Table 5-25).

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LACC restrictions because equipment would not be located near residential structures such that the 75 dBA restriction would be exceeded.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. Construction may require the use of mobile and stationary equipment within the vicinity of residential structures under or over a 10 day period. As listed in Table 5-29, the maximum sound levels associated with construction equipment at 50 feet from residential structures range from 73 dBA (Lmax) to 86 dBA (Lmax). Maximum sound levels associated with construction equipment at 100 feet from residential structures range from 67 dBA (Lmax) to 80 dBA (Lmax). However, the estimates are maximum sound levels associated with equipment operating under full power. It is unlikely that construction equipment will operate at full power for the duration of the work day. Thus, the maximum sound level for equipment operating at or under 100 feet from residential structures would likely be lower. Furthermore, temporary sound walls would be deployed when constructing within the vicinity of residential structures. In general, these structures reduce the sound level by 5 dB. Based on the above, it is unlikely that the average sound level would exceed 75 dBA. In addition, other avoidance measures identified in section 5.8.4 would be employed, such as the use of construction equipment with state-of-the-art noise shielding and muffling devices. Impacts would be less than significant.

Noise Significance Criterion 9: A violation of LAMC requirements that construction and industrial machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is technically infeasible.

Construction in Reaches 5 through 8 could occur within 50 feet of residential, recreational, industrial, and commercial land uses. Reaches 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. The Los Angeles River is a trapezoidal channel with an average invert width of 200 feet from Reaches 5 through 8. Thus, most equipment would be near or within 100 feet of residential, commercial, and industrial structures. Table 5-28 shows the estimated sound levels at various distances from the noise source. At 50 feet, the Lmax associated with most equipment would range from 75 dBA to 85 dBA.

At 50 feet from these structures, most construction work would need to occur on the embankment. As a result, the sloped embankments would attenuate sound levels to varying degrees. Temporary sound wall would be constructed for such work. Sound walls can further attenuate sound levels by 5 dB. With implementation of sound walls as needed as well as other measures at Section 5.8.4, such as the use of equipment with state-of-the-art noise shielding and muffling devices, sound levels at 50 feet could be attenuated below 75 dBA. Therefore, impacts would be less than significant.
Table 5-29 Alternative 13 (ACE) Received Construction Noise Levels

<table>
<thead>
<tr>
<th>Construction Phase</th>
<th>Equipment Type</th>
<th>Sound Level at 50 feet from Equipment (L_{max})</th>
<th>Sound Level at 100 feet from Equipment (L_{max})</th>
<th>Sound Level at 200 feet from Equipment (L_{max})</th>
<th>Sound Level at 400 feet from Equipment (L_{max})</th>
<th>Applicable Reach(es)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>1, 6</td>
</tr>
<tr>
<td></td>
<td>Loader</td>
<td>78</td>
<td>72</td>
<td>66</td>
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<tr>
<td></td>
<td>Water Truck</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
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</tr>
<tr>
<td>Place Storm Drain and Piping</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
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<tr>
<td></td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
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<td></td>
<td>Crane</td>
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<td>79</td>
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<td></td>
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<td>79</td>
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<td>Compactor</td>
<td>80</td>
<td>74</td>
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<td>62</td>
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<tr>
<td>Excavation Grade Control</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
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<td>67</td>
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<tr>
<td>Grouted Riprap</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>4</td>
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<td>Compacted Fill</td>
<td>Tractor</td>
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<td>Water Truck</td>
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<td>74</td>
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<td>Roller – Compactor</td>
<td>73</td>
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<tr>
<td>Excavation Embankment</td>
<td>Scraper</td>
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<td>79</td>
<td>73</td>
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<td>3, 4, 6, 7, 8</td>
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<td>Riprap</td>
<td>Hydraulic Excavator</td>
<td>85</td>
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<td>4, 8</td>
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<tr>
<td>Aggregate Base Course</td>
<td>Loader</td>
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<td>Grader</td>
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<td>79</td>
<td>73</td>
<td>67</td>
<td>6, 7</td>
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<tr>
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<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
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<tr>
<td>Asphalt Pavement</td>
<td>Paver</td>
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<td>79</td>
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<tr>
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<td>72</td>
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<td>67</td>
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<tr>
<td>Concrete Demolition</td>
<td>Loader</td>
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<td>72</td>
<td>66</td>
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<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>6, 7, 8</td>
</tr>
<tr>
<td></td>
<td>Crane</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
</tbody>
</table>

(a) Source: FHWA 2006.

**Operational Impacts**

Alternative 13 would have no significant adverse effect on noise in the study area. Impacts would be similar to those discussed under Alternative 10 above.

**Alternative 16 (AND)**

**Construction Impacts**

Construction would be more extensive under Alternative 16 compared to Alternatives 10 and 13 due to additional construction phases, a longer construction schedule, and additional truck trips due greater amounts of construction and excavation. Construction would occur over a period of 15 years.
Noise Significance Criterion 7: A violation of LAMC restrictions on construction equipment operating within 500 feet of residential uses between the hours of 7 a.m. to 10 p.m. to 75 dBA (Ldn).

The 75 dBA (Ldn) threshold in Noise Significance Criterion 7 is an average of sound levels over a 24-hour period. The sound levels associated with equipment in Table 5-30 are maximum sound levels. For the purpose of comparing these maximum sound values to an averaged regulatory threshold, the average sound level associated with each type of construction equipment is equated to the maximum values. Thus, the analysis is conservative since sound levels of equipment averaged over a work day would be less than their maximum sound levels.

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LAMC restrictions because equipment would not be located within 500 feet of residential structures.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. The Los Angeles River is a soft bottom trapezoidal channel with an average invert width of 200 feet through Reaches 5 and 6. Thus, most equipment would be near or within 100 feet of residential structures. Table 5-30 shows the estimated sound levels at various distances from the noise source. At 100 feet, the Lmax associated with most equipment would exceed 75 dBA during daytime hours. However, most construction work would occur within the invert, approximately 20 to 25 feet below grade. Thus, the sloped embankments would attenuate sound levels to varying degrees. Furthermore, since there would be no construction during the night, the potential for exceeding the 75 dBA (Ldn) is low. In cases where construction is expected to occur on the embankments, a temporary sound wall would be constructed. Sound walls can further attenuate sound levels by 5 dB. With implementation of sound walls as needed, sound levels would be sufficiently attenuated to below 75 dBA (Ldn). Impacts would be less than significant.

Noise Significance Criterion 8: A violation of LACC restrictions on construction noise levels at residential properties (see Table 5-25).

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LACC restrictions because equipment would not be located near residential structures such that the 75 dBA restriction would be exceeded.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. Construction may require the use of mobile and stationary equipment within the vicinity of residential structures under or over a 10 day period. As listed in Table 5-28, the maximum sound levels associated with construction equipment at 50 feet from residential structures range from 73 dBA (Lmax) to 86 dBA (Lmax). Maximum sound levels associated with construction equipment at 100 feet from residential structures range from 67 dBA (Lmax) to 80 dBA (Lmax). However, the estimates are maximum sound levels associated with equipment operating under full power. It is unlikely that construction equipment will operate at full power for the duration of the work day. Thus, the maximum sound level for equipment operating at or under 100 feet from residential structures would likely be lower. Furthermore, temporary sound walls would be deployed when constructing within the vicinity of residential structures. In general, these structures reduce the sound level by 5 dB. Based on the above, it is unlikely that the average sound level would exceed 75 dBA. In addition, other avoidance measures identified in section 5.8.4 would be employed, such as the
use of construction equipment with state-of-the-art noise shielding and muffling devices. Impacts would be less than significant.

**Noise Significance Criterion 9:** A violation of LAMC requirements that construction and industrial machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is technically infeasible.

Construction in Reaches 5 through 8 could occur within 50 feet of residential, recreational, industrial, and commercial land uses. Reaches 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. The Los Angeles River is a trapezoidal channel with an average invert width of 200 feet from Reaches 5 through 8. Thus, most equipment would be near or within 100 feet of residential, commercial, and industrial structures. Table 5-28 shows the estimated sound levels at various distances from the noise source. At 50 feet, the Lmax associated with most equipment would range from 75 dBA to 85 dBA.

At 50 feet from these structures, most construction work would need to occur on the embankment. As a result, the sloped embankments would attenuate sound levels to varying degrees. Temporary sound wall would be constructed for such work. Sound walls can further attenuate sound levels by 5 dB. With implementation of sound walls as needed as well as other measures at Section 5.8.4, sound levels at 50 feet could be attenuated below 75 dBA. In addition, other measures identified in Section 5.8.4, such as the use of equipment with state-of-the-art noise shielding and muffling devices, would be used. Therefore, impacts would be less than significant.

### Table 5-30 Alternative 16 (AND) Received Construction Noise Levels

<table>
<thead>
<tr>
<th>Construction Phase</th>
<th>Equipment Type</th>
<th>Sound Level at 50 feet from Equipment (Lmax)a</th>
<th>Sound Level at 50 feet from Equipment (Lmax)b</th>
<th>Sound Level at 100 feet from Equipment (Lmax)a</th>
<th>Sound Level at 200 feet from Equipment (Lmax)b</th>
<th>Applicable Reach(es)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>1, 5, 6, 8</td>
</tr>
<tr>
<td></td>
<td>Loader</td>
<td>78</td>
<td>72</td>
<td>66</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Truck</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Place Storm Drain and Piping</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>3, 4, 5</td>
</tr>
<tr>
<td></td>
<td>Tractor</td>
<td>86</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crane</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
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</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paver</td>
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<td>79</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compactor</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Excavation Grade Control</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>4, 8</td>
</tr>
<tr>
<td>Grouted Riprap</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>4, 8</td>
</tr>
<tr>
<td>Compacted Fill</td>
<td>Tractor</td>
<td>86</td>
<td>86</td>
<td>74</td>
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<td>3, 4, 5, 8</td>
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<tr>
<td></td>
<td>Loader</td>
<td>78</td>
<td>72</td>
<td>66</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Truck</td>
<td>80</td>
<td>74</td>
<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>67</td>
<td>61</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Excavation Embankment</td>
<td>Scraper</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td>Riprap</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td>3, 5, 8</td>
</tr>
<tr>
<td>Aggregate Base Course</td>
<td>Loader</td>
<td>78</td>
<td>78</td>
<td>66</td>
<td>60</td>
<td>6, 7</td>
</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>79</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
</tbody>
</table>
### Operational Impacts

Alternative 16 would have no significant adverse effect on noise in the study area. Impacts would be similar to those discussed under Alternative 10 above.

### Alternative 20 (RIVER)

#### Construction Impacts

Construction would be greater than under Alternative 16 as this alternative would entail more excavation. Construction would occur over a period of 15 years.

**Noise Significance Criterion 7:** A violation of LAMC restrictions on construction equipment operating within 500 feet of residential uses between the hours of 7 a.m. to 10 p.m. to 75 dBA (Ldn).

The 75 dBA (Ldn) threshold in Noise Significance Criterion 7 is an average of sound levels over a 24-hour period. The sound levels associated with equipment in Table 5-31 are maximum sound levels. For the purpose of comparing these maximum sound values to an averaged regulatory threshold, the average sound level associated with each type of construction equipment is equated to the maximum values. Thus, the analysis is conservative since sound levels of equipment averaged over a work day would be less than their maximum sound levels.
Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LAMC restrictions because equipment would not be located within 500 feet of residential structures.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. The Los Angeles River is a soft bottom trapezoidal channel with an average invert width of 200 feet through Reaches 5 and 6. Thus, most equipment would be near or within 100 feet of residential structures. Table 5-31 shows the estimated sound levels at various distances from the noise source. At 100 feet, the Lmax associated with most equipment would exceed 75 dBA during daytime hours. However, most construction work would occur within the invert, approximately 20 to 25 feet below grade. Thus, the sloped embankments would attenuate sound levels to varying degrees. Furthermore, since there would be no construction during the night, the potential for exceeding the 75 dBA (Ldn) is low. In cases where construction is expected to occur on the embankments, a temporary sound wall would be constructed. Sound walls can further attenuate sound levels by 5 dB. With implementation of sound walls as needed, and other measures identified in Section 5.8.4, such as the use of equipment with state-of-the-art noise shielding and muffling devices, sound levels would be sufficiently attenuated to below 75 dBA (Ldn). Impacts would be less than significant.

**Noise Significance Criterion 8:** A violation of LACC restrictions on construction noise levels at residential properties (see Table 5-25).

Construction in Reaches 1 through 4 would primarily occur near open space and recreational land uses. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. Construction at these locations would not violate LACC restrictions because equipment would not be located near residential structures such that the 75 dBA restriction would be exceeded.

Construction in Reach 5 and 6 would primarily occur in residential land uses. Many residential structures directly abut the channel embankments throughout these two reaches. Construction may require the use of mobile and stationary equipment within the vicinity of residential structures under or over a 10 day period. As listed in Table 5-31, the maximum sound levels associated with construction equipment at 50 feet from residential structures range from 73 dBA (Lmax) to 86 dBA (Lmax). Maximum sound levels associated with construction equipment at 100 feet from residential structures range from 67 dBA (Lmax) to 80 dBA (Lmax). However, the estimates are maximum sound levels associated with equipment operating under full power. It is unlikely that construction equipment will operate at full power for the duration of the work day. Thus, the maximum sound level for equipment operating at or under 100 feet from residential structures would likely be lower. Furthermore, temporary sound walls would be deployed when constructing within the vicinity of residential structures. In general, these structures reduce the sound level by 5 dB. Based on the above, it is unlikely that the average sound level would exceed 75 dBA. In addition, other avoidance measures identified in section 5.8.4 would be employed, such as the use of construction equipment with state-of-the-art noise shielding and muffling devices. Impacts would be less than significant.

**Noise Significance Criterion 9:** A violation of LAMC requirements that construction and industrial machinery shall not exceed a maximum of 75 dBA at a distance of 50 feet, except where compliance is technically infeasible.

Construction in Reaches 5 through 8 could occur within 50 feet of residential, recreational, industrial, and commercial land uses. Reaches 5 and 6 would primarily occur in residential land uses. Many residential
structures directly abut the channel embankments throughout these two reaches. Construction at Reach 7 and Reach 8 would primarily occur near industrial and commercial land uses. The Los Angeles River is a trapezoidal channel with an average invert width of 200 feet from Reaches 5 through 8. Thus, most equipment would be near or within 100 feet of residential, commercial, and industrial structures. Table 5-28 shows the estimated sound levels at various distances from the noise source. At 50 feet, the Lmax associated with most equipment would range from 75 dBA to 85 dBA.

At 50 feet from these structures, most construction work would need to occur on the embankment. As a result, the sloped embankments would attenuate sound levels to varying degrees. Temporary sound wall would be constructed for such work. Sound walls can further attenuate sound levels by 5 dB. With implementation of sound walls as needed as well as other measures at Section 5.8.4, such as the use of equipment with state-of-the-art noise shielding and muffling devices, or limiting the pieces of construction equipment used simultaneously, sound levels at 50 feet could be attenuated below 75 dBA. Therefore, impacts would be less than significant.

Operational Impacts
Alternative 20 would have no significant adverse effect on noise in the study area. Impacts would be similar to those discussed under Alternative 10 above.
Table 5-31 Alternative 20 (RIVER) Received Construction Noise Levels

<table>
<thead>
<tr>
<th>Construction Phase</th>
<th>Equipment Type</th>
<th>Sound Level at 50 feet from Equipment (Lmax)</th>
<th>Sound Level at 100 feet from Equipment (Lmax)</th>
<th>Sound Level at 200 feet from Equipment (Lmax)</th>
<th>Applicable Reach(es)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>Tractor</td>
<td>86</td>
<td>74</td>
<td>68</td>
<td>1, 2, 3, 5, 6, 8</td>
</tr>
<tr>
<td></td>
<td>Loader</td>
<td>78</td>
<td>66</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Truck</td>
<td>80</td>
<td>68</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>61</td>
<td>55</td>
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</tr>
<tr>
<td>Place Storm Drain and Piping</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td>3, 4, 5, 7</td>
</tr>
<tr>
<td></td>
<td>Tractor</td>
<td>86</td>
<td>74</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crane</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paver</td>
<td>85</td>
<td>73</td>
<td>67</td>
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<td></td>
<td>Compactor</td>
<td>80</td>
<td>74</td>
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</tr>
<tr>
<td>Excavation Grade Control</td>
<td>Hydraulic Excavator</td>
<td>85</td>
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<td>67</td>
<td>4, 8</td>
</tr>
<tr>
<td></td>
<td>Grouted Riprap</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td>4, 8</td>
</tr>
<tr>
<td>Compacted Fill</td>
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<td>86</td>
<td>74</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loader</td>
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<td>Water Truck</td>
<td>80</td>
<td>68</td>
<td>62</td>
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</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>61</td>
<td>55</td>
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<tr>
<td>Excavation Embankment</td>
<td>Scraper</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td>3, 4, 5, 6, 8</td>
</tr>
<tr>
<td>Riprap</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td>2, 3, 5, 7, 8</td>
</tr>
<tr>
<td>Aggregate Base Course</td>
<td>Loader</td>
<td>78</td>
<td>66</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roller – Compactor</td>
<td>73</td>
<td>61</td>
<td>55</td>
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<td>Asphalt Pavement</td>
<td>Paver</td>
<td>85</td>
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<td>Geotextile Turf Reinforcement</td>
<td>Loader</td>
<td>78</td>
<td>66</td>
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<tr>
<td>Rock at Geotextile Tie-In</td>
<td>Loader</td>
<td>78</td>
<td>66</td>
<td>60</td>
<td>2, 3, 6</td>
</tr>
<tr>
<td></td>
<td>Grader</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Concrete Demolition</td>
<td>Loader</td>
<td>78</td>
<td>66</td>
<td>60</td>
<td>2, 3, 5, 8</td>
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<tr>
<td></td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>73</td>
<td>67</td>
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<tr>
<td>Remove Spalls</td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td>2, 5, 8</td>
</tr>
<tr>
<td>Chain Link Fence Demolition</td>
<td>Loader</td>
<td>78</td>
<td>66</td>
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<td>Utility Pole Relocation</td>
<td>Tractor</td>
<td>86</td>
<td>74</td>
<td>68</td>
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<td></td>
<td>Crane</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Grouted Riprap Demolition</td>
<td>Loader</td>
<td>78</td>
<td>66</td>
<td>60</td>
<td>2, 5</td>
</tr>
<tr>
<td></td>
<td>Hydraulic Excavator</td>
<td>85</td>
<td>73</td>
<td>67</td>
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<tr>
<td>Riprap Demolition</td>
<td>Hydraulic Excavator</td>
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<td>73</td>
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<td>2, 4, 5</td>
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<tr>
<td>Sheet Pile Wall Demolition</td>
<td>Crane</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td>2, 5</td>
</tr>
<tr>
<td>Asphalt Demolition</td>
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<td>78</td>
<td>73</td>
<td>67</td>
<td>2, 5</td>
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<td>67</td>
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<td>Retaining Wall Gravel</td>
<td>Loader</td>
<td>78</td>
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<tr>
<td>Subdrain System</td>
<td>Loader</td>
<td>78</td>
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<td>Loader</td>
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<tr>
<td></td>
<td>Crane</td>
<td>85</td>
<td>73</td>
<td>67</td>
<td></td>
</tr>
</tbody>
</table>

(a) Source: FHWA 2006.
5.8.4 Best Management Practices and Impact Avoidance Measures

To minimize the impact of construction activities associated with implementation of all alternatives, construction contractors will adhere to the following:

- Develop and implement a project noise control plan that identifies when construction activities would occur and where and how avoidance measures shall be used. Construction activities would generally occur between the hours of 8 a.m. and 6 p.m. Monday through Friday, and 8 a.m. and 5 p.m. Saturday. Construction and operations would not occur on Sunday or a national holiday. The plan will require the identification of a Noise Control Coordinator, who will be available to receive and respond to any concerns from residents regarding construction noise. Residents shall be notified prior to the start of construction activities and informed of the Coordinator’s contact information. Signage will also be posted on the construction site with Noise Control Coordinator’s contact information.

- Use power construction equipment state-of-the-art noise shielding and muffling devices.

- Whenever construction occurs within 500 feet of occupied residences, temporary barriers shall be constructed around the construction sites to shield the ground floor of the noise-sensitive uses. These barriers shall be of ¾-inch medium density plywood sheeting, or equivalent, and shall achieve a Sound Transmission Class of 30 or greater, based on certified sound transmission loss data taken according to American Society for Testing and Materials Test Method E90 or as approved by the City of Los Angeles Building Department.

- Construction equipment staging areas shall be located as far as practicable from residential areas.

- Quieter “sonic” pile drivers shall be used as necessary, unless engineering studies are submitted to the City of Los Angeles showing this is not feasible and cost effective, based on geotechnical considerations.

- Routes for heavy construction site vehicles shall be identified to minimize noise impacts to residences and noise-sensitive receptors.

- Impose construction hours that are more restrictive than those set forth in the LAMC if necessary and when practical.

- Require vehicle parking and deployment activities to be separated and buffered from sensitive uses.

- Limit haul truck or other vehicle speed on roads adjacent to residences and on unpaved roadways.

- Notify residents about type and schedule of construction.

5.9 RECREATION

5.9.1 Regulatory Framework

Federal

The main Federal regulation that pertains to recreation is the Americans with Disabilities Act (ADA). ADA standards for accessible public facilities require that reasonable accommodation be made to allow disabled citizens access to recreational and other facilities.

State

Two state parks have been developed within the study area. These are the Rio De Los Angeles State Park in the Taylor Yard area (Reach 6) and the Los Angeles State Historic Park in the Cornfields area (Reach 7). General plans for these two parks provide guidelines for land use and recreational development.
The Quimby Act allows California municipalities to require that new residential subdivisions set aside parklands or to charge fees to developers in lieu of setting aside parklands. The City of Los Angeles has enacted ordinances that implement the Quimby Act, requiring that land be set aside for parks and establish fees for other types of permits and approvals.

Local

Within the City of Los Angeles, the Department of Recreation and Parks operates over 16,000 acres of parkland, made up of some 150 recreation centers and over 350 park sites citywide. Parks in Glendale are operated and maintained by the City of Glendale Department of Parks, Recreation & Community Services. Parks in Burbank are operated and maintained by the City of Burbank Park, Recreation & Community Services Department.

In 1978, the City of Los Angeles prepared the Griffith Park Master Plan, which is currently under revision. A draft version of the master plan was circulated in 2005 but was rejected. It is not known when the revised draft of the master plan would be prepared.

5.9.2 Significance Criteria

The proposed project alternatives under consideration would result in a significant impact related to recreation if they would (City of Los Angeles 2002):

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated,
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment,
- Substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity, or
- Implement operational or construction-related activities related to the placement of project facilities that would cause a substantial long-term disruption of any institutionally recognized recreational activities.

5.9.3 Environmental Impacts

No Action Alternative

Construction Impacts

No impacts to recreational resources would occur from construction under this alternative because construction would not occur.

Operational Impacts

Because the study area is largely developed, the potential for substantial conversion of land to recreational uses is limited. However, recreational features will continue to be pursued by state or local entities wishing to develop recreational park areas along the River corridor. State and local groups, such as the Santa Monica Mountains Conservancy and Mountains Recreation Conservation Authority, are likely to continue working to enhance the Los Angeles River Greenway through improvements of existing facilities along the River and installation of new park features.

The Metropolitan Transportation Agency (MTA) and City of Los Angeles are actively planning a bridge across the river that will provide a safe and convenient bicycle and pedestrian link between the Los Angeles River Bikeway on the right bank and the Taylor Yard on the east bank of Reach 6. The proposed
bikeway improvement will consist of a minimum 15-foot-wide bridge over the River, and a minimum 12-foot-wide connection to the Union Pacific’s Taylor Yard property (LARRC 2011d). As part of the North Atwater Park Expansion Project, a multimodal bridge is proposed to provide a connection from North Atwater Park, across North Atwater Creek and up to the banks of the River in Reach 3. This bridge will provide pedestrians and bicyclists access to the River (LARRC 2011d).

Demand for recreation in the area is expected to increase proportionally to growth of population in the study area. Continued implementation of the Los Angeles River Revitalization Master Plan (City of Los Angeles 2007) could increase recreational opportunities significantly over the long term in the study area.

**Alternative 10 (ART)**

**Construction Impacts**

Alternative 10 would have no significant adverse effect on recreation and public access resources in the study area. During the construction period, the alternative may result in minor and temporary adverse recreation and public access effects, including:

- Temporary closure of trail systems, access points, bridges, or crossings along the River (Reaches 1-3),
- Temporary partial closure of Harding golf course (Reach 3) during construction of side channel
- Temporary full closure of Los Feliz golf course during construction (Reach 3)
- Realignment/relocation of trail, access points, bridges, or crossings (Reaches 2-3),
- Temporary increase in noise and air pollution in the vicinity of construction, which may degrade the recreation experience at adjacent facilities, and
- Temporary restrictions on activities such as walking/jogging, cycling, equestrian, non-motorized boating, and bird watching.

Temporary closure of recreational facilities or reduction in access or availability of recreational features during the construction period would occur. This includes Pollywog Park and Bette Davis Park, and associated trails and park along the river corridor. However, adverse effects associated with any temporary closures of trail systems, access points, or crossings along the River and adjacent areas would be temporary and less than significant. Effects would include temporarily reduced access to the River as well as diminished walking, biking, and golfing opportunities at specific locations during the construction period. Los Feliz golf course may require temporary full closure, and Harding Golf Course will likely require partial closure and remain open during construction of the side channel in Reach 4. Affected golfers would be likely to visit another course during construction at these sites, possibly substituting the nearby Roosevelt course in Griffith Park. The Harding Golf Course would not be permanently modified by the adjacent restoration feature.

Los Feliz Golf Course will be modified permanently. A portion of the Los Feliz Golf Course property will be lowered and restored with riparian and wetland vegetation, but the greens would not be altered. The alteration would not impact the long-term use of the facility, but would result in temporary impacts to use of the course. Flood inundation is not expected to last more than a day at a time during and just after a rainfall event. The addition of restoration features along Rio De Los Angeles State Park (Taylor Yard) is consistent with the park’s General Plan, and is expected to complement and expand upon existing resources.

Although no specific recreation plan was formulated to correspond to Alternative 10, if this restoration alternative were to be selected for implementation, associated recreation facilities compatible with the restoration features would be anticipated to be implemented at similar but slightly reduced scale to those described for Alternative 13, increasing the quantity of existing trails within the project footprint.
extending trails/paths, and connecting project features with pedestrian bridges. Recreation features will be planned to connect to City of Burbank facilities whenever practicable. Construction of any recreation features would have minimal impacts on other resource categories.

Operational Impacts and Indirect Effects of Project Construction and Operation

The alternative would not decrease the quality or quantity of recreation and public access resources in the study area. Since recreational features that fall within the footprint of this project and which are affected by the project or experience increased use due to the project will be constructed or repaired in compliance with applicable building codes and health and safety regulations. Benefits include:

- Improved aesthetic quality of the River
- Increased quality, quantity, and diversity of recreation resources along the River, such as trails, bike paths, benches, signage, River access points, maintenance ramps, etc. Enhanced recreation resources along the river, such as new opportunities for outdoor education, or recreation-based businesses (recreation equipment rental, riding, or cycling trips, etc.), and
- Increased quantity of approved access points to the River, reducing use of unapproved access points.

Alternative 10 would benefit recreation and public access over the long term, in ways that are compatible with ecosystem restoration. Visitation to the river and adjacent lands for passive recreational purposes would be expected to increase due to restoration construction and operation. Visitors would view the restored area, utilize the trails within restoration features, use bike path extensions, and engage in other passive recreation activities compatible with the restored river. Because many restoration areas are in or adjacent to lands already in public preservation or park status, visitors to these areas would experience the effects of the restored environment at these sites. Other beneficial effects include increased public awareness of the recreation resources in the project reach and increased public health and safety from improved water quality along the River. Habitat quality improvements may have larger beneficial effects on specific recreation activities which are heavily dependent on health of the river, such as bird watching.

Relocation of LATC site functions to a location elsewhere in the Los Angeles Basin could potentially result in effects to recreation in the Los Angeles Basin, if the new site were located adjacent to existing recreation facilities. Construction activities, such as the presence of trucks and other equipment, could reduce the quality of nearby recreation or result in closures to adjacent bicycle or hiking trails or parks. Operation of the site could result in permanent closures of recreation sites, if it is necessary for expansion of an existing site or development of a new site. However, because the relocated site functions would be located within an industrial zone, no permanent or significant effects to recreation are anticipated. Prior to site selection, the CEQA lead agency would conduct detailed CEQA analysis to assess effects of relocation. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects would be the same for all action alternatives.

Alternative 13 (ACE)

Construction Impacts

Alternative 13 would have no significant adverse effect on recreation and public access resources in the study area. Alternative 13 would result in minor and temporary adverse effects similar to those described for Alternative 10, with the addition of temporary adverse effects on access to playing fields at Ferraro Fields, where side channel and daylighted stream features would be constructed Alternative 13. Access would not be fully restricted, but there may be occasions when the fields are not accessible by car due to construction closures.
In addition, construction of new and extended recreation features would be anticipated to occur along with construction of Alternative 13. Alternative 13 is a restoration plan, but if this plan were to be selected for implementation, a plan formulated for passive recreation corresponding with Alternative 13 would provide new recreational features compatible with the restoration plan. The recreation plan associated with this alternative would provide several miles of new unpaved non-motorized multi-use trail with signage, a short extension of the current southerly end of the LA River Bike Path, one small bridge within Taylor Yard, one bridge within the LATC site, two parking lots (one at Taylor Yard and one at LATC), four restrooms (at Bette Davis Park, Taylor Yard, and LATC), trail access points throughout the study area, including signage, benches, and trash receptacles, several wildlife viewing points, and pedestrian underpasses under bridges along the river. Construction of the recreation features would have minimal impacts on other resource categories.

Operational Impacts and Indirect Effects of Construction and Operation of the Project

Similar to Alternative 10, Alternative 13 would have no significant adverse effect on recreation and public access resources in the study area. The alternative would not decrease the long-term quality or quantity of recreation and public access resources in the study area. In contrast, the alternative would benefit recreation and public access over the long term through increased quality, quantity, and access to parks and trails along the River, increasing public recreation resource opportunities for local and regional visitors. Potential benefits to recreation may be slightly higher than for Alternative 10 due to the increased level of restoration under Alternative 13.

Alternative 16 (AND)

Construction Impacts

Alternative 16 would have no significant adverse effect on recreation and public access resources in the study area. Minor and temporary adverse recreation and public access effects during the construction period would be the same as those described for Alternative 13. Like Alternative 10, no specific recreation plan was formulated to correspond to this alternative; however, were this alternative to be selected for implementation, construction of recreation features associated with this alternative would be anticipated to be similar to those described for Alternative 20 but at reduced scale for areas not within the restoration footprint of this alternative. Recreation features would not have more than minimal effects on other resource categories.

Operational Impacts and Indirect Effects of Project Construction and Operation

Alternative 16 would have no significant adverse effect on recreation and public access resources in the study area. The alternative would not decrease the long-term quality or quantity of recreation and public access resources in the study area. In contrast, the alternative would benefit recreation and public access over the long term. Potential benefits to recreation may be slightly higher than for Alternative 13 due to the increased level of restoration under Alternative 16. In addition to the beneficial impacts mentioned for Alternative 13, the inclusion of channel bed deepening and terrace bank submeasures may further increase the aesthetic quality of the recreation resource and the quality of the recreation experience to visitors.

Alternative 20 (RIVER)

Construction Impacts

Alternative 20 would have no significant adverse effect on recreation and public access resources in the study area. During the construction period, the alternative would result in the same minor and temporary adverse recreation and public access effects as detailed for Alternative 16. In addition, in Reach 7 temporary partial closure of Los Angeles State Historic Park for construction of marsh/wetland
restoration features would be required. The addition of restoration features at Los Angeles State Historic Park is consistent with the park’s General Plan and is expected to complement existing recreation and educational opportunities at the park.

Alternative 20 is a restoration plan, but the features of a recreation plan compatible with the restoration would be constructed as well. Along with the features included with the recreation plan corresponding with Alternative 13, the recreation plan corresponding to Alternative 20 would provide additional unpaved trail (Reaches 3, 7, and 8), additional extension of the LA River Bike Path (Reaches 6-8), two bridges spanning the River (Reaches 4 and 8), three additional bridges within the LATC site in Reach 8, additional trail access points (Reaches 3 and 8), and two additional pedestrian underpasses along the river (Reach 7) to support trail connectivity. Recreation features would not have more than minimal effects on other resource categories.

Operational Impacts and Indirect Effects of Project Construction and Operation

Alternative 20 would have no significant adverse effect on recreation and public access resources in the study area. The alternative would not decrease the quality or quantity of recreation and public access resources in the study area. In contrast, the alternative would benefit recreation and public access over the long term. Potential benefits would be similar to those discussed under Alternative 16 above, but may be slightly higher for Alternative 20 due to the increased level of restoration.

5.9.4 Best Management Practices and Impact Avoidance Measures

No impact avoidance measures are required for recreation and public access resources since no significant adverse effects have been identified.

Any minor and temporary adverse effects from construction could be offset through a variety of public outreach and information measures in cooperation with local parks departments, business owners, and residents, such as:

- Public media/meetings to provide clear information on the types and durations of disruptions to the River and adjacent resources,
- Signed detour routes for affected roads as well as pedestrian, bicycle, and equestrian trails, and river access points, and
- Signage at construction areas with information relevant to recreation users (length of closure, alternative access points, etc.).
- Working with park representatives on timing of park and golf club closures to minimize effects on recreational access and use.
- Consult with park maintenance personnel prior to implementation of measures to coordinate maintenance during construction and operations.

5.10 AESTHETICS

5.10.1 Regulatory Framework

The Conservation Element of the City of Los Angeles General Plan contains objectives, policies, and programs for the City’s resources, which include land forms and scenic vistas. The conservation element contains the following land form and scenic vista objective and policy:

Objective: Protect and reinforce natural and scenic vistas as irreplaceable resources and for the aesthetic enjoyment of present and future generations.
Policy: Continue to encourage and/or require property owners to develop their properties in a manner that would, to the greatest extent practical, retain significant existing land forms (e.g., ridge lines, bluffs, unique geologic features) and unique scenic features (historic, ocean, mountains, unique natural features) and/or make possible public view or other access to unique features or scenic views.

The Los Angeles County General Plan (currently being updated) contains goals and policies pertaining to scenic resources (Los Angeles County 1993). One of the goals is to conserve aesthetic resources and protect the environment. General policies for this goal include the following:

Policy 15 – Protect areas that have significant natural resources and scenic values, including significant ecological areas, the coastal zone, and prime agricultural lands.

Policy 21 – Develop community parks, particularly in areas of the greatest deficiency, and take advantage of opportunities to preserve large natural and scenic areas.

Guidelines for maintaining aesthetic value are developed from a combination of criteria established for CEQA, and those put forth in applicable city, county, or state General Plans. For this project, applicable guidelines are derived from the City of Los Angeles CEQA guidelines, as well as the General Plans of the Burbank and Glendale.

5.10.2 Significance Criteria

The restoration measures would be considered to have a significant adverse effect if any of the following were to occur as a result of the project:

- Conflict with plans, policies, or regulations governing scenic resources,
- Permanent and substantial loss or degradation of a scenic vista or public viewshed,
- Permanent and substantial loss or degradation of components of scenic resources, such as natural features, parks, historic buildings, or architectural character,
- Creation of a new source of substantial light or glare that would adversely affect day or nighttime views in the area, or
- Obfuscation of existing light sources that result in reduced safety.

5.10.3 Environmental Impacts

No Action Alternative

Construction Impacts

No impacts to aesthetic resources would occur from construction under this alternative because construction would not occur.

Operational Impacts

Since channelization of the River, aesthetic conditions have declined. The natural setting of the River is gone and replaced with concrete that leads to the collection and proliferation of trash and graffiti. However, over time, substrate and debris deposits have amassed soils suitable for establishment of vegetation, thereby softening the look of the concrete channel and creating a more natural appearance.

Without restoration efforts, these trends are expected to continue. The area would continue to be vandalized and collect trash, and homeless encampments may increase with the growing population.

Continued discharge of greywater and stormwater would contribute to unpleasant odors. Increased use
tertiary treated water for irrigation and other uses may reduce the amount of water flowing in the River
during the dry months, further reducing the visual quality of the channel. Lighting conditions are not
expected to change significantly under current city or county guidelines.

Although continued deposition of substrate and growth of vegetation is likely to occur under the No
Action Alternative, attracting increasing numbers of shorebirds, waterfowl, and wading birds to the area,
removal of this vegetation is likely to occur. Channel maintenance is required to facilitate flood flows in
the channel, and the removal of all vegetation within the channel is generally prescribed although it is
subject to funding availability.

Small and localized improvement projects for recreation or independent restoration efforts are anticipated
to occur in the foreseeable future even if this larger study is not pursued; these projects would slowly
improve the aesthetics of the River a small area at a time. For example, FoLAR organizes a river cleanup
event each year, inviting citizens to assist in removing trash and debris from the River.

Alternative 10 (ART)

Construction Impacts
Impacts to aesthetic condition would occur during the construction phase of this alternative. The proposed
restoration measures under this alternative require large equipment to be present, extensive earthwork be
done, and mechanical or chemical removal of vegetation over expansive areas.

Many of the areas targeted for restoration are already in industrial use and therefore visually degraded.
Furthermore, the River channel and staging areas are not generally located in areas that are readily visible
from roadways, neighborhoods, or nearby parks and are not in areas that have special aesthetic value.

Riparian plantings would occur in all reaches under this alternative, as would non-native plant removal,
trash removal, installation of linear strips for biofiltration, greening of River channel walls, and creation
of buffer zones and planted swales. These components require little to no machinery, can be built or
installed quickly, and would have less than significant impacts on aesthetic resources.

In areas regularly utilized for recreation, where aesthetic appeal is particularly desirable, construction
efforts would be streamlined to occur quickly, to avoid interfering with recreational opportunities, and to
affect as small an area as possible in order to minimize impacts. Staging areas would be located away
from recreation sites as much as possible. Overall, due to the temporary nature of the impacts to visual
resources, and the objective of creating dramatically improved visual conditions as a result of restoration,
the adverse impacts are less than significant.

Operational Impacts
Adverse impacts of operation may result as measures are taken to ensure proper flood flow conveyance
within the channel, a constraint of the project. This may require removal of vegetation, both native and
non-native, if it is deemed necessary to avoid impacts to flood risk management through the life of the
project. Within the restored areas, native vegetation removal to avoid impacts to flood risk management
would be anticipated to be minimal, as features will be designed to avoid such impacts. The sponsor
would perform invasives management throughout the restoration footprint, including all constructed
restoration features and in-channel areas of the River and lower tributaries. The LACDA OMRRR plan
would be modified to accommodate the restoration project, with maintenance of the restoration project a
City responsibility under the restoration OMRRR plan. The LACDA OMRRR manual would be modified
to exclude constructed restoration features and would exclude invasives management throughout the
restoration project footprint. USACE would continue to be responsible for maintaining all other aspects of
the portions of the LACDA project that overlap with the restoration project footprint. USACE would also modify the LACDA operation and maintenance to allow native vegetation to remain in the channel to the extent it does not have more than minimal effect on conveyance. Detailed hydrologic and hydraulic analysis will be used during the design phase to further determine how much vegetation may be supported in the channel without affecting the flood risk management function. Riparian areas planted through restoration will be preserved on overbank areas, where they will not inhibit flood conveyance. Similarly, plantings on the channel walls or greening of the channel will also be designed in this way.

Maintenance of the restoration features will require presence of trucks, which could potentially compromise aesthetics. However, given their temporary presence and need to maintain visual conditions, their adverse impact is less than significant.

Aesthetics along the River will improve immediately following completion of the construction phase and will continue to improve over time, resulting in substantial and significant beneficial impacts that increase with each year. Riparian plantings along daylighted culverts, side channels, and overbank areas will mature and flourish, providing a greening and softening of the River channel. A total of 251 acres of valley foothill riparian community will be restored on overbank areas of the river, including those areas within the historic wash of LATC in Reach 8. The project area will be treated for invasive plant removal, addressing a total of 338 acres throughout all reaches. A total of 15 streams entering the river will be daylighted, or removed from culverts, creating visually appealing swales or wetlands in Reaches 3, 4, 5, and 7. Overbank terraces, creation of side channels, and widening of the channel will further create additional habitat, which contributes to improvements in visual quality in Reaches 2-8. Because the effluent that is the primary source of water for existing and restored vegetation is tertiary treated, reducing nutrient levels in the water, nutrient issues are not anticipated to negatively affect restoration success or associated aesthetics. Aesthetics associated with water quality are expected to be improved with implementation of restoration alternatives through incidental “polishing” and filtration from restored vegetation. Overall, the final restoration project will substantially improve the current aesthetic condition, providing a greener corridor and better habitat for native wildlife, and thereby increasing enjoyment by human visitors. Impacts will be substantial and beneficial.

Indirect Effects and Actions Related to Construction and Operation

Indirect effects on aesthetic quality could result from relocating the LATC site functions to a different location within the Los Angeles Basin, although such effects would not be anticipated to be significant. Construction activities typically result in temporarily reduced visual quality of a site, as a result of construction equipment or earthwork. However, once construction is complete, equipment is removed. Operation of the new facility could result in impacts to the surrounding area if the facility creates a visual contrast to the existing landscape. However, any future site would be located within an industrial zone, where aesthetic quality is presumably already reduced and native vegetation is not expected to be present. Prior to site selection, the CEQA lead agency would conduct detailed CEQA analysis of the relocation of the site functions, including analysis of potential impacts to aesthetic quality. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

Alternative 13 (ACE)

Construction Impacts

Construction under Alternative 13 will create temporary adverse impacts to the study area that are the same as Alternative 10 in nature, but would affect an incrementally larger area. Again, construction efforts would temporarily affect visual appeal, but would be less than significant as they will be minimized by construction management protocols and the existing degraded visual condition. Some
proposed measures are anticipated to take longer to implement due to the expanded area covered by the alternative, therefore visual impacts would extend for an additional 121 work days compared to Alternative 10. Operation and maintenance activities would not interfere with visual appeal.

Operational Impacts

Once completed, beneficial impacts to visual condition will be incrementally improved over Alternative 10. A greater area of native riparian habitat will be established, and more side channels, wetlands, and open water habitat will be restored. Specifically, Alternative 13 provides the following improvements over Alternative 10; 22 additional riparian acres created throughout all reaches, three times greater soft river bottom habitat in Reach 6, 26 acres of freshwater marsh throughout all reaches, and adds vegetation to channel walls in Reaches 6 and 7. These additional habitats will further improve aesthetic value of the river.

Alternative 16 (AND)

Construction Impacts

Similar to Alternatives 10 and 13, construction efforts would temporarily affect the visual quality of all reaches within the study area. Some proposed measures are anticipated to take longer to implement due to the expanded area covered by the alternative, resulting in an additional 565 work days compared to Alternative 10. However, for the same reasons noted above, adverse impacts to visual condition will not be significant.

Operational Impacts

Once completed, beneficial impacts to visual condition will be incrementally improved over Alternatives 10 and 13. More side channels, wetlands, and open water habitat will be restored. Specifically, Alternative 16 provides the following improvements over Alternative 13; creates an additional 500 feet of soft river bottom habitat in Reach 8, 12 additional acres of freshwater marsh, creates additional terraces in Reaches 5, 6, and 8, and adds side channels within the historic wash within LATC in Reach 8. These additional habitats will further improve aesthetic value of the River.

Alternative 20 (RIVER)

Construction Impacts

Similar to Alternatives 10, 13 and 16, construction efforts would temporarily affect the visual quality of some areas within the study area. Some proposed measures are anticipated to take longer to implement due to the expanded area covered by this largest alternative, resulting in an additional 667 work days compared to Alternative 10. Construction impacts in Alternative 20 are more extensive in Reaches 2, 3, and 7 compared to Alternative 16. Aesthetic impacts in Reach 2 would be similar to other alternatives, as channel widening will occur within the existing river right of way. Aesthetic impacts in Reach 3 would be more extensive during construction due to the larger footprint for widening of the Verdugo Wash confluence. Aesthetic impacts in Reach 7 would be more extensive and may be longer in duration than Alternative 13 and 16 due to the larger footprint including construction at the Los Angeles State Historic Park and terracing of the adjacent river bank, with trestling of the railroad line along the bank. However, for the same reasons noted above, adverse impacts to visual conditions will not be significant.

Operational Impacts

Once completed, beneficial impacts to visual condition will be incrementally improved over all other alternatives. Additional channel improvements will be made at Verdugo Wash, and additional wetlands will be created at the Los Angeles River State Historic Park in Reach 7. This alternative provides the greatest potential for improved aesthetic value of the river.
5.11 PUBLIC HEALTH AND SAFETY, INCLUDING HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

5.11.1 Regulatory Framework

Federal

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) established prohibitions and requirements concerning closed and abandoned hazardous waste sites. The law authorizes two kinds of response actions: short-term removal to address releases or threatened releases requiring prompt response, and long-term remedial responses that permanently and significantly reduce the dangers from releases or threats of releases of hazardous substances that are serious but not immediately life threatening. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA). Title 40 CFR part 312 provides standards and practices for All Appropriate Inquiries.

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid and hazardous waste. RCRA goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner. The solid waste program, under RCRA Subtitle D, encourages states to develop comprehensive plans to manage non-hazardous industrial solid waste and municipal solid waste. It also sets criteria for municipal solid waste landfills and other solid waste disposal facilities and prohibits the open dumping of solid waste. The hazardous waste program, under RCRA Subtitle C, establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal—in effect, from “cradle to grave.” The underground storage tank program, under RCRA Subtitle I, regulates underground storage tanks containing hazardous substances and petroleum products.

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Numerous EPA programs and regulations (such as RCRA and Superfund) are involved with the remediation of brownfields.

The Occupational Safety and Health (OSH) Act was enacted to ensure safe and healthful conditions for working men and women. The OSH Act created the Occupational Safety and Health Administration (OSHA) at the Federal level and provided that states could run their own safety and health programs as long as those programs were at least as effective as the Federal program.

The USACE’s Engineering Regulation 1165-2-132, HTRW Guidance for Civil Works Projects, defines an HTRW project, methods for performing HTRW surveys, and the USACE’s and sponsor’s involvement at, and responsibility for, HTRW sites. USACE policy is to identify HTRW issues early in the project process and avoid construction within HTRW-contaminated areas or properties, where practicable. The USACE will cost share the sponsor’s costs of surveys to identify the existence and extent of HTRW, but any response or remediation activities required, including studies to determine the appropriate response, are 100 percent non-project costs and the responsibility of the sponsor to undertake or ensure.

State

California Hazardous Waste Control Law

RCRA allows individual states to develop their own programs for regulating hazardous waste, provided that the state program is at least as stringent as RCRA (City of Los Angeles 2005). California has
developed the California Hazardous Waste Control Law (Health and Safety Code sec. 25100 et seq; 22 CCR sec. 66260.1 et seq.), which is modeled closely on RCRA. These regulations identify standards for the classification, management, transportation, and disposal of hazardous waste.

California operates a complete state plan covering both the private sector and state and local government employees. California Code of Regulations, Title 8, contains California OSHA regulations. The California OSHA program is administered and enforced by the Division of Occupational Safety and Health, a unit of the California Department of Industrial Relations.

Section 2002(j) of the State Health and Safety Code, for the purposes of vector control and prevention, defines a public nuisance (City of Los Angeles 2005). Section 2060 enables the Greater Los Angeles County Vector Control District to abate a public nuisance pursuant to “the person … who controls the diversion, delivery, conveyance, or flow of water shall be responsible for the abatement of a public nuisance that is caused by, or as a result of, that property or the diversion, delivery, conveyance, or control of that water.”

\textit{Government Code § 65962.5 (Cortese List)}

Government Code § 65962.5 was originally enacted in 1985, and requires the California Department of Toxic Substances Control to compile, update, and submit to Cal EPA annually a list of the following:

1. All hazardous waste facilities subject to corrective action pursuant to Section 25187.5 of the Health and Safety Code.
2. All land designated as hazardous waste property or border zone property pursuant to Article 11 (commencing with Section 25220) of Chapter 6.5 of Division 20 of the Health and Safety Code.
3. All information received by the Department of Toxic Substances Control pursuant to Section 25242 of the Health and Safety Code on hazardous waste disposals on public land.
4. All sites listed pursuant to Section 25356 of the Health and Safety Code.
5. All sites included in the Abandoned Site Assessment Program.

\textbf{Local}

Additional requirements pertaining to hazardous materials management are set forth in the City of Los Angeles Fire Code (City of Los Angeles 2005). The LAFC regulates the types, configuration, and quantities of hazardous materials that can be managed at a facility. Also, LAFC specifies design standards for the storage and management of hazardous materials. Citywide emergency response planning and emergency evacuation plans are coordinated by the Emergency Preparedness Department and the Emergency Operations Board of the City of Los Angeles. These plans are documented in the Emergency Operations Master Plan and Master Plan Procedures and Annexes of the City of Los Angeles. Operational units of the City of Los Angeles (e.g., departments) maintain emergency plans for their operations and facilities within the framework of the citywide plan. These plans are updated annually or when appropriate due to changed conditions.

In 2004, the City of Los Angeles approved Ordinance No. 175,790 amending Section 91.106.4.1 and Division 71 of Article 1, Chapter IX of the Los Angeles Municipal Code to establish citywide methane mitigation requirements and to include more current construction standards to control methane intrusion into buildings (City of Los Angeles 2005).

The City of Los Angeles Safety Element and Conservation Element address public health and safety with respect to hazardous materials, fires, methane, and brownfields (City of Los Angeles 2001). The safety
element goals, objectives, policies, and programs (which are also applicable to conservation element
issues) are broadly stated to reflect the comprehensive scope of the Emergency Operations Organization
(EOO). The EOO is the only program that implements the safety element. The safety element’s policies
outline administrative considerations, which are addressed by EOO procedures, including its master plan,
or which are observed in the carrying out of the plan. All City of Los Angeles agencies are part of the
EOO, and all emergency preparedness, response, and recovery programs are integrated into EOO
operations and are reviewed and revised continuously.

5.11.2 **Significance Criteria**

Potential public health and safety impacts, including HTRW impacts, are assessed based on changes to
public health and safety from the restoration alternatives. Under CEQA thresholds adopted by the cities of
Los Angeles and Burbank, and applied for the City of Glendale, a significant adverse impact would be
considered to occur if the selected project resulted in any of the following:

- Creation of a significant hazard to the public or the environment through the routine transport,
  use, or disposal of hazardous materials,
- Creation of a significant hazard to the public or the environment through reasonably foreseeable
  release of hazardous materials into the environment,
- Utilizes hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of
  an existing or proposed school;
- Construction or ground disturbance on a site that is included on a list of hazardous materials sites
  compiled pursuant to California Government Code Section 65962.5 and, as a result, creates a
  significant hazard to the public or the environment,
- Impairs implementation of or physically interferes with an adopted emergency response plan or
  emergency evacuation plan,
- Exposes people or structures to a significant risk of loss, injury, or death involving fires, or
- Exposes people to a significant risk of water-related injury of death, or
- Exposes people to infectious diseases.

5.11.3 **Environmental Impacts**

The impacts analysis in this subsection considers direct of construction together with indirect effects of
construction as well as related actions such as the sponsor’s remediation of HTRW contamination
necessary to facilitate the project alternatives. The impacts analysis in this subsection considers direct and
indirect effects of operation together.

**No Action Alternative**

*Construction Impacts*

No impacts to public health and safety would occur from construction under this alternative because
construction would not occur.

*Operational Impacts*

The baseline conditions regarding risks to public health and safety in the study area would be similar to
present conditions under the future without-study conditions. River safety risks would not be expected to
change substantially, and much of the River would likely continue to be fenced to reduce public access,
although transient use would be expected to continue to occur, with associated water safety risks to those
indivduals. Public recreational access would be expected to remain similar to existing conditions, with
seasonal recreational use of Reaches 4-6. Sensitive receptors would continue to exist in the area, and
health and safety risks to these receptors would not change if the project was not implemented. Wildfire
hazard zones would likely stay the same because most of the undeveloped areas where vegetation is present are designated as parks and likely to remain as parks. Methane zones in general are naturally occurring deposits and thus would not be likely to change substantially. Vector-borne diseases would continue to be a risk, but would also continue to be controlled by GLACVCD and similar public health agencies.

The baseline conditions regarding releases of HTRW would likely improve under the future without-study conditions. Parties responsible for the release of HTRW to the environment are required by law to address these sites through investigation and monitoring, and by carrying out remediation when warranted. Remediation has already reduced contaminant levels and is ongoing. Therefore, the trend over time would likely be toward remediation and natural attenuation (i.e., at the San Fernando Valley Superfund Site and Taylor Yard G2 site. Industrial remediation goals have been achieved at the Taylor Yard G1 site. Remediation and natural attenuation at some HTRW sites could occur within the life of the project; however, these activities may take longer to complete at some locations. For example, groundwater contamination associated with the San Fernando Valley Superfund Site is pervasive in the region and is not likely to be fully remediated over the next 50 years.

**Alternative 10 (ART)**

**Construction Impacts**

**Los Angeles River Water Safety**

Although construction activities would bring workers into contact with the River, OSHA and USACE safety standards will be diligently followed to avoid or minimize any dangers of water-related injuries. Construction would be suspended during any high flow events.

**Wildfire**

Construction equipment or activities could potentially cause an accidental fire in high fire hazard zones. Project activities would comply with all applicable Federal, state, and local laws, ordinances, and regulations related to fire prevention and fire safety. BMPs related to fire prevention would be implemented during and after construction to ensure that fires were not started and that if they did start, would be immediately extinguished, resulting in a less than significant impact.

**Methane Zones**

Construction would be done in accordance with regulations pertaining to development within methane zones and buffer zones; therefore, no adverse impacts from methane are expected.

**HTRW**

According to USACE policy, construction should be avoided in HTRW project areas where practicable. However, it would not be possible to implement any of the alternatives and still avoid sites with known or suspected contamination. Sites with known or suspected contamination include the San Fernando Valley Superfund Site, the Taylor Yard G1 and G2 sites, and the LATC site. Investigation and remediation of the identified known and suspected HTRW sites in the study area would be conducted before construction activities are undertaken at affected sites and are not part of project construction. For contaminated groundwater that cannot be addressed prior to construction activities, such as the San Fernando Valley Superfund Site, the sponsor would be responsible at 100 percent non-project cost for addressing treatment and disposal of contaminated groundwater during dewatering activities.
The USACE would share the cost of investigations for HTRW contamination but would not contribute funds for, or be involved in, preparing response plans and conducting remediation activities. The City would be responsible for conducting remediation or ensuring remediation by responsible parties at contaminated sites to support the project with the oversight of the appropriate regulatory agencies in accordance with all applicable laws, regulations, and ordinances, as described in the HTRW appendix for this IFR. In addition, it is possible that undocumented soil or groundwater contamination is present in the study area and could be identified after completion of this feasibility study. The risk of encountering unknown contamination during design or construction would be minimized through review of the existing American Society for Testing and Materials (ASTM) type Phase I and Phase II Environmental Site Assessments, and also by the sponsor undertaking industry-standard inquiries according to ASTM standards that are consistent with the CERCLA brownfields amendments and the All Appropriate Inquiries Rule prior to land acquisition and providing lands to the project.

Soil and water quality in the River would be tested at locations where contamination is suspected. Sampling locations and procedures would be coordinated with the Los Angeles Regional Water Quality Control Board, Department of Toxic Substances Control, USEPA, and the Los Angeles, Glendale, or Burbank environmental departments, as applicable. Any contamination found would be addressed in accordance with all applicable laws, regulations, and ordinances in a manner that would be protective of human and ecological health, so no adverse HTRW impacts are expected. Furthermore, BMPs will be in place, including standard procedures for addressing any contaminants uncovered or inadvertently released during construction, including containment, handling, disposal and reporting requirements.

**Approach to HTRW Impacted Soil**

The City would conduct remediation activities, or ensure they are conducted, prior to restoration project construction at the affected sites, not as part of the restoration project. For groundwater contamination that is infeasible to remediate prior to construction, the sponsor would be responsible for addressing treatment and disposal of such contamination during construction at 100 percent non-project costs. In the event that unknown contamination were to be discovered during construction despite making all appropriate inquiries, the approach to such contamination as relates to the project will be governed by the Project Partnership Agreement.

All HTRW impacted soil within the project footprint must be remediated to the requirements of the local environmental regulatory agencies and be compatible with the future land uses for and needs of the restoration project. At this time, those areas with HTRW impacted soil to be addressed by the sponsor are anticipated to be the Taylor Yard G1 and G2 sites and the LATC. The methodologies utilized to remediate HTRW impacted soils, regardless of the nature and extent of contamination must be compatible with the planned ecosystem restoration features and must be protective of human health and the environment. To preclude the adverse impact of contaminated soil leaching downward and further contaminating the shallow groundwater system, contaminated soil would be removed from areas that are planned as wetlands, areas that will be irrigated and areas that will be subject to erosion and infiltration of surface water runoff. Within areas where contaminated soil is remediated by removal and off-site disposal, the resulting excavations would not be filled with clean soil beyond the level of the planned ecosystem restoration grades. The sponsor must complete remediation that is acceptable to the environmental regulatory agencies and appropriate for the land use for the project selected prior to restoration project construction at those sites.

Although restoration project construction would occur on sites currently listed on the Cortese list, all necessary soil remediation will be completed prior to project construction, and therefore there would be no resulting significant hazard to the public or the environment from ground disturbing activities on those sites whether they remain listed at the time of construction.
Approach to HTRW Impacted Groundwater

Remediation of contaminated groundwater within the limits of the SFVSS site is ongoing and is expected to continue for the foreseeable future. Localized groundwater contamination from remnant contamination at some of the adjacent sites may also be encountered during dewatering activities. Contaminated groundwater encountered in excavations during construction and during dewatering operations must be treated and disposed of in accordance with the requirements of the local regulatory agencies. The persistent and shallow nature of the groundwater beneath the proposed restoration features, the widespread nature of the groundwater contamination, and potential impacts associated with local soil contamination make total remediation of the groundwater prior to construction of the restoration features infeasible. As a result, it is anticipated that regulator-supervised (USEPA) responsible-party remediation of contaminated groundwater will be ongoing during construction of the ecosystem restoration features. Therefore the Sponsor will design, implement, coordinate and fully fund all treatment and disposal of contaminated groundwater during construction, with regulator concurrence and any necessary permits. These temporary operations should also be consistent with current management of contaminated groundwater at SFVSS and Pollock Well Field.

Restoration Project Construction Transport, Use, and Disposal of Hazardous Materials

Construction of the project would involve the routine transport, use, and disposal of common hazardous materials, such as fuels (gasoline and diesel), oils and lubricants, and cleaners (e.g., solvents, corrosives, soaps, detergents). The project would not require the use of unusual or acutely hazardous materials. Accidental spills could occur; however, minor spills are not likely to have significant effects. BMPs would be implemented to minimize potential for the public to come into contact with or be exposed to hazardous materials during the routine transport, use, or disposal of hazardous materials or as a result of an accidental release.

Indirect effects of and Related Actions to Construction and Operation

Relocation of the LATC site functions is not anticipated to have significant impacts to public health and safety. It is assumed that the new site will be located within already developed industrial areas and that any necessary site remediation would occur prior to relocation of site functions. Requirements in place for protection of safety in construction areas, including from fire, water, hazardous wastes, vector-borne disease and methane zones would further reduce impacts. Prior to site selection, the CEQA lead agency will conduct a detailed CEQA analysis of the relocation of LATC site functions, including environmental and safety analysis. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all action alternatives.

Operational Impacts

Los Angeles River Water Safety

Implementation of the project would increase opportunities for the public to interact with the River. The potential for the public to enter the river channel during flooding would be greater than under current conditions, where much of the River is fenced and public access is impeded. Therefore, there is potential for water-related injuries and accidental drownings to increase.

However, operation of the restoration project would also involve greater oversight and incorporate restrictions on public access during hazardous conditions. Although the project would increase opportunities for the public to be near and access the River, the operation would incorporate public education to notify the public of dangers associated with water-related injury and drowning. The project construction and increased oversight associated with operation could also deter or reduce human habitation within the river. River channel designs would include, where consistent with the ecosystem...
restoration, features that would allow people to vacate the River channel quickly and facilitate swift water rescues. As a result, impacts are anticipated to be less than significant.

**Wildfire**

Potential impacts from wildfire during maintenance activities associated with operation are the same as those from construction, and would be less than significant assuming implementation of BMPs.

**Vector-Borne Diseases**

The project would increase the amount of surface water in the River corridor, increase the amount of riparian habitat and wetlands, and alter drainage patterns and water flow. As such, there is concern that breeding grounds such as standing water for disease vectors such as mosquitoes would increase under the project, potentially resulting in an increase in the incidence of infectious diseases. Although the extent of surface water is expected to increase under the proposed measures, the suitability of habitat for vectors will depend on microhabitat features that are subject to change with each large flow event. As in any natural system, pools and backwater areas may be formed or abandoned as new flow paths emerge. Once the project is constructed, the City of Los Angeles will continue to monitor and coordinate with vector control agencies as needed to provide treatment. Current measures to control rodent populations will continue and will be increased as needed to account for the greater amount of cover that will be afforded these species in the restored areas.

**HTRW**

Physical maintenance is typically limited to activities such as vegetation maintenance. Routine maintenance and adaptive management activities would generally not involve dewatering or other activities requiring direct human interaction with the groundwater. Maintenance activities are not anticipated to involve substantial disturbance of channel sediments, although O&M of widened areas may require some removal of sediment based on a sediment management plan that would be developed during PED.

Currently, contaminated groundwater does not result in contaminant levels in the river in non-concrete bottom areas requiring treatment. After construction of the restoration features, which would require localized dewatering as described above, the groundwater system would be expected to return to its present configuration, and no effects on the SFVSS groundwater plume are anticipated after construction and during operation and maintenance. The volume of contaminants from current and known sites entering groundwater will likely not change, the restoration project features would not contribute contaminants to groundwater, and the remediation underway for the SFVSS, as managed by LADPW, will continue to occur. The low or de minimis levels of contamination in the portion of the river in the study area directly interacting with groundwater do not currently impact ecological performance for existing vegetation in the river, and no different effect would be expected on the restored areas including widening of the river at Taylor Yard and at LATC. The widening of the river into restored areas at Taylor Yard and temporary irrigation during plant establishment infiltrating to groundwater could have some localized effects on the elevation of the groundwater table, but they are not anticipated to be significant. The upper extent of the groundwater system throughout the ARBOR Reach is roughly positioned at the flow line of the river and construction will not change this configuration. The position of the groundwater table at any given time is a function of permeability and the difference between subsurface inflow (recharge) and subsurface outflow (use). The permeability of the alluvial deposits beneath the river is a fundamental physical property that cannot be altered or changed by construction of any of the proposed features. Recharge to the groundwater system is largely a function of weather and climate conditions which are not controllable but over the long term is expected to be relatively uniform. Water rights, including pumping of groundwater, were decided for the Upper Los Angeles River Area in 1979 and as a
result groundwater use and the elevation of the water table have remained relatively constant and would not be altered by this alternative. The restoration features and their operation and maintenance would not change the properties of the alluvial soils or configuration of the groundwater system. Therefore, the constructed features and their operation would not impact the existing groundwater contamination plume. With respect to surface flows, discharges into the river today from storm drains are regulated by the Regional Water Quality Control Board. Potential impacts from HTRW exposure during maintenance activities during operation would be less than significant assuming implementation of BMPs and remediation of contaminated areas prior to construction.

Methane Zones

Maintenance activities during operation would not include subsurface activities that would have impacts on methane zones and buffer zones; therefore, there would be no adverse impacts.

Alternative 13 (ACE)
The larger project footprint for this alternative is not anticipated to result in significant adverse impacts during construction or operation. There would be no difference in the nature or type of impacts to water safety, wildfire, vector-borne diseases, or methane associated with this alternative compared to Alternative 10. As with other alternatives, although restoration project construction would occur on sites currently listed on the Cortese list, all necessary soil remediation will be completed prior to project construction, and therefore there would be no resulting significant hazard to the public or the environment from ground disturbing activities on those sites whether they remain listed at the time of construction. As with other alternatives, the sponsor would remediate or ensure remediation of contaminated sites prior to construction at those sites to provide sites compatible with the necessary land use for the project, and would address contaminated groundwater during dewatering activities. As with the other alternatives, BMPs would reduce potential impacts to less than significant.

Alternative 16 (AND)
The larger project footprint for this alternative is not anticipated to result in significant adverse impacts during construction or operation. There would be no difference in the nature or type of impacts to water safety, wildfire, vector-borne diseases, or methane associated with this alternative compared to Alternative 10. As with other alternatives, although restoration project construction would occur on sites currently listed on the Cortese list, all necessary soil remediation will be completed prior to project construction, and therefore there would be no resulting significant hazard to the public or the environment from ground disturbing activities on those sites whether they remain listed at the time of construction. As with other alternatives, the sponsor would remediate or ensure remediation of contaminated sites prior to construction at those sites to provide sites compatible with the necessary land use for the project, and would address contaminated groundwater during dewatering activities. As with the other alternatives, BMPs would reduce potential impacts to less than significant.

Alternative 20 (RIVER)
The larger project footprint for this alternative is not anticipated to result in significant adverse impacts during construction or operation. There would be no difference in the nature or type of impacts to water safety, wildfire, vector-borne diseases, or methane associated with this alternative compared to Alternative 10. As with other alternatives, although restoration project construction would occur on sites currently listed on the Cortese list, all necessary soil remediation will be completed prior to project construction, and therefore there would be no resulting significant hazard to the public or the environment from ground disturbing activities on those sites whether they remain listed at the time of construction. As with other alternatives, the sponsor would remediate or ensure remediation of contaminated sites prior to
construction at those sites to provide sites compatible with the necessary land use for the project, and would address contaminated groundwater during dewatering activities. As with the other alternatives, BMPs would reduce potential impacts to less than significant.

5.11.4 **Best Management Practices and Impact Avoidance Measures**

The types of BMPs that would reduce dangers associated with water safety, wildfire, methane, vector-borne diseases, and HTRW include the following:

- City will request increased police presence along the River, particularly during episodes of increased water levels and flow velocities,
- Fire extinguishers or other firefighting equipment (such as drums of water) would be close at hand during construction, regularly inspected, and maintained in proper working condition,
- Equipment with internal combustion engines would be placed so that exhaust is not near combustible materials,
- Combustible or flammable materials would be properly stored and proper clearance around these materials would be maintained,
- City will coordinate as needed with Vector Control agencies after project completion,
- A rigorous review of the HTRW sites identified as those with potential impacts on the project would be conducted. The review would include obtaining and reviewing regulatory files, site visits, and discussions with regulators and others about the severity of the contamination. Following this review, Phase I or II environmental site assessments would be conducted as necessary. In areas where existing information is limited, environmental investigations shall follow industry approved protocols for conducting Phase I and Phase II investigations as needed. The sponsor shall not provide lands for project construction without first ensuring that it has undertaken adequate investigation and determined there is no contamination of concern for the relevant parcel or, where contamination is identified, has remediated or ensured remediation of the parcel to the standards necessary to support the restoration project, as agreed by the relevant regulatory agency and USACE. Coordination and consultation with the appropriate regulatory agencies, including the USEPA and California lead agency (usually the LARWQCB or the DTSC), and responsible parties, as necessary, would begin as early as possible regarding investigation and remediation at the San Fernando Valley Superfund Site and Taylor Yard G1 and G2 sites, as well as the LATC site as needed. The City would conduct remediation at contaminated sites prior to construction of restoration features at those sites.
- A new ecological risk assessment would be performed for the Taylor Yards G1 and G2 properties. The risk assessment would include risk calculations and analyses for recreational human health standards.
- Prior to the start of construction, the USACE will develop engineering specifications and plans that will include a written environmental protection plan. This plan will include a written pollution prevention plan that outlines the actions needed to respond spill or release of hazardous materials during construction or maintenance activities. The environmental protection plan would describe hazardous materials management and spill prevention and response methods. The plan would be reviewed with all site workers.
- A site-specific health and safety plan would be prepared and reviewed with all workers detailing methods of compliance with occupational health and safety regulations, emergency response actions, and include the route to the nearest emergency medical facility,
- Relevant paperwork such as material safety data sheets and chain-of-custody documents recording the transport and disposal of hazardous materials and waste would be maintained and available for inspection,
- All hazardous materials would be removed from the site when construction or maintenance activities were completed if not before,
• Construction sites would be fenced to prevent unauthorized access.
• Operations of the project would include public education on hazards associated with the river channel, including risk of water-related injury and drownings.

Health Considerations Overview
In response to comments from the public, the Corps and City developed the following overview of health considerations of the Los Angeles River Ecosystem Restoration Project (Project), based on issues identified in “A Guide for Health Impact Assessment” prepared by the California Department of Public Health and issued in October 2010 (Bhatia 2010). As stated in the guide, a Health Impact Assessment (HIA) is designed to “make visible the potentially significant human health consequences of public decisions and thus to facilitate the greater consideration of health in policy decisions.” The following discussion is not meant to follow the above guide in its entirety, but to put together in one place an analysis of information provided in the IFR of the Guide’s health-related issues. This information addresses human health generally and is not intended as a separate evaluation according to the significance criteria in this section of the IFR.

Employment
Table 5-32 lists parameters that may be affected by projects of this type, and the connection between those parameters and human health.

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment and Livelihood</td>
<td>Unemployment results in material poverty, chronic stress, and low self-esteem. There is a dose-response relationship between income and life expectancy across the income distribution. Health care and sick leave benefits support the use of preventative care. Job autonomy predicts reduced mortality from cardiovascular disease.</td>
</tr>
<tr>
<td>Will the action affect:</td>
<td></td>
</tr>
<tr>
<td>Level and security of employment?</td>
<td></td>
</tr>
<tr>
<td>Proportion of the population living in relative or absolute poverty?</td>
<td></td>
</tr>
<tr>
<td>Hazardous employment conditions?</td>
<td></td>
</tr>
<tr>
<td>Employment quality or job benefits?</td>
<td></td>
</tr>
<tr>
<td>Industrial diversity and resilience?</td>
<td></td>
</tr>
</tbody>
</table>

All action alternatives result in a net creation of jobs, both during construction and in operation, as shown in Table 5-33.

<table>
<thead>
<tr>
<th>Table 5-33 Temporary and Permanent Changes in Employment (Action Alternatives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt. 10</td>
</tr>
<tr>
<td>Construction-related jobs</td>
</tr>
<tr>
<td>Permanent jobs</td>
</tr>
</tbody>
</table>

According to an economic analysis performed for this project (Appendix B of the Feasibility Study), the project alternatives should have no impact on the proportion of population living in relative or absolute poverty, nor impact on hazardous employment conditions. Jobs may be affected by relocation of existing businesses and the LATC facility to other locations within the Los Angeles Basin. While it is assumed that jobs would be transferred to the relocated site, some individuals may be unable to or choose not to commute to the new location. Construction-related jobs and permanent jobs resulting from the project are projected to be substantial although they may differ in type from jobs transferred outside the project area.
Table 5-34 Health Determinants Potentially Affected by Plans and Projects (Housing)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Crowded conditions can increase the potential for infections, respiratory disease, fires and poor mental health. Unaffordable rents or mortgages result in trade-offs between material needs such as housing, food, and medical care.</td>
</tr>
</tbody>
</table>

None of the alternatives would directly result in a change in housing stock in the project area, nor in the adequacy, quality, or safety of housing. Connections via new pedestrian crossings could have a positive effect on reducing residential segregation that may have been exacerbated by the barrier created by the waterways and industrial sites. Gentrification can affect the local economy and land uses, but no clear trends have emerged at the time of this assessment. No direct or indirect health effects are anticipated due to housing issues.

Table 5-35 Health Determinants Potentially Affected by Plans and Projects (Nutrition)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Safety and Nutrition</td>
<td>Adequate nutrition is necessary for normal development and growth, normal body homeostasis, immunity, and the prevention of obesity and diet related diseases.</td>
</tr>
</tbody>
</table>

There would be no effects on food supply, cost of food, or food safety, nor access to food resources. No direct or indirect health effects are anticipated due to food issues.

Environmental Hazards

Table 5-36 highlights the connection between environmental hazards, such as chemical and biological pollutants, and potential health outcomes.
Table 5-36 Health Determinants Potentially Affected by Plans and Projects (Environmental Hazards)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Quality</td>
<td>Air pollutant exposure retards lung growth, exacerbates respiratory disease, and increases cardio-pulmonary mortality. Indoor aero-allergens cause or exacerbate asthma. Water is a vehicle for communicable diseases. Chronic noise exposure harms sleep, temperament, hearing, and blood pressure. Solar and ionizing radiation are known carcinogens.</td>
</tr>
<tr>
<td>Will the decision affect:</td>
<td></td>
</tr>
<tr>
<td>- Level of hazardous chemical or biological pollutants in outdoor air, soil, or drinking water?</td>
<td></td>
</tr>
<tr>
<td>- Level of hazardous chemical or biological pollutants in indoor air?</td>
<td></td>
</tr>
<tr>
<td>- Level of environmental noise?</td>
<td></td>
</tr>
<tr>
<td>- Exposure to non-ionizing or ionizing radiation?</td>
<td></td>
</tr>
</tbody>
</table>

Investigation and remediation of the identified known and suspected HTRW sites in the study area would be conducted by the sponsor before construction activities are undertaken at affected sites. For contaminated groundwater that cannot be addressed prior to construction activities, such as the San Fernando Valley Superfund Site, the sponsor would be responsible at 100 percent non-project cost for addressing treatment and disposal of contaminated groundwater during dewatering activities. There should be no effects on the health of nearby residents, or on construction workers.

Construction noise will be present when work is occurring near sensitive receptors, including residences. Such activities will occur regardless of the build alternative, though the duration will vary greatly among the alternatives, ranging from 9 years for Alt. 10, 10 years for Alt. 13, 15 years for Alt. 16, and Alt. 20. Work in any one location, however, would be for a much shorter time period, with the loudest sound at 83 dbA at 100 feet. Nearly all construction would occur between 8 a.m. and 6 p.m. Monday through Friday, and from 8:00 a.m. to 5:00 p.m. Saturday. Because construction will be temporary, noise would not be a chronic issue at any given location, especially with appropriate best management practices.

The project would increase the spatial extent of surface water in the River corridor, increase the amount of riparian habitat and wetlands, and alter drainage patterns and water flow. As such, there is concern that breeding grounds such as standing water for disease vectors such as mosquitoes would increase under the project, potentially resulting in an increase in the incidence of infectious diseases. Although the extent of surface water is expected to increase under the proposed measures, the suitability of habitat will depend on microhabitat features that are subject to change with each large flow event. As in any natural system, pools and backwater areas may be formed or abandoned as new flow paths emerge. Once the project is constructed, the City of Los Angeles will continue to monitor and coordinate with vector control agencies as needed to control outbreaks of pests.

Social Cohesion

The links between social cohesion and public safety with potential health concerns are summarized in Table 5-37.
Table 5-37 Health Determinants Potentially Affected by Plans and Projects (Social Cohesion)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Social cohesion inhibits crime and violence which can result in injury or property loss and provokes fear or stress. Projects can stress capacity of public safety institutions, limiting their response capacity to emergency events. Projects may increase motor vehicle traffic and vehicle collisions.</td>
</tr>
</tbody>
</table>

Implementation of the project would increase opportunities for the public to interact with the River. The potential for the public to enter the river channel during flooding would be greater than under current conditions, where much of the River is fenced and public access is impeded. Therefore, there is potential for water-related injuries and accidental drownings to increase.

However, operation of the restoration project would also involve greater oversight and incorporate restrictions on public access during hazardous conditions. Although the project would increase opportunities for the public to be near and access the River, the operation would incorporate public education to notify the public of dangers associated with water-related injury and drowning. The project construction and increased oversight associated with operation could also deter or reduce human habitation within the river. River channel designs would include, where consistent with the ecosystem restoration, features that would allow people to vacate the River channel quickly and facilitate swift water rescues.

Transportation

Transportation decisions can have potential effects on human health. This link is highlighted in Table 5-38.

Table 5-38 Health Determinants Potentially Affected by Plans and Projects (Transportation)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>Access to employment, education, parks, and health care are critical for meeting health needs. Public transit provides such access for those without automobiles. Pedestrian and bicycle facilities facilitate active transport, reducing heart disease, diabetes, obesity, blood pressure, osteoporosis, symptoms of depression, anxiety, and falls in the elderly. Vehicle volume is proportional to collision rates and vehicle speeds are proportional to injury severity.</td>
</tr>
</tbody>
</table>

The project would add vehicle trips to area roads because it would make portions of the River a recreational destination. However, these trips would likely occur during off-peak travel hours and therefore would not affect the performance of the roadway network when it is at its busiest. Increased traffic would be offset by improved pedestrian and bicycle facilities in terms of overall pedestrian and bicycle safety.

Ridership on public transit routes with stops near portions of the study area where public access is enhanced would increase because people would use public transit to access the River.
Because the River corridor would be enhanced aesthetically and new multi-use walking and biking paths would be constructed, and public access would increase, more people would be expected to use the River corridor for local and recreational trips. Travel on the existing Los Angeles River Bike Path would also increase. The capacity of the Los Angeles River Bike Path and the new multi-use paths that would be constructed as part of the project should be sufficient to accommodate demand. The new walking and bike paths would provide an opportunity for nearby residents to exercise with the long-term potential to reduce certain types of disease and illness, including heart disease, diabetes, obesity, blood pressure among others. The greater the coverage of the bike and pedestrian paths, the better the project is in terms of overall public health benefits among the alternatives.

**Education**

The availability and quality of education resources have potential effects on human health as shown in Table 5-39.

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Educational success predicts both health status and life-expectancy. Children commuting to school get less sleep and exercise, and greater exposure to vehicle pollution. Quality community schools can promote parent participation and good educational outcomes.</td>
</tr>
</tbody>
</table>

Impacts on the education system should be minimal. The exception is that the restored river corridor may provide educational opportunities for students, especially those in nearby schools.

**Outdoor Access**

Availability of parks and natural space can have potential effects on health as shown in Table 5-40.

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks and Natural Space</td>
<td>Contact with nature facilitates cognitive and physical development and serves a restorative function throughout life. Park access increases physical activity which reduces the risk of developing heart disease, diabetes, osteoporosis, and obesity. Trees and green space remove air pollution from the air and mitigate urban heat island effects.</td>
</tr>
</tbody>
</table>

For all action alternatives, there would be benefits to recreation and public access over the long term, in ways that are compatible with ecosystem restoration. The addition of restoration features along Rio De Los Angeles State Park (Taylor Yard) and at Los Angeles State Historic Park (Cornfields) is consistent with the parks’ General Plans, and is expected to complement and expand upon existing resources. Benefits include:

- Improved aesthetic quality of the River,
- Increased public awareness of the recreation resources in the project reach,
- Increased visitation to recreation facilities in the project reach,
• Increased public health and safety from improved water quality along the River,
• Increased quality, quantity, and diversity of recreation resources along the River, such as trails, bike paths, benches, signage, River access points, maintenance ramps, etc., and
• Habitat quality improvements may have larger beneficial effects on specific recreation activities which are heavily dependent on the health of the river, such as bird watching.

Social/Economic Support

Table 5-41 shows potential connections between the proximity and quality of selected goods and services and human health.

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods and Services</td>
<td>Timely access and utilization of primary health services can prevent serious hospitalizations. Quality child care increases childhood education and job outcomes. Local financial institutions help families create and maintain wealth.</td>
</tr>
</tbody>
</table>

None of the action alternatives will have any adverse effect on essential services.

Community Involvement

Involvement in the community can have connections to health as well as shown in Table 5-42.

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Cohesion</td>
<td>Physical and emotional support buffers stressful situations, supports illness recovery, prevents isolation, contributes to self-esteem, and reduces the risk of early death.</td>
</tr>
</tbody>
</table>

Increase pedestrian connections over the river could lead to increased social cohesion linking residential and commercial areas on either side of the river. Such improvement in social cohesion, as well as the overall aesthetic and recreational improvements planned as part of the project, could lead to the easing of stressful situations and, ultimately, improvement in the overall health of the community.

Decisions related to the project should have no appreciable effect on stereotypes or attitudes, though there may be some feeling that certain neighborhoods or communities received a greater share of improvements along the river than did others.
Social Equity

Connections between segregation, inequality, and health outcomes are shown in Table 5-43.

Table 5-43 Health Determinants Potentially Affected by Plans and Projects (Socioeconomics)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Equity</td>
<td>Social contact across ethnic and income groups ensures equitable access to public health and educational services. Residents of low-income and ethnically segregated neighborhoods experience high rates of teenage childbearing, tuberculosis, cardiovascular disease, and homicide. Income inequality in a region or country predicts population life expectancy independent of income in wealthy countries.</td>
</tr>
</tbody>
</table>

The project is not expected to result in substantive changes in social equity, including increased segregation or increase inequality of income or wealth. Factors such as gentrification, poverty rates, and local businesses can affect the local economy and land uses, but no clear trends have emerged at the time of this assessment. No meaningful changes in health related to social equity issues are anticipated as a result of the project.

Community Empowerment

Participation in the public decision-making process can influence health outcomes as summarized in Table 5-41.

Table 5-44 Health Determinants Potentially Affected by Plans and Projects (Community Empowerment)

<table>
<thead>
<tr>
<th>Potential Effects</th>
<th>Connection between Potential Effects and Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Inclusion</td>
<td>Participation and power in the political process affects government responsiveness to health needs and crises.</td>
</tr>
</tbody>
</table>

The project partners have done considerable public outreach since the start of the project; outreach will continue through final decision-making and into project construction. The project itself should not have any substantive bearing on participation rates in the decision-making process. To the extent that communities get more involved in a project due to either beneficial or adverse perceptions of one or more alternatives, the more likely they are to participate in the public process and, thus, influence the final decision.

5.12 UTILITIES AND PUBLIC SERVICES

5.12.1 Regulatory Framework

No Federal agencies or regulations are applicable to utilities and service systems associated with the array of restoration measures proposed for this project. Applicable California regulations include the Solid Waste Reuse and Recycling Access Act and the Integrated Waste Management Act. The Board of Public Works is the Bureau of Sanitation’s oversight agency. Oversight for energy-related utilities at the state

5.12.2 **Significance Criteria**

An alternative would have a significant impact if it:

- Resulted in the need for new systems or supplies, or if it substantially altered power, natural gas, communications, local or regional water treatment or distribution facilities, sewer or septic tanks, stormwater drainage, solid waste disposal, or local or regional water supplies,
- Resulted in relocation of a utility to greater than 10 miles in any direction,
- Would use or take up the remaining capacity or capability of systems or eliminate the ability for facilities to accommodate new inputs,
- Exceeded wastewater treatment requirements of the RWQCB,
- Required or resulted in the construction of new water or wastewater facilities or expansion of existing facilities to serve the project’s projected demand, the construction of which could cause significant environmental affects,
- Required or resulted in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects,
- Resulted in insufficient water supplies available to serve the project from existing entitlements and resources, or would require new or expanded entitlements,
- Resulted in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project’s projected demand in addition to the provider’s existing commitments,
- Was served by a landfill with insufficient permitted capacity to accommodate the project’s solid waste disposal needs,
- Failed to comply with Federal, state, and local statues and regulations related to solid waste, or
- Created a need for additional government services related to police, fire protection, schools, parks, libraries, or other public facilities.

5.12.3 **Environmental Impacts**

This section considers direct and indirect effects and related actions together in the analysis.

**No Action Alternative**

**Construction Impacts**

No impacts to utilities would occur from construction under this alternative because construction would not occur.

**Operational Impacts**

Although conservation efforts and energy-efficient technology are helping to slow growth in demand for some utilities, continued population growth in the Los Angeles area would generally continue to result in increased energy demand under the future without-project conditions. The possible exception is natural gas, which may experience a slight decline in demand. In the study area, the owners and operators of the major utility systems (electric, natural gas, sewer, water, and storm systems) would be expected to maintain, repair, update, and augment these systems on an ongoing basis in order to protect supply and provide reliable service to customers. Infrastructure planning documents would continue to be developed, implemented, and updated and would forecast demand, analyze demand relative to capacity, and make plans to alter infrastructure so that capacity is sufficient to meet forecasted demand. Some capital
improvements would be expected to occur, resulting in increased capacity; however, funding for and completion of major improvements may lag behind demand. The market for telecommunications and solid waste management is characterized by multiple private service providers, which increases competition for customers. Due to this competition, these utilities would be expected to respond readily to customers’ needs and keep pace with demand.

**Alternative 10 (ART)**

**Construction Impacts**

Where utilities overlap the study area, it is possible that these utilities could be affected by construction activities. LADPW power lines occur in the study area within Reaches 6 and 7, and the project would require that the sponsor ensure the relocation of 6 electrical towers in Reach 6 (Taylor Yard) and 2 in Reach 7 to allow construction, operation, and maintenance of the project. This impact would be less than significant as the power lines would be relocated less than 10 miles away. No other relocations have been identified at this time.

A utility management plan would be prepared prior to the start of construction and would describe in detail:

- Procedures for marking utilities prior to construction,
- Any utilities that would be temporarily rendered inoperable during construction,
- Any utilities that would have to be permanently relocated a distance of greater than 10 miles from their current location, and the plan for their relocation,
- Practices for working safely around utilities, particularly overhead transmission lines,
- Response procedures if a utility line were accidentally breached or impacted,
- Procedures for coordinating construction activities with utility owners, and
- Any permanent impacts to utility infrastructure and capacity.

California Government Code Section 4216 requires anyone planning an excavation in Los Angeles to call Underground Service Alert of Southern California, also known as DigAlert or Call Before You Dig, at least two working days before starting excavation to ensure that underground utilities are marked so they would not be damaged. Underground Service Alert would be called to mark utilities prior to construction. If necessary, a private utility locator would also be contracted to supplement the utility locations provided by Underground Service Alert. Relocation of segments of utility easements or corridors of less than 10 miles would be less than significant.

Alternative 10 would involve daylighting selected stormwater outfalls in Reaches 3, 4, 5, and 7 as part of project construction. During construction, stormwater flow would have to be redirected to other stormwater outfalls, temporarily reducing overall stormwater system capacity, resulting in a short-term impact. The reduction in capacity would be less than significant and capacity would be restored when construction was complete.

Concrete and soils removed during construction would contribute to the debris that requires disposal. However, as much as possible, concrete and soils would be reused in other study areas or recycled. The amount of construction and demolition debris that would be generated by the project is shown in Table 5-45. The estimates provided in the table are based on the total debris generated by the project being divided by the number of days of construction to generate a daily amount of debris. The assumption then is that the daily amount that would be disposed in a landfill. Finally, based on reported recycling rates for similar materials throughout Los Angeles, it is assumed that 60 percent of the debris is reused or recycled rather than disposed in a landfill (Los Angeles Bureau of Sanitation 2007).
### Table 5-45 Construction and Demolition Debris

<table>
<thead>
<tr>
<th>Material</th>
<th>Total Debris Generated by Project (tons)</th>
<th>Debris Generated by Project Per Day (tons per day)</th>
<th>Debris Disposed at Landfill Assuming 60% is Reused or Recycled (tons per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 10 (ART)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavated Material</td>
<td>837,650</td>
<td>5,203</td>
<td>2,081</td>
</tr>
<tr>
<td><strong>Alternative 13 (ACE)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavated Material</td>
<td>995,718</td>
<td>3,531</td>
<td>1,412</td>
</tr>
<tr>
<td>Concrete Demolition</td>
<td>33,681</td>
<td>119</td>
<td>48</td>
</tr>
<tr>
<td>Spalls Removal</td>
<td>26,626</td>
<td>94</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>1,056,026</td>
<td>3,745</td>
<td>1,498</td>
</tr>
<tr>
<td><strong>Alternative 16 (AND)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavated Material</td>
<td>2,839,552</td>
<td>4,551</td>
<td>1,820</td>
</tr>
<tr>
<td>Concrete Demolition</td>
<td>113,146</td>
<td>181</td>
<td>73</td>
</tr>
<tr>
<td>Spalls Removal</td>
<td>107,691</td>
<td>173</td>
<td>69</td>
</tr>
<tr>
<td>Grouted Riprap Demolition</td>
<td>78,643</td>
<td>126</td>
<td>50</td>
</tr>
<tr>
<td>Riprap Demolition</td>
<td>12,192</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Asphalt Removal</td>
<td>3,502</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>3,154,725</td>
<td>5,056</td>
<td>2,022</td>
</tr>
<tr>
<td><strong>Alternative 20 (RIVER)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavated Material</td>
<td>4,044,573</td>
<td>5,571</td>
<td>2,228</td>
</tr>
<tr>
<td>Concrete Demolition</td>
<td>87,302</td>
<td>120</td>
<td>48</td>
</tr>
<tr>
<td>Spalls Removal</td>
<td>92,125</td>
<td>127</td>
<td>51</td>
</tr>
<tr>
<td>Grouted Riprap Demolition</td>
<td>70,563</td>
<td>97</td>
<td>39</td>
</tr>
<tr>
<td>Riprap Demolition</td>
<td>24,938</td>
<td>34</td>
<td>14</td>
</tr>
<tr>
<td>Asphalt Demolition</td>
<td>5,030</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>4,324,531</td>
<td>5,957</td>
<td>2,383</td>
</tr>
</tbody>
</table>

Debris would likely be disposed of at the Sunshine Canyon Landfill. This landfill is projected to reach capacity and close in 2037 (Browning Ferris Industries of California, Inc. 2008). Alternative 10 is scheduled to be completed in 2017, so the landfill would be operational throughout construction of the project. The landfill is permitted to receive up to 12,100 tons of solid waste per day and is currently receiving approximately 9,000 tons of solid waste per day (Browning Ferris Industries of California, Inc. 2008; Republic Services 2012).

Alternative 10 would generate 2,081 additional tons of debris per day, which would result in a total daily disposal of 11,081 tons of debris at the Sunshine Canyon Landfill. This would not exceed the landfill’s capacity. In addition, there are additional landfills in the area that could accommodate debris, if necessary.

Because construction personnel would follow safe construction practices and comply with health and safety requirements, accidents during construction are not likely and thus would not have an adverse
impact on local police, fire, and emergency medical personnel. Police, fire, or emergency medical would respond if accidents or incidents occur during construction. Construction would not impact schools or libraries.

**Operational Impacts**

The project would enhance stormwater management by creating more pervious surfaces in multiple Reaches, which would increase potential for stormwater to infiltrate into the ground.

The project may require temporary irrigation water to support restoration features until plants establish and for extreme drought conditions. Drought-tolerant native plants would be used; and the water budget has shown that there is sufficient water to support the alternatives.

Operation of the project would not likely alter the amount of solid waste generated in the study area or alter demand for natural gas or telecommunications infrastructure; therefore, there would be no impact on these utilities.

Increased public access would result in more people in the study area. Minor modifications or increases in police, fire, and emergency medical personnel, equipment, or facilities could be required in order to maintain an acceptable level of service and response time in the study area. The cities in the project area will request increased presence if necessary. The USACE would incorporate design measures to promote public safety and reduce incidences requiring police, fire, or emergency medical response such as adequate public lighting, signage stating rules and public access hours, and flood warning devices. Adverse impacts to public services would be less than significant.

Operation of the project would provide beneficial impacts to outdoor education opportunities for local schools. Operation of the project would have no effect on libraries.

The relocation of the LATC site functions to a new location within the Los Angeles Basin could result in impacts to existing utility lines and services as a result of construction or operation of a new facility. Construction activities are coordinated in a way to ensure that utilities services are not interrupted. However, if it is necessary, interruptions would be anticipated to be temporary. Following construction, the relocated site functions could place additional pressure on available utilities, beyond their existing capacity. However, selection of the site will be based on functional compatibility, ensuring that adequate facilities are in place. Operation of the site functions elsewhere in the basin is not anticipated to increase indirect effects on utilities and public services, since relocation is presumed to occur in an area with adequate capacity to support the new facility. Prior to site selection, the CEQA lead agency will conduct detailed CEQA analysis, including assessment of utilities and public services. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These effects are anticipated to be the same for all alternatives.

**Alternative 13 (ACE)**

**Construction Impacts**

The project footprint for this alternative is the same as Alternative 10 except in Reaches 3, 6, and 7; therefore, the effects in Reaches 1, 2, 4, 5, and 8 would be the same as Alternative 10. In Reaches 3, 6, and 7, a different design would be implemented but the utility relocations required to implement the project would be the same as in Alternative 10. Fewer stormwater outfalls would be daylighted than under Alternative 10; therefore, the temporary impacts associated with that measure would be less than under Alternative 10. All impacts would be less than significant.
As shown in Table 5-45, Alternative 13 would generate 1,498 tons of debris per day that would require landfill disposal, the least amount of any alternative. This would result in a total daily disposal rate of 10,498 tons of debris at the Sunshine Canyon Landfill. This would not exceed the landfill’s capacity, so the project would be served by a landfill with sufficient permitted capacity and there would be no adverse impact. In addition, there are additional landfills in the area that could accommodate debris, if necessary.

Construction activities would occur over a longer time period compared to Alternative 10, so the temporary effects of construction would last longer.

**Operational Impacts**

Impacts to public services during operation would be similar as those described for Alternative 10 but would be slightly more extensive due to the larger project footprint. The project may require temporary irrigation water to support restoration features until plants establish and for extreme drought conditions. The side channel proposed in Reach 3 may also require pumps and electricity supply, although it will be designed to be self-sustaining to the extent practicable. Drought-tolerant native plants would be used; and the water budget has shown that there is sufficient water to support the alternatives. Impacts would be less than significant.

**Alternative 16 (AND)**

**Construction Impacts**

The project footprint for this alternative is the same as Alternative 10 in Reaches 1, 2, and 4 and the same as Alternative 13 in Reaches 3 and 6. The effects in those Reaches would be the same as described for those alternatives. In Reaches 5, and 8, a different project design would be implemented and different specific utilities would be affected; however, there would be no unique impacts on utilities. Utility relocations required under this alternative would include those identified for Alternatives 10 and 13. Five additional towers and associated power lines in Reach 8 would require relocation. The proposed excavation within Reach 8 would also require the relocation of two sewer lines. The power lines and towers would be relocated outside the project footprint, and the sewer lines would be relocated to avoid conflicts with project construction, operation, and maintenance but within the project footprint. All impacts would be less than significant.

Alternative 16 would involve daylighting the same stormwater outfalls as Alternative 13, therefore impacts from this measure would be the same as Alternative 13.

As shown in Table 5-45, Alternative 16 would generate 2,022 tons of debris per day that would require landfill disposal, which is less than Alternative 10 but more than Alternative 13. This would result in a total daily disposal of 11,022 tons of debris at the Sunshine Canyon Landfill. This would not exceed the landfill’s capacity, so the project would be served by a landfill with sufficient permitted capacity and there would be no adverse impact. In addition, there are additional landfills in the area that could accommodate debris, if necessary.

Construction activities would occur over a longer time period compared to Alternatives 10 and 13, so the temporary effects of construction would last longer.

**Operational Impacts**

Impacts to public services during operation would be similar as those described for Alternatives 10 and 13 but would be slightly more extensive due to the larger project footprint. Impacts would be less than significant.
Alternative 20 (RIVER)

Construction Impacts

The project footprint for this alternative is the same as Alternative 16 in Reaches 1, 4, 5, 6 and 8. The effects in those reaches would be the same as described for Alternative 16. In Reaches 2, 3, and 7, a different project design would be implemented and utility towers in Reach 7 along the bank would require relocation. There would be no unique impacts on utilities. Although the project footprint would be larger, no utility relocations other than those identified for Alternative 16 are required for project construction, operation and maintenance. All impacts would be less than significant.

Alternative 20 would involve daylighting the same streams currently encased in culverts/stormdrains outfalls as Alternatives 13 and 16, and would also daylight the three streams in Reach 7 included in Alternative 10, therefore impacts from this measure would be slightly greater than the previous alternatives.

As shown in Table 5-45, Alternative 20 would generate 2,383 tons of debris per day that would require landfill disposal, which is the most of any alternative. This would result in a total daily disposal of 11,383 tons of debris at the Sunshine Canyon Landfill. The increased debris is associated with the construction of expanded features in Reaches 2 and 3, and the different set of features included in Reach 7, as compared to Alternative 16. The expanded features of modifying the channel bank in Reach 2, and expansion of the Verdugo Wash in Reach 3 require additional construction that would generate additional debris from channel bank removal and other measures. The construction debris generated by measures in Reach 7 would be the same as Alternative 13 and 16 with respect to the Arroyo Seco restoration and the same as Alternative 10 with respect to the daylighting of streams; however, the terracing of the bank and trestling of the railroad line would be anticipated to generate more debris than the restructured banks measure included in Alternative 13. The total daily disposal would not exceed the landfill’s capacity, so the project would be served by a landfill with sufficient permitted capacity and there would be no adverse impact. In addition, there are additional landfills in the area that could accommodate debris, if necessary. Construction activities would occur over a longer time period compared to the other alternatives, so the temporary effects of construction would last longer.

Operational Impacts

Impacts to public services during operation would be similar as those described for the previous alternatives but would be slightly more extensive due to the larger project footprint. The project may require temporary irrigation water to support restoration features until plants establish and for extreme drought conditions. The freshwater marsh proposed in Reach 7 may also require pumps and electricity supply, although it will be designed to be self-sustaining to the extent practicable. Drought-tolerant native plants would be used; and the water budget has shown that there is sufficient water to support the alternatives. Impacts would be less than significant.

5.12.4 Best Management Practices and Impact Avoidance Measures

Measures that would be implemented and would provide BMPs for reducing impacts include:

- Development of a utility management plan
- Obtaining a Private Solid Waste Hauler Permit from the City’s Bureau of Sanitation prior to collecting, hauling and transporting waste,
- Recycling/reuse of construction debris to the extent possible;
- Disposing of excess debris to City certified waste processing facility, and
• Staggering construction of daylighting outfalls in order to minimize reduction in capacity of the stormwater system.

5.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

5.13.1 Regulatory Framework

Federal

Federal Executive Order 12898 was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to help Federal agencies identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Environmental justice concerns may arise from impacts on the natural and physical environment, such as human health or ecological impacts on minority populations, low-income populations, and Indian tribes, or from related social or economic impacts.

State

In addition to its prioritization by the Federal government, California was one of the first states in the Nation to pass legislation to codify environmental justice in state statute, defining “environmental justice” as “The fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations and policies.” (Government Code Section 65040.12)

Local

The City of Los Angeles General Plan, Housing Element includes the City’s policies in regards to housing issues (City of Los Angeles 2001), Policy 2.3.2 states that the City will “…allow for the provision of sufficient public infrastructure and services to support the projected needs of the population and businesses of the City within the patterns of use established in the community plans.” Burbank’s General Plan (Burbank 2013b) specifies a set of housing goals that address equal housing opportunities, housing constraints, affordability and variety of housing, and conservation and improvement of existing housing stock.

5.13.2 Significance Criteria

The proposed project alternatives could cause significant impacts related to population, socioeconomics, and environmental justice if they would be inconsistent with the City of Los Angeles’ General Plan, Housing Element (City of Los Angeles 2002) or those of other affected communities, in the following ways:

• Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure),
• Cause growth (e.g., new housing or employment generators) or accelerate development in an undeveloped area that exceeds projected/planned levels for the year(s) of project occupancy/buildout, or
• Cause a substantial number of residents, businesses, or employees to be displaced (includes displacement of affordable housing), necessitating the construction of replacement housing elsewhere.
Additionally, alternatives would cause significant impacts under NEPA if they would:

- Have disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and, or, low-income populations. The CEQ guidance identifies three factors to be considered to the extent practicable when determining whether environmental effects are disproportionately high and adverse (CEQ 1997):
  - Whether there is or would be an impact on the natural or physical environment that
    significantly (as the term is employed by NEPA) and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment;
  - Whether the environmental effects are significant (as the term is employed by NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group; and
  - Whether the environmental effects occur or would occur in a minority population, low income population or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

5.13.3 Environmental Impacts

Direct and indirect effects of construction and operation are considered together in the analysis below.

No Action Alternative

No impacts to socioeconomics would occur from construction under this alternative because construction would not occur.

The socioeconomic assessment area consists of a predominantly residential and densely populated area in Los Angeles County. Due to the existing dense level of development, it is unlikely that changes in the local or regional economy will result in drastic changes in land use, population, or demographics in the assessment area. Other factors such as gentrification, poverty rates, and local businesses can affect the local economy and land uses, but no clear trends have emerged at the time of this assessment. Any changes that do occur in the period of analysis would likely be coincident with larger regional trends and would not materially alter the conditions in which an ecosystem restoration study would be constructed. Environmental justice considerations would not likely be altered substantially. Income and poverty in the assessment area appear to reflect national and regional trends of slow but increasing recovery from the recent recession. Unemployment in the assessment area is below that of the City or the County. The demographics of the assessment area may shift slowly in proportion to larger regional trends, but there is no indication for large shifts in demographics over the period of analysis.

Alternative 10 (ART)

Temporary closure of recreational facilities such as bike lanes and horseback riding areas or reduction in access or availability of recreational features during the construction period would occur. However, adverse effects associated with any temporary closures of trail systems, access points, or crossings along the River would be temporary and less than significant. Effects would include temporarily reduced access to the River as well as diminished walking, biking, and golfing opportunities at specific locations during the construction period. Los Feliz golf course may require temporary full closure, and Harding golf course will likely require partial closure and remain open. All construction areas where employment and facility operation would be disrupted would be prioritized and expedited as much as possible. No net
employment effects are expected at Los Feliz Golf Course. Because construction at Los Feliz is expected
to take no longer than two months, employees could be temporarily reassigned with the Los Angeles
Department of Parks and Recreation to reduce impacts. Affected golfers would be likely to visit another
course during construction, possibly substituting the nearby Roosevelt course in Griffith Park.

Proposed staging areas are typically open lots near the River. Staging areas may result in temporary minor
nuisances on adjacent businesses (traffic congestion, noise, etc.) but these effects would be managed by
implementing BMPs, such that the effects remain less than significant. Proposed staging areas do not
require business relocations. A phased construction approach that prioritizes areas with potential for
temporary adverse socioeconomic effects would limit the quantity of closures at any one time and result
in less than significant impacts.

As detailed in the Economic Appendix (see Appendix B), the infusion of construction funds into the
regional economy will generate beneficial economic effects such as increased sales, additional jobs,
increased labor income, and increased gross regional product during the construction period. The top
three industries affected include construction, food and drink services, and engineering services. See
Appendix B for detailed results of economic analysis.

This alternative is not expected to significantly affect environmental justice populations during
construction. The alternative may result in other minor and temporary adverse effects, such as increased
noise or dust around the construction area, which would affect adjacent populations. However, these
effects would be managed by implementing BMPs and staying within noise limits and construction
periods specified in city and county plans. All populations adjacent to the construction area would be
affected equally, rather than environmental justice populations being disproportionately affected. It is
likely that all communities adjacent to the river would experience similar levels of temporary adverse
effects mentioned above. However, the nature of this restoration project is such that project location is
to be driven by the location of the River, and cannot be located elsewhere. Moreover, adverse effects
are temporary in nature.

Alternative 10 would not induce substantial population growth in an area, either directly or indirectly,
cause growth or accelerate development in an undeveloped area, or cause a substantial number of
residents, businesses or employees to be displaced such that replacement housing must be constructed.
Therefore, effects would be less than significant. The alternative does not require relocation or removal of
existing residences, indicating that population and housing would not be directly affected. However,
commercial and industrial infrastructure at Los Angeles Trailer and Container Intermodal Facility
(LATC), also known as LATC, would be partially replaced with riparian and wetland habitat. Information
indicates that approximately 157 workers are employed at LATC. Site functions would relocate to a new
location within the Los Angeles Basin, as discussed below. For all private-sector relocations, the sponsor
would provide relocation assistance for the affected business per the Uniform Relocation Act of 1970, as
amended.

Furthermore, this alternative may also result in beneficial impacts to socioeconomic conditions in the
study area. Improved aesthetic quality of the River, improved habitat value, improved quality and
quantity of recreation resources along the River, and improved River accessibility would be the catalyst
for these beneficial effects, which may include the following:

• Improvement in quality and quantity of recreation resources along the River may result in indirect
economic benefits to businesses near or reliant upon the River, such as recreation equipment
rentals, educational activities, restaurants and food service, etc.,
• Any improvements in environmental quality (such as water quality) in the region as a result of a cleaner, active River system would benefit all populations in the study area, and

• Potential long term urban renewal/redevelopment benefits such as increased local economic output, job growth, and labor income following completion of the restoration project (see Appendix B for further discussion of redevelopment impacts).

Alternative 10 is likely to yield beneficial effects to adjacent communities over the long term. These beneficial impacts include enhanced visual aesthetics, reconnection of communities divided by the river with pedestrian bridges, increased environmental education opportunities, and new, enhanced recreational opportunities. With fewer project elements than the other three alternatives, however, it would provide fewer long-term benefits as well, including in the environmental justice communities.

While most of the study area demographics reflect a similar percentage of low-income and minority populations as the rest of the City of Los Angeles, communities in the census tracts immediately surrounding LATC include minority and low-income populations, and are considered to be environmental justice communities. These communities have less than 20 percent white residents on average, and approximately 31 percent of residents of these tracts live in poverty, which is 11 percent higher than the City of Los Angeles on the whole. Of the two census tracts on the east side of the Los Angeles River and immediately adjacent to LATC, the unemployment rate ranges from 12.7 to 21.8 percent, the latter the highest in the overall study area.

Though rail and freight operations would be relocated to another location within the Los Angeles Basin, it is unlikely that the operations will be relocated near the communities in and around the ARBOR reach due to lack of a suitable alternative location, and commuting to the new location may no longer be feasible for some local residents. Working class jobs at LATC may be transferred elsewhere in the Los Angeles regional economy. To determine whether the potential transfer or conversion of jobs that could occur if LATC were converted from industrial uses into green space would have a high and disproportionate effect on EJ communities, the number of “trade, transportation, and utilities” sector jobs provided by businesses in the eight census tracts surrounding and including LATC was calculated. Based on U.S. Census data, there are 635 such jobs in these eight census tracts, but only 27 of the holders of these jobs live in these census tracts. The balance of workers live in other parts of the greater Los Angeles area, so transfer of jobs to a new location within the Basin would not be expected to have disproportionately high and adverse effects on EJ communities. Therefore, this impact is considered less than significant.

In addition, although the conversion would result in relocation of site functions to a new location, with associated transfer of jobs, a much higher number of jobs are expected to be created during construction of the project. Depending on the alternative, cumulative construction jobs are projected to range from 2,200 to 14,100. The work at LATC is one of the largest single elements of the entire project and may account for up to 1,000 working class jobs during construction. While these jobs may be filled by persons throughout the greater Los Angeles area, many could be filled locally as well, and may result in providing at least a similar number of jobs as those relocated from the existing LATC. Based on the analyses presented in the Economics Appendix (Appendix B), any job growth predicted from urban renewal/redevelopment may not directly offset any initial job transfers resulting from relocation of LATC, as redevelopment will be a long term process, and the specific skilled labor jobs at LATC are not likely to be replaced in kind in the immediate area either during construction or over the long term.

Indirect impacts may also occur to other businesses in the area that rely on the LATC facility or clientele from the LATC workforce. Businesses that have operations linked to LATC functions may choose to relocate over time to be closer to the location of the relocated site functions. The LATC workforce would...
no longer be present in the existing location to patronize nearby businesses, but these businesses could benefit from increased visitation by the public to the restoration project area.

Under each of the action alternatives, relocating the LATC to a new location within the Los Angeles Basin may result in impacts to populations surrounding the future site. If operations at the new facility resulted in growth inducement and larger populations in the area, it could increase neighborhood density, increase environmental disturbance in the form of reduced air quality or noise effects in neighborhoods that already endure environmental pressures, or cause increased housing prices. However, the relocation would not be expected to induce substantial population growth in an area, either directly or indirectly, cause growth or accelerate development in an undeveloped area, or cause a substantial number of residents, businesses or employees to be displaced such that replacement housing must be constructed. Selection of the future site would be based on finding a site that can provide equivalent functionality in an area already zoned for industrial use within the Los Angeles Basin. It is presumed that the areas that fulfill these requirements would not be near residential neighborhoods and that the relocated site functions would require equivalent employees to the current site. It is also possible that indirect effects could include benefits to surrounding populations, as a result of having an additional source of industrial employment in the area. Prior to site selection, the CEQA lead agency would conduct a detailed CEQA analysis, including assessment of socioeconomic effects. Should any additional NEPA documentation be required, it would be undertaken by the NEPA lead agency. These impacts are anticipated to be the same for all action alternatives.

**Alternative 13 (ACE)**

Impacts for Alternative 13 would be similar to those for Alternative 10 in nature, though they may be slightly increased in duration due to the increase in overall level of restoration associated with the inclusion of channel reshaping in Reaches 6 and 7 and additional side channel work at Ferraro Fields in Reach 3.

Alternative 13 expands upon the features in Alternative 10 and adds additional measures. Impacts at LATC would be the same as those described under Alternative 10. The current project footprint does not necessitate removal/relocating of any additional buildings, although some parking lots or open areas adjacent to the channel which are currently used for equipment storage may be reduced in size to accommodate channel reshaping. Additional analysis would occur during later stages of design. Should any acquisitions or condemnations be required, the sponsor would provide necessary assistance per the Uniform Relocation Act. Socioeconomic impacts, therefore, would be less than significant.

Alternative 13 may also result in beneficial impacts in the study area. These beneficial impacts would be same as for Alternative 10, with the possibility of slightly greater impact due the increased level of restoration for Alternative 13. Potential environmental justice effects would be the same as those described for Alternative 10.

**Alternative 16 (AND)**

Impacts for Alternative 16 would be to the same as those for Alternative 13 in nature, though they may be increased in extent and duration due to the increase in overall level of restoration associated with the addition of channel deepening in Reach 5 and bank terracing submeasures in Reaches 5 and 8.

Alternative 16 may also result in beneficial impacts in the study area. These beneficial impacts would be same as for Alternatives 10 and 13, with the possibility of slightly greater impact due to the increased level of restoration for Alternative 16. Potential environmental justice effects would be the same as those described for Alternatives 10 and 13.
Alternative 20 (RIVER)

The footprint for Alternative 20 is the largest of the alternatives, including additional areas of restoration at Verdugo Wash, Los Angeles State Historic Park, and additional in-channel work compared to Alternative 16. As with previous alternatives, it is assumed that any minor adverse effects from construction would be managed using BMPs such that they remain less than significant. Alternative 20 would require temporary partial closure of Los Angeles State Historic Park for construction of marsh/wetland restoration features, a less than significant impact. At the Verdugo Wash confluence, a number of commercial/industrial parcels which fall within the project footprint would need to be acquired to allow construction, operation and maintenance of the project. Based on preliminary analysis, approximately 11 businesses would be displaced at Verdugo Wash. These businesses include warehousing, manufacturing, and industrial uses. In Reach 7, features at and adjacent to Los Angeles State Historic Park would affect two parcels zoned for warehouses would be affected and structures found there would need to be removed. As businesses are displaced during acquisition, it is anticipated business owners would relocate their operations elsewhere. For all relocations, the sponsor would provide relocation assistance per the Uniform Relocation Act of 1970, as amended. The project would not be expected to cause substantial population growth in an area, either directly or indirectly, cause growth or accelerate development in an undeveloped area, or cause a substantial number of residents, businesses or employees to be displaced such that replacement housing must be constructed. Thus socioeconomic impacts would therefore be less than significant.

The alternative may also result in beneficial impacts to the study area. These beneficial impacts would be same as for Alternatives 10, 13, and 16, with the possibility of greater beneficial impact due the increased level of restoration for Alternative 20.

Like Alternatives 10, 13, and 16, Alternative 20 does not require relocation or removal of existing residences, and as such would not displace any low-income or minority populations. Overall, it is expected that low-income and minority populations in the study area would experience the same long-term beneficial effects from this alternative as described for the previous alternatives. As described for Alternatives 10, 13, and 16, although there is potential for adverse effects on environmental justice communities from the conversion of LATC, these effects are determined to be less than significant.

5.13.4 Environmental Justice Summary

Table 5-46 summarizes the adverse and beneficial effects of the project on environmental justice communities (primarily along Reaches 7 and 8). While Environmental Justice determinations are based on disproportional high and adverse effects, the summary that follows also looks at the benefits that accrue to low-income, minority, and disabled communities along the Los Angeles River corridor.
<table>
<thead>
<tr>
<th></th>
<th>Alternative 10</th>
<th>Alternative 13</th>
<th>Alternative 16</th>
<th>Alternative 20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impacts</strong></td>
<td>Construction effects – esp. related to LATC; substantial portion of overall project</td>
<td>Construction effects – esp. related to LATC; smaller portion of overall project than Alt. 10</td>
<td>Construction effects – esp. related to LATC; smaller portion of overall project than Alt. 13</td>
<td>Construction effects – esp. related to LATC; relatively small portion of overall project compared to other alternatives</td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td>Proposed action in Reach 8 conflicts with current land use designation</td>
<td>Proposed action in Reach 8 conflicts with current land use designation</td>
<td>Proposed action in Reach 8 conflicts with current land use designation</td>
<td>Proposed action in Reach 8 conflicts with current land use designation</td>
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<tr>
<td><strong>Land Use</strong></td>
<td>Construction-related noise, esp. at LATC; substantial portion of overall project, but short overall timeframe</td>
<td>Construction-related noise, esp. at LATC; smaller portion of overall project, but duration of all components likely longer than Alt. 10</td>
<td>Construction-related noise, esp. at LATC; smaller portion of overall project, but duration of all components likely longer than Alt. 13</td>
<td>Construction-related noise, esp. at LATC; smaller portion of overall project, but duration of all components longer than other alternatives</td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td>Air quality impacts during construction; noise impacts during construction; substantial portion of overall project</td>
<td>Air quality impacts during construction; noise impacts during construction; small portion of overall project than Alt. 10</td>
<td>Air quality impacts during construction; noise impacts during construction; smaller portion of overall project than Alt. 10</td>
<td>Air quality impacts during construction; noise impacts during construction; smaller portion of overall project than other alternatives</td>
</tr>
<tr>
<td><strong>Public Health</strong></td>
<td>Up to 157 jobs relocated from LATC; indirect impact other neighborhood businesses may occur</td>
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</tr>
<tr>
<td><strong>Socioeconomics</strong></td>
<td>Improved water quality and flow rates due to habitat improvements at LATC; substantial portion of overall project</td>
<td>Improved water quality and flow rates due to habitat improvements at LATC and River in Reach 8; smaller portion of project than Alt. 13</td>
<td>Improved water quality and flow rates due to habitat improvements at LATC and River in Reach 8; smaller portion of project than Alt. 13</td>
<td>Improved water quality and flow rates due to habitat improvements at LATC and River in Reach 8; smaller portion of project than other alternatives</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Habitat improvements at LATC; substantial portion of overall project</td>
<td>Habitat improvements at LATC and River in Reach 8; smaller portion of overall project than Alt. 13</td>
<td>Habitat improvements at LATC and River in Reach 8; smaller portion of overall project than Alt. 13</td>
<td>Habitat improvements at LATC and River in Reach 8; smaller portion of project than other alternatives</td>
</tr>
<tr>
<td><strong>Water Resources</strong></td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at LATC</td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at</td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at</td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at</td>
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<td><strong>Biological Resources</strong></td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at LATC</td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at</td>
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<tr>
<td><strong>Recreation/Aesthetics</strong></td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at LATC</td>
<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at</td>
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<td>Improved aesthetic quality of River, increased recreational resources along River due to habitat improvements at</td>
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5.13.5 Best Management Practices and Impact Avoidance Measures

As currently analyzed, implementation of all alternatives would require conversion of the LATC property. Alternatives 13v and 20 would also require acquisition of multiple structures at the Cornfields site. Alternative 20 would also require acquisition of businesses at the confluence with Verdugo Wash. Under CEQA, economic and social effects are not considered significant (CEQA Article 5 Section 15064(e)). While impacts identified to these properties do not constitute a significant impact to socioeconomics or environmental justice under NEPA based on the analysis above, the LATC facility and businesses are anticipated to relocate and acquisition and compensation would occur in accordance with principles of just compensation. Acquisition and compensation would be carried out in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, Pub. L. 91-646, 42 U.S.C. 4601. As a component of the acquisition, businesses would have the opportunity to participate in the relocation assistance program. The non-Federal sponsor would actively participate in relocation of these businesses to ensure fair and equitable compensation.

5.14 CUMULATIVE IMPACTS

The CEQA guidelines and the regulations implementing NEPA require that the cumulative effect of a proposed action be assessed (14 CCR Section 15130; 40 CFR Parts 1500-1508). A cumulative effect is an “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions” (40 CFR §1508.7). In addition, they are defined as “two or more individual effects, which, when considered together, are considerable or which compound or increase other environmental impacts” (CEQA Guidelines Sec. 15355). Cumulative effects can result from individually minor but collectively significant actions taking place over time (40 CFR §1508.7). CEQ’s guidance for considering cumulative effects states that NEPA documents “should compare the cumulative effects of multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant” (CEQA 2010). The following sections discuss local and regional growth trends and projects that may result in cumulative effects when combined with effects from the actions discussed above.

In general, past, present, and reasonably foreseeable future projects are assessed by resource area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects. Interactive effects may be countervailing, where the adverse cumulative effect is less than the sum of the individual effects, or synergistic, where the net adverse cumulative effect is greater than the sum of the individual effects (CEQA 2010). The factors considered in determining the significance of cumulative effects are similar to those presented for each resource earlier in Chapter 5.
An integral part of the cumulative effects analysis involves determining whether effects from the project would contribute to ongoing or foreseeable resource trends. Where effects from the project contribute to regional resource trends, there is a potential for a cumulative effect. The cumulative effects analysis does not assess all expected environmental impacts from regional projects but only those resulting from the project and other past, present, and reasonably foreseeable future actions.

The timeframe for analysis of cumulative effects can be described as the reasonable and foreseeable estimate for implementation of cumulative projects, in addition to the proposed action. For purpose of this analysis and discussion of existing, ongoing, or planned projects, this timeframe would extend from the present to approximately 2035. This timeframe is based on the recent and pending adoption of various general, community, and resource plans proposing land use and resource projects incrementally being developed through that year, in addition to site-specific projects. Implementation of the restoration measures proposed in the Alternatives is also likely to be a long-term project that would coincide with the development schedule of the projects discussed below.

5.14.1 Existing, Ongoing or Planned Projects

This section is a discussion of projects that could contribute to cumulative effects, in addition to the project assessed in this IFR. Because of the large geographic region affected by the proposed project, the cumulative analysis primarily focuses on regional plans and planning documents in growth and development in addition to specific projects when identifying past, present, and reasonably foreseeable future actions for the effects analysis.

Analysis of cumulative effects considers past, present and reasonably foreseeable projects in addition to the proposed project. These projects include those potentially affecting environmental resource areas including land use, utilities, services, hydrology, parks and recreation, biological and cultural resources, and other issue areas.

The following are projects and plans that could potentially contribute to or address cumulative effects associated with implementation of the ARBOR alternatives. These include local and regional plans as well as public and private projects either recently adopted or in preparation by Los Angeles, Glendale, Burbank, utility and power agencies as well as regional planning agencies that could result in cumulative effects.

Hollywood Community Plan

In the City of Los Angeles, the Hollywood Community Plan encompasses portions of Reaches 1-6. This Plan has recently undergone a comprehensive update, and was adopted by the Los Angeles City Council in June 2012 (City of Los Angeles 2012). The major highlights of the Plan are the increased land use density and residential height limits for the central section of Hollywood, including sections of Hollywood Boulevard and Vine Avenue. No significant changes in zoning or land use designations affecting the portion of the Plan within Reaches 1-6 were adopted (City of Los Angeles 2012).

Boyle Heights Community Plan

In the City of Los Angeles, the Boyle Heights Community Plan, which includes portions of Reaches 7 and 8, has been undergoing a comprehensive update since 2006 (City of Los Angeles, 2012). This Plan update is focusing on the various challenges facing the Boyle Heights community, including promoting new businesses, preserving existing industrial uses, preserving and creating affordable housing, and promoting new and expanded park and recreational opportunities. It is unknown when this update would be finalized and adopted by the City.
Northeast Los Angeles Community Plan
The Northeast Los Angeles Community Plan, revised in 1999, includes portions of Reaches 3 through 7 (City of Los Angeles 1999). The Plan addresses community issues and opportunities. Pertinent issues to this project include lack of amenities and access to the Los Angeles River, destruction and deterioration of open space, and open space corridors. Opportunities enumerated in the Plan include preservation of open space, and enhancement of amenities and public access near flood control facilities.

Los Angeles River Improvement Overlay Supplemental Use District (LA-RIO)
The Los Angeles River Improvement Overlay Supplemental Use District was established by the Los Angeles City Council in 2009 to promote watershed improvements, promote sustainable habitats, and improve pedestrian, bicycle, and transit mobility along the River Greenway and the surrounding neighborhoods. The LA-RIO extends from Topanga Canyon Boulevard near the headwaters of the river downstream to the Boyle Heights area.

Los Angeles Convention and Event Center/Farmers Field Stadium Plan
The Los Angeles Convention Center is preparing an expansion plan that would add new exhibit space and a new football stadium at its adjacent Farmers Field site. Part of the existing convention center would be razed, but the new stadium would also be used for large events. Completion of the stadium is contingent upon securing a commitment from an NFL team to play in the stadium. If such a commitment is not secured, other parts of the expansion are still planned to move forward.

Los Angeles State Historic Park
The Los Angeles State Historic Park, located on the former 32-acre Cornfields site in Reach 7, opened in September 2006. The park is under development, and operates a number of amenities, including a natural amphitheater, a multiuse plaza, approximately four acres of open turf area for informal recreation and events, temporary classroom structures, interpretive panels, and walking trails (California Department of Parks and Recreation 2012).

Rio de Los Angeles State Park
The Rio de Los Angeles State Park is located on a portion of the Taylor Yard site in Reach 6. Jointly managed by the California State Parks Department and the Los Angeles Department of Recreation and Parks, park construction began in 2005 upon adoption of a general plan for the site. Facilities include an amphitheater, soccer fields, tennis courts, baseball fields, trails, play areas, natural areas, and picnic areas (California Department of Parks and Recreation 2012).

Los Angeles and San Gabriel Rivers Watershed Projects
A series of ongoing flood risk management and water quality projects and studies have been underway in coordination with the USACE and the Los Angeles County Department of Public Works (LACDPW) since 2000. The objective is to develop a framework for an integrated basin management plan in the Los Angeles County drainage area. The USACE and LACDPW are investigating solutions to flood risk management problems, while addressing environmental issues and impacts. These efforts are ongoing (LACDPW 2012).
Arroyo Seco Watershed Management and Restoration Plan

Prepared for the State Water Resources Control Board in 2006, this Plan developed policies to manage and restore water quality and habitat in the Arroyo Seco watershed. The Plan focused on water quality and habitat, and included a series of recommended projects to enhance water quality and habitat improvement, including restoration of riparian areas with native plants (North East Trees 2006).

Green Visions Plan

The Green Visions Plan is a joint venture between the University of Southern California and the region’s land conservancies, including the Rivers and Mountains Conservancy, Santa Monica Mountains Conservancy, Coastal Conservancy, and Baldwin Hills Conservancy. The mission of the Green Visions Plan for 21st Century Southern California is to provide a guide to habitat conservation, watershed health, and recreational open space for the Los Angeles metropolitan region and to design planning and decision support tools to nurture green land use patterns in southern California. Their goals are to protect and restore natural areas, to restore natural hydrological function, to promote equitable access to open space, and to maximize support via multiuse facilities (University of Southern California 2012).

2005 Los Angeles Urban Water Management Plan

The Urban Water Management Plan serves as the City’s master plan for water supply and resources management. The Plan describes how the City would address the following:

- Pursue cost-effective water conservation and recycling projects to increase supply reliability and offset increases in water demand due to growth and environmental enhancements;
- Protect groundwater supplies from contamination and provide treatment to optimize their use;
- Ensure access to reliable and affordable supplemental water supplies through active and effective representation at the Metropolitan Water District of Southern California;
- Maintain the operational integrity of the Los Angeles Aqueduct and the City’s water distribution system; and
- Secure needed funds, including outside funding, to develop more efficient use of existing supplies, such as by conservation and recycling projects, and resource management programs.

Los Angeles Integrated Resources Plan

This Plan describes the wastewater, recycled water, and runoff systems in Los Angeles, identifies system inadequacies based on the needs projected for 2020, and provides recommended alternatives to address the future needs of the systems. Los Angeles owns and operates four wastewater treatment plants and water reclamation plants that manage the wastewater generated in the City and other areas in neighboring jurisdictions. Future population increases in Los Angeles and its service areas would result in increased wastewater flows that must be managed safely. This Plan addresses the alternatives to manage the facilities effectively and ensure a continued supply of water for the City (City of Los Angeles 2012).

Integrated Regional Water Management Plan

The LACDPW adopted an Integrated Regional Water Management Plan in 2006 to define a clear vision and direction for the sustainable management of water resources in the Greater Los Angeles County Region. The Plan presents analysis and information regarding possible solutions and the costs and benefits of addressing water quality and quantity needs for the region (LACDPW 2006, 2012).
Water Quality Compliance Master Plan

In 2009, Los Angeles adopted the Water Quality Compliance Master Plan (WQCMP), a 20-year strategy for clean stormwater and urban runoff to reduce the pollution flowing into local rivers, creeks, lakes and beaches. By promoting green infrastructure, the WQCMP seeks a broad watershed-based perspective using green and natural solutions to improve water quality and maintain Los Angeles’ compliance with current and emerging water quality regulations. The master plan describes the existing status of urban runoff management in Los Angeles and watershed management efforts by Los Angeles and other organizations, identifies key issues for the future of urban runoff management, provides strategic guidelines for improving the quality of Los Angeles’ rivers, creeks, lakes and ocean, identifies opportunities for collaboration among City departments and with non-governmental organizations, and describes how rainwater can be used beneficially to augment the water supply (City of Los Angeles 2009).

Multi-County Goods Movement Action Plan

Various local and regional transportation agencies and private rail operators have been addressing long-term needs to ensure the continued viability of freight rail operations throughout the Los Angeles region and southern California. Metrolink has sponsored the Multi-County Goods Movement Action Plan to work with various transportation providers, community groups, and private rail companies to study intermodal transportation means of moving goods throughout the region. The Plan, prepared in 2008, provides guidelines for various agencies and recommends planning efforts to ensure that key freight corridors remain viable while addressing environmental concerns, economic benefits, and community needs (Metrolink 2008).

Johnny Carson Park

Johnny Carson Park is a 17.6-acre park in the City of Burbank. The amenities offered at this park include: a picnic area; an outdoor exercise course; a playground; two pedestrian bridges; a small performance stage; an abundant amount of mature trees; and vast areas of shaded green passive open parkland. The park’s topography and potential for streambed restoration provide some very exciting opportunities for sustainability-driven improvements. The City has recently received grant funding to enhance the existing loop trail with interpretative signage, performing Americans with Disability Act (ADA) improvements to two existing bridges, providing new par course exercise equipment and creating a secondary trail system complete with benches.

Glendale Narrows Riverwalk

The City of Glendale, in association with various state and Federal agencies, is developing the Glendale Narrows Riverwalk. This park and open space feature will provide a half mile of landscaped recreational trail along the north bank of the Los Angeles River across from Griffith Park. It will include a small entry park that will serve as a staging area for hikers and bicyclists, a separate staging area for equestrians using local trails, another small park area for walking and picnicking, enhancement of wildlife habitat in the river channel, and educational and interpretive exhibits. The project is funded by grants from the California River Parkways program and the Los Angeles County Regional Park and Open Space District. Most of Phase II of the project has been built as part of the Fairmont Avenue flyover extension off the 134 Freeway that is now nearing completion. Master Planning efforts for the remainder of Phase II and all of Phase III are now underway as the result of a Community-Based Planning grant from Caltrans. This effort will include linking Phases I and II, as well as exploring the potential for a bridge across the Verdugo Wash. Phase III will explore the prospect for what may become the signature element of the project – a multi-user bridge across the Los Angeles River from the Riverwalk to the Los Angeles Bike Path and on to Griffith Park, specifically for non-motorized travel between these recreational facilities.
Headworks Ecosystem Restoration Feasibility Study

The Headworks Ecosystem Restoration Feasibility Study will evaluate ecosystem restoration through the development of riparian habitat and wetlands, creating a multi-objective project that also include water quality improvement and passive recreation opportunities. Currently, alternatives are undergoing analysis, including habitat evaluation via the Combined Habitat Assessment Protocol methodology. Several alternatives involve the redirection of water from the main LA River channel to the overbank (Headworks site) to help encourage ecosystem restoration in the region. One of the alternatives involves the capture and redirection of surface water runoff and overland flow to the Headworks site to encourage ecosystem restoration. Construction of the selected alternative is not anticipated until at least 2018, pending construction of a reservoir on the site. The project is located in the southeastern portion of the San Fernando Valley off Forest Lawn Drive at the Los Angeles River, adjacent to Griffith Park.

Sennett Creek Park

The proposed Sennett Creek Park would create a park along the south bank of the LA River on a narrow strip between the River and Forest Lawn Drive in the City of Los Angeles. The park would connect Griffith Park and the Warner Bros. studio complex and would be adjacent to the Forest Lawn Memorial Park complex. The non-profit Friends of the LA River (FoLAR) and North East Trees are working with the City of Los Angeles, the USACE and major stakeholders, including Forest Lawn and Warner Bros., to implement a vision for this park and secure funding sources for its development. Proposed features of this park would include a river bicycle and pedestrian path, picnic areas, riparian restoration, and connectivity to wildlife corridors and nearby trails, including Sennett Creek.

Griffith Park Trail Planning

The City of Los Angeles, working with other agencies and non-profit groups, are proposing new trails or improvements to existing trails throughout Griffith Park. These improved or new trails are designed to enhance the visitor experience to Griffith Park as well as highlight the parks natural resources and connections with its historic past. These activities include developing a concept plan for Anza National Trail enhancement and management through the Griffith Park-L.A. River corridor promoting community connectivity, native habitat restoration, increased awareness of the trail, improved maintenance, and an enhanced user experience.

Griffith Park on the East Bank

The City of Los Angeles and various local non-profits are working on plans to transform a 28-acre portion of Griffith Park now being used as a service yard into usable parklands. The site is located next to the LA River, the existing North Atwater Park, and the City of Glendale water reclamation plant, and is near the Chevy Chase Recreation Center. Current plans call for a combination of playgrounds and picnic areas, athletic fields and recreation areas, and bicycle and pedestrian trails.

Senate Bill No. 1201

This law, adopted in 2012, amends the Los Angeles County Flood Control Act to include a provision that provides for public use of navigable waterways under the district’s control suitable for recreational and educational purposes. This provision codified that the river was subject to Section 4 of Article X of the California Constitution, which guarantees the public a right of access to navigable waters of the state. The LA River must be held in trust for the public and the state and its local governments are directed to manage it for public use and access when compatible with flood risk management.
Dreamworks Animation Campus

This entertainment media project in Glendale would create a 495,000 square foot entertainment production campus and employ approximately 1400 people at full build-out. The project would be constructed in two phases and would eventually encompass seven buildings with a distinct Mediterranean theme. The project would combine the studios design and production staff into an integrated setting for the creation and production of animated films and related media (City of Glendale 2006, 2008).

Cornfield-Arroyo Seco Specific Plan

The Cornfield-Arroyo Seco Specific Plan will guide the future development of the Arroyo Seco area within and adjacent to portions of Reach 7 by creating a series of mixed-use zoning districts that allow private, public, and nonprofit sector developers to combine retail, residential, commercial, civic, and industrial uses while ensuring that this development contributes to an engaging, human-scale urban fabric. The plan would create four new zoning districts that would result from implementation of the Specific Plan, including the following: Greenways, Urban Village, Urban Innovation, and Urban Center. Two existing, primarily residential zoning districts will remain. The specific plan area would encompass the River channel for several miles (City of Los Angeles 2010, 2012).

Albion Dairy Park Project

This project, located in Reach 7, would transform the Los Angeles River adjacent to the old Swiss Dairy site into a river greenway park. The 6-acre site is located next to Downey Park in the community of Lincoln Heights in the City of Los Angeles. The site would undergo a redevelopment and revitalization process which would incorporate multi-functional and multi-benefit design features that would serve as an amenity for the community while improving stormwater quality in the city. The Mitigated Negative Declaration for the project was approved in April 2011 (City of Los Angeles 2011).

Atwater Bridge

This project, headed by the Los Angeles River Revitalization Corp., is located in the Atwater areas of the study area and would construct a pedestrian, equestrian, and bicycle bridge across the Los Angeles River to connect Atwater Village with Griffith Park and the Los Angeles River bikeway. This project is in the approval process with the City of Los Angeles and the USACE.

Burbank2035 General Plan

The City of Burbank recently updated its General Plan. Named Burbank2035, its goals and policies affect a wide range of issues including housing, traffic circulation and mobility, parks and recreation, resource conservation, and public safety. Although parts of the City’s General Plan have been revised through the years, the Plan has not been comprehensively updated since the mid-1960s. In that time, both the City and the surrounding influences of southern California have experienced massive growth and environmental, physical, economic, social, and demographic changes. Due to the changing times, some community priorities have also shifted and evolved. An EIR for Burbank2035 has been certified as of 2013 (City of Burbank 2013c).

City of Los Angeles Proposition O

In November 2004, voters in the City of Los Angeles approved Proposition O, allowing the City to issue general obligation bonds to protect public health and meet the requirements of the Clean Water Act. In the Los Angeles River watershed, eight projects are designed to improve the quality of stormwater reaching the Los Angeles River, as well as providing open space, education opportunities, and recreation facilities.
5.14.2 Cumulative Impact Analysis

This section discusses the impacts of the alternatives when considered cumulatively with impacts of other past, present, and reasonably foreseeable future actions. The geographic scope for each resource is provided as part of the discussion.

Geology, Soils, and Seismic Hazards

The study area for cumulative impacts for this resource type includes the watershed of the River and its tributaries. The potential for cumulative impacts related to geology, soils, and seismic hazards is minimal under both the action alternatives and the No Action Alternative, since no significant issues related to these resources or hazards were identified for this project. Although most of the area within Reaches 1-8 is in a liquefaction zone, and the Raymond Fault is located within portions of Reach 5, the proposed action alternatives would not affect these features, and would not contribute to cumulative impacts related to past, present, or reasonably foreseeable future projects.

Soil erosion could occur due to the extensive amount of ground clearing and earthwork involved with construction of the project. However, the proposed channel restoration measures in the action alternatives would be required to meet modern construction criteria including stormwater pollution prevention. These criteria would also apply to cumulative projects in the study area; therefore, cumulative impacts would be considered less than significant.

Implementation of any of the alternatives would result in negligible impacts on sand and gravel deposits and underground oil and gas fields, so there would be no cumulative impacts on mineral resources expected with the project.

Air Quality

Due in part to the highly urbanized and dense areas, the SCAB currently does not meet all NAAQS or the equivalent California Ambient Air Quality Standards. With respect to the NAAQS, the SCAB is currently in extreme nonattainment for ozone (precursors: VOC or NOx); nonattainment for PM2.5; and partial nonattainment for lead. As noted in Section 5.2, the SCAQMD typically considers projects that exceed the RSTs to be cumulatively significant. This approach to assessing cumulative impacts was applied under both CEQA and NEPA. Estimated construction and operational emissions associated with all action alternatives would not exceed RSTs. Thus, construction and operational emissions would not result in significant cumulative impacts to air quality.

Land Use

The study area includes the applicable community plan areas within the jurisdiction of the City of Los Angeles proposed for restoration measures, as well as the Cities of Glendale and Burbank. These cities include policies generally supporting the restoration of the River in their General Plans and applicable community plans. The implementation of any of the alternatives would be consistent with the applicable general plans and community specific plans of these cities, with the exception of industrial land uses on several key sites. These general plans, as well as the land use plans by county and regional planning agencies such as the Southern California Association of Governments (SCAG), are addressing the River as an asset for the region along with its long-term and recognized importance for flood risk management, water quality, and fish and wildlife habitat. The City of Burbank recently prepared a comprehensive update of its General Plan, which addresses the impacts of cumulative projects, including this one, on transportation, utility, and public service expansions through the year 2035; therefore, none of the alternatives would contribute significantly to cumulative impacts in Burbank (City of Burbank 2013b, City of Glendale 2012e).
There would be no significant cumulative land use impacts with the No Action Alternative, since present land uses would continue in conformance with adopted community and general plans. Implementing the restoration measures within the reaches would result in significant impacts from converting industrial land uses to non-industrial uses. The degree of impact is most significant with Alternative 20, since the industrial land area affected is greatest, though impacts the other action alternatives would be significant as well. Impacts on industrial land use are a focused issue within Los Angeles and the applicable Community Plan updates as well. The viability of continued industrial uses in the vicinity of the study area is also an issue due to the age of some of these uses. Their continued operation may be subject to other factors independent of any change in land uses due to the proposed project or any other similar efforts in the area. Encroachment of other uses, including the Rio de Los Angeles State Park, poses the greatest challenge to the continued viability of adjacent and nearby industrial uses in this area. This could impact the City’s efforts to maintain areas that provide an economic base for long-term employment and fiscal health, and would contribute to significant adverse cumulative land use impacts (City of Los Angeles 2012).

### Hydrology, Floodplains, and Water Quality

The study area for hydrology, floodplains, and water quality includes the watershed of the River and its tributaries. Cumulative impacts to hydrology, floodplains, and water quality are expected to be beneficial under both the No Action Alternative and the restoration Alternatives. In addition to the various restoration measures in the action alternatives, other past, present, or reasonably foreseeable future projects include various master planning efforts by the Los Angeles County Department of Public Works and other local and regional agencies to develop comprehensive plans addressing hydrologic conditions, floodplains, and water quality from a regional perspective. These plans address hydrologic and water quality issues throughout Los Angeles County and in particular the various water courses and tributaries that eventually flow into the River. These collectively influence flood risk management and water quality issues within the River channel. Cumulative impacts related to floodplains would be beneficial since the implementation of these comprehensive plans favorably address floodplain and associated water release issues from various major and minor tributaries in addition to the main River channel.

Another beneficial cumulative impact would result from the various measures within the alternatives that would increase the riparian and native habitats. These measures would reduce the amount of impermeable surface area in the River channel. Vegetation features would help improve hydrologic conditions and water quality for cumulative projects located within and in the vicinity of the reaches, including the Rio de Los Angeles State Park, Griffith Park on the East Bank, Glendale Narrows Riverwalk, and the Albion Dairy Park (City of Los Angeles 2012; Los Angeles County 2006, 2012).

### Biological Resources

The study area for biological resources includes the watershed of the River and its tributaries. The restoration measures in the action alternatives would contribute to beneficial cumulative impacts to biological resources. These impacts would increase the amount of fish and wildlife habitat; provide greater ecological/biological benefits; aid in linking isolated habitats; help increase the amount of open space; help expand species diversity; and reduce the amount of impermeable surface area in the study area. These impacts would be beneficial from a regional perspective since they would benefit fish and wildlife species that may migrate outside of the study area. These benefits would also accrue to past, present, and reasonably foreseeable projects including the Albion Dairy Park, Griffith Park on the East Bank, Sennett Creek Park, and the Rio de Los Angeles State Parks that are located along or in the vicinity of the River. These projects would be developed under the No Action Alternative as well, so cumulative impacts would continue to be beneficial.
Construction activities would require excavation of surface and sub-surface materials and the subsequent disposal of these materials. However, any cumulative adverse impacts to biological resources as a result of construction activities would be addressed through the implementation of BMPs and stormwater requirements of local and state agencies as well as the USACE. These measures would be implemented as part of any other planned or reasonably foreseeable developments within the study area, including the development of Taylor Yard, the Cornfields site, and the Albion Dairy Park. In conjunction with other habitat restoration efforts proposed or being planned in the area, including significant restoration efforts on Arroyo Seco and other projects under consideration by watershed groups and local agencies, these measures would have a significant, beneficial cumulative impact (City of Los Angeles, California Department of Parks and Recreation 2012).

**Cultural Resources**

The study area for cultural resources includes the area within and in the vicinity of the River channel as well as the areas proposed for development of cumulative projects identified above. Overall, the project will contribute to the ongoing transformation of the LA River and its associated infrastructure.

Past developments in the study area have resulted in the loss or destruction of the spatial integrity of prehistoric and historic archaeological resources through ground-disturbing activities. Paleontological resources may have been lost through excavation as well. Historic buildings and structures have been lost or impacted due to demolition, substantial alteration, neglect, or incompatible construction. The impacts of current and future cumulative actions in the study area that are not subject to extensive cultural or historic resource review or result from neglect or vandalism would continue whether the proposed restoration measures were implemented or not. Restoration measures may stimulate the adaptive reuse, rehabilitation, or restoration of adjacent historic buildings and structures, but associated economic development may encourage removal of historic buildings and structures or incompatible construction. However, much of the current and future development would be subject to Federal, state, and local reviews that include some level of consideration and protection for cultural and paleontological resources which would lessen these impacts.

The restoration measures, combined with cumulative developments in, and in the vicinity of, the study area would be conducted in the context of environmental and cultural resource compliance review as proscribed by Los Angeles, Glendale, and Burbank ordinance provisions as well as state and Federal guidelines and regulations for the identification, handling, and preservation of cultural resources. Development of cumulative projects, including Rio de Los Angeles State Park, and Los Angeles State Historic Park, has already been subject to these multi-jurisdictional provisions. Cumulative developments in the planning stage within and in the vicinity of the study area, including Albion Dairy Park, Sennett Creek Park, and Griffith Park on the East Bank, would be subject to these provisions as these parklands are developed. These provisions are designed to identify cultural and paleontological resources, assess impacts, and avoid adverse effects.

To the extent that other cumulative projects have caused or may cause cultural resource impacts, NEPA and CEQA require consideration of mitigation for significant cultural impacts. After application of the mitigation measures identified in Section 5.6, the cumulative impacts would be less than significant. With adoption of these measures, the project’s contribution to the cumulative impact is rendered less than cumulatively considerable, and cumulative cultural resources impacts are less than significant.
Traffic and Transportation

The study area for traffic and transportation includes the highways, streets, railways, and transit corridors in Los Angeles County that serve both the project vicinity as well as the greater southern California region and beyond. Many elements of the current transportation network (past projects) are operating near or at their capacity. Current projects, including the expansion of I-5 in Burbank and Glendale, are addressing capacity and utilization requirements; however, long-term capacity is likely to lag behind projected population growth of the region and the lack of adequate space and facilities to expand the network. Other current or reasonably foreseeable future projects in the study areas include a TEA-21 project to upgrade the southern terminus of SR-2 and Glendale Boulevard, and the $898 million Metro Gold Line Eastside Extension project. The added capacity of these transportation elements will help to offset temporary increases in construction-related traffic.

The restoration measures in the various alternatives, together with these past, present, and reasonably foreseeable future projects, would expand open space and parkland opportunities primarily serving a local population, and would not likely result in a significant cumulative impact to the regional transportation system (Metrolink 2012).

The restoration measures, combined with cumulative developments within the study area, could result in cumulative impacts to current and planned rail operations. Various commuter and passenger rail projects, such as the Metrolink’s Metro Gold Line extension and the State-sponsored high-speed rail, include routes that overlap several project reaches. In addition, both Union Pacific and BNSF maintain both active rail lines and storage tracks along both sides of the River. These cumulative project efforts would occur either with the restoration measures or the No Action Alternative; therefore, cumulative impacts would be similar. These projects would be coordinated with Metrolink, SCAG, and other local and regional transportation agencies and private rail operators through the Multi-County Goods Movement Action Plan and similar regional planning efforts to ensure that any cumulative impacts would be less than significant.

Noise

Cumulative noise impacts typically occur when multiple projects affect the same geographic areas simultaneously or when sequential projects extend the duration of noise impacts on a given area over a longer period. Noise impacts are primarily localized because sound levels decrease relatively quickly with increasing distance from the source; therefore, the cumulative noise setting would be limited to the area subject to audible increase in noise levels with construction and development of cumulative projects. Cumulative noise impacts from implementing the proposed project, together with other reasonably foreseeable development activities in the study area, would result primarily from temporary construction activities. These construction activities would include several parks and recreation areas in the vicinity of the study area, including the Glendale Narrows Riverwalk, Sennett Creek Park, and the Albion Dairy Park. However, given the planned facilities for these parks and recreation areas, including trails, pathways, and small structures, construction activities would likely not necessitate use of heavy equipment for most activities. The potentially highest levels of cumulative noise impacts would take place if several development projects were to take place at the same time and be in fairly close proximity. However, these increases would be due to construction activities and would be temporary, and would be subject to local noise ordinance provisions from the Cities of Los Angeles, Glendale and Burbank. These ordinance provisions would be applicable to the cumulative projects under the No Action Alternative as well. Therefore, no significant cumulative adverse noise impacts would occur.
Recreation

The study area for recreation comprises the community plan areas of Los Angeles proposed for restoration measures, as well as the Cities of Glendale and Burbank. Implementation of any of the alternatives would contribute to cumulative beneficial recreation impacts for the residents of the study area. The restoration measures would increase riparian habitats that could present a recreation resource through attractive and aesthetic features both within and along the River channel. All communities in the study area have documented the need for more parks and open space in general plans and in various community plans. These planning efforts, including the development of the Rio de Los Angeles State park and the Los Angeles State Historic Park, have introduced new parklands along and adjacent to the River channel. Although these new parklands would continue to be developed under the No Action Alternative, the impact would be less beneficial without the comprehensive river parkland measures under the restoration measures. Additional planning efforts, including the Boyle Heights Community Plan update currently in progress, are addressing that neighborhood’s need for additional parks and recreational opportunities along Reaches 7 and 8, where there is currently little land available for parks and recreation spaces or amenities. The restoration measures would occur in areas that could connect with reasonably foreseeable parklands that could be identified through the update of this Plan as well as future community plan updates (City of Los Angeles, 2012). In addition, recreation and open space amenities are identified within the vicinity of the River in the Burbank 2035 General Plan, and cumulative impacts of the restoration measures within Reach 1 in Burbank would result in beneficial cumulative impacts as well (City of Burbank 2013c).

Aesthetics

Implementation of any of the alternatives, combined with cumulative projects in Los Angeles, Glendale, and Burbank would result in cumulative beneficial impacts for aesthetic resources. These reasonably foreseeable future projects would result primarily in the conversion of older industrial and industrial-serving uses to open space uses within the study area comprising the community plan areas of Los Angeles and areas of Glendale and Burbank with River frontage proposed for restoration. These projects include the Rio de Los Angeles State Park, Los Angeles State Historic Park, and improvements in the Glendale Bicycle Transportation Plan, and would result in new parklands, River access, bicycle and pedestrian paths, and landscaping features. Under the No Action Alternative, these projects would provide a beneficial cumulative impact to aesthetic resources. Combined with the LA River project, these projects would result in greater improvement to the aesthetic appearance of the study area and surrounding areas in the cumulative setting. In addition, the proposed project in itself and when combined with cumulative projects would not likely result in new sources of significant light or glare that would result in potential impacts. Therefore, the overall cumulative aesthetic impacts would be beneficial.

Public Health and Safety, Including Hazardous, Toxic and Radioactive Waste

The study area for public health and safety includes the River channel, and the immediate vicinity providing nearby or direct River access. Implementation of River restoration measures could result in less-than-significant potential cumulative impacts involving school safety, HTRW, methane zones, and infectious diseases associated with the project. However, because implementation of the River restoration measures and other reasonably foreseeable future parkland and recreation projects would increase the opportunities for the public to interact with the River, the cumulative risk of water-related injury could increase. This cumulative risk would be greatest with the development of parks and recreational activities with direct or nearby River access, such as Griffith Park on the East Bank, Sennett Creek Park, and the Glendale Narrows Riverwalk. Since these parks would be developed regardless of whether the restoration measures are implemented, the cumulative risks would be similar under a No Action Alternative. This risk would be greatest during and following seasonal flooding events. However, existing public health
and safety agencies in the Cities of Los Angeles, Glendale, and Burbank, including police, fire and other emergency services would be utilized to address any cumulative impacts to public health and safety.

Other large-scale projects in the region may remediate HTRW prior to construction, in addition to those efforts that the sponsor will ensure are completed to allow construction, operation and maintenance of the restoration project. In combination with remediation that would occur prior to construction for this project, significant beneficial impacts on the overall environment through less HTRW could occur.

Utilities and Public Services

The continued population and economic growth of Los Angeles, Glendale, Burbank, and the surrounding region requires commensurate growth in infrastructure and utility capacity. The study area, including the River channel and surrounding lands within the reach areas would continue to be used as a utility corridor and as a conduit for stormwater treatment and discharge. The increase in demand for power and telecommunications would likely result in the need for replacing, upgrading, and installing new transmission lines. Some of these replacements, upgrades, and installations would take place within the study reaches and would be in addition to, or parallel with, the movement of any lines required by expanding the river channel. These upgrades would occur under either the No Action Alternative or any of the restoration measures, and cumulative impacts would be similar. Implementation of any of the proposed alternatives would occur within areas primarily designated for open space and public facilities, and would not conflict with these upgrades or potential new facilities. Cumulative impacts would be addressed through various plans currently adopted or in progress, including the Greater Los Angeles County Integrated Water Resources Management Plan, Integrated Regional Water Management Plan, 2005 Urban Water Management Plan, Solid Waste Integrated Resources Plan, and related projects address long-term infrastructure and utility needs. These planning efforts would ensure that cumulative impacts associated with the restoration measures, and cumulative utility projects within the reaches and vicinity, are less than significant.

Socioeconomics and Environmental Justice

Under the No Action Alternative, no displacement of housing or industrial uses would occur and no significant impacts to socioeconomic and environmental justice would result.

Implementation of any of the alternatives would not result in the displacement of housing; however, all would result in the conversion of industrial land uses to open space and recreational land uses, resulting in a potential transfer of jobs and employment centers from the study area and vicinity. The study area comprises the community plan areas of Los Angeles including the applicable River reaches as well as the Cities of Glendale and Burbank. This conversion would be greatest with Alternative 20, due to the amount of industrial land at the LATC and Verdugo Wash sites identified for River restoration measures. However, it would occur with Alternatives 10, 13, and 16 as well due to the impacts at the LATC site. This, combined with present and reasonably foreseeable future projects including the Rio de Los Angeles State Park at the Taylor Yard site and the Los Angeles State Historic Park, would not result in significant cumulative socioeconomic impacts, nor would the combined projects be anticipated to result in significant cumulative impacts to environmental justice communities.

Cumulative impacts to children’s health and safety are not anticipated to be significant. The restoration measures, combined with current and foreseeable recreation and rehabilitation projects by the Cities of Los Angeles, Glendale and Burbank, would enhance the River and its vicinity as a recreational resource for the surrounding community; this would have a net positive effect on minority and low-income populations as well as children’s health and safety. Increased access to the River and enhanced recreational opportunities would also be consistent with recommendations from several groups that
advocate River enhancement measures as a means to unite various groups and populations and ameliorate environmental justice issues including minimal opportunities to access parks and other recreational facilities in neighborhoods dominated by minority and low-income populations, many of which are found along reaches in the study area. Present and reasonably foreseeable future projects in the study area, including the proposed project, could result in air quality and noise impacts due to the potential conversion of older industrial uses to open space uses. However, these impacts would primarily be due to construction, and would therefore be temporary. In addition, construction measures to address potential air quality and noise concerns, such as dust controls and adherence to local noise ordinances, would reduce any potential cumulative impact on environmental justice populations to a less than significant level. Furthermore, the same areas that would be affected during construction will receive a long-term benefit with the increased recreational amenities.

5.15 GROWTH-INDUCING IMPACTS

All of the proposed alternatives include efforts to provide additional environmental restoration. These are likely to decrease potential growth, rather than induce growth, since these lands would be converted to open space. The conversion of lands from high density uses to open space may have the effect of decreasing the potential for growth. Many restoration submeasures in are within marginal lands at the edge of the River or existing open space that can easily be converted to native habitat. Where larger-scale restoration measures are suggested such as at LATC, these measures would convert industrial and rail facilities into restored habitat and remove them from the potential of being developed into higher density commercial or industrial uses or converted into housing developments. Conversely, it is possible that large scale restoration would attract a greater number of residents to the surrounding areas, particularly as a result of the area becoming a desirable place to live due to its proximity to restored open space.

5.16 UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

<table>
<thead>
<tr>
<th>Resource</th>
<th>Alternative 10 (ART)</th>
<th>Alternative 13 (ACE)</th>
<th>Alternative 13v (AND)</th>
<th>Alternative 16 (RIVER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIR QUALITY</td>
<td>The construction phase of the proposed project is expected to exceed the CEQA localized significance thresholds for NOx. This results in a significant unavoidable impact under CEQA. Impacts under NEPA would be less than significant.</td>
<td>Same as Alt 10.</td>
<td>Impacts under all air quality significance criteria would be less than significant.</td>
<td>Same as Alt 10.</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Restoration in Reach 8 would conflict with the Industrial land use designation. This results in a significant adverse impact under NEPA and a significant and unavoidable impact under CEQA.</td>
<td>Same as Alt 10.</td>
<td>Same as Alt 10.</td>
<td>Same as Alt 10.</td>
</tr>
</tbody>
</table>
5.17 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The National Environmental Policy Act (NEPA) (40 CFR 1502.16) requires that an EIS consider the relationship between short-term uses of the environment and the impacts that such uses may have on the maintenance and enhancement of long-term productivity of the affected environment. This section compares the short and long term environmental effects of the proposed restoration action. Overall, the proposed restoration project would provide minor and temporary short-term losses, while resulting in significant beneficial impacts to the long-term productivity of the affected area.

The period of construction of the proposed project represents the cause of short-term impacts. These temporary and minor impacts or losses are considered non-significant and will include increases in noise, disruption to traffic and recreation in the area, demolition of existing features, removal of materials, reduction in air, water, and aesthetic quality, and disturbance to biological resources. Significant adverse impacts that will occur during construction include the exceedance of air quality thresholds.

Long-term adverse impacts will also result from the project, once the construction period is complete. These impacts will result entirely from the proposed transformation of LATC from its current industrial use condition to a restored historic wash condition. The long-term adverse impacts include the permanent loss of industrial land uses at LATC, the permanent closure of railroads and the resulting loss of rail capacity at LATC, and the loss of working class employment within the LATC neighborhood where minority and low-income populations will be disproportionately affected by that loss.

Long-term beneficial impacts will result from the restoration of the aquatic, wetland, and riparian habitats within the Los Angeles River. Additional in water habitat will provide greater habitat for fish and wildlife in the area, as well as provide other cumulative benefits, such as water attenuation for flood abatement, and aesthetic improvements. Daylighting streams will create new wetland habitat and removing non-native vegetation and replacing it with native plants will further increase fish and wildlife habitat. Secondary long-term benefits of restoration efforts will include improvements to aesthetic quality, air quality, water quality, recreation access and availability, and to those populations that do not have equal availability of recreational opportunities. Ecological restoration will provide a significant and long-term improvement in the condition of the River for the native wildlife populations that once occurred, and in doing so, will enhance the well-being of the human population that surrounds the River. These long-term benefits have been envisioned and designed to outweigh the short-term adverse impacts that are necessary to achieve the restoration goals.

5.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The irreversible environmental changes that would result from implementation of the proposed projects involve the consumption of material resources, energy resources, and human resources that affect the sustainability of resource use in future generations. The use of these resources is considered to be permanent because the use or destruction of the resource cannot be replaced within a reasonable timeframe.

Overall, the proposed action would result in the use of materials, energy, and human resources that would be irreversible and irretrievably lost. Losses would include those from materials demolished, fill material removed, vegetation uprooted, energy resources utilized, and labor hours spent. Levels of significance of these losses, both adverse and beneficial, are described in further detail in subsequent paragraphs. For all of the alternatives proposed, a variety of materials in place within the study area would be demolished, removed, or altered in a way that would result in their irreplaceable loss. This loss would be offset in part by the reuse of materials where possible. For example, it may be feasible to utilize
demolished concrete as bank protection where new channel or side channel features are implemented. Transfer of non-reusable materials for disposal will also create irretrievable losses as landfill capacity is occupied. Alternatives increase in footprint with increasing number (10, 13, 16, 20) and consequently, a greater amount of materials will be removed for each alternative. See Appendix C for a complete description of material volume to be removed or demolished for each alternative.

Materials used for construction would also be irretrievably lost, as they would no longer be available for other projects. This includes all materials noted in Appendix C, again with increasing commitments with each alternative. In addition, use of water for dust abatement will be irretrievable. These needed materials are not in short supply and would not limit other unrelated construction activities. The land itself will be committed to the selected restoration alternative and unavailable for use in future project. However, the River channel is already committed as a Federal project for flood reduction and management and cannot be otherwise apportioned.

Energy resources used would include fuels and electricity, which would be utilized during construction and continue to be used during operation of the channel and maintenance of restoration elements. These uses would constitute an irretrievable loss of energy. However, consumption of energy would not place a significant demand on energy in the region.

Use of human resources during construction would be an irreversible loss of labor supply for other projects. However, labor opportunities are desired in the study area and this use of human resources represents beneficial employment opportunities. Transfer of industrial land uses into recreational land uses represents an irreversible loss of employment opportunities in the downtown industrial area of Los Angeles for all alternatives, while Alternative 20 represents an additional loss of industrial land uses and opportunities within the Verdugo Wash vicinity.

Vegetation that would be altered would be irretrievably lost, though this is a designated objective of the restoration project in many portions of the study area. The irretrievable loss of non-native and invasive vegetation is a preferred outcome. In other areas, loss of vegetation due to construction will be remedied with revegetation efforts. Biological resources will be protected from irretrievable loss through construction management BMPs and site surveys conducted prior to groundbreaking.

Construction and operation of the selected alternative would result in the loss of cultural resources that are ineligible for listing on the NRHP or the CRHP. While not significant, the loss of these sites would constitute an irreversible and irretrievable commitment of a resource. The resources would be recorded and the information would be incorporated into agency and statewide data repositories. Impacts to resources eligible for listing on the NRHP or the CRHP would be avoided and minimized as outlined in the PA and when necessary mitigated as prescribed in the HPTP. However, a site’s full data potential can never be fully retrieved. Similarly, impacts to historic properties eligible under Criteria A-C, such as the flood control structures, cannot be completely mitigated. Residual, less than significant impacts would remain resulting in an irreversible and irretrievable commitment of a resource.
6 COMPARISON OF ALTERNATIVE PLANS

The comparison of the final array alternative plans is used to assist in the identification of the National Ecosystem Restoration (NER) Plan and the recommended plan.

As part of the planning process, the USACE identifies the NER Plan. As described in USACE planning guidance, the NER Plan is the alternative and scale having the maximum monetary and non-monetary beneficial effects over monetary and nonmonetary costs. This plan occurs where the incremental beneficial effects just equal the incremental costs, or alternatively stated, where the extra environmental value is just worth the extra costs. The guidance also notes that in all but the most unusual cases, the NER Plan should be derived from the final set of “Best Buy” solutions. To put it simply, the USACE and City have to answer the question about whether the plan’s benefits are worth the costs, but this is a difficult process because monetary calculations do not capture all ecosystem benefits. Environmental benefits analysis is still developing as an area of study. Therefore, other comparisons between ecosystem benefits are provided within this chapter as well.

This section provides a comparison of the final array of alternatives that were described in Section 4. As described in that section, the final array in the Draft IFR consisted of the “No Action” alternative and 4 action alternatives. In this Final IFR, a variation on Alternative 13, referred to as 13v, includes substituting the Reach 7 plan from Alternative 20 is also evaluated as part of the final array. This variation is within the spectrum of alternatives analyzed in the Draft IFR. This variation was identified through further cost analysis subsequent to the circulation of the Draft IFR as described in Section 6.6.3 and has been integrated into the comparison of plans below as appropriate.

As noted in Chapter 4, there is a significant cost difference among the alternatives in the final array. The results of the CE/ICA for the final array of alternatives also show significant increases in the incremental cost per habitat unit among alternatives. The environmental outputs and the CE/ICA are one measure of the merits of the alternatives that must be weighed against other evaluation criteria. As part of the 6-step planning process, alternatives are compared against the No Action Alternative as well as each other. This section describes how the NER Plan was identified. This section also includes additional analysis to confirm or change that selection. The details of each alternative were independently described in previous chapters and will be compared in this step. In each evaluation step, the significant contributions or effects of each individual plan are quantified and judged. The further comparison and evaluation of alternatives considers each plan’s effects on:

- Project Objectives
- Project Constraints
- Policy Issues
- National Objectives and the Four Accounts
  - National Economic Development
  - Environmental Quality
  - Regional Economic Development
  - Other Social Effects
- Principles and Guidelines Criteria
  - Completeness
  - Efficiency
  - Effectiveness
  - Acceptability
Sections 6.1 and 6.2 compare the alternatives, including updates to address the variation on Alternative 13, with respect to objectives (6.1) and policy issues, risks, and constraints (6.2).

Section 6.3 addresses the four accounts. Section 6.3.1 provides the NED analysis associated with the recreation plans that are compatible with ecosystem restoration for the NER Plan and Recommended Plan. Section 6.3.2 provides the Environmental Quality account comparison, including the effects analysis from Section 5. Section 6.3.3 and 6.3.4 present the RED and OSE analysis used in the Draft IFR.

Sections 6.4 and 6.5 show the cost comparison and analysis used in initially identifying the NER Plan and Tentatively Selected Plan in the Draft IFR as Alternative 13. Section 6.6 then describes the public and Independent External Peer Review comments received on the Draft IFR, explains the additional analysis and comparison in this Final IFR utilized to refine the NER plan with the variation on Alternative 13, and identifies the request and grant of permission to recommend Alternative 20 for authorization.

The updated costs associated with Alternative 13\(v\) are provided in Chapter 7 and compared to Alternative 20. They are not comparable to costs reported for the Draft IFR because the updated costs are based on 2015 price levels, a full Cost Schedule Risk Analysis (CSRA), and updates to LERRD costs through more detailed analysis. The RED analysis for Alternative 13\(v\) is presented in Chapter 7 and compared to Alternative 20.

### 6.1 FINAL ARRAY COMPARISON BY PROJECT OBJECTIVE

The planning objectives for this study, described in detail in Section 4, are summarized below.

1. Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat: Restore Valley Foothill Riparian wildlife habitat types, aquatic freshwater marsh communities, and native fish habitat within the ARBOR reach throughout the period of analysis, including restoration of supporting ecological processes and biological diversity, and a more natural hydrologic and hydraulic regime that reconnects the river to historic floodplains and tributaries, reduces velocities, increases infiltration, and improves natural sediment processes.

2. Increase Habitat Connectivity: Increase habitat connectivity between the river and the historic floodplain, and increase nodal connectivity for wildlife between restored habitat patches and nearby significant ecological zones such as the Santa Monica Mountains, Verdugo Hills, Elysian Hills, and San Gabriel Mountains within the ARBOR reach throughout the period of analysis.

3. Increase passive recreation: Include recreation that is compatible with the restored environment in the ARBOR reach throughout the period of analysis.

Table 6-1 and Table 6-2 below include information pertaining to performance criteria for the two objectives related to ecosystem restoration and describe how each meets the criteria. Each is ranked from 1 to 4 with 4 being the highest. A zero is given if there is no value added for that objective target. The third objective related to recreation is described in the recreation plan analysis in Section 4.16, with further analysis provided in Section 6.3.
Widen channel to accommodate meandering of the River in at least one reach.

For Vally Foothill Riparian Habitat:
- Restore structurally diverse riparian habitat consisting of herbaceous (e.g., herbaceous vine cover), shrub (e.g., shabby willow thicket), and tree (e.g., mature cottonwood-willow trees) layers in a minimum of five reaches resulting in 3 contiguous reaches. Restore riparian habitats with a varying number of structural layers (one, two, and three layers) to support survival and reproductive requirements for riparian obligate and transient wildlife species, including food, water, shelter, breeding, migration, and dispersal (Krueper, 1995).

- Restore a minimum of two aquatic habitat nodes with a natural hydrologic connection to the river and riparian communities with a minimum distance of 150 meters from the water’s edge to create areas capable of functioning as core habitat and refuge for native reptiles and amphibians (Sennrich and Bodie 2003) and to minimize the risk of localized extinction due to natural disasters (IE flood, fire, drought) (Schippers et al. 1996; Denning et al. 1995).

- Restore structurally diverse riparian habitat consisting of emergent herbaceous vegetation (i.e., cattails, rushes, sedges) adapted to saturated soil conditions.

- Restore aquatic habitat to support survival and reproductive needs of wildlife. Restore a minimum of one habitat node with a minimum width of 250 meters (820 feet) to support high frequencies of the Federally endangered least Bell’s vireo (Kus 2002).

- For Freshwater Marsh and Fish Habitat:
- Restore functional freshwater marsh habitat consisting of emergent herbaceous vegetation (i.e., cattails, rushes, sedges) adapted to saturated soil conditions.

- Restore aquatic habitat to support survival and reproductive requirements for fish and wildlife species, including food, water, shelter, breeding, migration, and dispersal.

- For a More Natural Hydrologic and Hydraulic Regime:
- Expansion of the River into at least one large, contiguous river adjacent area within the study area that promotes hydrologic connections to the floodplain and overbank areas.

- Widens channel to accommodate meandering of the River in at least one reach.

<table>
<thead>
<tr>
<th>Target Objective</th>
<th>ALT 10 (ART)</th>
<th>ALT 13 (ACE)</th>
<th>ALT 13v</th>
<th>ALT 16 (AND)</th>
<th>ALT 20 (RIVER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal and management of invasives to less than 10 percent within 5 to 7 years post-construction of each feature: Includes both proposed restoration features and existing habitat in soft bottom reaches during construction and adaptive management.</td>
<td>1: Provides invasives management in 528 acres</td>
<td>2: Provides invasives management in 588 acres</td>
<td>2: Provides invasives management in 598 acres</td>
<td>3: Provides invasives management in 659 acres</td>
<td>4: Provides invasives management in 719 acres</td>
</tr>
<tr>
<td>Restore structurally diverse riparian habitat consisting of herbaceous (e.g., herbaceous vine cover), shrub (e.g., shabby willow thicket), and tree (e.g., mature cottonwood-willow trees) layers in a minimum of five reaches resulting in 3 contiguous reaches. Restore riparian habitats with a varying number of structural layers (one, two, and three layers) to support survival and reproductive requirements for riparian obligate and transient wildlife species, including food, water, shelter, breeding, migration, and dispersal (Krueper, 1995).</td>
<td>1: Restores eight contiguous reaches, 528 acres providing a net increase of 93% in habitat or 5321 habitat units</td>
<td>2: Restores eight contiguous reaches, 588 acres providing a net increase of 104% in habitat or 5902 habitat units</td>
<td>2: Restores eight contiguous reaches, 598 acres providing a net increase of 106% in habitat or 5989 habitat units</td>
<td>3: Restores eight contiguous reaches, 659 acres providing a net increase of 114% in habitat or 6850 habitat units</td>
<td>4: Restores eight contiguous reaches, 719 acres providing a net increase of 119% in habitat or 6872 habitat units</td>
</tr>
<tr>
<td>Restore a minimum of two aquatic habitat nodes with a natural hydrologic connection to the river and riparian communities with a minimum distance of 150 meters from the water’s edge to create areas capable of functioning as core habitat and refuge for native reptiles and amphibians (Sennrich and Bodie 2003) and to minimize the risk of localized extinction due to natural disasters (IE flood, fire, drought) (Schippers et al. 1996; Denning et al. 1995).</td>
<td>1: Restores 1 aquatic habitat node with natural connection and width of 150 meters in reaches 6 and 7 (Arroyo Seco) providing 309% more nodal connections than Alternative 10.</td>
<td>2: Restores 2 aquatic habitat nodes with natural connection and width of 150 meters in reaches 6 and 7 (Arroyo Seco) providing 33% more nodal connections than Alternative 13 with the addition of the Cornfields node</td>
<td>2: Restores 2 aquatic habitat nodes with natural hydrologic connections and a width of 150 meters in reaches 6, 7 and 8 providing 39% more nodal connections than Alternative 13v</td>
<td>3: Restores 3 aquatic habitat nodes with natural hydrologic connections and a width of 150 meters in reach 3, 6, 7 and 8 providing 120% more nodal connections than Alternative 16</td>
<td>4: Restores 4 aquatic habitat nodes with 4 natural hydrologic connections and a width of 150 meters in reach 3, 6, 7 and 8 providing 20% more nodal connections than Alternative 16</td>
</tr>
<tr>
<td>Within 5-10 years of construction, restore and maintain dense, structurally diverse riparian habitat sufficient to maintain survival and reproductive needs of wildlife. Restore a minimum of one habitat node with a minimum width of 250 meters (820 feet) to support high frequencies of the Federally endangered least Bell’s vireo (Kus 2002).</td>
<td>3: Restores one reach with strand widths of at least 250 meters (820 feet)</td>
<td>3: Restores one reach with strand widths of at least 250 meters (820 feet)</td>
<td>3: Restores one reach with strand widths of at least 250 meters (820 feet)</td>
<td>3: Restores one reach with strand widths of at least 250 meters (820 feet)</td>
<td>4: Restores two reaches with strand widths of at least 250 meters (820 feet)</td>
</tr>
<tr>
<td>Restore functional freshwater marsh habitat consisting of emergent herbaceous vegetation (i.e., cattails, rushes, sedges) adapted to saturated soil conditions.</td>
<td>1: Fourteen acres restored in 15 daylighted streams and in widened area of Taylor Yard</td>
<td>2: Twelve acres restored in 12 daylighted streams and 21 additional acres in Reach 6 to Taylor Yard</td>
<td>1: Fifteen acres restored in 15 daylighted streams, 21 additional acres in Reach 6 to Taylor Yard, and 10 acres in Reach 7</td>
<td>3: Twelve acres restored in 12 daylighted streams, 27 acres added in Reach 5, 21 additional acres in Reach 6 to Taylor Yard, 44 acres in LATC</td>
<td>4: Thirteen acres restored in 13 daylighted streams, 20 acres in Reach 27 acres added in Reach 2, 10 acres in Reach 3, Reach 5, 21 additional acres in Reach 6 to Taylor Yard, 10 acres in Reach 7, 44 acres in LATC</td>
</tr>
<tr>
<td>Restore aquatic habitat to support survival and reproductive requirements for fish and wildlife species, including food, water, shelter, breeding, migration, and dispersal.</td>
<td>1: Minimal main stem restoration of aquatic habitat in Reach 6, 138 acres</td>
<td>2: In addition to Alt 10, increase in main stem aquatic habitat in Reach 6, 17 acres</td>
<td>2: In addition to Alt 10, increase in main stem aquatic habitat in Reach 6, 17 acres</td>
<td>3: In addition to Alt 10, increase in main stem aquatic habitat in Reaches 5, 6 and 8 – 27, 38, and 44 acres respectively</td>
<td>4: In addition to Alt 10, increase in channel aquatic habitat in Reaches 2, 5, 6 and 8 – 17, 27, 38, and 44 acres respectively respectively</td>
</tr>
<tr>
<td>Expansion of the River into at least one large, contiguous river adjacent area within the study area that promotes hydrologic connections to the floodplain and overbank areas.</td>
<td>1: Minimal restored hydrologic connection Reach 4 Griffith Park side channel &amp; Los Feliz seasonal flooding, Reach 6 to Taylor Yard</td>
<td>2: Increased restored hydrologic connection in Reach 6 to Taylor Yard and Reach 3 side channel, in addition to Alt 10 connections</td>
<td>2: Increased restored hydrologic connection in Reach 6 to Taylor Yard and Reach 3 side channel, in addition to Alt 13 connections</td>
<td>3: Increased restored hydrologic connection in Reach 8 to LATC in addition to Alt 13 connections</td>
<td>4: Increased restored hydrologic connection in Reach 3 Verdugo Wash</td>
</tr>
<tr>
<td>Widens channel to accommodate meandering of the River in at least one reach</td>
<td>1: Widens channel by approximately 24 feet in Reach 6</td>
<td>2: Widens channel to approximately 544 feet in Reach 6, modification of Arroyo Seco confluence in Reach 7</td>
<td>2: Widens channel to approximately 544 feet in Reach 6, modification of Arroyo Seco confluence in Reach 7 and Reach 3 LA State Historic Park terrace into river</td>
<td>3: Reach 5 is widened approximately 24 feet x 1.6 miles by modification of channel walls from trap to vertical and terrace of left bank, and Reach 8 includes terrace on the right and left banks upstream and downstream of LATC and channel widening in channel 500 feet and on a bench in LATC of 1,000 ft in addition to Alt 13</td>
<td>4: Reach 2 is widened approximately 24 feet by converting right bank from trapezoidal to vertical, in addition to Alt 16 changes and Reach 7 LA State Historic Park terrace into river as in Alt 13v</td>
</tr>
</tbody>
</table>
### Table 6-I Objectives Performance Criteria Analysis of Final Array for Objective 1

<table>
<thead>
<tr>
<th>Target Objective</th>
<th>Alt 10 (ART)</th>
<th>Alt 13 (ACE)</th>
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</thead>
<tbody>
<tr>
<td>Connect river hydrologically (assisted or naturally) to overbank with at least one such connection per reach</td>
<td>1-Daylights 15 small tributary streams, and adds two side channels, adds a minimal amount of restored natural riverbed in Reach 6 with some terracing, historical wash in Reach 8</td>
<td>2-Daylights 12 small tributary streams, terraces and widens significantly in Reach 6, in addition to Alt 10</td>
<td>2-Daylights 15 small tributary streams, terraces and widens significantly in Reach 6, adds terracing in LA State Historic Park in Reach 7 in addition to Alt 10</td>
<td>3-Daylights 12 small tributary streams, reaches 8, widens minimally in Reach 9, terraces in Reaches 5 and 8, and adds 3 side channels, historical wash in Reach 8 in addition to changes in Alt 13</td>
<td>4-Daylights 15 small tributary streams, Verdugo Wash confluences, widens minimally in Reach 2, adds terracing in LA State Historic Park in Reach 7 in addition to changes in Alt 16</td>
</tr>
<tr>
<td>Within the main stem of the river, when increasing vegetation, target velocity should be less than 12 ft/s and ideally 8 ft/s</td>
<td>3 - Velocities &gt;12ft/s existing within Reach 6. All other Reaches have velocities within the target range.</td>
<td>2 - Velocities &gt;12ft/s existing within Reach 6. All other Reaches have velocities within the target range.</td>
<td>2 - Velocities &gt;12ft/s existing within Reach 6. All other Reaches have velocities within the target range.</td>
<td>2 - Velocities &gt;12ft/s existing within Reaches 5 and 6. All other Reaches have velocities within the target range.</td>
<td>4 - Velocities &gt;12ft/s existing within Reaches 5 and 6. All other Reaches have velocities within the target range.</td>
</tr>
<tr>
<td>Restore seasonal overbank flooding to river adjacent areas for sustainability of habitat and natural ecological, hydrologic processes</td>
<td>2-Minimal seasonal overbank flooding on terracing in Reach 6</td>
<td>2-Minimal seasonal overbank flooding on terracing in Reach 6</td>
<td>2-Minimal seasonal overbank flooding on terracing in Reach 6</td>
<td>3-Minimal seasonal overbank flooding on terracing in Reaches 5, and 6</td>
<td>4-Increasing overbank flows in greater area in Reach 6 and 8, and on terracing in Reaches 2, 5, 6, and 8</td>
</tr>
<tr>
<td>Target Objective</td>
<td>Alt 10 (ART)</td>
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<td>Alt 13v</td>
<td>Alt 16 (AND)</td>
<td>Alt 20 (RIVER)</td>
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<tr>
<td>Restoration of riparian and wetland aquatic wildlife habitat at tributary confluences to create connectivity to similar upstream habitats on the tributaries with ultimate nodal connection to the aquatic habitats in the San Gabriel and Verdugo Mountains (at least one major tributary connection should be restored.)</td>
<td>0-No connection</td>
<td>3-Reconnection hydrologically with Arroyo Seco</td>
<td>3-Reconnection hydrologically with Arroyo Seco</td>
<td>3-Reconnection hydrologically with Arroyo Seco</td>
<td>4-Reconnection hydrologically with Arroyo Seco and Verdugo Wash</td>
</tr>
<tr>
<td>Restore habitat corridors between large nodes in the ARBOR area to maximize connectivity for wildlife movement and dispersal on the local scale and minimize the risk of habitat sinks in an urban environment (Hilty et al. 2006, Hanski &amp; Thomas 1994, Rudd 2002, Noss 1983), and to provide opportunities for regional wildlife movement</td>
<td>0-no habitat corridors created between nodes</td>
<td>2-connection created between Taylor Yard (Reach 6) and Arroyo Seco (Reach 7)</td>
<td>2-connection created between Taylor Yard (Reach 6) and Arroyo Seco (Reach 7)</td>
<td>3-connections created between Taylor Yard (Reach 6), Arroyo Seco (Reach 7), and LATC (Reach 8)</td>
<td>4-connections created between Verdugo Wash (Reach 3), Taylor Yard (Reach 6), Arroyo Seco (Reach 7), and LATC (Reach 8)</td>
</tr>
<tr>
<td>Restoration of wildlife habitat on channel banks</td>
<td>1-Restores 12 acres of habitat on channel banks</td>
<td>2-Restores 54 acres of habitat on channel banks</td>
<td>2-Restores 64 acres of habitat on channel banks</td>
<td>3-Restores 95 acres of habitat on channel banks</td>
<td>4-Restores 105 acres of habitat on channel banks</td>
</tr>
<tr>
<td>Improved aquatic-habitat connectivity within the ARBOR area through restoration of habitat nodes with wetland and riparian habitat that are naturally hydrologically connected to the river corridor upstream and downstream of the Glendale Narrows. (Rudd et al. 2002)</td>
<td>0-No Nodal Connectivity upstream or downstream of the Glendale Narrows</td>
<td>2-Increased Nodal Connectivity of 30% over Alt 10</td>
<td>2-Increased Nodal Connectivity of 33% over Alt 13</td>
<td>3- Increased Nodal Connectivity of 39% over Alt 13v</td>
<td>4- Increased Nodal Connectivity of 120% over Alt 16</td>
</tr>
<tr>
<td>Lengthen the extent of contiguous vegetated pathways for reptile and small/medium mammal movement (currently limited to Reaches 4 to 6, to achieve upstream and/or downstream connections to at least one additional tributary or open space area that is currently isolated from the soft-bottom reach. This may be achieved by either in-channel or side-channel vegetated corridors.</td>
<td>Reaches 1-6</td>
<td>Reaches 1-8</td>
<td>Reaches 1-8</td>
<td>Reaches 1-8</td>
<td>Reaches 1-8</td>
</tr>
<tr>
<td>Reconnect hydrologically with at least one main tributary- Confluence restoration provides an improved hydraulic connection to the LA River. Widening or laying back the side slopes adds capacity. Removal of concrete sides slopes and/or inverts allow establishment of vegetation which reduces velocities, increases infiltration, and improves the natural sediment processes.</td>
<td>0-No connection</td>
<td>3-Reconnection hydrologically with Arroyo Seco</td>
<td>3-Reconnection hydrologically with Arroyo Seco</td>
<td>3-Reconnection hydrologically with Arroyo Seco</td>
<td>4-Reconnection hydrologically with Arroyo Seco and Verdugo Wash</td>
</tr>
</tbody>
</table>
### OBJECTIVE 2: INCREASE HABITAT CONNECTIVITY

<table>
<thead>
<tr>
<th>Target Objective</th>
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<th>Alt 16 (AND)</th>
<th>Alt 20 (RIVER)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ideally, the alternatives will also achieve the following:</strong></td>
<td>1-Restores 202 acres of habitat on river adjacent and contiguous areas</td>
<td>2-Restores 207 acres of habitat on river adjacent and contiguous areas</td>
<td>2-Restores 207 acres of habitat on river adjacent and contiguous areas</td>
<td>3-Restores 234 acres of habitat on river adjacent and contiguous areas</td>
<td>4-Restores 234 acres of habitat on river adjacent and contiguous areas</td>
</tr>
<tr>
<td>Expansion of riparian and wetland wildlife habitat into large, contiguous river adjacent lands within the study area to support higher abundance of wildlife and more significant nodal connections to nearby ecological zones. Connections to Santa Monica Mountains created through Headworks, Ferraro Fields, and side channels.</td>
<td>0-Does not include Arroyo Seco confluence connections</td>
<td>4-Includes Arroyo Seco confluence restoration</td>
<td>4-Includes Arroyo Seco confluence restoration</td>
<td>4-Includes Arroyo Seco confluence restoration</td>
<td>4-Includes Arroyo Seco confluence restoration</td>
</tr>
<tr>
<td>Include Reach 7 to provide nodal connections to San Gabriel Mountains via Arroyo Seco confluence and/or other smaller tributaries and to provide potential for future direct connections to the mountains via other projects upstream on Arroyo Seco.</td>
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</tbody>
</table>

1. Rating from 1 to 4, with 4 being highest. A zero is given if there is no value added for that objective target.
2. Percent increase in nodal “connectedness” was performed based on the sizes of habitat nodes in the study area and the minimum distance of vegetated corridors between nodes (Rudd et al. 2002). “Connectedness” was calculated based on the size of habitat nodes with natural hydrologic connections to the river and the length of natural habitat corridors between them. Restoration of large nodes that are close together, connected by natural habitat corridors, increase the level of “connectedness”. For each alternative in the final array, additional nodes and/or corridors are restored, increasing the level of “connectedness” in the project area.
6.1.1 Use of CHAP to Assess Alternatives by Restoration Objective

USACE Guidance on the objective of Civil Works ecosystem restoration (ER 1105-2-100) states, “Restored ecosystems should mimic, as closely as possible, conditions which would occur in the area in the absence of human changes to the landscape and hydrology. Indicators of success would include … the ability of the restored area to continue to function and produce the desired outputs with a minimum of continuing human intervention.” Guidance goes on to state “Restoration projects should be conceived in a systems context … in order to improve the potential for long-term survival as self-regulating, functioning systems. This system view will be applied both in examination of the problems and the development of alternative means for their solution. Consideration should be given to the interconnectedness and dynamics of natural systems….” (USACE 2000).

The habitat model (CHAP) outputs as described in Section 4.9 and CE/ICA analysis as described in Section 4.11 were utilized to compare the ecosystem benefits of the alternatives under consideration. Results of the incremental analysis must be synthesized with other decision-making criteria. IWR Report 95-R-1, Evaluation of Environmental Investments Procedures Manual describes that “In some cases, the economic and environmental models used to estimate the effects of environmental restoration plans are not capable of capturing the full range of such effects. The models may be incapable of accounting for all considerations that impact upon the decision process. For example, concerns about endangered species, support by a local sponsor or other interest group, cost sharing arrangements, and other factors may lead to the continuing consideration and selection of solutions that may not be the most cost effective, or that may incur substantial incremental costs.

CHAP was the primary tool used to assess habitat value restored by the study alternatives. The HU output measured habitat value as described in Section 4.9, but did not distinguish the value of in-channel habitat and natural hydrologic connectivity. Equal weight was given to in channel habitat and out of channel habitat. In-channel habitat and natural hydrologic connections support sediment and nutrient exchange with floodplain habitats, and in-channel restoration is only possible by providing additional area for the river to naturally meander and widen. Widening of the river channel does not just seek to restore habitat and hydrologic connectivity along the river but to: “restore significant structure, function and dynamic processes that have been degraded” (EP 1165-2-501) and to partially “reestablish the attributes of a naturalistic, functioning, and self-regulating system” (EP 1165-2-502). Restoration of a more natural hydrologic regime and connections between the river and historic floodplain also removes barriers (such as concrete or high overbank elevations) which supports wildlife movement for a greater variety of species. The HU output also did not fully capture habitat nodal connectivity within the study area and regionally. Restoration of habitat patches and vegetated corridors to link them improves connectivity for the movement of wildlife within the study area and to nearby ecological areas by reducing habitat fragmentation, restoring corridors, and removing barriers. Section 6.1.2 provides the analysis used to further compare restoration of natural hydrologic function and habitat connectivity. Section 6.1.3 provides additional quantitative comparison of habitat connectivity in response to concerns from the public and a recommendation from the IEPR panel to more fully quantify connectivity benefits, as described in 6.1.2 and 6.1.3 below.

6.1.2 Comparison of Restoration of Natural Hydrological Function and Habitat Connectivity

A comparison was performed for the final array of alternatives to assess their responsiveness to the hydrologic restoration component of Objective 1 and habitat connectivity in Objective 2. This provides a comparison of the factors not captured by the CE/ICA results necessary to support NER plan selection.
A comparison of restoration habitat connectedness was performed based on the sizes of habitat nodes in the study area and the minimum distance of vegetated corridors between nodes (Rudd et al. 2002). “Connectedness” was calculated using equations found in Rudd et al. 2002, which was measured based on the size of habitat nodes with natural hydrologic connections to the river and the length of natural habitat corridors between them. This is based on the knowledge that in order for wildlife to move through a landscape they need large patches of habitat to support resources for survival (foraging, resting, breeding, “live-in” habitat) and accessible vegetated corridors to allow for movement between the habitat patches. Restoration of large nodes that are close together, connected by natural habitat corridors, increase the level of “connectedness”.

The direct natural hydrologic connections between the river and historic floodplain would occur in the final array at Taylor Yard in all four alternatives in the Draft IFR (with less acres of habitat in Alternative 10), LATC (Alt 16, 20), Arroyo Seco (Alt 13, 16, 20), and at Verdugo Wash (Alt 20). These direct hydrologic connections, where the river/tributary can spread and naturally meander into the adjacent floodplain and establish riparian and wetland habitat, provide the most natural habitat connections and the best opportunities for wildlife movement between the river and the historic floodplain. Assisted hydrologic connections, where water is fed to the historic floodplain sites via culverts (i.e. Ferarro Field, Griffith Park, Pollywog Park, Los Feliz Golf Course, LATC (Alt 13)), can support riparian and wetland habitat and create habitat connectivity by increasing the amount and availability of resources (food, shelter, nesting habitat) within the historic floodplain, where it is currently extremely limited to “soft-bottom” portions of the channelized river. This habitat would attract and could support higher populations of wildlife that are now limited to the scarce riparian habitat in the river channel. However, movement to and from these floodplain sites with assisted watering would be more limited to birds and other small wildlife that would not be hindered by using culverts or climbing channel walls to reach the river adjacent habitat. As stated previously, a variation the Alternative 13, substituting the Reach 7 plan from Alternative 20 is also evaluated. This variation is within the spectrum of alternatives analyzed in the Draft IFR. Comparisons for Alternative 13 for reaches 1-6 and 8 is the same for Alternative 13v and comparisons for reach 7 in Alternative 20 apply to reach 7 for Alternative 13v.

The comparison of local and regional habitat connectivity and the nature of the hydrologic regime (natural vs. assisted) to support ecosystem functioning and wildlife movement is discussed for the final array of alternatives below. It includes a comparison of restoration of a more natural hydrologic and hydraulic regime with increased connectivity to the floodplain. It also includes evaluation of local habitat connectivity within the study area. Restoration of connectivity to the floodplain and local habitat connectivity would improve movement opportunities for native fish, including arroyo chub and Santa Ana sucker, as well as riparian obligate bird species, including the least Bell’s vireo, yellow warbler, and yellow breasted chat, seasonal migrants, amphibians, reptiles, and mammals, possibly including larger carnivores such as coyote and bobcat. This comparison also evaluates opportunities for connectivity over longer distances to regional significant ecological zones. Restored regional habitat connectivity is expected to improve movement opportunities for larger mammals including coyote and bobcat. The two comparisons for hydrologic and habitat connectivity are provided together as they are closely linked.

**Interactions with Surrounding Environments**

The project has been designed to widen the channel where feasible, which will provide space to accommodate slower flows and restored habitat.

The restored habitat will continue to be flanked by highly urbanized areas. This may have negative effects on the restoration area in the form of trash, human intrusion and trampling, and invasion by non-native weeds. However, implementation of OMRRR requirements for invasives management and implementation of the Recreation Plan, which will designate trails for human use, will lessen these effects.
from the surrounding environment. Restoration in a highly urbanized area provides the benefits of
improving nodal connectivity for wildlife. Where habitat is extremely scarce, addition of patches of
habitat in an urban setting provides opportunity for both resident and migrating wildlife to live in and
move through the landscape, providing refuge, improving transfer of genetic material, reducing
inbreeding depression, and promoting increased biodiversity.

Semi-natural areas outside the riparian corridor may serve as buffers against the urban environment, as
well as contribute to movement of wildlife to and from other significant regional habitat. Certain areas
may support non-natives that could intrude upon the restored area; however, OMRRR within the project
area would help address this effect.

Alternative 10

Alternative 10 consists of a corridor of 528 acres along the approximately 11-mile stretch proposed for
restoration on the LA River. The plan consists of restoring valley foothill riparian wildlife habitat,
freshwater marsh aquatic habitat, and native fish habitat (though currently native fish no longer exist in
the Study area). Alternative 10 has the least cost of the four proposed plans in the final array and
minimally meets planning objectives.

Alternative 10 (Figure 6-1) restores a natural hydrologic connection between the River and the historic
floodplain at the Taylor Yard Site in Reach 6, which re-establishes lost functions and supports more
sustainable habitat in that area. This restoration at Taylor Yard establishes a large node of historic valley
foothill riparian and marsh habitat adjacent to the River corridor. The habitat at Taylor Yard is then
connected to other habitats currently existing within the river channel in the Glendale Narrows (Figure
6-2). Connectivity to other restored habitat in the Study area is more limited by the overbank locations
(i.e. Ferraro Fields, Los Feliz golf course) and assisted watering in those areas.
Figure 6-1 Alternative 10 Footprint Map
Figure 6-2 Alternative 10 Local Habitat and Hydrologic Connectivity
Restoration of habitat in Reaches 1, 2, and 3 provides regional habitat connections to Griffith Park, leading to the greater Santa Monica Mountains and the Pacific Ocean (Figure 6-3). Additional opportunity for connection in this area may exist via the USACE’s on-going Headworks Ecosystem Restoration Study.

**Figure 6-3** Alternative 10 Regional Habitat Connectivity Illustrated by Red Lines

**Alternative 13**

Alternative 13 restores 588 acres along the 11 mile study area. Below is a map (Figure 6-4) showing the footprint of Alternative 13 ACE. While the footprint is very similar to that of Alternative 10, the added measures in Reaches 3, 6 and 7 provide additional connectivity benefits, including natural hydrologic and hydraulic connectivity between the river, floodplain, and overbank areas, and habitat connectivity for wildlife movement. Natural hydrologic connectivity supports additional ecological processes such as natural disturbance, nutrient cycling, biotic interactions, and population dynamics which improve the sustainability of the restored ecosystem pursuant to the definition of connectivity found in planning guidance.

Alternative 13 adds additional increments of restoration that contribute to the planning objectives by:
Figure 6-4 Alternative 13 ACE Footprint with Yellow Highlight Areas Showing Additions over Alternative 10
Objective 1: Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat

- Reach 3 provides 17 additional acres of riparian and marsh habitat and Reach 6 provides 21 acres of additional marsh. Arroyo Seco restoration in Reach 7 adds 22 acres of additional riparian habitat.
- A more natural hydrologic and hydraulic regime is incrementally increased with the widening in Reach 6 of over 200 additional feet of river bed and naturalization of the major tributary confluence on the Arroyo Seco. Assisted hydrologic connections are made at the overbank side channel in Ferraro Fields, Griffith Park Golf Course, and Los Feliz Golf Course.

Objective 2: Increase Habitat Connectivity

- This alternative provides 309 percent more connectedness (Rudd et al. 2002) within the Study Area over Alternative 10 via the restored nodal connections between Taylor Yard and Arroyo Seco (Figure 6-5). In Alternative 13, by adding the natural hydrologic connection at Arroyo Seco, which is very close in proximity to Taylor Yard, the level of connectedness is substantially increased from Alternative 10, where there is very limited connectivity (assisted watering). Increased channel bed restoration in Reach 6 and in Arroyo Seco in Reach 7 allow for creation of riffle/pool complexes which supports habitat for and movement of native fish species.
- Increased regional habitat connectivity through Arroyo Seco confluence to the San Gabriel Mountains.

Alternative 13 adds to the regional connection through Griffith Park to the Santa Monica Mountains with addition of a side channel at Ferraro Fields, and restores a natural hydrologic connection between the river and historic floodplain at the Arroyo Seco confluence, which restores natural ecosystem processes as well as improved nodal and regional habitat connectivity. In addition, the increased widening in Reach 6 and modified bank allow for more habitat and hydrologic connectivity in this reach.

Alternative 13 would remove the bank and widen the river channel bed at the Taylor Yard site more substantially than in Alternative 10. This alternative restores a natural hydrologic and habitat connection between the river and the site. This would allow for natural in-channel geomorphic character and habitat to establish and for the currently confined river to spread into its historic floodplain. This natural hydrologic connection between the river and the floodplain restores key processes that exist in a native river ecosystem such as a more natural disturbance regime, scour and deposition of sediment and vegetation, nutrient cycling, biotic interactions, and colonization of new habitat areas (Stromberg et al. 2007).

The restoration of the Arroyo Seco confluence restores natural in-channel geomorphic character and riparian and aquatic habitat in the currently channelized tributary at the confluence with the river. This natural hydrologic connection between the river and tributary also restores key ecosystem processes that normally exist in a native river ecosystem. The restored habitat at Arroyo Seco would also improve local connectivity for wildlife by serving as a new habitat node, with a connection to Taylor Yard via the river channel as a vegetated corridor (Figure 6-5). Improved nodal connectivity promotes wildlife movement within the study area and prevents inbreeding depression and local extinction of wildlife populations. Nodal habitat connectivity would increase 309 percent within the study area over Alternative 10, through restoration of a more natural hydrologic regime and habitat at the Arroyo Seco confluence and its extremely close proximity to habitat at Taylor Yard.
Figure 6-5 Alternative 13 Local Habitat and Hydrologic Connectivity
On a regional scale, restoration at Arroyo Seco confluence provides future opportunities to restore aquatic habitat connectivity between the river at the Study area and the San Gabriel Mountains via the Arroyo Seco tributary (Figure 6-6). Additional opportunity for connection in this area exists via the USACE’s on-going Arroyo Seco Ecosystem Restoration Study. Urbanization has eliminated the historic habitat corridor that once existed on the Arroyo Seco tributary, and without restoration of the confluence reconnection of the river to the San Gabriel Mountains could not be realized in the future. Additional neighborhood habitat in the communities of San Rafael Hills, Mount Washington, and Montecito Heights could eventually be incorporated into the movement corridor as regional habitat nodes.

Figure 6-6 Alternative 13 Regional Habitat Connectivity Illustrated by Red Lines

**Alternative 13v**

Alternative 13v restores 598 acres of habitat along the 11-mile study area, the difference between this variation plan and Alternative 13 is in Reach 7. Connections for Alternative 13v are the same in reaches 1-6 and 8 as in Alternative 13 as discussed in the text above. In Reach 7, this alternative includes the same reach plan as in Alternative 20, which restores habitat at the LA River State Historic Park (Cornfields) site and provides an additional habitat connection within Reach 7 through terracing on the west bank. Regional habitat connectivity is further improved by restoring connections between the river and the 575-acre habitat node at Elysian Park via restoration of the Cornfields site.

The added increments of restoration that contribute to the planning objectives are summarized below:
Objective 1: Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat

- Reach 7 restores 10 acres of habitat at the LA State Historic Park (Cornfields) site, utilizing the same reach plan as in Alternative 20.
- Reach 7 restores a natural habitat connection between the river and the LA State Historic Park via removal of the concrete bank between the river and the site, terracing the area with potential for seasonal flooding on the terraces from the LA River mainstem.

Objective 2: Increase Habitat Connectivity

- Nodal connectivity is increased 33 percent over Alternative 13 through the restoration at the LA State Historic Park (Cornfields).
- Increased regional connectivity through the LA River State Historic Park to the Elysian Hills and upstream to Griffith Park and the Santa Monica Mountains.

Alternative 16

Alternative 16 restores 659 acres of habitat along the 11 mile study area. Below is a map (Figure 6-7) showing the footprint of Alternative 16. Alternative 16 adds the following benefits and incremental increase in objectives criteria as follows:

Objective 1: Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat

- Reach 5 provides an added 17 acres of in-channel riverine habitat via channel widening from a trapezoidal to vertical configuration
- Reach 8 provides an added 21 acres of in-channel riverine habitat via removal of the concrete channel bed
- Reach 8 restores a natural hydrologic connection between the river and LATC via removal of the concrete bank between the river and the site
- Reach 8 provides an additional 17 acres in wetland marsh habitat via restoration of a large side channel in LATC.

Objective 2: Increase Habitat Connectivity

- 39 percent more connectedness (Rudd et al. 2002) within the Study Area over Alternative 13v through the restored hydrologic connection at LATC. (Figure 6-8)
- Reach 8 modifies 0.75-miles of concrete channel to natural river bed, which restores a more natural geomorphic character and habitat in approximately 30 acres of river channel and supports a new wildlife movement corridor.
- Reach 8 removes the concrete bank at LATC to directly connect restored in-channel habitat to approximately 90 acres of floodplain habitat.
- Reach 8 restored historic wash and two smaller tributary streams at LATC with 1.6 miles of tributary restoration.
- Reach 8 modifies channel banks upstream and downstream of LATC with planted terraces which connect the naturalized river bed with overbank areas (increasing regional habitat connectivity).
- Reach 5 widens 1.6 miles of channel which supports a wider vegetated movement corridor for wildlife.
- Channel bed restoration in Reaches 5 and 8 allow for creation of riffle/pool complexes which supports habitat for and movement of native fish species.
Figure 6-7 Alternative 16 AND footprint – Areas with Changes from Alternative 13 Circled in Yellow
Figure 6-8 Alternative 16 Local Habitat and Hydrologic Connectivity
While the footprint is very similar to that of Alternative 13, the added measures in Reaches 5 and 8 provide incremental increases in benefits, connectivity benefits, including natural hydrologic and hydraulic functioning which reconnects the river, floodplain, and overbank areas, and improved local habitat connectivity for wildlife movement.

Alternative 16 increases natural hydrologic connectivity and local habitat connectivity but does not significantly increase regional connectivity over Alternative 13. Alternative 16 would remove a concrete wall and concrete in the channel bed at the LATC site. Direct natural hydrologic connection would allow for interaction between the river and historic floodplain. Concrete removal and expanded width for natural physical processes are directly linked. Restoring the hydrologic interaction between the river and the LATC site allows for removal of concrete in the bed of this reach that would otherwise be unacceptable from a flood risk standpoint. The interaction between the river and historic floodplain would increase sustainability and diversity within this resource scarce reach. With this removal of concrete, a natural hydrologic connection between the river and the site would be restored. The incremental modifications at LATC included in Alternative 16 would allow the site to function as a natural wetland area with a flow off channel, providing an area of low velocity. Lower velocity areas would allow for development of more structurally diverse habitat while maintaining a direct connection with the river.

Restoration of the channel bed at LATC would provide an additional 41 acres of native fish habitat via establishment of natural channel geomorphic character and freshwater marsh.
The restored floodplain connection to the river in Alternative 16 would allow the large habitat node at LATC to support high populations of wildlife in Reach 8, which is currently completely built out and resource poor. The LATC habitat node would then serve as a source population for other nodes along the river and minimize the risk of local extinction in smaller nodes. The restored channel bed at LATC in also provides a habitat corridor that connects to other nodes in the study area. Wildlife could travel in and out of this node to other habitat nodes in the project area.

Alternative 16 additionally widens the river for a length of 1.6 miles in Reach 5. This widening allows for expansion of in-channel river habitat, which supports wildlife movement corridors. Restoration of a more natural in-channel geomorphic character, including riffle/pool complexes, would also support 25 acres of increased habitat for native fish.

In Alternative 16, local habitat connectivity would increase 39 percent within the study area over Alternative 13v, through restoration of a more natural hydrologic regime and habitat at the LATC site and its connection to Arroyo Seco via restored in-channel and channel bank habitat.

**Alternative 20**

Alternative 20 restores 719 acres of habitat along the 11 mile study reach. Below is a map showing the footprint of Alternative 20 (Figure 6-10). Alternative 20 adds the following benefits and incrementally meets objectives criteria above the level provided by Alternative 16 as follows:

**Objective 1: Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat**

- Reach 2 provides an added 10 acres of in channel riverine habitat via channel widening from a trapezoidal to vertical configuration (Freshwater marsh biological diversity objective 1a)
- Reach 3 provides an added 35 acres of in channel riverine habitat via removal of the concrete channel bed and bank in the tributary confluence of Verdugo Wash
- As in Alternative 13v, Reach7 restores a natural hydrologic connection between the river and the LA River State Historic Park via removal of the concrete bank between the river and the site.

**Objective 2: Increase Habitat Connectivity**

- 120 percent more connectedness (Rudd et al. 2002) within the Study Area over Alternative 16 via the restored nodal connections at Verdugo Wash and LA River State Historic Park (Figure 6-11).
- Increased regional habitat connectivity through Verdugo Wash to the Verdugo Hills and the San Gabriel Mountains
- Increased regional connectivity through the LA River State Historic Park to the Elysian Hills and upstream to Griffith Park and the Santa Monica Mountains (Figure 6-12)
- Reach 2 widens 0.6 miles of channel which supports a wider vegetated movement corridor for wildlife
- Channel bed restoration in Reaches 2 and 3 allow for creation of riffle/pool complexes which supports habitat and refugia for and movement of native fish species.

The added measures in Reaches 2, 3 and 7 provide additional connectivity benefits, including natural hydrologic and hydraulic connectivity between the river, floodplain, and overbank areas, and habitat connectivity for wildlife movement locally within the river system and to regional areas.
Figure 6-10 Alternative 20 Footprint Shows Areas with Changes from Alternative 16 in Yellow Circles
Figure 6-11 Alternative 20 Local Habitat and Hydrologic Connectivity Increase in Red Polygons
In addition to the features in Alternative 16, Alternative 20 restores a natural hydrologic connection between the river and the historic floodplain at the Verdugo Wash tributary, which increases local habitat connectivity within the study area as well as opportunities for widespread regional habitat connectivity. This alternative also restores an assisted hydrologic connection to the LA River State Historic Park (Cornfields) site, which provides additional opportunity for regional habitat connectivity, and widens the natural channel bed in Reach 2, which provides additional in-channel marsh and riparian habitat.

Alternative 20 would remove concrete and widen the confluence of the Verdugo Wash in Reach 3 to support a more natural hydrologic regime and reconnection of the tributary to the historic floodplain. This creates a third reach of the river with a large natural connection to the floodplain and restores a direct geomorphic connection between the River and the bed and banks of the Verdugo Wash. This reach is currently very constrained hydraulically. Opening up the confluence at this location provides a wide natural channel bed and confluence with potentially slower velocities providing an opportunity in the reach for nutrient cycling and refugia for native fish as they move up and down the river system.

Additionally, restoration of the channel bank at the LA River State Historic Park (Cornfields) provides an additional habitat connection within Reach 7 (as in Alternative 13v). Terracing the bank of the river at this location provides a habitat connection on the west bank of the river. Alternative 20 also widens the river for a length of 0.5 miles in Reach 2. This widening allows for expansion of in-channel river habitat.
and a more natural geomorphic character, including riffle/pool complexes, which would support 5 acres of increased habitat for native fish.

Local connectivity would be improved through restoration of the Verdugo Wash confluence, which would provide an additional habitat node in the Study Area with connectivity to the Los Feliz Golf Course via existing habitat in the Glendale Narrows (Figure 6-11) and connectivity through the downstream reaches. The added restoration at the Cornfields site in Reach 7 provides a 10 acre riparian habitat node that decreases the distance between habitat nodes at Arroyo Seco and LATC in the resource poor downtown area (Figure 6-11). In Alternative 20, the restoration at Verdugo Wash and at Cornfields would increase local habitat connectivity 120 percent within the study area over Alternative 16.

Regional connectivity in Alternative 20 is improved over Alternative 16 through the restoration at the Verdugo Wash tributary, which provides opportunity for a future connection between the LA River and the Verdugo Mountains, a 26 square mile area serving as a stepping stone to the western San Gabriel Mountains (Figure 6-12). Urbanization has eliminated this habitat corridor, and without restoration of the confluence at Verdugo Wash, reconnection of the river to the Verdugo Mountains could not be realized. Additional habitat in the community of San Rafael Hills could also be incorporated into the movement corridor as a regional habitat node. Regional habitat connectivity is further improved by restoring connections between the river and the 575-acre habitat node at Elysian Park via restoration of the Cornfields site.

6.1.3 Additional Connectivity Comparison

As discussed in Section 6.6 below, many public comments received, as well as a comment from the project’s Independent External Peer Review (IEPR) Panel, suggested that an additional analysis of connectivity benefits would assist with alternative comparison and selection. The following analysis has been added in response to those comments. The USACE used a framework suggested by the project’s IEPR panel to better quantify the beneficial outputs of connectivity. Four different metrics were developed to further quantify different connectivity outputs. By evaluating hydrologic, local, and regional connectivity and combining the resultant output with the initial habitat model output, the USACE was able to more comprehensively compare the alternatives in the final array.

Local connectivity was evaluated based on the potential for wildlife to physically move between the river and areas restored by the project. The metric is based on the acreage of the restored sites and the ability of wildlife to access them. For the purpose of this evaluation, it was assumed that all types of wildlife must have access in order to be considered in the metric (i.e., mammals, reptiles, and amphibians, in addition to birds whose movements are not limited by barriers between the channel bottom and restored areas). Regional connectivity was evaluated based on the restored opportunities for wildlife to move out of the restored project area into adjacent, more distant significant habitat areas (now or in the future, after additional restoration occurs along river tributaries). This metric is based on the acreage of habitat area to which a given alternative connects. Areas considered include the Santa Monica Mountains (via Griffith Park) and Elysian Park, which constitute terrestrial connections, and potential future opportunities via tributaries to the San Gabriel Mountains (via Arroyo Seco) and the Verdugo Mountains (via Verdugo Wash), which constitute aquatic connections.

Hydrologic connectivity was evaluated based on the restored areas/floodplain that would be reconnected to the river via a more natural hydrologic regime. The total acreage of the sites with a natural hydrologic connection, as well as the number of sites with a natural hydrologic connection, was evaluated (giving two separate metrics). Parcels were considered hydrologically connected if the river is widened into a floodplain area, where the river can more naturally flood, meander, change shape, and interact with
adjacent sites. The floodplain is considered to be the area where floodwaters would be allowed to inundate.

For each metric, the values for each site (i.e., acres, count) were calculated and then summed across each alternative. In order to calculate the metric value, a Relative Value Index (RVI) was used, whereby the total for a given alternative was divided by the maximum possible value. In this way, the metric value is a simple proportion of the total possible, on a scale of 0 to 1 (1 being the maximum).

To obtain an overall connectivity metric, the metric values for each connectivity component were then summed, and an RVI calculated to determine a single, combined connectivity metric (Table 6-3). These combined metric values were then input into the economic analysis (CE/ICA) and weighted at varying levels using the Combined Habitat Assessment Protocol (CHAP) outputs. The original analysis only considered the CHAP analysis in the quantitative comparison and resulted in all four Final Array Plans included in the Draft IFR (10, 13, 16, and 20) being Best Buy Plans. In the revised analysis, two additional scenarios were evaluated that based the CE/ICA analysis on a Total Weighted Output Metric that included CHAP and connectivity benefits. The first scenario weighted the CHAP and Combined Connectivity equally. The second scenario weighted the CHAP at 75 percent and Combined Connectivity at 25 percent. These results were consistent in showing Alternative 13 as the first Best Buy Plan. After identification of the variation on Alternative 13, it was also analyzed according to the connectivity metrics, producing results very similar to Alternative 13.

Table 6-3 Connectivity Metrics

<table>
<thead>
<tr>
<th></th>
<th>Local Connectivity</th>
<th>Regional Connectivity</th>
<th>Hydrologic Connectivity</th>
<th>Hydrologic Connectivity</th>
<th>Total</th>
<th>Connectivity Metric Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt 10</td>
<td>0.30</td>
<td>0.22</td>
<td>0.29</td>
<td>0.25</td>
<td>1.06</td>
<td>0.26</td>
</tr>
<tr>
<td>Alt 13</td>
<td>0.48</td>
<td>0.98</td>
<td>0.48</td>
<td>0.50</td>
<td>2.43</td>
<td>0.61</td>
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<tr>
<td>Alt 13v</td>
<td>0.51</td>
<td>0.98</td>
<td>0.48</td>
<td>0.50</td>
<td>2.46</td>
<td>0.62</td>
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<tr>
<td>Alt 16</td>
<td>0.86</td>
<td>0.98</td>
<td>0.88</td>
<td>0.75</td>
<td>3.46</td>
<td>0.87</td>
</tr>
<tr>
<td>Alt 20</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>4.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

6.1.4 Plan Recognition

While not a Federal plan, the Los Angeles River Revitalization Master Plan gathered the input of Federal, state, regional and local agencies and stakeholders. It was adopted by the Los Angeles City Council in 2007. The Corps was directed by WRDA 2007, as part of this study, to develop plans consistent with the goals of the Los Angeles River Revitalization Master Plan. Four of its major recommendations for ecosystem improvement are:

4.13) Create a continuous functional riparian corridor that provides habitat for birds, mammals, amphibians, reptiles, invertebrates, and fish within the channel bottom

4.14) Connect this corridor to other significant habitat and migration routes along the tributaries and into the mountains

4.15) Improve water quality and provide... [features and habitat] that would support desirable fish species...

4.16) Bio-engineer [or naturalize] the River’s edge where feasible...
The study alternatives vary in their degree of responsiveness to the Plan. All alternatives include some restoration in all reaches of the river in the study area, supporting the establishing of a continuous river corridor. However, they vary in their responsiveness to connecting this corridor to other significant habitat and migration routes along the tributaries and into the mountains, providing aquatic habitat necessary to sustain fish, and naturalizing the river’s edge.

6.1.5 Comparison by Objectives Conclusion

The primary NER objectives include restoring Valley Foothill Riparian strand and freshwater marsh habitat and increasing habitat connectivity. Figure 6-13 depicts the degree to which the final array of alternatives meets planning objectives for habitat restoration based on the CHAP analysis. Alternative 10 minimally meets the planning objectives while the larger alternatives provide incremental increases in NER outputs toward this objective. Table 6-4 compares nodal and regional habitat connectivity for each alternative. Alternative 13 provides the greatest percent incremental increase in habitat connectivity of the combinations in the Draft IFR, with Alternative 13v providing a slight increase above Alternative 13 with the change in Reach 7. Alternatives 16 and 20 provide additional increases in habitat connectivity.

Although quantifying connectivity showed more restoration output for each of the alternatives, the increase in cost between Alternative 13 and the next bigger best buy plan was substantial. Given the magnitude of the incremental costs relative to the incremental increase in benefits (after quantifying connectivity functions), there was not a sufficient basis to justify the selection of Alternative 16 or 20 as the NER Plan. However, as described in Section 6.2.3 below, additional cost analysis identified a more cost effective variation on Alternative 13 (Alternative 13v) that provides more benefits at lower cost than Alternative 13.

Final Array Comparison
Average Annual Habitat Units & Restored Acres

Figure 6-13 Final Array Comparison – AAHU’s and restored acres
Table 6-4 Final Array Comparison by Objectives-Habitat Connections

<table>
<thead>
<tr>
<th>Habitat Connections</th>
<th>Alternative 10</th>
<th>Alternative 13</th>
<th>Alternative 13v</th>
<th>Alternative 16</th>
<th>Alternative 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental / nodal increase between alternatives</td>
<td>Minor improvement</td>
<td>309% over Alt 10</td>
<td>33% over Alt 13</td>
<td>39% over Alt 13</td>
<td>120% over Alt 16</td>
</tr>
<tr>
<td>Added Regional Connections</td>
<td>Santa Monica Mtns</td>
<td>Santa Monica &amp; San Gabriel Mtns</td>
<td>Elysian Hills, Santa Monica &amp; San Gabriel Mtns</td>
<td>Santa Monica &amp; San Gabriel Mtns</td>
<td>Verdugo &amp; Elysian Hills, Santa Monica &amp; San Gabriel Mtns</td>
</tr>
</tbody>
</table>

6.2 FINAL ARRAY POLICY ISSUES, RISKS, AND CONSTRAINTS COMPARISON

During plan formulation, each measure and alternative was formulated to avoid constraints and minimize risk as much as was possible. An alternatives comparison by major project constraints for the final array is displayed in Table 6-5. Levee vegetation regulations will be followed either by request for variance or limitation. Where levee modifications occur, they will maintain existing levels of protection. Alternative 10 has the least amount of construction activity and modification of current conditions, which accounts for its having the fewest changes to current levee conditions. Alternatives 13, 13v, 16, and 20 have relatively more changes due to the increasing levels of habitat restoration. Percentages of real estate reflect the differences in construction activities relative to land area, with Alternative 20 having the lowest percentage and Alternative 10 having the highest. Not shown in the table is compliance with the constraint of avoiding urbanization and infrastructure wherever practicable. All alternatives would avoid urbanization and infrastructure wherever practicable; however, all alternatives would displace some industrial use. In addition, Alternatives 13v, 16, and 20 would require the relocation of segments of rail lines on trestles at grade to facilitate project construction (in Reach 7 for Alternatives 13v and 20, and in Reach 8 for Alternatives 16 and 20).

Table 6-5 Final Array Comparison by Key Constraint

<table>
<thead>
<tr>
<th>Alternative</th>
<th>HTRW</th>
<th>Potential Levee Area (LAR#) Changes, and Variance Areas in Compliance with Levee Regulations</th>
<th>Percentage of Lands Relative to Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – ART</td>
<td>Sponsor response/remediation required at G1 and G2, potential remediation at LATC, and for San Fernando Valley groundwater plume</td>
<td>Reaches 1, 2, 4 and 5</td>
<td>83%</td>
</tr>
<tr>
<td>13 – ACE</td>
<td>Remediation similar to Alternative 10</td>
<td>Reaches 1, 2, 3, 4, 5, and 7</td>
<td>69%</td>
</tr>
<tr>
<td>16 – AND</td>
<td>Remediation similar to Alternative 10</td>
<td>Reaches 1, 2, 3, 4, 5, 7, and 8</td>
<td>47%</td>
</tr>
<tr>
<td>20 – RIVER</td>
<td>Remediation similar to Alternative 10</td>
<td>Reaches 1, 2, 3, 4, 5, and 8</td>
<td>46%</td>
</tr>
</tbody>
</table>

*Subsequent to Draft IFR, the 13v variation was compared for these constraints and has equivalent remediation and similar percentage of lands relative to project cost as 13. Potential levee area is in Reaches 1, 2, 3, 4, and 5

6.2.1 Flood Risk Management

A key constraint of the study was that existing levels of flood risk management will be maintained. The study area includes a portion of the Los Angeles River that was altered and engineered as part of the LACDA Project. Any restoration alternatives had to take into account the continued functioning of the flood risk management system and avoid induced flooding. The existing river channel in this reach does not provide a high level of protection (with or without existing vegetation). The existing channel provides less than a 1 percent annual chance exceedance (ACE) (100-year) level of protection for most of the ARBOR reach. For this reason, an alternative located solely within the existing LACDA project right of...
way was infeasible, as it would be likely to reduce conveyance capacity and/or be unsustainable and unable to meet restoration objectives given the high velocity flows carried by the system during storm events. Widening the channel at opportunity areas is thus critical to provide restoration benefits while maintaining existing levels of flood risk management. The inclusion of the Taylor Yard and LATC properties provided the only opportunities in the study area to substantially widen the channel and increase channel vegetation.

The addition of Taylor Yard, LA River State Historic Park (Cornfields), Verdugo Wash, Arroyo Seco, and LATC do not provide any additional flood risk reduction for larger floods, but may have an ecologically beneficial effect on the small to moderate size events that are contained within the channel. Unlike conventional hydraulics for the larger events where discharge is the dominant channel-forming parameter, vegetation dictates the channel forms during the small to moderate size events. Vegetation influences flow patterns and sediment settling on floodplains (Darby 1999, Larsen et al. 2007) as well as bedform changes, largely due to its effect on velocity.

The study analyzed impacts to the flood risk management function by looking at potential water surface elevation change. The study screened out any alternatives that adversely impacted the water surface elevation in a way that could not be addressed through design. Appendix E, Hydrology and Hydraulics, describes the hydraulic analyses conducted on the final array of alternatives. That analysis focused on changes to maximum velocity and associated changes to maximum water surface elevation. The alternatives were analyzed as compared to the existing conditions to determine the impacts on the flood risk management function of the channel. The results in the H&H Appendix are based on the limited hydraulic modeling that shows the alternatives are feasible without inducing flooding. Any minor increases in water surface elevations will be eliminated in the detailed design phase. These design refinements will not increase the costs of the recommended plan. If the water surface elevation for the with-project condition was significantly greater than that for the existing condition, then that restoration scenario was removed from further consideration.

All of the final alternatives can work hydraulically without inducing increased flooding. While the initial assessment identified that an increase in water surface elevation could occur at transition areas if no design refinements were made, the detailed design will ensure the maximum water surface elevations will not increase when compared to the existing conditions. Any change in water surface in the transition areas can and will be avoided through design refinements to the modifications to channel geometry and/or avoidance of introduction of vegetation and enforcing existing O&M requirements limiting vegetation growth in those areas. Characteristics of transition areas are either geometric (transitioning from trapezoidal to rectangular or from a widened section to a narrow section) or construction material (transitioning between soft-bottom and concrete). The exact refinements for avoidance will be further determined during the detailed design phase. The costs of these minor alterations have been included in the cost estimate for the project.

Under the analysis conducted during feasibility, the Engineering team also analyzed average velocities to determine channel function with respect to scour and sustainability of constructed restoration features. For widened areas, the flows need to be slowed sufficiently or sufficient protection need to be included to ensure channel erosion does not occur. Several areas exhibit average velocities in excess of 12 ft/s. In those areas, planting of vegetation as part of the restoration project is not recommended because vegetation may not withstand high velocities. For those areas with velocities greater than 8 ft/s, appropriate protection is included to avoid effects of scour and ensure channel function.

Concurrent with implementing the restoration project, the Corps would modify the current operations and maintenance (O&M) requirements of the LACDA project to accommodate and complement the ecosystem restoration project, which would be maintained by the City, while continuing to maintain the
channel for flood risk management. Constructed restoration features will be maintained by the City as restoration project sponsor, and the City will also conduct invasives management throughout the project footprint including the River and tributary bottom areas. There are no increased Corps flood risk management O&M requirements or costs as a result of the ecosystem restoration project when compared to the current O&M responsibilities. In addition, using the detailed hydrologic and hydraulic analysis the Corps will determine the extent to which the existing LACDA O&MRR for areas outside of the restoration features can be modified to accommodate native vegetation without negatively affecting design conditions.

During the detailed design phase, 2D unsteady flow numeric models, and possibly physical modeling, will be required to more accurately simulate the flow hydraulics for the project. This may result in adjustments to plan features, but should not change the overall habitat benefits and will not induce damages from the flood risk perspective.

As described above and in Section 3.4.1, the 1992 LACDA Review Feasibility Study showed that the LACDA channel and dam flood control system had a relatively low level of flood protection for a metropolitan area. Although the 1992 LACDA Review Feasibility Study resulted in Congressional authorization to upgrade flood risk management features for the Los Angeles River downstream of the Rio Hondo confluence to provide for the 0.8 ACE event (133 year), Congress did not authorize upgrades for the upper Los Angeles River including the ARBOR reach. Flood risk management upgrades within the study area were not found to be economically justified in the 1992 review. There are currently no proposals to study flood risk management improvements in the ARBOR reach. If a flood risk management study were to be undertaken in the future, by the Corps and/or non-Federal interests, the implementation of any of the restoration alternatives would not preclude potential flood risk management improvements. While some typical flood risk management measures (e.g., adding concrete or parapet walls at some locations) would likely be excluded due to inconsistency with the restoration alternatives, other FRM measures (e.g., diversions, detention, sheet pile,) could still be implemented. Any future flood risk management measures will need to take account of and be consistent with the ecosystem restoration project.

6.2.2 Existing Levee Systems

There are five existing levee systems that are within the study area. These levees are part of the existing LACDA project and are maintained by the Corps. The levees are identified based on their initials for the river name, Los Angeles River (LAR), and numbered. They are LAR-2, LAR-3, LAR-5, LAR-6, and LAR-7. Management of the vegetation on these levee systems, and any proposals for ecosystem restoration affecting these levee systems, must be compatible with the Corps vegetation management guidelines. There are several areas along these levee systems where the area directly behind the levee embankment has been filled in over time. For these areas, channel capacity is the main concern related to vegetation management. Appendix D (Geotechnical) contains information on the current condition of these levee systems as well as their location.

Corps vegetation management practices emphasize that levee embankments must be accessible for inspection, maintenance, and emergency activities. In addition, for any vegetation that is proposed or retained, it must be demonstrated that the vegetation does not pose an unacceptable risk. Restoration features in the final array of alternatives have been planned to be compatible with the Corps vegetation management guidelines allowing for forbs (native perennial grasses) grown on the levee embankment and other vegetation to be planted farther from the levee embankment. The riparian forbs on the levees are expected to occur in a relatively narrow band and be surrounded by more structurally diverse riparian vegetation in adjacent areas. Forbs provide habitat for small mammals, reptiles, birds and insects, and are an important part of the riparian community. Levees in each alternative that may be affected by
Alternative measures along with the proposed vegetation that would be further assessed are indicated in
the bulleted list below,

- **Alternative 10**: In Reaches 1 and 2, the proposed riparian corridor along the left and right
  overbanks includes riparian vegetation on or along the existing levee (LAR-7 and LAR-3). The
  proposed riparian corridors along the left bank of Reaches 4 and 5 include riparian vegetation on
  the existing levee berm and crown (LAR-6).

- **Alternative 13**: In Reaches 1 and 2, the proposed riparian corridor along the left and right
  overbanks includes riparian vegetation on or along the existing levee (LAR-7 and LAR-3). In
  Reach 3, the proposed riparian corridor along the left and right overbanks includes riparian
  vegetation on or along the existing levee (LAR-7 and LAR-6 on left, LAR-3 on right). The
  proposed riparian corridors along the left overbank of Reaches 4 and 5 include riparian vegetation
  on the existing levee berm and crown (LAR-6). The Reach 7 features include banks restructured
to support vegetation on both sides of the channel (LAR-2 and LAR-5).

- **Alternative 13v**: In Reaches 1 and 2, the proposed riparian corridor along the left and right
  overbanks includes riparian vegetation on or along the existing levee (LAR-7 and LAR-3). In
  Reach 3, the proposed riparian corridor along the left and right overbanks includes riparian
  vegetation on or along the existing levee (LAR-7 and LAR-6 on left, LAR-3 on right). The
  proposed riparian corridors along the left overbank of Reaches 4 and 5 include riparian vegetation
  on the existing levee berm and crown (LAR-6).

- **Alternative 16**: In Reaches 1 and 2, the proposed riparian corridor along the left and right
  overbanks includes riparian vegetation on or along the existing levee (LAR-7 and LAR-3). In
  Reach 3, the proposed riparian corridor along the left and right overbanks includes riparian
  vegetation on or along the existing levee (LAR-7 and LAR-6 on left, LAR-3 on right). The
  proposed riparian corridors along the left overbank of Reaches 4 and 5 include riparian vegetation
  on the existing levee berm and crown (LAR-6). The Reach 7 features include banks restructured to
  support vegetation on both sides of the channel (LAR-2 and LAR-5). In Reach 8, the features include
  planted terracing on the right bank (LAR-2) and channel expansion and terracing on the left bank
  (LAR-5).

- **Alternative 20**: In Reaches 1 and 2, the proposed riparian corridor along the left and right
  overbanks includes riparian vegetation on or along the existing levee (LAR-7 and LAR-3). The
  Reach 2 proposed features also involve channel modifications that would include overhanging
  vegetation on a vertical wall on the right bank (LAR-3). The Reach 3 features include the
  widening of Verdugo Wash and planting on the left bank (LAR-7 and LAR-6) and planting of a
  riparian corridor along the right overbank, on or along the existing levee (LAR-3). The proposed
  riparian corridors along the left overbank of Reaches 4 and 5 include riparian vegetation on
  the existing levee berm and crown (LAR-6). The Reach 5 plan also calls for planted terracing on the
  left bank (with concrete erosion control) and overhanging vegetation on a vertical wall on the
  right bank (LAR-6). In Reach 8, the features include planted terracing on the right bank (LAR-2)
  and channel expansion and terracing on the left bank (LAR-5).

Wildlife is still expected to use the levee plantings as a movement corridor between the more diverse
riparian habitat areas, which will provide habitat for small mammals, reptiles, and birds. By substituting
riparian vegetation with riparian forbs on the levees, CHAP values in the final array would decrease
slightly for those areas. However the overall CHAP values and the ranking of the final array would not be significantly impacted as the decrease would be relative across all alternatives in the final array.

Construction of restoration features that modify levees would necessitate removal of existing vegetation on and adjacent to the existing levees being modified. Where vegetation removal on and adjacent to levees is necessary to accommodate construction, no additional engineering analysis of the existing vegetation is needed to confirm vegetation removal. Removal of invasive species will be undertaken to accomplish the ecosystem restoration project purpose. Where vegetation removal is not necessary to accommodate feature construction but vegetation may have a detrimental effect on safety, structural integrity, or accessibility of the constructed/modified levee features, an engineering analysis will be undertaken to determine whether the vegetation poses an unacceptable risk. Based on the engineering analysis, vegetation determined to pose an unacceptable risk to the constructed features shall be removed as part of project construction. Vegetation on or adjacent to levees modified by the restoration project that is not determined to pose a safety, structural integrity, or accessibility risk will be documented in a vegetation variance. Any required analysis will be accomplished during PED.

For levee embankments within the ARBOR reach, which is the project reach, that would not be modified as part of the ecosystem restoration project, these portions will continue to be operated and maintained as part of the LACDA project by the Corps.

6.2.3 HTRW

A study constraint was to avoid sites contaminated with HTRW to the extent practicable. The Corps’ policy is for ecosystem restoration projects to avoid lands with hazardous, toxic and radioactive waste (HTRW) whenever practicable to do so. In most scenarios, avoidance of HTRW is possible. However, as described in this report and Appendix K, HTRW Survey Report Appendix, given the highly constrained river corridor and the historical industrial uses within it, HTRW contaminated lands and groundwater cannot be fully avoided in plan formulation while still providing a project responsive to the project objectives. The proposed project area for the action alternatives contains three major areas of known contamination, and one area with high potential for contamination of concern. The northern half of the river, including Reaches 1-6 in the Study Area, is underlain by a groundwater plume known as the San Fernando Valley Superfund Site, which is currently being remediated with oversight by EPA and LADPW. Furthermore, the Taylor Yard has two sites (G1 and G2) with known contamination resulting from its historical use as a railyard. In addition to these three sites, the LATC, another key site within the study area, is a railyard that can reasonably be anticipated to have some contaminated soils requiring remediation given the similarity of historical use at that site to Taylor Yard uses, although it has been paved for several decades. There are 19 other sites in various stages of remediation, adjacent to the alternative plan footprints, which were avoided by the alternatives, and these sites are considered to be low impact to a potential project. An exhaustive search for other appropriate real estate parcels was conducted, but no other parcels or groups of parcels of sufficient size to address study objectives and fully avoid HTRW impacted sites were identified. Although initial plans were developed that excluded the Taylor and LATC parcels, they did not meet the restoration objectives for restored habitat and habitat connectivity and were eliminated through the planning process.

Therefore, in order to meet project objectives, the project footprint for the action alternatives includes sites with known and suspected soil and groundwater contamination requiring response and remediation. There are known contaminated sites within the study area that cannot be avoided by the project. These include the San Fernando Valley Superfund Site, and Taylor Yard G1 and G2, which are considered high impact sites. In addition, contamination is possible at the LATC site based on historical uses, posing a potentially high impact to the project since the extent of this potential contamination is unknown. Localized groundwater contamination may also be encountered during construction. For the sites with soil contamination...
contamination, the City must undertake or otherwise ensure the remediation of the sites to the standards necessary to support the restoration project at 100 percent non-project cost, prior to construction at those sites. For the groundwater contamination that cannot be addressed prior to construction, the City will undertake necessary dewatering activities including treatment and disposal, at 100 percent non-project cost in areas with contaminated groundwater. The City of Los Angeles is aware of these requirements, and has accepted responsibility for delivering lands suitable for ecosystem restoration and addressing groundwater contamination during dewatering.

Although excluded from cost shared project costs, effort and costs of HTRW response and remediation have been considered in evaluating and comparing plans for implementation. Under all alternatives the non-Federal sponsor would remediate or ensure the remediation of soil contamination to the standard required for the restoration project prior to construction of restoration features at the affected sites. Because it is infeasible to remediate groundwater contamination prior to construction, the sponsor would be responsible at 100 percent non-project cost for addressing contaminated groundwater including treatment and disposal during dewatering activities.

The City understands its responsibility and has directly committed to undertaking or ensuring completion of the necessary remediation efforts on affected parcels and provide sites cleaned to the standard required to support the restoration project prior to project construction being undertaken on those sites, and its responsibility for addressing contaminated groundwater during dewatering, including treatment and disposal.

6.2.4 Real Estate

Corps policy provides that ecosystem restoration projects should not be composed primarily of land acquisition. To reflect that projects should be restoration focused, the Corps uses a target of 25 percent for land costs as a percentage of total project cost. The policy states,

Land acquisition in ecosystem restoration plans must be kept to a minimum. Project proposals that consist primarily of land acquisition are not appropriate. As a target, land value should not exceed 25 percent of total project costs. Projects with land costs exceeding this target level are not likely to be given a high priority for budgetary purposes (ER 1105-2-100, Appendix E, para. E-30f).

Real estate and potential relocation costs are known to be exceptionally high in the Los Angeles area. Initially, a conceptual alternative that restored the river to an area similar to its historic floodplain and removed the concrete channel within the study area was estimated to have real estate costs of approximately $7.6 billion, an excessive amount that did not include relocation costs or construction costs. Mindful that real estate costs would be high for any alternative that involved urban Los Angeles lands, the study examined lands already included in the LACDA project boundary, open space lands adjacent to the existing LACDA boundary, and other parcels that would support restoration goals such as habitat connectivity. Despite efforts to minimize land acquisition, real estate costs for the alternatives in the final array range from approximately 83 percent of total project cost for the smaller alternatives to approximately 45 percent for the largest alternatives. In recognition of the unusual nature of the real estate costs of the proposed alternatives and in commitment for the project, the City of Los Angeles proposed to waive reimbursement of real estate costs that exceed its statutorily required 35 percent share of total ecosystem restoration costs. The Assistant Secretary of the Army (Civil Works) has granted the request to waive reimbursement. The Corps and City would cost share the recreation feature costs 50-50, and other costs would be governed by the partnership agreement.

Additional discussion of real estate costs and cost share is presented in Chapter 7.
6.3 COMPARISON BY NATIONAL OBJECTIVES AND THE FOUR ACCOUNTS

In the 1970 Flood Control Act, Congress identified four equal national accounts for use in water resources development planning. They are national economic development (NED); regional economic development (RED); environmental quality (EQ); and social well-being (OSE, other social effects). Policy in the 1970s regarded making contributions to only two of these, NED and EQ, as national objectives. Now only contributing to NED remains a national objective, as stated in the Principles and Guidelines.

The Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation’s environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

However, all four of these planning categories remain important considerations of water resource projects and the USACE is considering revising this in new guidelines. The four categories, known as the System of Accounts as suggested by the U.S. Water Resources Council, address long-term impacts and are defined in such a manner that each proposed plan can be easily compared to the No Action plan and other alternatives. Collectively, the four accounts are required to include all significant effects of a plan on the human environment.

Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. They are the direct net benefits that accrue in the planning area and the rest of the nation. Recommended ecosystem restoration measures do not need to exhibit net NED benefits, but will be based on non-monetary outputs compatible with the Principles and Guidelines selection criteria. Although alternatives may produce incidental NED benefits, for this study, the NED account addresses the recreation benefits with the national ecosystem restoration benefits shown in the EQ account providing the primary basis for comparison for the project purpose. Ecosystem restoration has become one of the primary missions of the Civil Works program. The NER plan is the option with the greatest net ecosystem restoration benefits. The NER objective is to contribute to the nation’s ecosystems through restoration, with contributions measured by changes in the amounts and values of habitat. The four accounts used to compare the alternative plans have been modified to include the NED account, and the EQ, RED, and OSE accounts. The NED account comparison utilizes the two recreation plans formulated to complement Alternatives 13 and 20. The EQ account comparison includes Alternative 13v. The RED and OSE account comparisons use the analyses from the Draft IFR as used to preliminarily identify the NER plan and TSP in the Draft IFR. Updated RED analysis for the plans identified as the NER and the LPP and Recommended Plan in this Final IFR is provided in Section 7.

6.3.1 National Economic Development

National Economic Developments are accrued in the recreation plan. Benefits of recreation are summarized below. For both the Alternative 13 and the Alternative 20 recreation plan options, benefits exceed cost. Annual benefits, annual costs, net benefits, and the benefit-to-cost ratio (BCR) for each of the options are summarized in Table 6-6 below. Because the BCR for the proposed recreation features is above 1.0 for both options, the recreation features are economically justified. The Alternative 20 recreation plan option provides the greatest net benefits of the two options under evaluation. Alternative 13v is essentially the same as Alternative 13. For this project, the primary outputs are ecosystem restoration. The EQ (Environmental Quality) Account in Section 6.3.2 provides a discussion of those benefits.
### Table 6-6 NED Benefits Summary (Price Level October 2014, Interest Rate FY15-3.375 Percent)

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Annual Benefits ($)</th>
<th>Annual Costs ($)</th>
<th>Net Benefits ($)</th>
<th>BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Alternative 13v Recreation Plan Option</td>
<td>$2,479,000</td>
<td>$606,000</td>
<td>$1,873,000</td>
<td>4.09</td>
</tr>
<tr>
<td>Alternative 20 Recreation Plan Option</td>
<td>$3,510,000</td>
<td>$978,000</td>
<td>$2,532,000</td>
<td>3.59</td>
</tr>
</tbody>
</table>

#### 6.3.2 Environmental Quality

The Planning Manual describes environmental quality as “favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources.” Adverse effects within these categories can also be included in this assessment. Resource and use types that were assessed in this document (Chapter 5) include the following:

- Geology, Soils, Seismic Hazards, or Mineral Resources
- Air Quality
- Land Use
- Water Resources
- Biological Resources
- Cultural Resources
- Traffic and Circulation
- Noise
- Recreation and Public Access
- Aesthetics
- Public Health and Safety, including HTRW
- Utilities and Public Services
- Socioeconomics and Environmental Justice

Table 6-7 below summarizes the comparison of environmental quality between No Action and the final array of alternatives. Costs shown in the incremental costs were those used for the CE/ICA and based upon April 2013 price level with a FY 2013 interest rate of 3.75 percent.
## Table 6-7 EQ Evaluation and Comparison Summary

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>No Action</th>
<th>10 (ART) ARBOR Riparian Transitions</th>
<th>13 (ACE) ARBOR Corridor Extension</th>
<th>Alternative 13v</th>
<th>16 (AND) ARBOR Narrows to Downtown</th>
<th>20 (RIVER) ARBOR Riparian Integration via Varied Ecological Reintroduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net gain in AAHU</td>
<td>0</td>
<td>5,321</td>
<td>5,902</td>
<td>5,989</td>
<td>6,509</td>
<td>6,782</td>
</tr>
<tr>
<td>Incremental Cost/AAHU</td>
<td>0</td>
<td>$3,259</td>
<td>104%</td>
<td>Incremental Cost in Chapter 7</td>
<td>$29,253</td>
<td>$46,827 (incremental costs is updated in Chapter 7)</td>
</tr>
<tr>
<td>% increase in AAHU versus no action</td>
<td>No change</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 251 acres.</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 271 acres.</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 283 acres.</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 288 acres.</td>
<td></td>
</tr>
<tr>
<td><strong>Geology, Seismology, Soils, and Minerals</strong></td>
<td>No change</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 251 acres.</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 271 acres.</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 283 acres.</td>
<td>Temporary, less than significant adverse impacts due to construction. Long term beneficial due to stabilization of soils from increased wetland and riparian vegetation over 288 acres.</td>
<td></td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td>No change</td>
<td>Temporary, less than significant adverse impacts from air quality threshold exceedances during construction under NEPA.</td>
<td>Temporary, less than significant adverse impacts from air quality threshold exceedances during construction under NEPA.</td>
<td>Temporary, less than significant adverse impacts from air quality threshold exceedances during construction under NEPA.</td>
<td>Temporary, less than significant adverse impacts from air quality threshold exceedances during construction under NEPA.</td>
<td>Temporary, less than significant adverse impacts from air quality threshold exceedances during construction under NEPA.</td>
</tr>
<tr>
<td><strong>Land Use</strong></td>
<td>No change</td>
<td>Permanent, significant adverse impacts through conflict with land use designation in Reach 8.</td>
<td>Permanent, significant adverse impacts through conflict with land use designation in Reach 8.</td>
<td>Permanent, significant adverse impacts through conflict with land use designation in Reach 8.</td>
<td>Permanent, significant adverse impacts through conflict with land use designation in Reach 8.</td>
<td>Permanent, significant adverse impacts through conflict with land use designation in Reach 8 and Reach 3</td>
</tr>
<tr>
<td>Resource Area</td>
<td>No Action</td>
<td>10 (ART) ARBOR Riparian Transitions</td>
<td>13 (ACE) ARBOR Corridor Extension</td>
<td>Alternative 13v</td>
<td>16 (AND) ARBOR Narrows to Downtown</td>
<td>20 (RIVER) ARBOR Riparian Integration via Varied Ecological Reintroduction</td>
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</tr>
<tr>
<td>Water Resources</td>
<td>Continued degradation.</td>
<td>Temporary, less than significant adverse impacts to water quality due to erosion. Long term beneficial impacts resulting from increase in riparian vegetation (251 acres) and wetland creation (16 acres).</td>
<td>Temporary, less than significant adverse impacts to water quality due to erosion. Long term beneficial impacts resulting from increase in riparian vegetation (271 acres) and wetland creation (39 acres).</td>
<td>Temporary, less than significant adverse impacts to water quality due to erosion. Long term beneficial impacts resulting from increase in riparian vegetation (271 acres) and wetland creation (49 acres).</td>
<td>Temporary, less than significant adverse impacts to water quality due to erosion. Long term beneficial impacts resulting from increase in riparian vegetation (288 acres) and wetland creation (58 acres).</td>
<td></td>
</tr>
<tr>
<td>Biological Resources</td>
<td>Continued degradation.</td>
<td>Long term benefits to biological resources from creation of riparian vegetation (251), wetland creation (16), creation of one new side channel, and additional open water habitat (80 foot expansion).</td>
<td>Long term benefits to biological resources from creation of riparian vegetation (271), wetland creation (39), creation of 2 new side channels, and additional open water habitat (300 foot expansion).</td>
<td>Long term benefits to biological resources from creation of riparian vegetation (271), wetland creation (49), creation of 2 new side channels, and additional open water habitat (300 foot expansion).</td>
<td>Long term benefits to biological resources from creation of riparian vegetation (270), wetland creation (49), creation of 3 new side channels, additional open water habitat (500 foot expansion), and restoration of Arroyo Seco and Verdugo Wash confluences, and connection to LASHP.</td>
<td></td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>No change.</td>
<td>Pending implementation of the program laid out in the PA, no significant adverse effects are anticipated.</td>
<td>Pending implementation of the program laid out in the PA, no significant adverse effects are anticipated.</td>
<td>Pending implementation of the program laid out in the PA, no significant adverse effects are anticipated.</td>
<td>Pending implementation of the program laid out in the PA, no significant adverse effects are anticipated.</td>
<td>Pending implementation of the program laid out in the PA, no significant adverse effects are anticipated.</td>
</tr>
<tr>
<td>Resource Area</td>
<td>No Action</td>
<td>10 (ART) ARBOR Riparian Transitions</td>
<td>13 (ACE) ARBOR Corridor Extension</td>
<td>Alternative 13v</td>
<td>16 (AND) ARBOR Narrows to Downtown</td>
<td>20 (RIVER) ARBOR Riparian Integration via Varied Ecological Reintroduction</td>
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</tr>
<tr>
<td>Traffic and Circulation</td>
<td>No change, continued degradation with population growth.</td>
<td>Temporary, less than significant adverse impacts from traffic congestion during construction.</td>
<td>Temporary, less than significant adverse impacts from traffic congestion during construction.</td>
<td>Temporary, less than significant adverse impacts from traffic congestion during construction.</td>
<td>Temporary, less than significant adverse impacts from traffic congestion during construction.</td>
<td>Temporary, less than significant adverse impacts from traffic congestion during construction.</td>
</tr>
<tr>
<td>Noise</td>
<td>No change, continued degradation with population growth.</td>
<td>Temporary increase during construction.</td>
<td>Temporary increase during construction.</td>
<td>Temporary increase during construction.</td>
<td>Temporary increase during construction.</td>
<td>Temporary increase during construction.</td>
</tr>
<tr>
<td>Recreation</td>
<td>No change</td>
<td>Minor and temporary adverse effects due to closures during construction. Long-term beneficial effects resulting from greater access and improved recreation features.</td>
<td>Minor and temporary adverse effects due to closures during construction. Long-term beneficial effects resulting from greater access and improved recreation features.</td>
<td>Minor and temporary adverse effects due to closures during construction. Long-term beneficial effects resulting from greater access and improved recreation features.</td>
<td>Minor and temporary adverse effects due to closures during construction. Long-term beneficial effects resulting from greater access and improved recreation features.</td>
<td>Minor and temporary adverse effects due to closures during construction. Long-term beneficial effects resulting from greater access and improved recreation features.</td>
</tr>
<tr>
<td>Public Health and Safety, Including Hazardous, Toxic and Radioactive Waste</td>
<td>No change.</td>
<td>Impacts would be avoided by implementing safety standards and BMPs. HTRW remediation would occur where necessary prior to construction</td>
<td>Impacts would be avoided by implementing safety standards and BMPs. HTRW remediation would occur where necessary prior to construction</td>
<td>Impacts would be avoided by implementing safety standards and BMPs. HTRW remediation would occur where necessary prior to construction</td>
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</tr>
<tr>
<td>Resource Area</td>
<td>No Action</td>
<td>10 (ART) ARBOR Riparian Transitions</td>
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<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Utilities and Public Services</td>
<td>No change.</td>
<td>Utility relocations would occur in Reaches 6 and 7.</td>
<td>Utility relocations would be the same as Alt 10.</td>
<td>Utility relocations would be the same as Alt 13.</td>
<td>Utility relocations would be the same as Alt 13 except in Reach 8, where more utilities would be relocated.</td>
<td>Utility relocations would be the same as Alt 16.</td>
</tr>
<tr>
<td>Socioeconomics and Environmental Justice</td>
<td>No change.</td>
<td>Potential minor temporary adverse effects from recreation closures. Temporary benefit to employment during construction. Long-term beneficial effects to low-income and minority populations from improved ecological condition, water quality, recreation access, aesthetics.</td>
<td>Potential minor temporary adverse effects from recreation closures. Temporary benefit to employment during construction. Long-term beneficial effects to low-income and minority populations from improved ecological condition, water quality, recreation access, aesthetics.</td>
<td>Potential minor temporary adverse effects from recreation closures. Temporary benefit to employment during construction. Long-term beneficial effects to low-income and minority populations from improved ecological condition, water quality, recreation access, aesthetics.</td>
<td>Potential minor temporary adverse effects from recreation closures. Temporary benefit to employment during construction. Long-term beneficial effects to low-income and minority populations from improved ecological condition, water quality, recreation access, aesthetics.</td>
<td></td>
</tr>
</tbody>
</table>
For most of the resource or use categories listed above, environmental effects arising from this project would be beneficial. However, significant, unavoidable adverse impacts have been identified under some resource categories. A summary of effects by alternative is as follows:

**Alternative 10 (ART)**
Long-term, beneficial impacts to water resources, biological resources, aesthetics, and recreation would occur under this alternative. In general, these beneficial effects would occur during operation and maintenance of the restored habitat, and are associated with increased wetland and riparian function, a higher ratio of plants to hardscape compared to existing conditions, and increased opportunities for bird watching and outdoor education.

Short-term, minimal to moderate adverse impacts to water resources, biological resources, aesthetics, recreation, transportation and circulation, and socioeconomics would occur under this alternative. Significant, unavoidable adverse impacts to land use would occur under this alternative. Significant land use impacts are associated with conflicts with the industrial and light industrial designation in Reach 8.

**Alternative 13 (ACE) and Alternative 13v**
Impacts under this alternative, both beneficial and adverse, would include those identified under Alternative 10. These impacts may be more extensive compared to Alternative 10 due to more extensive implementation of proposed restoration measures under this alternative. The significant, unavoidable adverse impacts to land use would be the same as in Alternative 10.

**Alternative 16 (AND)**
Impacts under this alternative, both beneficial and adverse, would include those identified under Alternatives 10 and 13. These impacts may be more extensive compared to Alternative 10 due to more extensive implementation of proposed restoration measures under this alternative. The significant, unavoidable adverse impacts to land use would be the same as in Alternative 10.

**Alternative 20 (RIVER)**
Impacts under this alternative, both beneficial and adverse, would include those identified under the previous alternatives. Impacts would likely be most extensive under this alternative since it would involve the most extensive implementation of proposed restoration measures. In addition to the significant adverse land use impacts in Alternative 10 in Reach 8, this alternative would also result in conflicts with the industrial land use designation in Reach 3, constituting a significant adverse impact.

### 6.3.3 Environmentally Preferable Alternative and Environmentally Superior Alternative

For NEPA, the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA’s Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources. NEPA requires that, when finalizing an EIS, the Record of Decision (ROD) specify the alternative that was considered to be environmentally preferable.

CEQA Guidelines in section 15126.6(e)(2) requires that an EIR identify an “environmentally superior alternative.” The Guidelines go on to state that if the No Project Alternative is the environmentally superior alternative, then the EIR must also identify an environmentally sensitive alternative from among the build (or “action”) alternatives.
Based on the following analysis and the information elsewhere in this IFR, Alternative 20 is the environmentally preferable alternative under NEPA and the environmentally superior alternative under CEQA.

The five action alternatives under consideration each have a combination of adverse and beneficial effects on the environment, although by far the overall effect of each action alternative is beneficial. With one exception, there are no instances where there is a significant adverse effect for one alternative and not for another; the same is true for less than significant effects and beneficial effects. (Construction scheduling assumptions made for Alternative 13v result in less than significant air quality impacts for that alternative, whereas the other action alternatives would potentially exceed Localized Significance Thresholds under CEQA.) In determining the environmentally superior/environmentally preferable alternative for this project, alternatives were compared against one another in regards to the extent of impacts versus the extent of benefits.

The No Action alternative clearly has the least adverse effects during construction, since construction would not occur. However, there are also no beneficial effects in the long term for the No Action alternative.

As shown in Table 5-1, significant adverse effects (under NEPA) and significant and unavoidable impacts (under CEQA) to Land Use were identified for construction and operations for all five alternatives, and significant unavoidable impacts to Air Quality (exceedance of localized significance thresholds during construction) were identified under CEQA for all alternatives other than Alternative 13v. In the case of Land Use, all alternatives have significant adverse effects associated with inconsistency with industrial and light industrial land use designations and community plans in Reach 8. Alternative 20 has an additional significant adverse impact in Reach 3, where proposed restoration measures at Verdugo Wash are inconsistent with the industrial land use designation. In the case of Air Quality, the types of effects are the same across the alternatives, with the primary differences occurring in the magnitude of emissions of criteria pollutants during construction. Differences among alternatives were most noticeable for the following environmental elements: Biological Resources; Geology, Seismology, Soils, and Minerals; Water Resources; Recreation; Traffic and Circulation; and Socioeconomics and Environmental Justice.

In the cases of Biological Resources, Water Resources, and Recreation, Alt. 20 has greater beneficial effects than the other alternatives, due to the larger scale of the restoration effort and, thus, the greater benefits to water, species, and habitat, and greater recreational resources. For Geology, Seismology, Soils, and Minerals, there is a greater area of ground disturbance for Alternative 20 (and lesser for Alternatives 16, 13v, 13, and 10 in that order), though the effects for all five are less than significant. Traffic and Circulation effects are spread out for a longer period for Alternatives 16 and 20, than for 13v and 13, and finally for Alternative 10. Again, in all cases, the effects are less than significant. Socioeconomics and Environmental Justice impacts are again linked primarily to construction duration and are greatest for Alternatives 16 and 20, but again are less than significant for all alternatives.

Although Alternative 20 has the most extensive adverse impacts, the additional impacts are offset by the additional environmental benefits of having the greatest net gain in average annual habitat units, both in absolute terms and in percentage terms versus the No Action alternative. This, combined with the greater operational benefits in the key long-term biological and water resource elements, results in Alternative 20 being designated as the environmentally superior/environmentally preferable alternative. While there is a longer construction duration and larger work footprint for Alternative 20 than other alternatives, this is more than balanced by the gains in habitat units and other resources.
6.3.4 Regional Economic Development

RED impacts include, principally, changes in income and employment. There may be some overlap with the other accounts. Indirect and induced impacts are the focus of the RED account, and differences between it and NED are considered transfers from the rest of the nation. The study area for RED is the Los Angeles metropolitan area, which is home to 15.4 million people with the largest population and largest area in the United States. If this area were a country, it would have the 15th largest economy in the world, just below Australia and just above the Netherlands, Turkey, Sweden, Belgium, and Indonesia.

The following summarizes the RED assessment as reported in the Draft IFR. Updated numbers are reported in Chapter 7. These results were developed by the study team as reasonable factors, based upon available information, for developing a general estimate of potential redevelopment RED benefits associated with project alternatives. Ranking is in terms of employment, Gross Regional Product, and tax revenues. Additional detail pertaining to the RED is found in Appendix B Economics.

Table 6-8 provides the RED in three levels. Level 1 is impacts of construction of the project (both by the ecosystem restoration and the recreation components), Level 2 is impacts of redevelopment construction, and Level 3 shows impacts of long-term redevelopment.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Regional Economic Development From Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan Description</td>
<td>No Action</td>
</tr>
<tr>
<td></td>
<td>10 (ART)</td>
</tr>
<tr>
<td></td>
<td>13 (ACE)</td>
</tr>
<tr>
<td></td>
<td>16 (AND)</td>
</tr>
<tr>
<td></td>
<td>20 (RIVER)</td>
</tr>
<tr>
<td></td>
<td>ARBOR Riparian Transitions</td>
</tr>
<tr>
<td></td>
<td>ARBOR Corridor Extension</td>
</tr>
<tr>
<td></td>
<td>ARBOR Narrows to Downtown</td>
</tr>
<tr>
<td></td>
<td>ARBOR Riparian Integration via Varied Ecological Reintroduction</td>
</tr>
<tr>
<td>Ecosystem Construction Cumulative Impacts</td>
<td></td>
</tr>
<tr>
<td>Jobs</td>
<td>0</td>
</tr>
<tr>
<td>Labor Income</td>
<td>$0</td>
</tr>
<tr>
<td>Sales</td>
<td>$0</td>
</tr>
<tr>
<td>GRP</td>
<td>$0</td>
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<td></td>
<td>913</td>
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<td></td>
<td>1,986</td>
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<td>6,491</td>
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<td></td>
<td>9,001</td>
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<tr>
<td></td>
<td>$52,560,000</td>
</tr>
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<td>$114,350,000</td>
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<td>$373,823,000</td>
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<td></td>
<td>$518,341,000</td>
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<td>$84,665,000</td>
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<td></td>
<td>$5,789,000</td>
</tr>
<tr>
<td></td>
<td>$5,789,000</td>
</tr>
<tr>
<td></td>
<td>$22,896,000</td>
</tr>
</tbody>
</table>

Table 6-8 Assessment of Impacts from Construction (Price level April 2013)
The alternatives are estimated to create between 2,200 to 14,100 construction related jobs over the period of analysis. Employment is anticipated to generate labor income ranging from $138 million to $860 million. Regional economic activity from construction is expected to increase by $260 million to nearly $1.5 billion with ecosystem restoration, recreation and redevelopment construction.

The long-term economic impacts of redevelopment are estimated to eventually create permanent employment of 630 to 2,700 jobs. This employment will have a greater impact to the region as these employment opportunities exist throughout the period of analysis. Total labor income from these employment opportunities is estimated to range from nearly $900 million to just under $4 billion depending upon alternative.

The cumulative effects of the construction/redevelopment components over the period of analysis will create between 2,800 to 16,800 jobs with incomes from over $1 billion to nearly $5 billion.

### 6.3.5 Other Social Effects Assessment

The OSE account describes the potential effects of project alternatives in areas that are not dealt with explicitly in the NER and RED accounts. The Principles and Guidelines state that the OSE, when included in USACE documents, should “display plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation and others.”

Social effects in a general sense refer to a concern for how the constituents of life that influence personal and group definitions of satisfaction, well-being, and happiness are affected by some condition or proposed intervention. Well-being is an ensemble concept composed of multiple dimensions. While economic factors are very important in characterizing well-being, there are many more factors which come into play. In particular the distribution of resources; the character and richness of personal and community associations; the social vulnerability and resilience of individuals, groups, and communities; and the ability to participate in systems of governance are all elements that help define well-being.

This OSE analysis describes the potential social effects of the alternatives under consideration. The OSE account explores the following categories of effects from the implementation of the alternatives considered: this is described in Appendix B, Economics, and summarized in the Table 6-9 below. In most cases it is not possible to differentiate between the social effects of the restoration alternatives. Appendix B Economics presents the OSE effects in much more detail.

- Displacement/Impacts to Population
- Public Health and Safety
- Displacement/Impacts to Minorities and Special Interest Groups
- Displacement/Impacts to Businesses
- Displacement/Impacts to Agriculture
- Displacement/Impacts to Recreational Areas
- Community Growth
- Project Impacts and Connectivity of the Community
- Community Well-being
- Environmental Health
<table>
<thead>
<tr>
<th>Criteria</th>
<th>No Action</th>
<th>10 (ART)</th>
<th>13 (ACE)</th>
<th>16 (AND)</th>
<th>20 (RIVER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement/Impacts to Population</td>
<td>No effects</td>
<td>No displacement to population</td>
<td>No displacement to population</td>
<td>No displacement to population</td>
<td>No displacement to population</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>Same as existing condition</td>
<td>Improved community health through restored river and open space/recreation opportunities</td>
<td>Improved community health through restored river and open space/recreation opportunities</td>
<td>Improved community health through restored river and open space/recreation opportunities</td>
<td>Improved community health through restored river and open space/recreation opportunities</td>
</tr>
<tr>
<td>Displacement/Impacts to Minorities and Special Interest Groups</td>
<td>Same as existing condition</td>
<td>No displacements or relocations. Improved linkages to trails and neighborhood parks, increasing property values</td>
<td>No displacements or relocations. Improved linkages to trails and neighborhood parks, increasing property values</td>
<td>No displacements or relocations. Improved linkages to trails and neighborhood parks, increasing property values</td>
<td>No displacements or relocations. Improved linkages to trails and neighborhood parks, increasing property values</td>
</tr>
<tr>
<td>Displacement of Businesses</td>
<td>No impacts</td>
<td>Business displacement in Reach 8</td>
<td>Business displacement in Reach 8</td>
<td>Business displacement in Reach 8</td>
<td>Business displacement in Reaches 3, 7, and 8</td>
</tr>
<tr>
<td>Displacement/Impacts to Recreational Areas</td>
<td>No impacts</td>
<td>Temporary restriction to existing recreation areas during construction</td>
<td>Temporary restriction to existing recreation areas during construction</td>
<td>Temporary restriction to existing recreation areas during construction</td>
<td>Temporary restriction to existing recreation areas during construction</td>
</tr>
<tr>
<td>Community Growth</td>
<td>Continued as in the existing conditions</td>
<td>Ecosystem restoration measures are projected to revitalize commercial, industrial, and residential development in several areas</td>
<td>Ecosystem restoration measures are projected to revitalize commercial, industrial, and residential development in several areas</td>
<td>Ecosystem restoration measures are projected to revitalize commercial, industrial, and residential development in several areas</td>
<td>Ecosystem restoration measures are projected to revitalize commercial, industrial, and residential development in several areas</td>
</tr>
<tr>
<td>Project Impacts and Connectivity to the community</td>
<td>River would not be restored and not result in any improvement to existing conditions</td>
<td>Promote connectivity of the community by providing a common place for residents to recreate and interact and create a sense of community and belonging</td>
<td>Promote connectivity of the community by providing a common place for residents to recreate and interact and create a sense of community and belonging</td>
<td>Promote connectivity of the community by providing a common place for residents to recreate and interact and create a sense of community and belonging</td>
<td>Promote connectivity of the community by providing a common place for residents to recreate and interact and create a sense of community and belonging</td>
</tr>
<tr>
<td>Community Well Being</td>
<td>No changes</td>
<td>Restored River with recreation opportunities promotes well-being and livability of the community</td>
<td>Restored River with recreation opportunities promotes well-being and livability of the community</td>
<td>Restored River with recreation opportunities promotes well-being and livability of the community</td>
<td>Restored River with recreation opportunities promotes well-being and livability of the community</td>
</tr>
<tr>
<td>Environmental Health; aesthetics, stormwater runoff, energy savings, air quality</td>
<td>No changes</td>
<td>$4,216,800</td>
<td>$4,586,400</td>
<td>$4,536,000</td>
<td>$4,838,400</td>
</tr>
</tbody>
</table>
6.3.6 Principles and Guidelines

The Principles and Guidelines (U.S. Water Resources Council 1983) and the USACE Institute for Water Resources (IWR) Planning Manual (USACE 1996) present decision criteria for evaluation, comparison, and selection of measures. These are effectiveness, completeness, efficiency, and acceptability, as defined in Chapter 4. The discussion below addresses Alternatives 10, 13, 16 and 20. The assessment of these criteria for Alternative 13v is provided in Section 6.6.3 below.

Alt 10 ART

- **Effectiveness.** Alt 10 ART is judged to be minimally effective, in that while it meets the planning objectives overall and has restoration in all 8 reaches, it fails to meet the key target objective of reconnection to tributaries, and thereby does not realize those potential habitat benefits, nor does it provide opportunities for key regional connectivity to the San Gabriel or Verdugo Mountains.
- **Completeness.** Alt 10 ART is considered complete, though it is considered the less resilient than alternatives 16 AND or 20 RIVER and therefore is subject to higher risk of failure to realize the estimated habitat benefits over the period of analysis.
- **Efficiency.** Alt 10 ART is efficient. All components of the plan were judged to be cost effective and best buys in the CE/ICA.
- **Acceptability.** Alt 10 ART complies with applicable laws, regulations, and public policies, and any adverse effects would be mitigated per discussion provided in Chapter 5.

Alt 13 ACE

- **Effectiveness.** Alt 13 ACE is judged to be more effective than Alternative 10; it meets the planning objectives overall, including restoration in all 8 reaches, but also includes restoration of the tributary confluence at Arroyo Seco, which provides opportunity for key regional connectivity to the San Gabriel Mountains.
- **Completeness.** Alt 13 ACE is considered complete and is more resilient than Alternative 10.
- **Efficiency.** Alt 13 ACE is efficient. All components of the plan were judged to be cost effective and best buys in the CE/ICA.
- **Acceptability.** Alt 13 ACE complies with applicable laws, regulations, and public policies and any adverse effects would be mitigated per discussion provided in Chapter 5.

Alt 16 AND

- **Effectiveness.** Alt 16 AND is judged to be more effective than Alternative 13. It meets the planning objectives, especially in terms of contiguous restoration within and across reaches. The widening at LATC reconnects the river to its historic floodplain with a natural hydrologic connection and provides connectivity for wildlife to a key habitat node within the project area.
- **Completeness.** Alt 16 AND is considered complete, more resilient than Alt 10 ART or Alt 13 ACE.
- **Efficiency.** Alt 16 AND is efficient. All components of the plan were judged to be cost effective any best buys in the CE/ICA. However, Alt 16 AND is substantially less efficient than Alt 13 ACE due to a significant increase in incremental cost per gain in output (HUs) compared to Alt 13 ACE.
- **Acceptability.** Alt 16 AND complies with applicable laws, regulations, and public policies, and any adverse effects would be mitigated per discussion provided in Chapter 5.

Alt 20 RIVER

- **Effectiveness.** Alt 20 RIVER is judged to be the most effective of the final alternatives. It maximizes contribution toward achievement of the planning objectives. Restoration at the
Verdugo Wash confluence provides additional habitat while maximizing opportunities for regional connectivity to the San Gabriel and Verdugo Mountains. Restoration at Cornfields provides additional habitat and opportunities for connectivity to the Elysian Hills. This alternative also maximizes the potential for near and long term RED and OSE benefits.

- **Completeness.** Alt 20 RIVER is considered complete. It would be resilient, and likely to achieve the estimated habitat benefits over the period of analysis.
- **Efficiency.** Alt 20 RIVER is efficient. All components of the plan were judged to be cost effective any best buys in the CE/ICA. It is the most expensive of the four final alternatives and is substantially less efficient than Alt 13 ACE due to a significantly higher incremental cost per gain in output (HUs).
- **Acceptability.** Alt 20 RIVER complies with applicable laws, regulations, and public policies and any adverse effects would be mitigated per discussion provided in Chapter 5.

### 6.4 FINAL ARRAY COST ESTIMATES IN DRAFT IFR

Following identification of the final array of alternatives for the Draft IFR, refinements were made to the cost estimates. An abbreviated cost risk analysis was also conducted. In a risk analysis, both risks and uncertainties pertaining to design and implementation of the project are considered and possible risks of future cost escalation considered. This risk analysis is included in Appendix C Cost Estimating, and applicable contingencies have been applied to the costs shown below in Table 6-10. These costs are shown as April 2013 price level as that is the time that they were last updated. These costs were the basis for plan formulation, evaluation and comparison used to identify the NER Plan. These are level 4 cost estimates per ER 1110-2-1302. Refinements to the costs for the Draft IFR final array resulted in minor changes to the total first costs and average annual costs. Economic evaluation confirmed that these impacts would not have had a material impact on the alternative comparison described in Chapter 4, or the selection of the final array of alternatives for the Draft IFR. Costs for the NER and LPP plans presented later in the report are expressed in October 2015 price levels and were refined based upon more detailed design and cost estimates.

#### Table 6-10 Draft Final Array Cost Information Ecosystem Restoration
*(Price level April 2013, Interest Rate FY13-3.375 Percent)*

<table>
<thead>
<tr>
<th></th>
<th>Alt 10</th>
<th>Alt 13</th>
<th>Alt 16</th>
<th>Alt 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Cost</td>
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<td>$120,312,641</td>
<td>$360,927,221</td>
<td>$506,743,287</td>
</tr>
<tr>
<td>PED/EDC</td>
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<td>$12,104,790</td>
<td>$39,106,569</td>
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</tr>
<tr>
<td>S&amp;A</td>
<td>$3,278,181</td>
<td>$7,259,203</td>
<td>$23,452,081</td>
<td>$32,218,193</td>
</tr>
<tr>
<td>LERRDs</td>
<td>$310,581,116</td>
<td>$313,729,423</td>
<td>$380,442,863</td>
<td>$487,941,715</td>
</tr>
<tr>
<td><strong>TOTAL FIRST COST</strong></td>
<td><strong>$374,782,639</strong></td>
<td><strong>$453,406,057</strong></td>
<td><strong>$803,928,734</strong></td>
<td><strong>$1,080,627,339</strong></td>
</tr>
<tr>
<td>Interest During Construction</td>
<td>$8,525,508</td>
<td>$11,466,426</td>
<td>$49,902,201</td>
<td>$60,615,729</td>
</tr>
<tr>
<td>Total Investment Cost</td>
<td>$383,308,147</td>
<td>$464,872,483</td>
<td>$853,830,935</td>
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<tr>
<td>Annualized Investment Cost</td>
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<td>$19,374,611</td>
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<tr>
<td>Annualized O&amp;M</td>
<td>$579,141</td>
<td>$872,445</td>
<td>$2,257,215</td>
<td>$2,515,390</td>
</tr>
<tr>
<td>Total Annual Cost</td>
<td>$16,554,374</td>
<td>$20,247,056</td>
<td>$37,842,547</td>
<td>$50,079,272</td>
</tr>
<tr>
<td>AAHU</td>
<td>5,321</td>
<td>5,902</td>
<td>6,509</td>
<td>6,782</td>
</tr>
</tbody>
</table>
6.5 COMPARISON OF ALTERNATIVES TO SUPPORT TSP SELECTION AND DESIGNATION OF NER FOR DRAFT IFR

The final array of action alternatives in the Draft IFR provided a range of approaches for the project, from Alt 10 ART which minimizes cost but does not fully meet all target objectives, to Alt 20 RIVER, which provides the most extensive restoration actions to maximize NER, RED, and OSE benefits at higher costs. Comparisons of alternatives for impacts in chapter 5 and benefits in chapter 6 provide the following supported the selection of a TSP and designation of the NER plan in the Draft IFR.

6.5.1 Cost Effectiveness and Incremental Cost Analysis

The CE/ICA performed for the Draft IFR strongly supported the identification of Alternative 13 as the NER Plan. The following table summarizes the key cost and output metrics for the CE/ICA. As shown below, Alternative 10 provides 5,321 AAHUs at a total cost of $374 million and an annual cost of about $17 million. The AAC/AAHU is $3,111. Relative to Alternative 10, Alternative 13 provides an 11 percent increase in output at an incremental first cost of $79 million and an incremental average annual cost of $3.7 million (a 22 percent increase). The incremental AAC/AAHU is $6,365, which is about double the incremental AAC/AAHU for Alternative 10. Costs in table 6-11 are shown at April 2013 price level, per when it was last updated.

<table>
<thead>
<tr>
<th>Table 6-11 Final Array CE/ICA Comparison Table (Price level April 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Total First Cost</td>
</tr>
<tr>
<td>Incremental First Cost</td>
</tr>
<tr>
<td>Incremental First Cost %</td>
</tr>
<tr>
<td>AHAHU</td>
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<tr>
<td>Incremental AHAHU</td>
</tr>
<tr>
<td>Incremental AHAHU %</td>
</tr>
<tr>
<td>Total Cost/AHAHU</td>
</tr>
<tr>
<td>Total Cost/AHAHU % Increase</td>
</tr>
<tr>
<td>Total First Cost/Restored Acre</td>
</tr>
<tr>
<td>TFC/Acre % Increase</td>
</tr>
<tr>
<td>Total Annual Cost</td>
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<td>Incremental Annual Cost</td>
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<tr>
<td>Incremental Annual Cost %</td>
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<tr>
<td>AAC/AHAHU</td>
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<tr>
<td>AAC/AHAHU % Increase</td>
</tr>
<tr>
<td>AAC/Acre</td>
</tr>
<tr>
<td>AAC/Acre % Increase</td>
</tr>
<tr>
<td>Incremental AAC/AHAHU</td>
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<tr>
<td>Incremental AAC/AHAHU %</td>
</tr>
<tr>
<td>Incremental AAC/AHAHU vs. Alt 13</td>
</tr>
<tr>
<td>Multiple</td>
</tr>
</tbody>
</table>
There is a substantial increase in cost (both in total cost and percent increase in cost) associated with Alternative 16 relative to Alternative 13. While the percent increase in output for Alternative 16 of 10 percent is approximately the same as under Alternative 13 (relative to Alternative 10), the percent increase in costs are approximately 80 percent (vs. about 20 percent for Alternative 13). Therefore, the incremental AAC/AAHU for Alternative 16 is over four times higher than for Alternative 13. Similarly, Alternative 20 requires a significant increase in cost relative to output compared to Alternative 13. The incremental AAC/AAHU for Alternative 20 is about seven times higher than Alternative 13. The following two graphs display the substantial increases in cost and cost per output for Alternatives 16 and 20 relative to Alternative 13.

![Final Array Comparison Cost and Cost/Output Metrics](image)

Figure 6-14 Final Array Comparison Cost and Cost/Output Metrics
Based upon these CE/ICA results, Alternative 13 was identified as the NER Plan. The following sections describe considerations other than the CE/ICA analysis considered in the selection of the tentatively selected plan, including completeness, effectiveness and acceptability, as well as the other Principles and Guidelines accounts.

6.5.2 Completeness, Effectiveness and Acceptability Criteria Comparison

Alternative 10 is complete, but less resilient than other alternatives, and only minimally effective as it does not provide key nodal connections to large tributary watersheds. Alternative 13 is incrementally more effective, and complete, as it is more resilient than Alternative 10. Alternative 16 is incrementally more complete and effective as it is more resilient than Alternatives 10 and 13. Alternative 20 is also incrementally more complete, and effective. All four alternatives are acceptable as they comply with applicable laws, regulations and public policies except as mitigated per the discussion in Chapter 5.

6.5.3 Effectiveness: Objective Analysis Summary

The alternatives were qualitatively analyzed for their ability to meet objectives, which is an important component of effectiveness. Alternative 10 minimally met the objectives with the incremental differences in 13, 16 and 20 increasing each larger alternative’s capacity to meet each objective. For example, in restoring nodal habitat connectivity, Alternative 10 restores minimal connectivity within the reach where none existed before. Compared to Alternative 10, Alternative 13 significantly increases nodal connectivity by 309 percent. Increases in nodal connectivity for Alternatives 16 and 20 are incrementally...
smaller (85 percent for Alternative 16 over Alternative 13 and 120 percent for Alternative 20 over Alternative 16). Alternative 13 adds restoration of a major tributary confluence and Alternative 20 adds a second major tributary. Each alternative adds increasing levels of naturalization of the riverbed and banks with Alternative 13 the first to add significant channel restoration in the centrally located Taylor Yard and Alternative 16 adding the naturalizing of the concrete bed (Reach 8).

6.5.4 Analysis using the Four Accounts

The final array of alternatives were also compared using the four accounts of National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE). The EQ analysis shows similar results to that seen in the habitat evaluation with the highest incremental increases in benefits realized with Alternative 13. Benefits increase incrementally as the size of the alternative area increases. There are significant temporary adverse effects to environmental quality however, benefits increase after construction. RED benefits are significantly increased for each alternative. However, the largest increase in RED benefits occurs with the incremental change from Alternative 16 to Alternative 20. OSE benefits are similar and increasing with relative area.

6.5.5 Analysis by Constraints

There were several constraints considered in plan formulation, including avoidance of HTRW where practicable and sponsor remediation where avoidance is impracticable; avoidance of surrounding urbanization and infrastructure where practicable; sponsor provision of real estate; maintenance of existing levels of flood risk management; and avoidance of conflicts with existing engineering policies for flood risk management projects. The major constraints are compared in Section 6.2 above. All alternatives include similar requirements for use of sites currently known or suspected of having HTRW contamination with the inclusion of the two Taylor Yard sites in Reach 6, LATC in Reach 8 in addition to the SFVSS groundwater contamination within the study area. All alternatives have high real estate costs that required a policy exception. Existing levels of flood risk management are maintained with each alternative, and each alternative would avoid conflicts with existing engineering policies for flood risk management projects. All alternatives avoided surrounding urbanization and infrastructure where practicable, but all alternatives would displace some industrial uses and Alternatives 13v, 16, and 20 would all impact segments of active rail lines, requiring that these segments be trestled at grade.

6.5.6 Impact Analysis

The comparison of the benefits and impacts of each alternative shows that all alternatives will have similar environmental impacts in nearly all categories, with an increase in impacts as the alternatives increase in areal extent from Alternative 10 to 20. Each alternative has temporary impacts due to construction in all categories and similar beneficial cumulative impacts over the long-term. Alternative 20 would have more significant land use changes in Reach 3 adjacent to Verdugo Wash and in Reach 7 adjacent to the Los Angeles River State Historic Park. The impact analysis supports the choice of any of the four alternatives, however, the larger the alternative the higher the impacts, but with higher beneficial impacts in the long-term.

6.5.7 NER Plan Identification

Based on the comparative analysis above, the Draft IFR identified Alternative 13 as the Tentatively Selected Plan and NER Plan as it reasonably maximized net NER benefits. Alternative 13 reasonably maximizes outputs while passing tests of CE/ICA, reasonably met all planning objectives, reasonably avoids constraints (at least as well as other alternatives), provides significant ecosystem outputs, and is effective, efficient, complete, and acceptable. Therefore, it was identified as the NER Plan in the Draft IFR. The following section describes additional analysis and actions taken after the circulation of the
Draft IFR that resulted in identification of a variation on the previously identified NER plan and recommendation of a Locally Preferred Plan.

6.6 NATIONAL ECOSYSTEM RESTORATION (NER) PLAN AND LOCALLY PREFERRED PLAN (LPP)

The Los Angeles District (District) circulated the Draft IFR for a 45-day public review period beginning on September 20, 2013, and a public meeting was held on October 17, 2013. The Draft IFR identified Alternative 13 as the Tentatively Selected Plan and NER Plan as it reasonably maximizes net NER benefits. After consideration of public comments, IEPR panel comments, and further updates to cost to prepare this final IFR, the NER Plan was refined and a Locally Preferred Plan was approved for recommendation to Congress.

6.6.1 Public Review Comments

Review comments during the public comment period came from letters, emails, and participants at the Public Meeting. The District received and evaluated nearly 500 comments. Federal agencies including the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Department of Interior, the Urban Waters Federal Partnership, state and local agencies, non-governmental organizations, interest groups, elected officials, and private citizens provided comments. The public meeting included over 300 attendees, with close to unanimous support for Alternative 20. In addition, the District received over 8,000 petition signatures in support of Alternative 20. The comments can be reviewed in Appendix L and responses. Key comments related to the following topics:

- Scope of the recommended plan
- Acceptability and completeness of the plans
- Habitat and hydrologic connectivity benefits associated with the plans
- Model used to calculate benefits
- Environmental justice
- Union Pacific Rail Road Yard (LATC) relocation

6.6.2 Independent External Peer Review

Independent External Peer Review (IEPR) was conducted on the Draft IFR and Appendices. IEPR comments were addressed and responses provided in December 2013.

Overall, seventeen comments were identified and documented in the IEPR Report. Of the seventeen comments, one was identified as economics related; two were plan formulation related; six were hydrology or hydraulic related; one was hydrological and geotechnical related, two were cost engineering related, one was environmental related, one was related to hazardous, toxic and radioactive waste (HTRW) issues, one was environmental and hydrologic related, one was both environmental and cost engineering related, one was related to hydrology and hydraulics, environmental and cost engineering, and environmental issues. Four comments were identified as having high significance, eleven comments had medium significance, and two comments had low significance. All comments were responded to and resolved. Resolution of comments included clarifications and additions to this IFR and appendices where appropriate, along with commitments in some cases to undertake further analysis during PED. PED commitments are identified in the discussion of the Recommended Plan in Chapter 7 and relevant appendices.

The Addendum on the Public and Agency Comments provided one additional environmental-related technical concern of high significance. In the Addendum, the IEPR Panel recommended quantification of...
connectivity outputs of proposed alternatives and reevaluation of Alternative 13 as the TSP after factoring in connectivity outputs as well as public review comments in support of Alternative 20. A framework suggested by the IEPR panel was applied to quantify the beneficial outputs of connectivity noted by public comments as not being fully captured in the alternatives analysis. By evaluating hydrologic, local, and regional connectivity and combining the resultant output with the initial habitat model output, USACE was able to more comprehensively compare the alternatives in the final array.

This additional analysis has been included above in Section 6.1.3. Quantifying connectivity benefits showed more restoration outputs for each of the alternatives, as well as for key features included in Alternatives 16 and 20 but not Alternative 13. Four different metrics were developed to further quantify different connectivity outputs. The individual metrics were then combined into a single connectivity metric. These combined metric values were then input into the economic analysis (CE/ICA) and weighted at varying levels along with the Combined Habitat Assessment Protocol (CHAP) outputs. The original analysis only considered the CHAP analysis in the quantitative comparison and resulted in all four Final Array Plans included in the Draft IFR (10, 13, 16, and 20) being Best Buy Plans. In the revised analysis, two additional scenarios were evaluated that based the CE/ICA analysis on a Total Weighted Output Metric that included CHAP and connectivity benefits. The first weighted the CHAP and Combined Connectivity equally, and the second weighted the CHAP at 75 percent and Combined Connectivity at 25 percent. These results were consistent in showing Alternative 13 as the first Best Buy Plan. After identification of the variation on Alternative 13 (13v), it was also analyzed according to the connectivity metrics, producing results very similar to Alternative 13. By capturing these additional benefits, this analysis showed that the incremental costs per output for larger scale plans were substantially lower, but still in excess of $100 million. Notwithstanding the incremental increase in benefits, based on the magnitude of this incremental increase in cost it was determined that the additional benefits of the larger plans were not worth the additional investment and did not materially affect the identification of the NER plan. The IEPR panel assessed the evaluation that factored in connectivity outputs, and was satisfied that the updated analysis confirmed the NER Plan identification.

### 6.6.3 Validation Process for the NER Plan and Identification of Refined NER

Following the public review period for the Draft IFR, the USACE performed further analysis that included a more detailed cost analysis using Mii software, real estate cost updates, and further modifications of contingencies based upon a cost and schedule risk analysis. Updates to real estate costs included completion of gross appraisal of the lands required for the project. Costs for the LATC site in Reach 8 increased substantially. Table 6-12 shows the total first costs as presented in the Draft IFR and as updated subsequent to the Draft IFR based on October 2014 price levels.

| Table 6-12 Comparison of First Costs Draft IFR (April 2013) and Updated (October 2014) |
|----------------------------------------|--------|--------|--------|--------|
| **First Cost Draft IFR**               | Alt 10 | Alt 13 | Alt 16 | Alt 20 |
| (April 2013 Price Level)              | $374,782,639 | $453,406,057 | $803,928,734 | $1,080,627,339 |
| **First Cost Updated**                | $591,371,000 | $707,800,000 | $1,051,057,000 | $1,309,332,000 |
| (October 2014 Price Level)            |        |        |        |        |

*Updated costs are derived from reach-based cost updates, due to rounding there is a minor difference between Alternative 13 and 20 as shown above and in the Total Project Cost Summary (TPCS). Alternatives 10 and 16 have not been developed in Micro-Computer Aided Cost Estimating System (MCACES).*
When developing the detailed cost estimates, the following design and cost assumptions were revisited for Reach 7: (1) to consider maintaining Baker Street in place, (2) to determine if the project could work around the proposed Water Wheel, and (3) to examine utilities. In conducting this review it was determined that costs for concrete removal and terracing associated with the Reach 7 Plan associated with Alternative 20 were higher than necessary. In addition the costs for the Reach 7 Plan associated with Alternative 13 required revisions to account for additional removal and hauling costs of concrete, and therefore increased.

Due to the changes in costs described above, an additional review of the project costs and benefits was completed. This analysis identified a more cost effective variation for Alternative 13 which included a change in Reach 7. The Alternative 13 variation in Reach 7, in addition to restoring the lower Arroyo Seco, restores 10 acres of freshwater marsh and provides a terraced connection from the river to the Los Angeles State Historic Park. This reach plan also daylight three streams while omitting the measure in Alternative 13 that implanted vegetated in channel banks. The Reach 7 substitution provides greater benefits than Alternative 13 at lower cost. When considered against the criteria in the Principles and Guidelines, the variation on Alternative 13 is effective, complete, efficient, and acceptable. It is slightly more effective and efficient than Alternative 13. With respect to the additional quantitative connectivity analysis, it is nearly identical to Alternative 13. Therefore, the updated cost analysis largely confirmed Alternative 13’s selection as the NER plan, with the variation for Reach 7 as described. Alternative 13v is thus identified as the NER plan.

Table 6-12 provides the comparison of costs and benefits of Alternatives 13 and 13v. These costs are shown as FY 15 price level. Alternative 13v generally performs equivalently to Alt 13 in the categories analyzed above except with more cost effectiveness and greater benefits in Reach 7.

Table 6-13 Comparison of Alternative 13 and 13v (Price Level October 2014, 3.375 Percent Interest Rate)

<table>
<thead>
<tr>
<th></th>
<th>Alt 13</th>
<th>Alt 13v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Cost</td>
<td>$147,851,000</td>
<td>$113,958,000</td>
</tr>
<tr>
<td>PED/EDC (14%)</td>
<td>$24,182,000</td>
<td>$15,954,120</td>
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<tr>
<td>S&amp;A (9.5%)</td>
<td>$16,856,000</td>
<td>$10,826,010</td>
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<tr>
<td>Lands &amp; Damages (P.L. 91-646 included)</td>
<td>$350,474,000</td>
<td>$348,648,000</td>
</tr>
<tr>
<td>Utility/Facility Relocations</td>
<td>$168,437,000</td>
<td>$177,886,000</td>
</tr>
<tr>
<td>Total LERRDs*</td>
<td>$518,911,000</td>
<td>$526,534,000</td>
</tr>
<tr>
<td>TOTAL FIRST COST</td>
<td>$707,800,000</td>
<td>$667,272,130</td>
</tr>
<tr>
<td>AAHU</td>
<td>5,902</td>
<td>5,989</td>
</tr>
<tr>
<td>Annualized Investment Cost**</td>
<td>$31,147,128</td>
<td>$27,810,000</td>
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<tr>
<td>Annual O&amp;M</td>
<td>$941,566</td>
<td>$951,887</td>
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<tr>
<td>Total Annual Cost</td>
<td>$32,088,695</td>
<td>$28,761,887</td>
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<tr>
<td>Total Annual Cost per AAHU</td>
<td>$5,438</td>
<td>4,802</td>
</tr>
<tr>
<td>Acres</td>
<td>588</td>
<td>598</td>
</tr>
</tbody>
</table>

* PED/EDC and Construction Management costs for Relocations are part of LERRD rather than Construction. Because provision and performance of LERRD required for the project is a non-Federal sponsor responsibility, these relocation-related PED/EDC and Construction Management costs are shown as separate line items in cost apportionment tables. The LERRD total in this table also includes Federal administrative costs, which are displayed separately in Chapter 7.

** IDC is included via simple addition of individual reach-based IDC calculations.
6.6.4 Locally Preferred Plan Request

By letter dated April 10, 2014, the City of Los Angeles requested that Alternative 20 be the plan recommended to Congress for authorization. The basis for the sponsor’s request for Alternative 20 included: the Administration’s America’s Great Outdoors and Urban Waters Federal Partnership initiatives; strong public, agency, and stakeholder support; Los Angeles Congressional delegation support; the USACE’s acceptability criteria; redressing environmental injustice; the scarcity of Mediterranean-type habitat; and the ability of the plan to connect to opportunity areas highlighted in the City’s LA River Revitalization Master Plan.

6.6.5 Locally Preferred Plan Details

Alternative 20 includes most of the restoration features of the other alternatives in the final array, and includes greater channel modifications and hydrologic connectivity. The most substantial additional features compared to the NER plan are restoration of the LATC site as part of the river in Reach 8 (also present in Alternative 16), restoration of the Verdugo Wash confluence in Reach 3, and channel bank modification and river bed widening in Reaches 2 and 5. The LATC feature, which in Alternative 13v restores a historic wash but connects to the river only through a culvert, would be physically reconnected to the river in Alternative 20. Hydrologic connection would be accomplished through removal of the concrete channel wall, removal of the approximately 0.7 miles of concrete riverbed, and restoration of freshwater marsh on the site. The confluence of the Verdugo Wash is restored by removing concrete in the channel and widening the channel opening, creating wetland and riparian habitat.

6.6.6 Approval to Recommend Locally Preferred Plan

By memorandum dated May 27, 2014, the Assistant Secretary of the Army (Civil Works) approved the Locally Preferred Plan request.
7 RECOMMENDED PLAN

As described in the previous section Alternative 13v is the NER Plan and Alternative 20 is the Locally Preferred Plan. The LPP, Alternative 20, is the Recommended Plan. Both plans include construction of restoration features in and along the river in specific locations as well as removal of non-native vegetation throughout the project area, including the River and lower tributary channel bottoms, particularly in the soft bottom channel areas. As previously stated in Chapter 4, the influence of restoration features extends beyond their immediate footprint to adjacent intermittent open water and perennial open water channel bottom areas, increasing their habitat and wildlife function. The project features make the entire channel more conducive to wildlife movement and provide new nodal and regional habitat connections as well as hydrologic connections.

Acres in the reach descriptions below are restored acreages in the soft bottom reaches as well as hard bottom open water areas both intermittently and perennially flowing. In-channel areas restored include over 146 acres of existing soft or natural bottom with mostly perennial flows and 91 acres of existing hard bottom channel with intermittent open water. In addition to the restoration provided by the NER Plan, Alternative 20 adds the LPP restores additional acres of soft bottom channel in Reaches 2 and 5 through widening the channel, and modifies removes the a portion of the hard bottom channel in Reach 8 as described in the reach by reach descriptions below, therefore, ultimately resulting in more soft bottom acres and fewer hard bottom acres than were included in existing conditions. Table 7-1 includes the approximate acreages in the project footprint by reach.

<table>
<thead>
<tr>
<th>Reach</th>
<th>Alt 13v Acres</th>
<th>Alt 20 RIVER Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>2</td>
<td>39</td>
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</tr>
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<td>5</td>
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<td>6</td>
<td>159</td>
<td>159</td>
</tr>
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<td>7</td>
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<td>59</td>
</tr>
<tr>
<td>8</td>
<td>109</td>
<td>153</td>
</tr>
<tr>
<td>Total</td>
<td>598</td>
<td>719</td>
</tr>
</tbody>
</table>

The acreages provided in this table are based on conceptual drawings and GIS. The resolution of these estimates is at a feasibility level for planning purposes. The Real Estate Plan used individual parcel information based on County records for greater accuracy for future acquisition purposes.

The features that make up the ecosystem restoration and recreation components of the NER Plan and LPP are described in Section 7.1. Section 7.2 includes description of plan implementation including apportionment of costs between the Federal government and non-Federal sponsor and allocation of costs among project purposes. It also describes Federal and non-Federal responsibilities for implementation.
7.1 ECOSYSTEM RESTORATION FEATURES OF THE NER AND LPP

The NER Plan, Alternative 13v, restores 598 acres of habitat throughout the 11 miles of study area. Table 7-1 includes the total approximate acres restored by reach. These acreages reflect newly restored acres as well as existing habitat and open water that will be improved. This plan includes restoration of valley foothill riparian and freshwater marsh habitat, daylighting of 15 streams (storm drains), creation of side channels in two locations, river widening in Reach 6, terracing in Reaches 6 and 7, and restoration of the lower Arroyo Seco tributary. Restoration measures were described in Chapter 4 Plan Formulation. The alternative is depicted on a map at the end of this chapter.

The LPP, Alternative 20 (RIVER), restores 719 acres of habitat throughout the 11 miles of study area. Table 7-1 includes the total approximate acres restored by reach. These acreages reflect newly restored acres as well as existing habitat and open water that will be improved. This plan includes restoration of valley foothill riparian and freshwater marsh habitat, daylighting of 13 streams (storm drains), creation of side channels in three locations, river widening and terracing in Reaches 2, 5, 6, 7 and 8, restoration at the Verdugo Wash confluence, and restoration of the lower Arroyo Seco tributary.

General measures related to vegetation and wildlife for both the NER and LPP, including invasives removal, are discussed in Sections 7.1.9 and 7.1.10.

7.1.1 Reach 1 Pollywog Park Area of Griffith Park

NER Plan

Approximately 82 acres would be restored in Reach 1 in the NER Plan. This reach plan would implement a habitat corridor with riparian planting on the overbanks of both sides of the River and other nearby locations. Overbanks are those areas adjacent to the river where overland flow in flood events could occur in a natural river environment. Areas of restoration include the left overbank across the River from the Headworks Study Site, the Pollywog Park area of Griffith Park, the open area directly downstream of Headworks on the right overbank, and the left overbank of Burbank Western Channel (tributary from the north/west). The riparian corridors will increase habitat and wildlife connectivity through the channel from Sennett Creek at the upstream end of the Headworks site on the right bank to the outlet at the downstream end of Pollywog Park on the left bank. Connections between these areas through the channel include a connection under SR-134 to the River and the open area restored on the overbank directly downstream of Headworks would be connected under Forest Lawn Drive on the same side of SR-134 with the Headworks Study site, and across the river with restored riparian habitat on the overbank of Burbank Western Channel. The channel in this reach is concrete and often develops a vegetated mat with shallow open water flowing through it further enhancing these connections.

Restored habitat corridors would be planted with a riparian community of cottonwood/willow, sycamore, mugwort, mulefat, and scarlet monkeyflower with a buffer of sagebrush, buckwheat, and native herbaceous plants. It would include irrigation for establishment and water harvesting features to sustain plants, including micro-grading and/or swales to capture and infiltrate water. Water sources could include reclaimed water, harvesting of stormwater and street runoff (with small wetland features at the end of adjacent streets), and/or highway runoff. Where stormwater or street runoff is excessive during storm events, a connection to the River at the downstream edge of the park would allow it to overflow into the channel. Figure 7-1 includes a graphic depiction of the restoration at the downstream end of Pollywog Park. Establishment and drought management for this vegetation would utilize irrigation, either through flood irrigation (simulating a natural riparian regime) or drip irrigation, dependent upon the availability of water. There are no channel modifications within this reach. While there is a levee at the downstream end of this reach, any planting in that area will comply with all levee regulations. This set of measures in this reach subplan was the most incrementally cost effective and beneficial plan for all alternatives in the final
array. Stormwater harvesting of the types described for this reach will be used as appropriate in all
reaches for restoration of riparian corridors.

![Figure 7-1 Graphic Depiction of the Restoration in Pollywog Park](image)

**LPP**

For Reach 1, the restoration features in the LPP are the same as those described above for the NER plan.

### 7.1.2 Reach 2 Bette Davis Park Area of Griffith Park

**NER Plan**

The NER Plan restores approximately 39 acres in Reach 2. The NER Plan establishes riparian habitat
corridors along the overbanks of both sides of the River as described for Reach 1. This includes
restoration of riparian habitat in the Bette Davis Park area of Griffith Park on the left overbank and in the
area between Zoo Drive and SR-134, with connections under the highway to a restored linear riparian
planting along the River extending into Reach 3. The riparian corridor measure would include irrigation
for establishment and water harvesting features similar to those described for Reach 1. There are no
channel modifications within this reach. The channel is a soft bottom with mature riparian vegetation.
Modifications to vegetation on or adjacent to levees will comply with levee regulations.
LPP

The LPP provides the restoration features included in the NER Plan. However, the LPP would add modification of the channel. In Reach 2, the right bank would be modified from trapezoidal to a vertical bank, creating 80 feet of additional soft bottom width in the channel with terraces transitioning from the existing trapezoidal bank configuration to the vertical bank and with overhanging vines on the new vertical bank. This feature provides an additional 20 acres of restoration along 0.6 miles of the existing soft bottom (Figure 7-2).

7.1.3 Reach 3 Ferraro Fields/Verdugo Wash area of Griffith Park

NER Plan

The area restored in this reach covers 50 acres. This reach sub-plan continues establishment of the riparian corridor along Zoo Drive on the right side of the River. It also daylights a stream currently confined in a large culvert just downstream of Ferraro Fields on the right bank in the Zoo Drive area and daylights two smaller streams on the left bank. In addition, using water diverted from the River, it creates a side channel that would flow along the west side of Ferraro Fields and reenter the River through the daylighted stream on the right bank. The side channel and daylighted stream will support a riparian fringe, open water and freshwater marsh. The two smaller streams daylighted on the left bank will also include riparian fringe with freshwater marsh at the confluence with the LA River. If it is not possible to design an efficient confluence, the connection to the river would remain gated. The riparian fringe measure would involve planting riparian communities described in Reach 1. It would include irrigation for establishment and water harvesting features similar to those described for Reach 1. In addition to the area along Zoo Drive, riparian areas would be located along the River's edge at Ferraro Fields and between the daylighted streams on the left overbank. There are no modifications to the channel itself, which has a hard or concrete bottom with intermittent open water and little developed vegetation. Levee protection will remain and levee vegetation policy will be followed. A graphic illustration of the side channel, its outlet and riparian corridor is shown in Figure 7-3.
The LPP provides the same restoration features as the NER Plan at Ferraro Fields on the west bank. However, the LPP would add substantial restoration at the Verdugo Wash confluence (Figure 7-4) on the east bank. While there would be no additional modifications to the main channel, the Verdugo Wash channel mouth would be widened and the left bank would be sloped back to the existing overbank elevation adding 30 acres of restoration but omitting the 2 daylighted streams on the east bank included in the NER Plan. Riparian vegetation would be used to stabilize the bank and a combined riparian and marsh community would be restored in the widened channel. Levee protection would be tied-into the bank, and other levee protection will remain. Levee vegetation policy will be followed. Design details for the confluence area will be determined during the detailed design phase of the study.

Figure 7-3 Graphic Rendering of the Ferraro Fields Area

Figure 7-4 Graphic Rendering of the Verdugo Wash Area
7.1.4 Reach 4 Griffith Park

NER Plan

There are approximately 59 restored acres in this reach by the NER Plan. Restoration includes construction of a side channel at the edge of the Griffith Park Golf Course on the west. This is accomplished through a diversion of river flow into a side channel up to 10 feet deep with a riparian fringe through Griffith Park along the edge of Harding Golf Course. The side channel through Griffith Park would enter the park from the River under the I-5 Freeway through an existing tunnel (or farther upstream if necessary to facilitate diversion of flows) and exit the park to reenter the River downstream under I-5 through existing tunnels. A riparian fringe of trees and marsh vegetation would line the channel.

The Los Feliz Golf Course would be lowered, rebuilt, and allowed to flood (with no changes to the River channel levee walls) in order to establish a riparian habitat interspersed without changes to the golf course greens. Any necessary flood protection on the outer edge of the golf course will be included in the design. A graphic depiction of restored habitat at Los Feliz Golf Course is shown in Figure 7-5.

Restoration will include daylighting approximately eight small streams. The eight storm drains would be opened and naturalized as tributaries as far upstream as possible (at a minimum opening up the stream within the river right-of-way). Design of the channel and confluence would be similar to that described in Reach 3 daylighted streams.

Lining the left river bank will be a riparian corridor implemented as continuously as possible within levee regulation requirements. The riparian corridor would involve planting a riparian strip of just herbaceous vegetation such as mugwort and scarlet monkeyflower with a buffer of and native herbaceous plants to comply with levee vegetation policies. It would include irrigation for establishment and the same water harvesting methods described for Reach 1 as appropriate for the site. There are no channel modifications within this reach, which is a soft natural bed with mature riparian vegetation developed on channel bars.
For Reach 4, the restoration features in the LPP are the same as those described above for the NER plan.

7.1.5 Reach 5 Riverside Drive

NER Plan

The area restored in this reach would cover approximately 41 acres. This reach will continue implementation of the habitat corridor restoration in a narrow strip along the east bank to avoid interference with the existing levee system (within current guidance for vegetation on levees), and restoration of one daylighted stream area with a riparian fringe and freshwater marsh at the downstream end of this reach on the east bank. Design of the daylighted stream would be similar to that described in Reach 3. The riparian corridor measure would involve planting riparian communities described in Reach 1 or in a levee area as described in Reach 4. It would include irrigation for establishment and water harvesting features similar to those described for Reach 1. There would be no channel modifications in this reach for the NER Plan. The channel is soft bottom with open water and mature riparian vegetation developed on channel bars.

LPP

In Reach 5, the LPP would include the same implementation of riparian habitat corridors and daylighting of the one stream with riparian fringe and freshwater marsh, but would also add substantial channel modifications. The right bank would be modified from a trapezoidal bank to a vertical bank. This would increase the width of the soft bottom river bed by over 100 feet for approximately 1.6 miles. The top of the bank in the widened area would be notched and planted with overhanging vines. The left bank would be modified with terraces planted with herbaceous vegetation and necessary erosion measures, which would consist of concrete-lined beds. The top of bank would be planted with riparian vegetation. At the downstream end of this reach, the river will also be widened on the left bank with appropriate erosion control measures in place. This would further increase the natural river bottom area. Restored area would cover approximately 27 additional acres above that in the NER Plan. All of these measures would comply with levee vegetation regulations.

7.1.6 Reach 6 Taylor Yard

NER Plan

The area restored in this reach would cover approximately 159 acres. Reach 6 includes riparian corridors and widening of the soft bottom river bed by approximately 300 feet and gradual riparian slope to the overbank elevation along the reach length approximately 1,000 feet. At the upstream end of the Bowtie parcel, a back water wetland would be developed at river level and there would be a small terraced area transitioning into the widening of Taylor Yard at the downstream end of the Bowtie parcel. Aquatic riverine habitat including freshwater marsh dominates the new river bed. The banks of the river upstream of Bowtie and downstream of Taylor Yard and on the west bank would be restructured to support overhanging vines and other implanted riparian vegetation. Restoration area would cover approximately 159 acres. Where west banks present a levee conditions around stormwater culverts, vegetation will comply with levee vegetation policies. Aquatic riverine habitat including freshwater marsh dominate the new river bed; the existing channel is a soft natural bottom with mature riparian vegetation developed on channel bars. A graphic depiction of the restored area is included in Figure 7-6.
For Reach 6, the restoration features in the LPP are the same as those described above for the NER plan.

7.1.7 Reach 7 Arroyo Seco/Los Angeles River State Historic Park

NER Plan

In Reach 7, approximately 59 acres would be restored, with a key feature, the restoration of the Arroyo Seco confluence restored with riparian habitat. This ephemeral stream will have its banks and bed softened by removing concrete for approximately half a mile upstream and will be stabilized with erosion control elements to maintain the existing protection. At the confluence on the upstream edge of the River, a backwater riparian wetland would be established. The riparian corridor measure would involve planting riparian communities described in Reach 1. It would include irrigation for establishment and water harvesting features similar to those described for Reach 1. Figure 7-7 includes a graphic rendering depicting the restored section of the Arroyo Seco. At the downstream end of the reach on the right bank, the existing rail line would be put on a trestle at grade, and the right bank would be terraced and planted under the rail line connecting the main channel of the River with the Los Angeles State Historic Park. Approximately 10 acres of wetland would be restored within the Park and would gradually slope down to connect to the terraced bank (Figure 7-8). Three storm drains would be daylighted in this reach and designed as described in Reach 3. The River bottom in this reach is concrete with a low flow channel which contains most of the flow, although the channel bed is often wetted and has an algal mat.
LPP

Restoration features are the same as those described above for the NER Plan.

7.1.8 Reach 8 LATC

NER Plan

In Reach 8, approximately 109 acres would be restored. The LATC site would be restored with riparian habitat, which would involve planting riparian communities in riparian corridors as described in Reach 1. It would include irrigation for establishment and water harvesting features similar to those described for Reach 1. Micro-grading would slope the site to restore the historical wash that once ran through this area. The restored historical wash would meander through the property and would be connected to the existing river channel through a wide culvert or designed confluence, if possible. The wash location will be determined by the USACE’s hydrology and hydraulic analysis and would be located in the most
appropriate place. Riparian vegetation would be established within the site in and around the restored wash.

![Figure 7-9. Graphic Depiction of the Restored LATC](image)

There are no channel modifications within this reach as water entering the River from the historical wash would be routed through existing storm drains in the channel wall. The River channel in this reach is a concrete channel with intermittent flow.

**LPP**

In Reach 8, the LPP would include all the features of the NER with the additional features modifying the channel and adding to the restoration within LATC itself. Terracing would be created on the right bank upstream of LATC and on the left bank downstream of LATC. Riparian herbaceous vegetation would be planted in the terracing. The channel adjacent to LATC would also be changed from concrete to soft bottom to support freshwater marsh and aquatic habitat. The reach would also be widened. At the LATC site, marsh would extend approximately 500 feet into the property, with riparian area extending another 1,000 feet, gradually sloping up to existing bank elevations. The restoration of the historical wash would include riparian fringe and side channels. Additionally, river flows would be diverted out of the River into the LATC, creating a large wetland area as illustrated in Figure 7-9. A railroad trestle would be included with this alternative to allow the described restoration to occur and allow for the connection of the river channel and the adjacent restored areas increasing the river floodplain. These features would increase the restoration area by 44 acres above the NER Plan.

### 7.1.9 Vegetation

In addition to features described reach by reach above, plans would include these general measures related to vegetation. Such measures would depend on the detailed design and hydraulic analysis developed during the detailed phase, to ensure that they are not in conflict with flow conveyance requirements or other constraints on the project. Much of the proposed restoration areas are currently comprised of urban land uses, where concrete will be removed. Active planting and temporary irrigation will initially be required in these areas to begin establishing native vegetation. After storm events bring seed material from upstream and after active planting establishes a seed bank, passive restoration can be
implemented consisting mainly of invasives removal. Invasives species removal would occur throughout the project area for both the NER and LPP, both in constructed restoration features and River and tributary channel bottom.

Temporary irrigation will be used to establish restored vegetation in widened and overbank areas, after which vegetation is expected to be self-sustaining, requiring minimal O&M and relying on groundwater and surface flows to persist. Temporary irrigation will also be used to establish vegetation in the concrete channel walls and terraces. Detailed design will identify all water sources to support the proposed vegetation in the concrete channel walls, including surface flows and runoff that may be redirected to sustain this vegetation and avoid permanent irrigation. During extreme drought supplemental water may be used to protect the investment in the restored vegetation.

In widened areas, increased conveyance capacity will allow for varied substrates and a more natural hydrologic regime, high vegetative cover and structural diversity, and very limited and well-buried hard structures. It is expected that these widened areas will support high levels of heterogeneity. The active channel will have opportunity to migrate and change form and terraces and sediments will be redistributed with storm events. Initial grading during construction of widened areas will be heterogeneous and diverse topography will be created. The dynamic and episodic nature of the River flows will be accommodated in these areas, allowing the River to carve new channel configurations over time. Vegetation is expected to be denuded with natural higher flows and velocities, and be re-established naturally. Any grade stabilizers in these areas will be well buried perpendicular to flows, and not visible from the surface. Once initially planted and a seed bank established, passive recovery will be the method for re-vegetation after flood events. Such natural hydrologic functions would support riparian/aquatic interactions by providing habitat elements including shade over water, and stream nutrient and woody debris inputs.

The Corps plans to adopt maintenance practices that allow for ecosystem restoration while not significantly changing the current level of flood risk management provided by the channel. Vegetation within the channel has a significant impact on conveyance of the design flood within the ARBOR reach. If allowed to grow completely unchecked under the With-Project Conditions, such vegetation could eventually create an adverse condition with respect to flood risk. Therefore, during design, the Corps will further determine limits on vegetation volume and structure to ensure adequate channel conveyance.

In reaches where the Corps is proposing to construct a vertical wall to replace the trapezoidal side slopes, vegetation will be allowed to grow to the extent that it does not affect the conveyance of the channel. During the detailed design phase, the Corps will identify the methods for measurement to determine impacts on flow conveyance. It is anticipated that limitations to vegetation growth will be modest because of the increased conveyance caused by changing the wall to a vertical orientation.

### 7.1.10 Wildlife

In addition to features described reach by reach above, plans would include measures such as those listed below, or other opportunities, to maximize restoration potential for wildlife to the extent practicable. Such measures would depend on the detailed design and hydraulic analysis developed during the detailed design phase, to ensure that they are not in conflict with flow conveyance requirements or other constraints on the project.

In widened areas, restored river channels will be designed to support habitat for native fish including arroyo chub and Santa Ana sucker, and provide the necessary constituent elements including but not limited to water shaded by riparian vegetation, riffle/run/pool/glide sequences and refugia, in channel woody debris, gravel and cobble substrates. Some areas designated in restoration plans for open water
will also be designed to support these native fish by providing such features as including riffle/pool/glide sequences.

Vegetation and habitat elements in widened areas will also be restored with the goal to support a large number of territories for various riparian obligate birds, including least Bell’s vireo, yellow warbler, and yellow breasted chat, stop over habitat for migrants, as well as habitat and refugia for amphibians, reptiles, and mammals, including larger carnivores such as coyote and possibly bobcat.

Local connectivity for these species will be improved by connecting restored widened patches in part via existing soft bottom reaches 2, 4, 5, and 6 and restored in-channel habitat in Reach 8. Regional connectivity would also be improved for larger mammals such as coyote and bobcat. It is expected that larger mammals may use the three existing equestrian tunnels in the project area (Reaches 1 and 4) to access the restored river near Griffith Park, and use restored vegetation and in-channel features to move through the project area and to disperse to greater regional habitat areas using tributary channels such as Arroyo Seco and Verdugo Wash.

Measures for wildlife access are described in Section 4.4.5, measures 3a-c, as measures retained for implementation where appropriate. Specific placement of these measures will, in some cases, utilize more detailed design information, as discussed below.

As part of the Corps’ coordination with the USFWS under the FWCA, additional opportunities for restoration of habitat connectivity as part of the project, particularly within the River channel, along with design considerations for habitat opportunities, were identified. The Corps will further evaluate these measures during the design phase, as their implementation or placement is likely to require hydrologic and hydraulic modeling data and/or more detailed design. Prior to implementation of the measures identified, the Corps will assess whether supplemental analysis is needed to address new or different effects than those already assessed in this IFR.

In existing hard-bottom reaches 1, 3 and 7, which cannot be widened, opportunities for aquatic connectivity, to maximize restoration potential for aquatic wildlife, will be further evaluated during detailed design. These measures would create in-channel diversity and heterogeneity to support further passage of wildlife, including aquatic species such as native fish. Such measures may include 1) use of anchored boulders and a new meandering low flow channel in the existing concrete, 2) “speed bumps” perpendicular to flow that can trap sediment and allow small to moderate sized vegetation to grow, and 3) a new v-shaped low flow channel with varying widths and depths. Implementation of these measures would depend on the detailed design and hydraulic analysis developed during the detailed design phase, to ensure that they are not in conflict with flow conveyance requirements or other constraints on the project.

These measures would, in particular, improve connectivity for aquatic and terrestrial wildlife in Reach 3 from the Verdugo Wash confluence to the upstream edge of the soft bottom Reach 4, and in Reach 7 from the downstream edge of the soft bottom Reach 6 to Arroyo Seco. In addition, terrestrial wildlife may then more easily move from Griffith Park using the equestrian tunnel in Reach 4 upstream to Verdugo Wash or downstream to Arroyo Seco. Additional restoration of these tributaries outside the project area would facilitate further regional movement in the future. This restoration may be accomplished by other Federal, State, or local stakeholders.

Specific features for wildlife access will be considered during the detailed design stage, and would depend on the detailed design and hydraulic analysis developed during the detailed design phase, to ensure that they are not in conflict with flood damage reduction and flow conveyance requirements or
other constraints on the project. Movement for bobcats will be the standard for design of access, and such
designs will be implemented wherever practicable.

Placement of wildlife access measures may include access in Reach 1 from Pollywog Park into the river
channel, as practicable. In this area, wildlife access may be achieved through the creation of a slope along
the currently vertical bank, as described in measure 3b in Section 4.4.5. Such a design would allow
wildlife moving from Griffith Park into the river channel access to the restored Pollywog Park site, which
is currently disconnected from the River by a vertical wall. Implementation of specific methods and
location of access would be dependent on the detailed hydrologic and hydraulic modeling developed
during the design phase.

Other design features specific to certain species may be incorporated in the detailed design phase and
accommodated where practicable and appropriate. It is expected that while these features could
potentially be installed artificially during restoration activities, many of these features will also evolve
naturally over time as vegetation matures and natural hydrologic forces continue to shape the hydrologic
regime of the widened areas. These features may include, but are not limited to, artificial nest cavities
(which could be used by wood duck, barn owl, tree swallow, and western bluebird among other species),
large hollow snags (used by swifts), and artificial steep sandy banks (used by northern rough-winged
swallow and belted kingfisher).

Considerations for segregation of “spring fed waters” from surface water flows would also be made
during the detailed design phase. This segregation would be considered to support refugia for fish, where
groundwater would feed the refugia while surface flows might bypass such areas. Parameters required for
engineering design would include groundwater levels as well as anticipated local fluctuations in
groundwater conditions.

7.1.11 River Function and Sustainability

Per Civil Works Ecosystem Restoration Policy; “The intent of restoration is to partially or fully
reestablish the attributes of a naturalistic, functioning, and self-regulating system.” (ER 1165-2-501).
While the study area is highly modified and occurs within the nation’s second largest urban area with the
largest population of any county in the country the NER and LPP both meet this intent.

As described in the water budget summary for the alternatives (Section 4.14.7), there is sufficient water
available in the study area to support the proposed restoration project and alternatives. This is through a
combination of surface water and rainfall runoff. Groundwater is also present in the soft bottom portions
of the study area, such as Glendale Narrows. Treated effluent makes up a portion of the flows in the
channel and that effluent is currently the primary source of water supporting wetland and riparian
vegetation in many portions of the River. It is highly treated effluent that is tertiary treated and includes
denitrifications thereby preventing eutrophication. The use of reclaimed water is frequent in the Western
United States and there are effluent dominant streams supporting habitat in many parts of the Southwest.

The Study area includes the Glendale Narrows, which currently support some of the only remaining
riparian and freshwater marsh habitat on the LA River. This area historically sustained the greatest natural
surface flow on the river, a condition that still exists as the high water table prevented the paving of the
Glendale Narrows in concrete. The existing habitat and perennial surface flow in the Narrows provides a
base for restoration, connectivity, and expansion of riparian habitat, and maintains one of the most diverse
assemblages of wildlife on the river today.
The existing pockets of habitat in the Glendale Narrows are a reference for the potential that can be achieved by the restoration proposed in this report. Although within a flood risk management channel and supported by effluent and groundwater, the Glendale Narrows includes functioning habitat that withstands flood flows. Riparian and wetland habitat proposed both within and adjacent to the channel is expected to achieve that same success.

7.1.12 Climate Change

The general consensus for climate change in the project area is that the region will experience longer droughts intermixed with less frequent but larger floods. Climate change effects on the project are mainly a consideration with respect to water availability and sustainability in drought conditions. A water budget was developed for the study. The proposed features are planned to be consistent with low water availability. In addition, the dominant water source is not directly affected by drought conditions. The dominant source of water during non-flood periods is effluent from the upstream treatment plants. There is also some runoff from the upstream watershed even during the dry periods. The water budget shows the water demand for the vegetation within the project area represents only a portion of the total released from the treatment plants. Since the non-Federal sponsor is also the owner of the main treatment plant, the Donald C. Tillman Water Treatment Plant, the non-Federal sponsor can and will ensure the delivery of water to sustain the vegetation into the future. Although drought conditions could increase desires to utilize effluent in other ways, the non-Federal sponsor is committed to ensuring adequate provision of water for this project. There are also other community interests in sustaining water in the proposed project area (e.g., passive recreation use).

Under existing conditions, larger flood events have an impact on the vegetation within the river. During larger flood events velocities can be relatively high and tear out some of the vegetation. However, based on previous events that tended to wash out the smaller vegetation, bend over the moderate size trees, and have little impact on the larger trees, the vegetation recovers relatively quickly on its own. Climate change indicates the larger events will be less frequent and allow for longer recovery times. This would not affect the long-term sustainability of the project or the design of the proposed features.
7.2 RECREATION PLANS

The objective of the recreation plan is to maintain and improve the quality and quantity of recreation amenities that complement the ecosystem restoration, especially in regard to promoting access and connectivity between both banks of the river and throughout the length of the reach. The recreation plans were developed through coordination with the non-Federal Sponsor to take advantage of existing recreation facilities, as well as proposed ecosystem restoration improvements, while complying with USACE policies and regulations pertinent to recreation improvements at ecosystem restoration projects. The recreation features will be designed and managed to avoid any negative impacts to the restoration areas. The recreation plans formulated to be consistent and compatible with the NER plan and the LPP includes the modification, upgrade, or creation of multi-use trails and related basic amenities (access points, wildlife viewpoints, parking lots, restrooms, and signage). The plans also include non-motorized multi-use bridges and smaller pedestrian bridges across tributaries or within large restored areas.

7.2.1 Recreation Plan Formulated for NER Plan

The recreation plan formulated for the NER recreation plan includes the following specific features:

- 5.89 miles of new unpaved non-motorized multi-use trail (to include decomposed granite surface and trail signage)
- 0.3 miles of new paved multi-use trail (short extension of current southern end of LA River Bike Path)
- 1 small bridge/crossing within Taylor Yard
- 1 medium bridge within LATC
- 2 paved parking lots, one at Taylor Yard and one at LATC (each about 15,000 square feet)
- 4 restrooms, one at Bette Davis Park, two at Taylor Yard, and one at LATC
- 1 pedestrian underpass at the south end of Taylor Yard
- 24 trail access points throughout the study area (access points would include grading and planting, signage, stairs, benches, gating, and trash receptacles to provide quality trail access)
- 6 wildlife viewing points throughout the study area (viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)
- 4 pedestrian underpasses along the river to support trail connectivity

Recreation features are displayed on a series of maps at the end of this chapter. Table 7-2, below, summarizes the two proposed bridges. Table 7-3 below, summarizes the proposed changes in trails. As shown in the table, the plan would result in a 41-percent increase in accessible trails and multi-use paths along the river. When including multi-use paths created by the ecosystem restoration plan, the total increase is 51.2 percent.

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>Taylor Yard</td>
<td>1 pedestrian bridge within Taylor Yard over restoration area</td>
</tr>
<tr>
<td>250</td>
<td>LATC</td>
<td>Medium pedestrian bridge over restoration area within LATC</td>
</tr>
</tbody>
</table>

As shown in Table 7-3 below, 13.07 miles of existing trail would not be modified by the recreation plan. However, the recreation plan would upgrade 1.12 miles of existing trail to a fully-developed multi-use trail. There would also be 6.19 miles of new trail added in the study area, and conversion of 0.82 miles of currently inaccessible access road to multi-use trail.
The ecosystem restoration plan would upgrade 5.28 miles of existing trail, and convert 2.96 miles of currently inaccessible access road to multi-use trail. These changes would result in 29.44 miles of accessible trail and multi-use pathway.

At the current level of design, un-paved trails are assumed to be multiple-use, twelve feet wide, using a decomposed granite surface, and paved trails are assumed to be similar to the existing LA River Bike Path. Safety ramps will be part of project design and will be multi-use for maintenance, safety exits, and potential access by kayakers and canoeists.

### Table 7-3 Proposed Trail Changes, Recreation Plan Formulated for NER Plan

<table>
<thead>
<tr>
<th>Trail Type</th>
<th>Miles</th>
<th>% of Total With Project Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Trail/Pathway Remaining As-Is</td>
<td>13.07</td>
<td>44.4%</td>
</tr>
<tr>
<td>Existing Trail/Pathway Upgraded per Recreation Plan</td>
<td>1.12</td>
<td>3.8%</td>
</tr>
<tr>
<td>New Paved and Unpaved Trail/Pathway per Recreation Plan</td>
<td>6.19</td>
<td>21.0%</td>
</tr>
<tr>
<td>Inaccessible access road converted to trail per Recreation Plan</td>
<td>0.82</td>
<td>2.8%</td>
</tr>
<tr>
<td>Existing Trail Upgraded per Ecosystem Restoration Plan</td>
<td>5.28</td>
<td>17.9%</td>
</tr>
<tr>
<td>Inaccessible access road converted to trail per Restoration Plan</td>
<td>2.96</td>
<td>10.1%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>29.44</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

#### 7.2.2 Recreation Plan Formulated for LPP

The recreation plan formulated for the LPP utilizes the large land base of the LPP and includes the following specific features:

- 7.98 miles of new unpaved non-motorized multi-use trail (to include decomposed granite surface and trail signage)
- 1.26 miles of new paved multi-use trail (extension of current southern end of LA River Bike Path)
- 2 bridges spanning the LA River
- 1 smaller bridge/crossing within Taylor Yard
- 4 small/medium bridges within LATC
- 2 paved parking lots, one at Taylor Yard and one at LATC (each about 15,000 square feet)
- 4 restrooms, one at Bette Davis Park, two at Taylor Yard, and one at LATC
- 1 pedestrian underpass at the south end of Taylor Yard
- 28 trail access points throughout the study area (access points would include grading and planting, signage, stairs, benches, gaging, and trash receptacles to provide quality trail access)
- 11 wildlife viewing points throughout the study area (viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)
- 6 pedestrian underpasses along the river to support trail connectivity

All of the features identified are eligible for Federal participation in cost sharing Recreation features are displayed on a series of maps at the end of this chapter. Table 7-4, below, summarizes the 7 proposed bridges. Shaded rows indicate bridges which were also included in the NER plan. Table 7-4, below, summarizes the proposed changes in trails. As shown in the table, the plan would result in a 58.1-percent increase in accessible trail and multi-use pathways. Including multi-use pathways created by the ecosystem restoration plan, the total increase in accessible trails and pathways would be 66.9 percent.
Table 7-4 Proposed Bridges, Recreation Plan Formulated for LPP

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>450</td>
<td>Verdugo Wash</td>
<td>Spans the LA River on diagonal downstream of Verdugo Wash, connecting the Verdugo confluence to the LA River Bike Path</td>
</tr>
<tr>
<td>150</td>
<td>Taylor Yard</td>
<td>1 pedestrian bridge within Taylor Yard over restoration area</td>
</tr>
<tr>
<td>300</td>
<td>LATC</td>
<td>Spans the LA River at the upstream end of LATC</td>
</tr>
<tr>
<td>25</td>
<td>LATC</td>
<td>Small pedestrian bridge over restoration area in LATC</td>
</tr>
<tr>
<td>100</td>
<td>LATC</td>
<td>Medium pedestrian bridge over restoration area in LATC</td>
</tr>
<tr>
<td>250</td>
<td>LATC</td>
<td>Medium pedestrian bridge over restoration area in LATC</td>
</tr>
<tr>
<td>30</td>
<td>LATC</td>
<td>Small pedestrian bridge over restoration area in LATC</td>
</tr>
</tbody>
</table>

As shown in Table 7-5 below, 12.93 miles of existing trail would not be modified by the recreation plan. However, the recreation plan would upgrade 1.26 miles of existing trail to a fully-developed multi-use trail. There would also be 9.24 miles of new trail added in the study area, and conversion of 0.82 miles of currently inaccessible access road to multi-use trail.

The ecosystem restoration plan would upgrade 5.28 miles of existing trail, and convert 2.96 miles of currently inaccessible access road to multi-use trail. These changes would result in 32.49 miles of accessible trail and multi-use pathway.

At the current level of design, trails are assumed to be multiple-use, twelve feet wide, using a decomposed granite surface.

Table 7-5 Proposed Trail Changes, Recreation Plan Formulated for LPP

<table>
<thead>
<tr>
<th>Trail Type</th>
<th>Miles</th>
<th>% of Total With Project Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Trail/Pathway Remaining As-Is</td>
<td>12.93</td>
<td>39.8%</td>
</tr>
<tr>
<td>Existing Trail/Pathway Upgraded per Recreation Plan</td>
<td>1.26</td>
<td>3.9%</td>
</tr>
<tr>
<td>New Paved and Unpaved Trail/Pathway per Recreation Plan</td>
<td>9.24</td>
<td>28.4%</td>
</tr>
<tr>
<td>Inaccessible access road converted to trail per Recreation Plan</td>
<td>0.82</td>
<td>2.5%</td>
</tr>
<tr>
<td>Existing Trail Upgraded per Ecosystem Restoration Plan</td>
<td>5.28</td>
<td>16.3%</td>
</tr>
<tr>
<td>Inaccessible access road converted to trail per Restoration Plan</td>
<td>2.96</td>
<td>9.1%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>32.49</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

7.3 REGIONAL ECONOMIC DEVELOPMENT AND ECONOMIC IMPACTS SUMMARY

Table 7-6 presents the cumulative regional economic impacts from project implementation through the study’s period of analysis for the NER and LPP alternatives. RED impacts associated with construction expenditures were developed using construction cost information updated following public review and reflect October 2015 price levels. RED impacts from redevelopment were not updated and reflect the values for Alternatives 13 and 20 as presented in Section 6.3.4 at April 2013 price levels. Because redevelopment effects are a function of the restoration plan components rather than their costs, no substantial changes in the redevelopment effects documented in Section 6.3.4 are expected for the NER and LPP alternatives. Redevelopment related RED impacts would be slightly higher if updated to reflect October 2015 price levels, as was done for construction related RED impacts, but this would not change the overall magnitude of estimated impacts or conclusions of the analysis.
Table 7-6 Cumulative RED & Economic Impacts of Ecosystem Restoration

<table>
<thead>
<tr>
<th>Ecosystem Construction Cumulative Impacts (October 2015 PL)</th>
<th>NER</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>4,781</td>
<td>11,430</td>
</tr>
<tr>
<td>Labor Income</td>
<td>$275,351,761</td>
<td>$658,227,256</td>
</tr>
<tr>
<td>Sales</td>
<td>$659,750,801</td>
<td>$1,577,131,584</td>
</tr>
<tr>
<td>GRP</td>
<td>$384,759,602</td>
<td>$919,766,251</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreation Construction Cumulative Impacts</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>125</td>
<td>217</td>
</tr>
<tr>
<td>Labor Income</td>
<td>$8,455,129</td>
<td>$14,677,719</td>
</tr>
<tr>
<td>Value</td>
<td>$12,289,089</td>
<td>$21,332,299</td>
</tr>
<tr>
<td>Output</td>
<td>$21,920,484</td>
<td>$38,052,963</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Redevelopment Construction Cumulative Impacts (April 2013)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>1,281</td>
<td>5,087</td>
</tr>
<tr>
<td>Labor Income</td>
<td>$84,665,000</td>
<td>$336,278,000</td>
</tr>
<tr>
<td>Value</td>
<td>$115,791,000</td>
<td>$460,153,000</td>
</tr>
<tr>
<td>Output</td>
<td>$193,002,000</td>
<td>$767,247,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Redevelopment Long-term Economic Activity Cumulative Impacts</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>675</td>
<td>2,671</td>
</tr>
<tr>
<td>Labor Income</td>
<td>$964,851,000</td>
<td>$3,815,989,000</td>
</tr>
<tr>
<td>Taxes – Local</td>
<td>$5,789,000</td>
<td>$22,896,000</td>
</tr>
</tbody>
</table>

The cumulative effects of the construction/redevelopment components over the period of analysis will create between 6,862 (NER Plan) to 19,405 (LPP) jobs generating labor income of $1.3 billion (NER Plan) to nearly $5 billion (LPP) as shown in Table 7-7.

Table 7-7 Employment and Income Cumulative Impacts

<table>
<thead>
<tr>
<th>NER</th>
<th>LPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>6,862</td>
</tr>
<tr>
<td>Labor Income</td>
<td>$1,333,322,890</td>
</tr>
</tbody>
</table>

Price level-See Table 7-6

7.4 COST SUMMARY

The tables below summarizes the first costs of both the NER Plan and the LPP. These are shown as escalated to Fiscal Year 2016 price levels (October 2015). Data for this estimate is provided in Appendix C, the Cost Appendix. Following public review of the Draft Report and selection of the Recommended Plan a more detailed cost estimate was developed using the Corps MCACES version Mii software. A Total Project Cost Summary with refined contingency costs based upon a detailed cost and schedule risk analysis was also completed. These are Class 3 cost estimates per ER 1105-2-1302, and relocation costs include Class 4 cost estimates.
Table 7-8 First Cost Summary Table for the NER Plan including Recreation, Alternative 13v

<table>
<thead>
<tr>
<th>Construction Item</th>
<th>Cost ($1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lands and Damages (P.L. 91-646 Included)</td>
<td>$348,615</td>
</tr>
<tr>
<td>Utility/Facility Relocations</td>
<td>$181,305</td>
</tr>
<tr>
<td>Ecosystem Restoration</td>
<td>$114,637</td>
</tr>
<tr>
<td>Adaptive Management &amp; Monitoring</td>
<td>$10,386</td>
</tr>
<tr>
<td>Recreation Facilities*</td>
<td>$8,556</td>
</tr>
<tr>
<td>Preconstruction Engineering and Design (PED)</td>
<td>$27,556</td>
</tr>
<tr>
<td>Construction Management (S&amp;A)</td>
<td>$13,412</td>
</tr>
<tr>
<td>Total First Cost</td>
<td>$704,467</td>
</tr>
</tbody>
</table>

*Includes Costs for Recreation Plan formulated for the NER Plan

Table 7-9 First Cost Summary Table of the LPP including Recreation, Alternative 20

<table>
<thead>
<tr>
<th>Construction Item</th>
<th>Cost ($1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lands and Damages (P.L. 91-646 Included)</td>
<td>$526,285</td>
</tr>
<tr>
<td>Utility/Facility Relocations</td>
<td>$228,562</td>
</tr>
<tr>
<td>Ecosystem Restoration</td>
<td>$450,233</td>
</tr>
<tr>
<td>Adaptive Management &amp; Monitoring</td>
<td>$12,250</td>
</tr>
<tr>
<td>Recreation Facilities</td>
<td>$14,921</td>
</tr>
<tr>
<td>Preconstruction Engineering and Design (PED)</td>
<td>$85,135</td>
</tr>
<tr>
<td>Construction Management (S&amp;A)</td>
<td>$39,222</td>
</tr>
<tr>
<td>Total First Cost</td>
<td>$1,356,608</td>
</tr>
</tbody>
</table>

*Includes Costs for Recreation Plan formulated for the LPP

7.5 PLAN IMPLEMENTATION

This section presents the Federal and non-Federal responsibilities for implementing the recommended plan. This includes Federal and non-Federal project cost sharing requirements and the division of responsibilities between the Federal government and the non-Federal sponsor, the City of Los Angeles. It also lists the steps toward project approval, and a schedule of the major milestones for the design and construction of the tentatively recommended plan.

Cost Apportionment of the Recommended Plan

The following summarizes cost apportionment for the LPP, which is the Recommended Plan. The following guidance (ER 1105-2-100) specifically addresses cost sharing for LPPs.

- Projects may deviate from the National Ecosystem Restoration Plan if requested by the non-Federal sponsor and approved by ASA(CW).
• Plans requested by the non-Federal sponsor that deviate from these plans shall be identified as the Locally Preferred Plan (LPP).
• If the non-Federal sponsor prefers a plan more costly than the NER Plan, and the increased scope of the plan is not sufficient to warrant full Federal participation, ASA(CW) may grant an exception as long as the sponsor pays the difference in cost between those plans and the locally preferred plan.

As noted, the ASA (CW) has granted an exception to allow the recommendation of Alternative 20 as the LPP. As stated above, the Federal participation limit for LPPs is based upon the Federal share of the NER Plan, with the non-Federal sponsor paying for the non-Federal share of the NER Plan, as well as all of the incremental costs of the LPP over the cost of the NER Plan.

The non-Federal sponsor is responsible for providing 100% of lands, easements, rights of way, relocations, and disposal sites (LERRD) but has voluntarily offered to forgo reimbursement for the value of LERRD that exceed its statutory share (35%) of total ecosystem restoration costs. The ASA(CW) has approved this voluntary request. In addition, a non-standard cost sharing option is also presented in response to a request by the non-Federal sponsor. Selection of a cost sharing option for recommendation to Congress will be made subsequent to the circulation of this Final IFR and documented in the Chief of Engineers' Report.

Cost Sharing Option 1

Under this cost sharing option, the limit of Federal participation in cost sharing would be based upon the Federal share of the NER Plan according to standard cost sharing policy. Current guidance (ER 1105-2-100) describes cost sharing for ecosystem restoration projects as follows:

• The non-Federal share will be 35 percent of the project or separable element implementation costs (preconstruction, engineering and design, and construction), or total implementation costs of a multiple purpose project allocated to ecosystem restoration.
• Non-Federal sponsors shall provide 100 percent of LERRDs, and operation, maintenance, repair, rehabilitation, and replacement (OMRRR).
• The value of LERRD shall be included in the non-Federal 35 percent share. Where the LERRD exceeds the non-Federal sponsor’s 35 percent share, the sponsor will be reimbursed for the value of LERRD which exceeds its 35 percent share.
• As noted previously, the non-Federal sponsor has volunteered to forgo reimbursement for the value of LERRDs which exceeds its 35 percent share of NER Plan costs. Since the value of LERRDs significantly exceeds this 35 percent threshold, the non-Federal sponsor’s share of the ecosystem restoration component of the NER plan is equal to the value of all LERRDs (approximately $536.3 million, including PED and Construction Management relating to relocation), and the Federal share is equal to the remainder of the total project first cost (approximately $158 million). Costs for the recreation plan developed for the NER Plan would be shared equally between the Federal government and non-Federal sponsor. The following table (Table 7-10) summarizes costs apportionment for the NER Plan.
• As indicated in the notes to the following apportionment tables, PED and Construction Management costs relating to relocations are listed under the Non-Federal cost columns. This is because relocations are a component of LERRD, and provision and performance of LERRD required for the project is a non-Federal sponsor responsibility. PED and Construction Management costs are shown separately from other LERRD costs to distinguish these cost components from lands and damages and relocation construction costs. The Total Project Cost...
Summary (TPCS) in Appendix C presents all PED and Construction Management Costs as a single line item and does not separate out those costs that relate to relocations.

- The following apportionment tables also show line items for Federal Administrative Costs. These costs represent Federal administration and review activities relating to the non-Federal sponsor’s provision of LERRD for the project, and are therefore a cost shared component of the project and are not part of LERRD. The TPCS in Appendix C includes these costs under the category of Lands and Damages.

**Table 7-10 Federal and Non-Federal Apportionment of Total Project First Cost of the NER Plan (October 2015 Price Level)**

<table>
<thead>
<tr>
<th>Item (1)</th>
<th>Federal Cost</th>
<th>Non-Federal Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ecosystem Restoration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PED</td>
<td>$18,449,900</td>
<td>$7,865,500</td>
<td>$26,315,400</td>
</tr>
<tr>
<td>LERRDs</td>
<td>$0</td>
<td>$523,875,400</td>
<td>$523,875,400</td>
</tr>
<tr>
<td>Federal Admin. Cost (3)</td>
<td>$6,044,600</td>
<td>$0</td>
<td>$6,044,600</td>
</tr>
<tr>
<td>Ecosystem Restoration</td>
<td>$114,637,000</td>
<td>$0</td>
<td>$114,637,000</td>
</tr>
<tr>
<td>Adaptive Management &amp; Monitoring</td>
<td>$10,386,000</td>
<td>$0</td>
<td>$10,386,000</td>
</tr>
<tr>
<td>Construction Management</td>
<td>$8,272,800</td>
<td>$4,583,100</td>
<td>$12,855,900</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$157,790,200 (23%)</strong></td>
<td><strong>$536,324,000 (77%)</strong></td>
<td><strong>$694,114,200 (100%)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreation</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PED</td>
<td>$620,300</td>
<td>$620,300</td>
<td>$1,240,600</td>
</tr>
<tr>
<td>LERRDs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recreation Facilities</td>
<td>$4,278,000</td>
<td>$4,278,000</td>
<td>$8,556,000</td>
</tr>
<tr>
<td>Construction Management</td>
<td>$278,100</td>
<td>$278,100</td>
<td>$556,100</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$5,176,400 (50%)</strong></td>
<td><strong>$5,176,400 (50%)</strong></td>
<td><strong>$10,352,800 (100%)</strong></td>
</tr>
<tr>
<td><strong>Total Project</strong></td>
<td><strong>$162,967,000 (23%)</strong></td>
<td><strong>$541,500,400 (77%)</strong></td>
<td><strong>$704,467,000 (100%)</strong></td>
</tr>
</tbody>
</table>

(1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding. (2) Non-Federal PED and Construction Management Costs for Ecosystem Restoration are for Relocations and are therefore part of LERRD. (3) Federal Administrative Cost- Federal administrative costs of LERRD acquisition oversight.

For the LPP, the Federal share of ecosystem restoration costs under Option 1 is limited to the Federal share of ecosystem restoration costs for the NER Plan (or $157.79 million). The non-Federal sponsor is responsible for the remainder of total project first cost for ecosystem restoration features (approximately $1.18 billion). The following table (Table 7-11) summarizes cost sharing under Option 1; the effective non-Federal cost share under Option 1 is approximately 88 percent. Costs for the recreation plan developed for the LPP would be shared equally between the Federal government and the non-Federal sponsor.
Table 7-11 Federal and Non-Federal Apportionment of Total Project First Cost of the LPP (Option 1) (October 2015 Price Level)

<table>
<thead>
<tr>
<th>Item (1)</th>
<th>Federal Cost</th>
<th>Non-Federal Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem Restoration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PED (2)</td>
<td>$68,253,700</td>
<td>$14,717,700</td>
<td>$82,971,500</td>
</tr>
<tr>
<td>LERRDs</td>
<td>$0</td>
<td>$748,652,000</td>
<td>$748,652,000</td>
</tr>
<tr>
<td>Federal Admin Costs (3)</td>
<td>$6,195,000</td>
<td>$0</td>
<td>$6,195,000</td>
</tr>
<tr>
<td>Ecosystem Restoration</td>
<td>$450,233,000</td>
<td>$0</td>
<td>$450,233,000</td>
</tr>
<tr>
<td>Adaptive Management &amp; Monitoring</td>
<td>$12,250,000</td>
<td>$0</td>
<td>$12,250,000</td>
</tr>
<tr>
<td>Construction Management (2)</td>
<td>$30,597,300</td>
<td>$7,654,800</td>
<td>$38,252,100</td>
</tr>
<tr>
<td>Non-Federal Cash Contribution (4)</td>
<td>($409,738,800)</td>
<td>$409,738,800</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$157,790,200</td>
<td>$1,180,763,400</td>
<td>$1,338,553,600</td>
</tr>
<tr>
<td>Recreation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PED</td>
<td>$1,081,800</td>
<td>$1,081,800</td>
<td>$2,163,500</td>
</tr>
<tr>
<td>LERRDs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recreation Facilities</td>
<td>$7,460,500</td>
<td>$7,460,500</td>
<td>$14,921,000</td>
</tr>
<tr>
<td>Construction Management</td>
<td>$484,900</td>
<td>$484,900</td>
<td>$969,900</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$9,027,200</td>
<td>$9,027,200</td>
<td>$18,054,400</td>
</tr>
<tr>
<td><strong>Total Project</strong></td>
<td><strong>$166,817,400</strong></td>
<td><strong>$1,189,790,600</strong></td>
<td><strong>$1,356,608,000</strong></td>
</tr>
</tbody>
</table>

1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding. (2) Non-Federal PED and Construction Management Costs for Ecosystem Restoration are for Relocations and are therefore part of LERRD. (3) Federal Administrative Cost- Federal administrative costs of LERRD acquisition oversight. (4) Non-Federal sponsor cash contribution for LPP incremental cost. Federal share of LPP limited to Federal share of the NER Plan. All LERRD is non-Federal cost with no reimbursement.
Cost Sharing Option 2

In a 27 May 2014 memorandum, the ASA (CW) specified the following regarding cost sharing for the LPP:

Having fully reviewed and taken into consideration the unique aspects of the project as detailed by the Los Angeles District, the concurrence by other Federal agencies in the plan, the city’s willingness to limit the Federal government’s exposure to real estate costs beyond 35 percent of project cost as approved in my August 8, 2013 memorandum, and the non-Federal sponsor’s offer to share equally in the costs of the LPP, I have concluded there is substantial Federal interest in the LPP. Equal cost sharing of the LPP between the Federal government and the non-Federal sponsor, as requested by the City of Los Angeles, would total $540 million each. I have decided to permit the Corps to recommend equal cost sharing of the LPP plan.

These decisions are subject to the Corps incorporating the information discussed above into the final decision documents and subject to the non-Federal sponsor’s continued agreement to forgo reimbursement or credit for real estate which may exceed 35 percent of the LPP cost. All other requirements of local cooperation remain the same, including the non-Federal sponsor’s requirement to operate, maintain, repair, replace, and rehabilitate (OMRRR) the project after construction...

Based upon the above, the non-Federal sponsor’s share under this option is equal to 50 percent of total project first cost, with the following adjustments:

1. The non-Federal sponsor’s creditable LERRDs are limited to 35 percent of total project first cost for ecosystem restoration features.
2. Since the value of LERRDs for the LPP exceeds 35 percent of total project first cost for ecosystem restoration features, but only 35 percent is creditable, the non-Federal sponsor must also provide a 15 percent cash contribution to bring the sponsor’s creditable share to 50 percent.
3. The non-Federal sponsor’s request to forgo reimbursement for LERRDs in excess of 35 percent of total project first cost for ecosystem restoration features also applies to this cost sharing option.
4. In accordance with 3 above, the non-Federal sponsor must therefore contribute all LERRDs in excess of 35 percent of total project first cost for ecosystem restoration features, in addition to the 35 percent of LERRDs that is creditable and the required 15 percent cash contribution per 2 above.

The following table (Table 7-12) summarizes cost sharing under Option 2 based upon these provisions. Note that under this option, the non-Federal sponsor’s effective share of total project first cost for ecosystem restoration features is approximately 73 percent (vs. 88 percent under Option 1).
### Table 7-12 Federal and Non-Federal Apportionment of Total Project First Cost of the LPP (Option 2)
(October 2015 Price Level)

<table>
<thead>
<tr>
<th>Item (1)</th>
<th>Federal Cost</th>
<th>Non-Federal Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem Restoration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PED (2)</td>
<td>$68,253,700</td>
<td>$14,717,700</td>
<td>$82,971,500</td>
</tr>
<tr>
<td>Creditable LERRDs (4)</td>
<td>$0</td>
<td>$468,493,800</td>
<td>$468,493,800</td>
</tr>
<tr>
<td>Non-creditable LERRDs</td>
<td>$0</td>
<td>$280,158,300</td>
<td>$280,158,300</td>
</tr>
<tr>
<td>Federal Admin Costs (3)</td>
<td>$6,195,000</td>
<td>$0</td>
<td>$6,195,000</td>
</tr>
<tr>
<td>Ecosystem Restoration</td>
<td>$450,233,000</td>
<td>$0</td>
<td>$450,233,000</td>
</tr>
<tr>
<td>Adaptive Management &amp; Monitoring</td>
<td>$12,250,000</td>
<td>$0</td>
<td>$12,250,000</td>
</tr>
<tr>
<td>Construction Management (2)</td>
<td>$30,597,300</td>
<td>$7,654,800</td>
<td>$38,252,100</td>
</tr>
<tr>
<td>Non-Federal Cash Contribution (5)</td>
<td>($200,783,000)</td>
<td>$200,783,000</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$366,746,000 (27%)</td>
<td>$971,807,600 (73%)</td>
<td>$1,338,553,600 (100%)</td>
</tr>
<tr>
<td>Recreation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PED</td>
<td>$1,081,800</td>
<td>$1,081,800</td>
<td>$2,163,500</td>
</tr>
<tr>
<td>LERRDs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recreation Facilities</td>
<td>$7,460,500</td>
<td>$7,460,500</td>
<td>$14,921,000</td>
</tr>
<tr>
<td>Construction Management</td>
<td>$484,900</td>
<td>$484,900</td>
<td>$969,900</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$9,027,200 (50%)</td>
<td>$9,027,200 (50%)</td>
<td>$18,054,400 (100%)</td>
</tr>
<tr>
<td><strong>Total Project</strong></td>
<td>$375,773,200 (28%)</td>
<td>$980,834,800 (72%)</td>
<td>$1,356,608,000 (100%)</td>
</tr>
</tbody>
</table>

1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding. (2) Non-Federal PED and Construction Management Costs for Ecosystem Restoration shown are for Relocations and are therefore part of LERRD. (3) Federal Admin Costs- Federal administrative costs of LERRD acquisition oversight. (4) Per ASA (CW) 27 May 2014, LERRD credit up to 35% of total project first cost. (5) Non-Federal cash contribution which brings non-federal creditable share to 50%.

Section 103 of the Water Resources Development Act of 1986, as amended, 33 U.S.C. 2213, sets out the standard requirements for cost sharing Corps water resources projects. Because Option 2 cost sharing deviates from these requirements, specific statutory language would be necessary in order to authorize Option 2 cost sharing, in addition to the Congressional authorization to carry out the Locally Preferred Plan.
7.5.1 **Recommended Plan**

Alternative 20 is the Recommended Plan. The table below displays the allocation of costs between Ecosystem Restoration and Recreation purposes. It also displays the annual benefits for both.

### Table 7-13 Recommended Plan Cost Allocation (October 2015 Price Level)

<table>
<thead>
<tr>
<th>Item (1)</th>
<th>Ecosystem Restoration</th>
<th>Recreation</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Allocated Costs</td>
<td>Benefits</td>
<td>Allocated Costs</td>
</tr>
<tr>
<td><strong>Investment Cost</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Cost</td>
<td>$1,338,554,000</td>
<td>$18,054,000</td>
<td>$1,356,608,000</td>
</tr>
<tr>
<td>Interest During Construction (2)</td>
<td>$57,911,000</td>
<td>$54,000</td>
<td>$57,965,000</td>
</tr>
<tr>
<td>Total</td>
<td>$1,396,465,000</td>
<td>$18,108,100</td>
<td>$1,414,573,000</td>
</tr>
<tr>
<td><strong>Annual Benefits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Monetary (Ecosystem)</td>
<td>6782 AAHU’s</td>
<td></td>
<td>6782 AAHU’s</td>
</tr>
<tr>
<td>Monetary (Recreation)</td>
<td>$3,510,000</td>
<td></td>
<td>$3,510,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$60,507,000</td>
<td>$978,000</td>
<td>$61,485,000</td>
</tr>
</tbody>
</table>

**Net Annual Recreation Benefits**

$2,532,000

**Recreation Benefit-Cost Ratio**

3.59

(1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding.

(2) IDC was calculated based on the start and end of construction for each contract in the MCACES TPCS. See Appendix C.

(3) Operation, Maintenance, Repair, Replacement, and Rehabilitation.

7.5.2 **Operation and Maintenance Considerations.**

Operation and maintenance (O&M) for specific reaches of the Los Angeles River as part of the LACDA are divided between the Corps and the Los Angeles County Department of Public Works (LACDPW). The ARBOR reach is maintained by the Corps. O&M of the current project includes maintenance of structures, vegetation control and subdrain cleaning. Vegetation maintenance from the concrete channel is recurring maintenance, and manholes are inspected and cleaned on a 3-year basis.

Operation, maintenance, repair, replacement, and rehabilitation activities (OMRRR) would occur after the project is constructed in order to keep project features functioning as designed. A detailed Operation and Maintenance Plan will be developed during implementation and will be coordinated with the current O&M plan for the existing flood risk management project. It is assumed that ongoing O&M of this restoration project will include the following activities:

**Annual inspections and maintenance**- Project features will be inspected to verify performance and identify damages or repair needs quarterly, and after major flood events. Clean up and minor repairs will also occur at least quarterly. Inspection would include evaluation of scour, sedimentation, and integrity of geotechnical structures.
**Invasive Species Management** - Periodic removal of invasive species will take place as needed. It will likely be required more frequently in the early stages of vegetation establishment and taper off as native vegetation matures. Invasives control will be carried out throughout the restoration project footprint, including the River and tributary channel bottom areas. Control of invasive vegetation is assumed to cost approximately $300,000 annually, and be completed each year for 5 years followed by once every 5 years. This is based on vegetation control that was conducted in the Glendale Narrows reach in the past several years.

**Restored Vegetation** - O&M costs for areas to be revegetated outside the river channel have been estimated as 1.5 percent of the initial construction cost annually. This cost will include maintenance of the temporary irrigation system infrastructure on an as-needed basis. Supplemental irrigation will also be provided during extreme drought. There is a limit to the size and amount of vegetation that will be allowed in the river since too much will affect the conveyance of flow. The amount of existing vegetation will be quantified during the annual inspections and a removal plan will be prepared and implemented, if necessary.

Additional maintenance, repair/and or replacement of project features was estimated by applying a percentage of initial construction cost of items anticipated to require maintenance over the life of the project, and listed in Appendix C Cost. The estimated annual O&M costs for the LPP is $2,306,000 for Restoration and $223,000 for Recreation.

**LACDA O&M** - USACE identified that a modification to the LACDA OMRRR plan would be needed to avoid contradictory maintenance requirements for the areas of restoration features. The LACDA OMRRR plan would thus be modified to accommodate the restoration project, with maintenance of the restoration project a City responsibility under the restoration OMRRR plan. The LACDA OMRRR manual would be modified to exclude constructed restoration features and would exclude invasives management throughout the restoration project footprint. The Corps would continue to be responsible for maintaining all other aspects of the portions of the LACDA project that overlap with the restoration project footprint.

At the same time, the USACE would modify the LACDA OMRRR plan for the rest of the ARBOR reach to preserve the flood risk management function while complementing the restoration project. These modifications would allow some native vegetation to remain in the ARBOR reach outside of the constructed restoration features to the extent that design conveyance capacities would be met or would experience only minimal changes from the design conditions. Such OMRRR would be contingent on funding and would be anticipated to be phased in over time. These OMRRR modifications would be refined during detailed design of the restoration project with H&H data. OMRRR modifications would also account for levee vegetation requirements within the channel, either by limitation or variance.

Under this approach, if the District received funding to undertake OMRRR, the LACDA maintenance would be anticipated to selectively remove the larger trees but allow the smaller bendable vegetation to remain, in contrast to the vegetation-free design under the current OMRRR plan. OMRRR would be contingent on funding and would be anticipated to be phased in over time. There is a limit to the size and amount of vegetation that will be allowed in the river since too much will affect the conveyance of flow. The amount of existing vegetation will be quantified during the annual inspections and a removal plan will be implemented when necessary.

This approach provides a route to a return to design or near-design conditions for LACDA within the ARBOR reach while facilitating and supporting the restoration features and goals. This course of action would have the least impact on environmental resources and would have the smallest effect on habitat benefits while having no more than a minimal impact on flow conveyance. The remaining bendable vegetation would still provide the majority of the habitat benefits afforded by the current conditions.
With construction of the restoration project features, there may be some incidental flood risk management benefits from the proposed channel re-configurations in the Taylor Yard area due to widening the channel in that area. In the LATC area, where the channel would also be widened, there are no significant flood risk impacts because the channel already has greater than 100-yr level of protection. Within the lower reaches of the ARBOR (Reaches 6, 7, and 8), the OMRRR plan is expected to be able to allow some vegetation to establish and remain within the channel without reducing flood conveyance capacity from Design Conditions. With completion of the hydrology and hydraulics modeling during the design phase, the level of vegetation that could be maintained in the channel can be determined, consistent with or with only minimal changes to Design Conditions.

7.5.3 Detailed Design

Detailed design in PED will involve all technical elements and will be undertaken in accordance with applicable Corps regulations. This IFR and each technical appendix identify key design considerations and commitments where appropriate. Design considerations that were clarified during IEPR, coordination with other agencies, and/or the Corps review process include the following.

Detailed design will include detailed hydrologic and hydraulic analysis. The detailed hydrologic and hydraulic analysis would verify that there is no increase in flood risk compared to existing conditions, evaluate whether conveyance in the additional channel area is offset by the inclusion of vegetation, and further analyze incidental flood risk benefits. The detailed hydrologic and hydraulic analysis would also be used to determine to what extent some native vegetation in the channel outside the constructed restoration features could be maintained, as discussed in Sections 6.2.1 and 7.5.2. During PED, risk and uncertainty will be documented to ensure there are no adverse impacts to existing conditions.

Hydrologic and hydraulic modeling will include two-dimensional modeling and may include physical modeling to more accurately simulate the proposed alterations in and adjacent to the channel. Detailed modeling and design will involve actions identified in Section 6.2.1. In addition, perennial effluent base flow, channel forming discharge, and flow duration will be analyzed. The Corps will also clarify the hydrologic and hydraulic design of low flow channels and analyze the low flow channels in modified reaches. The detailed analysis will include design and evaluation of daylighted storm drains, with determination of effective and ineffective flow areas, verification and refinement of contraction/expansion coefficients for bridges; consideration of energy grade line, shear stress, and possibly stream power for determination of vegetation size, density, and extent; assessment of specific vegetation species and associated bending and/or breaking or washing out; and more detailed analysis of vegetation roughness using an appropriate tool such as ERDC’s HYDROCAL. During PED, the Corps will also look for additional sources of existing data on groundwater-surface water interaction to incorporate into the water budget and evaluate possible segregation to support fish refugia.

As part of the detailed design phase, several additional stream gages may be recommended to be installed. These gages will be necessary to provide information to Corps personnel involved in flood risk management on real-time water levels within the river and to City personnel operating and maintaining the restoration and recreation features of the project. These gages would supplement the data from the four existing stream gages along the Los Angeles River that are maintained by LACDPW.

The PED analysis will also include sediment transport modeling and detailed analysis of scour and erosion. A detailed sediment management plan will be developed to protect against sedimentation and scour and further define sediment management required in O&M.

Geotechnical considerations, including levee policy compliance, appropriate erosion control measures, and investigation of HTRW and other contamination, will be further evaluated and addressed. Levee
vegetation policies will be followed, either by limitation or variance, as described in Section 6.2.2.

Sampling, testing, and engineering in the areas of channel modifications will be conducted during PED, Further investigation of HTRW contamination will be undertaken by the non-Federal sponsor as identified in Sections 5.11.3 and 7.5.5 and Appendix K. Channel protection products will be evaluated to ensure they meet Corps specifications and surpass all hydraulic, geotechnical, and structural criteria. As identified in Section 4.4.5, use of HPTRM or other soft methods to resist erosion will be fully evaluated using site specific data and engineering analysis before being incorporated into a final design and may require augmentation with more traditional channel protection measures.

As described in Sections 7.1.9 and 7.1.10 and the responses to the USFWS’s CAR (provided in full in Appendix N and summarized in Section 8.7.1), more specific vegetation planting and management plans will be developed, and features for wildlife habitat and habitat connectivity will be refined, in PED. Such measures are dependent on the detailed design and hydraulic analysis as well as levee policies. As identified in Section 5.6, the Corps will ensure that appropriate cultural resource investigations occur early in PED for each reach of the project so that avoidance and impact minimization measures for cultural resources can be incorporated into the project design.

Detailed design drawings of all project features and multiple cross sections for each affected project reach will be developed in PED.

7.5.4 Monitoring and Adaptive Management

Monitoring and adaptive management conforms with the requirements of Section 2039 of WRDA 2007 and Corps implementation guidance (CECW-PB Memo 31 August 2009). The Corps and the non-Federal sponsor are responsible for carrying out the monitoring and adaptive management plan after construction of each project phase/component until ecological success criteria are met, but for no more than ten years. It is anticipated that the restored habitats can reasonably be expected to achieve success within five years for most or all project components. Upon the determination of the District Engineer that ecological success criteria have been met, cost-shared monitoring will be concluded, and in no case shall cost-shared monitoring extend beyond ten years after construction of each component. The monitoring and adaptive management plan has been developed to ensure the success of the recommended restoration plan in meeting project objectives and to provide a process to identify when any adaptive management actions are warranted during the monitoring period.

The Monitoring and Adaptive Management Plan (MAMP) is included in Appendix H-2. This MAMP describes the rationale for monitoring and adaptive management, monitoring parameters and methods, assessment of monitoring results, an adaptive management framework, decision-making triggers, the cost and duration of monitoring, and responsible parties.

Monitoring

An effective monitoring program is required to determine if the project outcomes are consistent with original project objectives. Monitoring must be closely integrated with the adaptive management components because it is the key to the evaluation of project objectives and adaptive management needs. The MAMP includes a monitoring plan that identifies performance measures along with desired outcomes and monitoring design in relation to specific objectives. Monitoring parameters for vegetation and native fish habitat are included.

Results of the monitoring will be assessed in comparison to project objectives and decision-making triggers to evaluate whether the project is functioning as planned and whether adaptive management actions are needed to achieve project objectives. The results of the monitoring will be provided to an
Adaptive Management Team (AMT) who will evaluate and compare data to project objectives and decision making triggers. The information generated by the monitoring plan will be used by the Corps and City in consultation with the other AMT members to guide decisions on adaptive management that may be needed to ensure that the ecosystem restoration project meets the success criteria. Final decisions on implementation of adaptive management actions are made by the Corps.

Adaptive Management

The primary incentive for implementing an adaptive management program is to increase the likelihood of achieving desired project outcomes given uncertainties. Adaptive management provides an organized, coherent, and documented process that suggests management actions in relation to measured project performance compared to desired project outcomes. The need for adaptive management actions will be based on assessment of monitoring results as compared to established decision-making triggers for vegetation and native fish habitat. Adaptive management actions may include such actions as temporary supplemental water drought conditions, addition of natural substrates, or re-grading. Details of the implementation of adaptive management are described in Appendix H-2.

Cost

The monitoring and adaptive management costs at October 2015 price levels total $12.25 million for the Recommended Plan and $10.4 million for the NER Plan including contingency. The plan includes cost shared monitoring and adaptive management actions during the first five years after construction of each project phase/component, or until success criteria are met, for no more than ten years.

7.5.5 Hazardous, Toxic and Radioactive Waste

As described in this report and Appendix K HTRW Survey Report, there are known and suspected contaminated sites within the study area that cannot be avoided by the project. These include the San Fernando Valley Superfund Site, and Taylor Yard G1 and G2 parcels, and LATC. Per ER 1105-2-100 and ER 1165-2-132, if sites cannot be avoided, studies or investigations undertaken by the sponsor may be cost shared, but the non-Federal sponsor has responsibility at 100 percent non-project cost for undertaking or ensuring remediation of any HTRW, both known and unknown, to provide sites compatible with the land use necessary for the restoration project. The City would undertake all appropriate inquiries prior to land acquisition and would adequately investigate City-owned lands. The City is responsible for ensuring that all lands provided for the project are remediated to the standards required for the ecosystem restoration project as determined by the local regulator and with input from USACE. The City must undertake the remediation or ensure the remediation is undertaken prior to providing such lands for construction of project features. Prior to providing a parcel for project construction, the City must ensure that it is either shown to be free of contamination through adequate site investigation or that it has been remediated to regulator and USACE satisfaction to the standards required for the ecosystem restoration project. Additionally, for groundwater contamination that is impracticable to remediate prior to project construction, the non-Federal sponsor will be responsible, at 100 percent non-project cost, for all treatment, handling and disposal of contaminated groundwater during dewatering. The City of Los Angeles is aware of these requirements, and has accepted responsibility for delivering lands suitable for ecosystem restoration and addressing groundwater contamination during dewatering.

7.5.6 Construction Phasing

Detailed construction schedules for both the NER and LPP are included in Appendix C, Cost. Both schedules assume construction sequencing to include multiple construction contracts. Construction of the NER Plan is assumed to span 10 years and the LPP a period of 15 years. Additional time is included in
the schedule for both design and acquisition of LERRD. The sequence of construction was modified from the Draft IFR to minimize air emissions and allow additional time for LERRD acquisition.

In an effort to reduce construction costs, sequencing of the earthwork operations for the HTRW remediation and grading to project design grades should be performed to eliminate double handling of soils and materials. This sequencing is proposed as follows and depicted in the conceptual and not to scale figure below. Sequencing is further discussed in Appendix K HTRW Survey Report.

1. Dewatering and subsequent contamination remediation prior to earthwork activities and prior to construction of the project would be needed to be performed. Continuation of dewatering would likely continue throughout construction of the project and monitoring and treatment would need to be performed by the non-Federal sponsor.

2. City responsibility: Removal of HTRW impacted soils would be performed by the non-Federal sponsor to the depth and grade required for restoration standards leaving in place the river channel and/or existing levee. If contaminants extend into channel or levee right of way, additional coordination with USACE would be needed to avoid flood risk management impacts during remediation.

3. City responsibility: The resulting excavation should not be filled beyond the design grades for the project landward of the channel.

4. Restoration Project construction: Modification of the channel and/or removal of the existing levee would be performed.

5. Restoration Project construction: Placement of fill to meet the desired grades at the channel would be made.

6. Restoration Project construction: Any planting and habitat efforts would be made.

**Figure 7-10 Conceptual earthwork sequencing**

### 7.5.7 Environmental Operating Principles

The Corps of Engineers has reaffirmed its commitment to the environment by formalizing a set of “Environmental Operating Principles: applicable to all of its decision-making and programs. These principles foster unity of purpose on environmental issues, reflect a new tone and direction for dialog on environmental matters, and ensure that employees consider conservation, environmental preservation, and restoration in all Corps activities. The principles are described in Engineering Circular 1105-2-4040 “Planning Civil Work Projects under the Environmental Operating Principles,” 1 May 2003.
The EOP are supported by the Los Angeles River Ecosystem Restoration Recommended Plan as follows.

1. Foster sustainability as a way of life throughout the organization.

The proposed project will foster sustainability as a way of life as it restore ecosystem function and will have associated beneficial effects of spurring redevelopment and contributing to improved public health and well being for the adjacent community.

Environmental sustainability, when applied to a water resource project must be designed to balance three major elements: environmental health, economic prosperity, and social well-being.

Environmental Health: The project complies with this environmental operating principle by first improving environmental health with restoration of habitat in and along 11 miles of the Los Angeles River. Hydrologic connections will be restored by widening the river in several places, opening up small streams that were once confined to storm drains, and restoring the confluence of two of the River’s main tributaries.

Economic Prosperity: Second, restoration will contribute to future economic development by creating jobs during construction, increasing environmental education and recreational opportunities, and spurring future redevelopment in the area.

Social Well Being: In addition, the project will improve social well being by providing increased opportunities for the public to experience restored habitat in an urban setting, benefiting public health. In addition, the project increases open space and includes recreational features that assist in restoring community cohesion.

2. Proactively consider environmental consequences of all Corps activities and act accordingly.

The Corps has proactively considered environmental consequences of the proposed project, along with consequences and requirements of the existing flood risk management project whose footprint overlaps with the proposed project. The proposed project restores a portion of the aquatic and riparian ecosystem degraded over time by a cycle of development, flooding, and flood risk management efforts, including the LACDA flood risk management project constructed by the Corps and LACDPW during the twentieth century. The environmental consequences of the proposed project are largely beneficial, with positive benefits to biological, water, aesthetic, and other resources, and impacts to other resources have been avoided or minimized to the extent practicable. The project reestablishes habitat nodes and reconnects the river to its historic floodplain in key areas and widens the river within the existing right of way in others, restoring ecosystem functions lost or highly degraded during earlier periods of development and channelization. This reach is also the backbone of the river’s connection to the nearby significant environmental areas of the Santa Monica Mountains, the Verdugo Hills, and the San Gabriel Mountains. This project will serve as a foundation for those reconnections. At the same time, the proposed project takes into account the need to preserve flood risk management levels provided by the existing project.

3. Create mutually supporting economic and environmentally sustainable solutions.

Seeking the balance between human development and natural systems is especially important in the arena of environmental restoration in urban areas. Improving measurements of success requires improvement of evaluation methods and finding ways to understand the value of what is achieved in both economic and environmental terms. The real costs of environmental degradation are not always recognized.
The ARBOR reach of the Los Angeles River is heavily urbanized. It is lined with highways, rail lines, and industrial and residential development. This urbanization was aided by channelization undertaken as part of flood risk management projects, including the construction of hardened levees and channel walls and concrete lining of the river bed as part of the Corps’ and LACDPW’s flood risk management project. Science and the public have begun to realize the value of riverine ecosystems to the health of the environment, as well as the economic and social well-being of the community. The proposed project for ecosystem restoration in this reach of the LA River is a strong example of a solution supporting the needs of the ecosystem within both the river and the region while maintaining flood risk management functions.

The project will provide significant regional economic development benefits. Construction of the project and anticipated redevelopment of river adjacent properties attributable to the restoration project are projected to support over 19,000 jobs and billions of dollars in labor income.

These restoration goals and economic and societal benefits would be achieved through sustainable ecosystem improvements that build upon existing remnants of a once vast mosaic of riparian and wetland habitats, and utilize groundwater and surface water resources that are still sufficient to support the proposed increase in restored acres.

4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.

The values of environmental sustainability are incorporated into the Nation’s laws and mandates to governmental and private actors. The statute that provides a basis for evaluation of environmental impacts is the National Environmental Policy Act of 1969 (NEPA). The planning framework found in the Water Resources Council’s Principles and Guidelines (P&G) provides a guide for seeking sustainable solutions in civil works projects. Other standards include the Clean Water Act and the Clean Air Act.

The proposed project would restore a more sustainable ecosystem along the River in a reach that has been highly altered by human activities including activities of the Corps itself. The project incorporates a coordinated approach to the need for restoration while complying with environmental laws such as NEPA, the Clean Water Act, and the Clean Air Act.

5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.

As an ecosystem restoration study, the study gave restoration of functions of the natural environment foremost consideration during the development, evaluation, and comparison of alternatives. Habitat benefits or changes in value were calculated or forecasted for multiple points throughout the life of the project. Quantitative and qualitative benefits were based on not only the degree to which an alternative improved habitat value within the study area as a whole, but also on consideration of regional and watershed benefits associated with wildlife connectivity. The risks associated with achievement of restoration objectives will be addressed through implementation of the Monitoring and Adaptive Management Plan, which includes monitoring to evaluate ecological success and includes appropriate triggers for contingency actions.

6. Leverage scientific, economic, and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

The Corps must effectively utilize sources of expertise existing among other professional organizations, and other Federal, state and local entities to address problems of regional and national significance.
The Corps has utilized the scientific expertise within the agency as well as that of other Federal
governmental entities, State and local governmental organizations, and private sector and non-profit-
affiliated scientists in all phases of the study. Their efforts were included during the assessment phase
and plan formulation phase and will be utilized in future phases to include the most up to date
knowledge available in support of a more sustainable project.

7. Employ an open, transparent process that respects views of individuals and groups
interested in Corps activities.

Throughout the study process, the Corps and the non-Federal sponsor have sought the views of
individuals and groups on the best ways to restore the Los Angeles River ecosystem and its resources of
significance to the region and Nation. The Corps has actively sought involvement of scientists, engineers,
and other experts in academia, members of the private sector, public interest groups, and Federal, state,
and local agencies, listening objectively to their input and concerns. For this study, the Corps and City
incorporated public input through the scoping process and gathered public input during the public review
of the Draft IFR including a public meeting. The Corps also participated in the development of the City’s
Revitalization Master Plan and participates in the EPA’s Urban Waters Federal Partnership initiative for
Los Angeles River watershed and Department of Interior’s America’s Great Outdoors on the Los Angeles
River. We continue to provide information to keep the public informed on the study. The Corps
recognizes its obligation to promote the interests of the Nation by continuously engaging the public and
stakeholders throughout the project delivery process.

7.5.8 USACE Campaign Plan and Strategic Plan

The Corps’ Campaign Plan Goal 2 to Transform Civil Works and the Sustainable Solutions to America’s
Water Resources Needs: Civil Works Strategic Plan 2014-2018 guided this effort. The team worked
diligently and tirelessly with all segments of our partners and stakeholders. By following the Corps’ 6-
step plan formulation process as well as the extensive review process, the Corps is delivering an enduring
and essential solution that meets the Nation’s needs under Goal 2 which seeks to “Deliver enduring and
essential water resources solutions through collaboration with partners and stakeholders.”

These Campaign Plan and Strategic Plan priorities are supported by the Recommended Plan through the
following:

• The adaptive management plan incorporates measures to account for potential
environmental/cultural changes.
• The O & M plan will provide assurance of engineering, economic, and environmental
sustainability of project over 50-year economic life.
• The Recommended Plan has been peer reviewed and is supported by the Non-Federal sponsor
and Resource Agencies.
• Employed an integrated, comprehensive systems – based approach by planning and designing
project features as a system including up and downstream projects.
• Employed risk-based concepts in planning and conceptual design and will continue to do so in
construction and O&M by acknowledging and planning for risk of flood flows, uncertainty in
storm water discharges, and sizing of storm water features.
• Employed a continuous assessment of study policy issues through coordination with the South
Pacific Division and Headquarters USACE, assessing and modifying organizational behavior as
needed.
• Met design and construction standards by collaborating with Construction and Operations and
applying lessons learned from other ecosystem projects into planning and alternative design.
Examples include: use of storm water outfalls for water source, habitat established in low flow
channel, and potential cost of debris removal, wetland designs, and cost estimates.
• Used a dynamic independent review process with Inter-District, Policy, Sponsor, and Agency Review throughout the study.
• Employed adaptive planning and engineering systems developing a Monitoring and Adaptive Management Plan cost shared for no more than 10 years after construction to allow for unexpected changes in system, and respond to necessary modifications of restoration following construction.
• Used a rationale for restoration alternatives focused on sustainability and applied ecological and engineering principles in design of alternatives to maximize functioning river and minimize future maintenance costs.
• Applied ecological and engineering principles in design of alternatives to place project features where appropriate ecologically, restore river functions, and maximize use of existing water sources.
• Considered the need for review and inspection of completed works by considering the needs of the existing flood risk management project and the future ecosystem restoration features.
• Effectively communicated risk using public involvement vehicles and discussions the non-Federal sponsor and with key stakeholders.
• Established public involvement early in the study process with regular meetings and study updates on the web and with the media.
• Manage and enhanced technical expertise and professionalism with an interdisciplinary team from the Corps, Federal and local agencies, the non-Federal sponsor, University and contractor personnel. Shared and learned from multiple disciplines within the Corps and from outside the Corps.

7.5.9 Division of Plan Responsibilities

The Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) and various administrative policies have established the basis for the division of Federal and non-Federal responsibilities in the construction, maintenance, and operation of Federal water resource development projects accomplished under the direction of the Corps. Anticipated Federal and non-Federal responsibilities are described in this section. The final division of specific responsibilities will be formalized in the project partnership agreement (PPA).

Federal Responsibilities

For Option 1, the estimated Federal share of the total first cost of the project is not more than 65 percent of the costs of the NER plan, limited to costs of construction, and 50 percent of first costs related to recreation. The ASA (CW) waiver granting the non-Federal sponsor’s request to forgo reimbursement for LERRDs in excess of its statutory share of total ecosystem restoration costs applies to this option. For Option 2, the estimated Federal share of the total first cost of the project is not more than 50 percent of total ecosystem restoration costs for the Locally Preferred Plan, limited to costs of construction, and 50 percent of first costs related to recreation. This option also requires the sponsor to forgo credit or reimbursement for LERRD in excess of 35 percent of total ecosystem restoration costs of the Locally Preferred Plan. First costs are typically all costs to implement the project inclusive of LERRD but do not include OMRRR costs or remediation of hazardous substances regulated by CERCLA. The Federal Government’s responsibilities are anticipated to be:

a. Sharing the costs for Preconstruction, Engineering and Design (PED), including preparation of the Plans and Specifications, which is cost shared at the same percentage that applies to construction of the project.

b. Sharing the construction costs for the project in accordance with the cost sharing option recommended by the Chief of Engineers.
c. Administering contracts for construction and supervision of the project after authorization
funding and receipt of non-Federal assurances.

Non-Federal Responsibilities

Federal implementation of the recommended project would be subject to the non-Federal sponsor
agreeing to comply with applicable Federal laws and policies, including but not limited to:

For Option 1:

a. Provide a minimum of 35 percent of total ecosystem restoration costs of the National Ecosystem
Restoration Plan as further specified below:

1. Provide 35 percent of design costs allocated by the Government to ecosystem restoration
in accordance with the terms of a design agreement entered into prior to commencement
of design work for the ecosystem restoration features;
2. Provide all lands, easements, and rights-of-way, including those required for relocations,
the borrowing of material, and the disposal of dredged or excavated material; perform or
ensure the performance of all relocations; and construct all improvements required on
lands, easements, and rights-of-way to enable the disposal of dredged or excavated
material as determined by the Government to be required or to be necessary for the
construction, operation, and maintenance of the ecosystem restoration features;
3. Provide, during construction, any additional funds necessary to make its total
contribution of ecosystem restoration National Ecosystem Restoration Plan costs equal to
35 percent;

b. Provide, during construction, 100 percent of the costs of the total ecosystem restoration costs of
the Locally Preferred Plan increment above the total ecosystem restoration costs of the National
Ecosystem Restoration Plan;

c. Provide a minimum of 50 percent of total recreation costs of the Locally Preferred Plan as further
specified below:

1. Provide 35 percent of design costs allocated by the Government to recreation in
accordance with the terms of a design agreement entered into prior to commencement of
design work for the recreation features;
2. Provide, during the first year of construction, any additional funds necessary to pay the
full non-Federal share of design costs allocated by the Government to recreation.
3. Provide, during construction, any additional funds necessary to make its total
contribution for recreation equal to 50 percent of total recreation costs;
4. Provide, during construction, 100 percent of excess recreation costs in the event that the
Federal share of total recreation costs exceeds 10 percent of the Federal share of total
ecosystem restoration costs;

For Option 2:

a. Provide a minimum of 50 percent of total ecosystem restoration costs of the Locally Preferred
Plan as further specified below:

1. Provide 35 percent of design costs allocated by the Government to ecosystem restoration
in accordance with the terms of a design agreement entered into prior to commencement
of design work for the ecosystem restoration features;
2. Provide, during construction, a contribution of funds equal to 15 percent of total
ecosystem restoration costs;
3. Provide all lands, easements, and rights-of-way, including those required for relocations,
the borrowing of material, and the disposal of dredged or excavated material; perform or
ensure the performance of all relocations; and construct all improvements required on
lands, easements, and rights-of-way to enable the disposal of dredged or excavated
material all as determined by the Government to be required or to be necessary for the
construction, operation, and maintenance of the ecosystem restoration features;
4. Provide, during construction, any additional funds necessary to make its total
contribution of ecosystem restoration costs equal to 50 percent;

b. Provide 50 percent of total recreation costs as further specified below:
   1. Provide 35 percent of design costs allocated by the Government to recreation in
      accordance with the terms of a design agreement entered into prior to commencement of
      design work for the recreation features;
   2. Provide, during the first year of construction, any additional funds necessary to pay the
      full non-Federal share of design costs allocated by the Government to recreation;
   3. Provide, during construction, any additional funds necessary to make its total
      contribution for recreation equal to 50 percent of total recreation costs;

c. Provide, during construction, 100 percent of the total recreation costs that exceed an amount
   equal to 10 percent of the Federal share of total ecosystem restoration costs;

For Both Options:

d. Shall not use funds from other Federal programs, including any non-Federal contribution required
   as a matching share therefor, to meet any of the non-Federal obligations for the project unless the
   Federal agency providing the Federal portion of such funds verifies in writing that expenditure of
   such funds for such purpose is authorized;

e. Prevent obstructions or encroachments on the project (including prescribing and enforcing
   regulations to prevent such obstructions or encroachments) such as any new developments on
   project lands, easements, and rights-of-way or the addition of facilities which might reduce the
   outputs produced by the ecosystem restoration features, hinder operation and maintenance of the
   project, or interfere with the project’s proper function;

f. Shall not use the ecosystem restoration features or lands, easements, and rights-of-way required
   for such features as a wetlands bank or mitigation credit for any other project;

g. Keep the recreation features, and access roads, parking areas, and other associated public use
   facilities, open and available to all on equal terms;

h. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property
   Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and
   the Uniform Regulations contained in 49 Code of Federal Regulations Part 24, in acquiring lands,
   easements, and rights-of-way required for construction, operation, and maintenance of the
   project, including those necessary for relocations, the borrowing of materials, or the disposal of
   dredged or excavated material; and inform all affected persons of applicable benefits, policies,
   and procedures in connection with said Act;

i. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace
   the project, or functional portions of the project, including any mitigation features, at no cost to
   the Federal Government, in a manner compatible with the project’s authorized purposes and in
   accordance with applicable Federal and State laws and regulations and any specific directions
   prescribed by the Federal Government;

j. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner,
   upon property that the non-Federal sponsor owns or controls for access to the project for the
   purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing
   the project;
k. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

m. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; the Age Discrimination Act of 1975 (42 U.S.C. 6102); the Rehabilitation Act of 1973, as amended (29 U.S.C. 794) and Army Regulation 600 7 issued pursuant thereto; and 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (labor standards originally enacted as the Davis-Bacon Act, the Contract Work Hours and Safety Standards Act, and the Copeland Anti-Kickback Act);

n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

o. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary remediation and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;

p. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and

q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.
7.5.10 Non-Federal Sponsor’s Financial Capability

The non-Federal sponsor has committed to provide its share of total project costs, as well as all LERRD required for the project. The non-Federal sponsor has committed to performing all OMRRR required for the project. The non-Federal sponsor has also made a commitment to undertake all necessary response and remediation for CERCLA contaminants required for the Project, including providing lands free of soil contamination prior to construction of the Project features on those lands and handling groundwater contamination during construction activities.

7.5.11 Project Partnership Agreement

Prior to advertisement for the first construction contract, a Project Partnership Agreement will be required to be signed by the Federal Government and the City of Los Angeles, requiring formal assurances of local cooperation from the City. This agreement will be prepared and negotiated during the Plans and Specifications Phase.

7.5.12 Approval and Implementation

The necessary reviews and activities leading to approval and implementation of the tentatively recommended plan are listed below:

a. Environmental Impact Statement Filing – after circulation of this Final IFR for state and agency review, as well as public review, the District will file Final IFR together with the proposed report of the Chief of Engineers with EPA.

b. Environmental Impact Report Certification – The Final IFR will be circulated for public and agency review and comment a minimum of 10 days before consideration by the City of Los Angeles Board of Public Works. At a public hearing, the Board of Public Works will decide whether to recommend approval of the EIR and forward the document to the Los Angeles City Council for certification. If adopted, a Notice of Completion is filed with the City Clerk.

c. Chief of Engineers Approval – Chief of Engineers signs the report signifying approval of the project recommendation and submits the following to ASA (CW): the Chief of Engineers Report, the Final IFR, and the unsigned ROD.

d. ASA (CW) Approval – The Assistant Secretary of the Army for Civil Works will review the documents to determine the level of administration support for the Chief of Engineers recommendation. The ASA (CW) will formally submit the report to the Office of Management and Budget (OMB). OMB will review the recommendation to determine its relationship to the program of the President. OMB may clear the release of the report to Congress.

e. Project requires congressional approval for construction.

f. Funds could be provided, when appropriated in the budget, for preconstruction, engineering and design (PED), upon issuance of the Division Commander’s public notice announcing the completion of the final report and pending project authorization for construction. Surveys, model studies, and detailed engineering and design for PED studies will be accomplished first and then plans and specifications will be completed, upon receipt of funds.

g. Construction would be performed with Federal and non-Federal funds, once the construction project was advertised and awarded.
Figure 7-11 Map of the Recommended Plan

LEGEND
Sub-Measures

2. Expose storm drain outlets; convert to natural stream confluence
3/5. Create geomorphology and plant for freshwater marsh
10. Divert tributary & river flow into side channels
16. Bioengineer channel walls
17. Habitat corridors/riparian planting on banks

21. Lower channel banks and provide setback levees or vegetated berms
25. Tributary channels/widen channel with concrete removal
27. Modify trap channel to vertical sides
29. Invasive management

Potential Temporary Construction Staging Areas
Figure 7-11 Continued
Figure 7-12 Continued
Figure 7-12 Continued
Figure 7-12 Continued
Figure 7-12 Continued
8 PUBLIC INVOLVEMENT AND COLLABORATION

8.1 OVERVIEW AND HISTORY OF PUBLIC INVOLVEMENT

The development of the proposed restoration project has resulted from a systematic process of evaluating the River’s existing conditions and any associated problems and opportunities, then identifying objectives to help solve the problems and measures for realizing those opportunities. Throughout this process, public involvement has been an essential and invaluable ingredient. Successful public involvement for this study began with the robust engagement process the City developed for the Los Angeles River Revitalization Master Plan (LARRMP). Beginning in 2005, the public engaged in the decision-making process at each step, including review of the Programmatic EIS/EIR for the LARRMP. Building off that process, this Study was able to engage the public and stakeholders in the development and review of this IFR. An overview of public involvement throughout this process is included in Table 8-1. Additional details regarding each of the steps of this process are provided in the sections below. In summary, over 40 meetings and outreach opportunities were held for this specific effort.

<table>
<thead>
<tr>
<th>Document/Event</th>
<th>Timeframe</th>
<th>Public Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles River Revitalization Master Plan</td>
<td>2005-2007</td>
<td>During a 20-month period, a total of six sets of workshops were held to introduce the public to the LARRMP process and to solicit input for its development. A total of 17 workshops were held from San Fernando Valley to downtown Los Angeles. In addition, public briefings for professional organizations, briefings for Neighborhood Councils, press conferences, briefings for Congressional representatives, and a youth summit for several hundred high school students have taken place.</td>
</tr>
<tr>
<td>LARRMP Programmatic EIS/EIR</td>
<td>February 2007</td>
<td>The final series of public involvement workshops for the LARRMP were dedicated to updating the public about the Draft document and providing public hearings regarding the Programmatic EIS/EIR. Three workshops/public hearings were conducted in River-adjacent communities.</td>
</tr>
<tr>
<td>Los Angeles River Ecosystem Restoration Feasibility Study</td>
<td>2009-2012</td>
<td>A 3-day planning charrette was held in December of 2009 to introduce the Los Angeles River Restoration IFR and solicit feedback on the study area’s problems and opportunities, objectives to address them, and measures that could be used to meet the objectives. Participants included staff from the USACE, County, City, resource and municipal agencies, and non-governmental organizations, as well as local community members and consultants. Meetings with agencies on the Habitat Evaluation Team, the Urban Waters Federal Partnership, Transportation Authorities, and other agencies were held to solicit input.</td>
</tr>
<tr>
<td>Los Angeles River Ecosystem Restoration Feasibility Report and Integrated EIS/EIR</td>
<td>2013</td>
<td>A 45-day review period was held from September 20 to November 18, 2013 to allow the public and agencies to review and submit comments on the Draft IFR.</td>
</tr>
<tr>
<td>River Update Meetings</td>
<td>2005-2013</td>
<td>Since 2007, a total of six meetings have been held for public information and to solicit public input. The meetings have provided status updates on the LARRMP as well as discussion on the development of the IFR.</td>
</tr>
<tr>
<td>City Council and Committee Meetings</td>
<td>2005-2014</td>
<td>USACE staff provided regular updates to the LA City Council and general public. The City Council of Los Angeles’ Ad Hoc River Committee and its Arts, Parks, Health, Aging and River Committee held at least seven public meetings during the formulation of alternatives and Draft IFR public review period, and more than twenty meetings during the feasibility and scoping stage of the Study.</td>
</tr>
<tr>
<td>Public Briefings on the Draft LA River IFR</td>
<td>September 2013- January 2015</td>
<td>Since the release of the Draft LA River IFR in September of 2013, there have been more than ten public and focus group meetings to discuss the draft document and receive input on the alternatives and final IFR product.</td>
</tr>
</tbody>
</table>
8.2 LOS ANGELES RIVER REVITALIZATION MASTER PLAN

The community outreach process for the Los Angeles River Revitalization Master Plan needed to address a considerable geographic coverage area. In addition, it had to meet the challenge of attracting and involving potential new stakeholders, non-English-speaking stakeholders, and stakeholders who had not participated in or were not familiar with public involvement processes. Importantly, the outreach process sought to recognize past contributions and concerns from a broad range of existing leaders, community groups, and residents, thereby ensuring their ongoing participation and maximizing the continuity and historical framework of previous involvement.

The following objectives helped focus the outreach effort:
• Empower residents, businesses, and community leaders to participate in River-related decision- and policy-making processes that impact their lives and their livelihoods.
• Utilize an inclusive outreach strategy that maximizes input opportunities from existing project stakeholders while simultaneously working to identify and motivate new participants.
• Reinforce that community members are included in the decision-making process, and that their input is valued and incorporated.
• Create multiple opportunities for the generation of ideas and alternatives.
• Build trust in, and ultimately consensus around, the project by ensuring that stakeholders feel vested in the decision-making process.

The outreach strategy for this project was predicated on three critical factors:
• Increasing public awareness through an aggressive campaign that included a proactive outreach to both known and new stakeholders,
• A strong and creative media component, and
• Creating an atmosphere of celebration, uniqueness, and relevance at each of the community events.

Interest was expressed for returning the River to its natural state and habitat values as well as for recreation and enjoyment. The public also expressed interest in improving public access, creating more open/green space, dedicating space for athletics, beautifying the River with landscaping, preserving existing neighborhoods, finding socially conscious solutions to homelessness issues, and keeping the River and its environs clean and safe. Additionally, areas of interest such as arts/public art, community involvement/education, water quality, flood risk management, land use, and River management received significant feedback and comment.

As public input was collected, a consistent pattern of interest emerged that revealed a clear, primary concern for how the surrounding communities and general public will safely use the River for recreation and enjoyment. In particular, interest was expressed for improving public access, creating more open/green space, dedicating space for athletics, beautifying the River with landscaping, returning the River to its natural state, preserving existing neighborhoods, finding socially conscious solutions to homelessness issues, and keeping the River and its environs clean and safe. Additionally, areas of interest such as arts/public art, community involvement/education, water quality, flood risk management, habitat, land use, and River management received significant feedback and comment.

Methods used to communicate the planning efforts to the public included press conferences and coverage in the local, national, and global media as well as newsletters and other community notifications distributed on a regular basis.

In addition to the public outreach conducted as part of this IFR, outreach was conducted by the Alianza de los Pueblos del Rio, a collaborative organization funded by the Packard Foundation to concentrate
outreach efforts in the Latino community. The Alianza hosted three public workshops in August 2006, and involved organizations such as the Mujeres de la Tierra, the William C. Velasquez Institute, the Anahuak Youth Soccer Association, and the Center for Law in the Public Interest.

8.2.1 LARRMP Workshops

SERIES #1, Meetings 1 & 2
- Saturday, October 15, 2005; 10 a.m. – 12:30 p.m.
  North Weddington Recreation Center, North Hollywood
- Saturday, October 22; 10 a.m. – 2 p.m.
  Goodwill Work Source Center, Cypress Park

SERIES #2, Meetings 3, 4, & 5
- Saturday, January 21, 2006; 10 a.m. – 12:30 p.m.
  Reseda High School, 18230 Kittredge Street, Reseda
- Tuesday, January 24, 2006; 6 p.m. – 8:30 p.m.
  Exposition Park Intergenerational Community Center, 3890 S. Menlo Avenue, Los Angeles
- Saturday, January 28, 2006; 10 a.m. – 12:30 p.m.
  Chevy Chase Recreation Center, 4165 Chevy Chase Drive, Los Angeles

SERIES #3, Meetings 6, 7, & 8
- Saturday, March 25; 10 a.m. – 12:30 p.m.
  Birmingham High School in Van Nuys
- Tuesday, March 28; 6 p.m. – 8:30 p.m.
  Glassell Park Elementary School in Los Angeles
- Wednesday, March 29; 6 p.m. – 8:30 p.m.
  International Institute of Los Angeles

SERIES #4, Meetings 9, 10, & 11
- Saturday, June 24; 10 a.m. – 12:30 p.m.
  Goodwill Work Source Center, 342 N. Fernando Road, Los Angeles
- Tuesday, June 27; 6 p.m. – 8:30 p.m.
  Oakwood School, 11600 Magnolia Boulevard, North Hollywood
- Wednesday, June 28; 6 p.m. – 8:30 p.m.
  Evergreen Recreation Center, 2839 E. 4th Street, Boyle Heights

SERIES #5, Meetings 12, 13, & 14
- Tuesday, September 26; 6 p.m. – 8:30 p.m.
  The New Academy – Gymnasium, 21425 Cohasset Street, Canoga Park
- Wednesday, September 27; 6 p.m. – 8:30 p.m.
  LADWP Headquarters – Auditorium, 111 N. Hope Street, Los Angeles
- Saturday, September 30; 10 a.m. – 12:30 p.m.
  Chevy Chase Recreation Center, 4165 Chevy Chase Drive, Atwater Village

SERIES #6, Meetings 15, 16, 17, 18, 19, & 20
(Each location and date below included a separate Public Hearing on the Draft Programmatic EIS/EIR)
- Saturday, February 24, 2007; 10 am – 12:30 p.m.
  Hollenbeck Middle School Auditorium, 2510 East 6th Street, Boyle Heights
- Tuesday, February 27, 2007; 6:30 – 9 p.m.
  Canoga Park High School Auditorium, 6850 Topanga Canyon Boulevard, Canoga Park
- Wednesday, February 28, 2007; 6:30 – 9 p.m.
8.3 LARRMP PROGRAMMATIC EIS/EIR

Three public workshops/public hearings were held in February 2007 for the Los Angeles River Revitalization Master Plan. This was the sixth and final series of meetings in the 20-month planning process. These meetings combined the presentation of the Los Angeles River Revitalization Draft Master Plan and Public Hearings with the Draft Programmatic EIS/EIR.

SERIES #6, Meetings 15, 16, 17, 18, 19, & 20
(Each location and date below included a separate Public Hearing on the Draft Programmatic EIS/EIR)
- Saturday, February 24, 2007; 10 am – 12:30 p.m.
  Hollenbeck Middle School Auditorium, 2510 East 6th Street, Boyle Heights
- Tuesday, February 27, 2007; 6:30 – 9 p.m.
  Canoga Park High School Auditorium, 6850 Topanga Canyon Boulevard, Canoga Park
- Wednesday, February 28, 2007; 6:30 – 9 p.m.
  Metropolitan Water District Board Room, 700 N. Alameda Street, Los Angeles

8.4 LOS ANGELES RIVER ECOSYSTEM RESTORATION FEASIBILITY STUDY WORKSHOPS

At the outset of the USACE Study, it was clear that to fully integrate the input of the public and stakeholders for the Los Angeles River, it was necessary to design a workshop process that would best provide adequate background about the project and allow participants to effectively produce feasible restoration options. In this spirit, a 3-day charrette workshop was conducted in December 2009. A charrette is a focused process by which stakeholders engage in a collaborative brainstorming process to expedite the development of plans, alternatives, and/or management measures that address specific objectives. The purpose of the 3-day workshop was to receive input for the formulation of plans to restore ecosystem function to the highest level possible within the Los Angeles River, with an emphasis on ecosystem restoration for development of the NER plan. Specifically, the workshop sought to bring stakeholders together to:

- Identify new measures.
- Help validate study objectives for ecosystem restoration.
- Aid in the development of a list of alternatives to meet ecosystem restoration objectives.
- Provide conceptual representation of alternatives on maps.

The workshop series differed from previous workshops that were held during and subsequent to development of the LARRMP because it:

- Concentrated on approximately a 11-mile stretch of the Los Angeles River.
- Included a 6-hour field outing to critical locations within the study area during which specific problems and opportunities were discussed.
- Focused on ecosystem and habitat restoration as opposed to also emphasizing flood risk management, recreation, and/or adjacent development opportunities.
- Engaged the participants in organized brainstorming that developed long lists of problems and measures as well as personal vision statements.
- Grouped teams of experts in the disciplines of economics, biology, engineering, hydraulics, landscape architecture, geotechnical/soils engineering, planning, and recreation. These teams were able to apply their expertise, along with the information gathered from the public and other stakeholders during the LARRMP outreach efforts, to the focused charrette process.
The charrette workshop consisted of presentations about the history and condition of the River to the attendees. The problems occurring within the study area, the opportunities existing for restoration, identification of study objectives, planning constraints and considerations, and the methodology for evaluating and selecting the final restoration plan were all presented to attendees. Participants were also taken on a field trip through the focused study area.

Participants included representatives from USACE, the City of Los Angeles as the non-Federal Sponsor, the USFWS, LADPW, the California Coastal Conservancy and the Mountains Recreation and Conservation Authority, Audubon, California State Parks, the City of Glendale, non-governmental agencies such as FoLAR, The River Project, the Los Angeles and San Gabriel Rivers Watershed Council, (renamed the Council for Watershed Health), and other stakeholders and experts having interest and knowledge about the Los Angeles River. A total of 68 participants attended the workshop for one or more of the 3 days.

Once the participants were familiarized with the project, the goals, and the constraints, they were divided into teams and given the task of identifying a variety of restoration measures that fulfilled the goals of the project. Teams were asked to brainstorm restoration alternatives, to imagine what the sites would ideally look like in 50 years, and to collate their ideas. A matrix was ultimately prepared that encompassed each of the distinct restoration alternatives. A series of weightings and rankings were applied to the matrix to identify the alternatives that were most feasible. Pairwise weighting provided the first culling, as pairs of alternatives were compared and one was selected over the other. This allowed for a reduction in alternatives that weren’t substantially different from each other. Finally, the remaining alternatives were then ranked according to their completeness, effectiveness, efficiency, and acceptability.

Through this intensive charrette process, participants were able to accomplish the following:

- Identify study area problems related to ecosystem restoration.
- Validate study objectives to solve these problems.
- Aid in development of an alternatives matrix to meet ecosystem restoration objectives.
- Provide conceptual representation of alternatives on maps.

The highest ranked alternatives were then combined into groups of alternatives. This process provided the initial 19 alternatives utilized for plan formulation, as described above in Chapter 4. In March of 2012, the Corps and City met and held a workshop to discuss the array of alternatives. The final array of alternatives presented in this IFR was directly taken from the charrette process, and final selections were the result of the CHAP and CE/ICA process. The City and USACE also held Workshops on the LA River Study on focused topics:

- June 4, 2012: City Staff Workshop
- June 13, 2012: Public Stakeholder Workshop
- August 30, 2012: California High Speed Rail Coordination
- October 20, 2012: American Institute of Architects (AIA) and American Society of Landscape Architects (ASLA) Outreach Workshop and Charrette
- October 29-31, 2012: In-Progress Review I
- November 29, 2012: In-Progress Review II
- February 14, 2013: Briefing with Southern California Edison Staff
8.5 LOS ANGELES RIVER ECOSYSTEM RESTORATION FEASIBILITY STUDY AND INTEGRATED ENVIRONMENTAL IMPACT STATEMENT/REPORT

A Feasibility Scoping Meeting was held in November 2007. The Draft IFR was initially available to the public on September 13, 2013. Hard copies of the document and CD’s were placed at more than eight libraries and agency offices for the 45-day public review period held from September 20, 2014 to November 18, 2013. A public hearing was held October 17, 2013 from 5:30-7:30 p.m. in the Atrium of the Los Angeles River Center and Gardens, located adjacent to the project’s study area at 570 West Avenue 26, Los Angeles, CA 90065. Over 230 people attended the meeting, and over 500 individuals, agencies, elected officials and non-governmental organizations submitted comments, letters and petitions during the 45-day review period.

Other meetings and events were held by others during the 45-day review period, and are summarized below:
- LA River Revitalization Corporation’s “Let’s Talk River” Event: October 20, 2013

In addition, the City of Los Angeles and USACE visited Washington, D.C. for LA River Day on Capitol Hill to discuss the LA River Study and overall status October 28-29, 2013.

Comments from the public and agencies were received, evaluated, and responded to by the team. Appendix L documents comments and responses. During the public review period, the Corps received a total of 483 public review comment letters and emails, along with 8,494 signatures on multiple petitions in support of the ecosystem restoration project and specifically the Recommended Plan (Alternative 20).

Key commenters include three Federal agencies, U.S. Senator Boxer, three members of Congress, four California state legislators, six state agencies, 13 local agencies, five City councilmembers, 17 key stakeholders, eight neighborhood councils and numerous individuals. The nature of the comments ranged in technical comments and questions to general support of the overall project. Table 8-2 provides a summary of comments.

This Final IFR is being circulated to the public and agencies for a 30-day review period.
## Table 8-2 Public Comment Summary

<table>
<thead>
<tr>
<th>Comment Category</th>
<th>Public Comments Summary</th>
<th>Primary Commenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity</td>
<td>- Connectivity benefits (wildlife movement and hydrologic) not captured in habitat evaluation or CE/ICA analysis.</td>
<td>- Federal Agencies:</td>
</tr>
<tr>
<td></td>
<td>- Benefits of connectivity qualitatively described, not quantitatively captured</td>
<td>- USFWS</td>
</tr>
<tr>
<td></td>
<td>- Since they were not represented in CE/ICA analysis, connectivity benefits and importance were undervalued when ranking alternatives.</td>
<td>- USEPA</td>
</tr>
<tr>
<td></td>
<td>- Restoration in Alternatives 16 and 20 provide a restored direct hydrologic connection between LATC site and the river. Alternative 13 does not.</td>
<td>- DOI</td>
</tr>
<tr>
<td></td>
<td>- Lack of hydrologic connection between the river and LATC site does not allow for restoration of valuable fluvial processes and does not support wildlife movement to and from the large habitat node.</td>
<td>- State/Regional Agencies:</td>
</tr>
<tr>
<td></td>
<td>- Opportunity missed for inclusion of large habitat area in wildlife movement corridor.</td>
<td>- CA State Parks</td>
</tr>
<tr>
<td></td>
<td>- Decisions biased towards habitat acres, habitat units, and incremental costs; wildlife and hydrologic connectivity was not adequately considered in the decision making process.</td>
<td>- Santa Monica Mountains Conservancy</td>
</tr>
<tr>
<td></td>
<td>- Decisions failed to consider connectivity to other Federal agency conservation areas critical to wildlife movement (i.e. SMMNRA, NPS Rim of the Valley Study, County SEA Programs).</td>
<td>- Mountains Recreation and Conservation Authority</td>
</tr>
<tr>
<td></td>
<td>- especially critical for large carnivores (bobcats, coyotes, mountain lions)</td>
<td>- Stakeholders:</td>
</tr>
<tr>
<td></td>
<td>- evidence of use of movement corridors and current attempted use of the river</td>
<td>- Friends of the LA River</td>
</tr>
<tr>
<td>Other Incidental</td>
<td>- Water quality improvements</td>
<td>- LA River Revitalization Corporation</td>
</tr>
<tr>
<td>Environmental Benefits</td>
<td>- Increased groundwater recharge</td>
<td>- Sierra Club</td>
</tr>
<tr>
<td></td>
<td>- Value of habitat scarcity in urban setting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Value of restoring biodiversity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Air quality improvements</td>
<td></td>
</tr>
</tbody>
</table>

- Federal Agencies:  
  - USEPA  
  - DOI  

- State/Regional Agencies:  
  - CA State Parks  
  - Santa Monica Mountains Conservancy  
  - Mountains Recreation and Conservation Authority  

- Stakeholders:  
  - Friends of the LA River  
  - LA River Revitalization Corporation  
  - Sierra Club  
  - Trust for Public Land  
  - California Native Plant Society  
  - Arid Lands Institute  
  - National Wildlife Federation  
  - Audubon Society  
  - Arroyo Seco Foundation  
  - 6 Neighborhood Councils  

- Federal Agencies:  
  - USEPA  

- State/Regional Agencies:  
  - Regional Water Quality Control Board  
  - Santa Monica Mountains Conservancy  
  - Mountains Recreation and Conservation Authority  

- Stakeholders:  
  - Friends of the LA River  
  - Council for Watershed Health  
  - Sierra Club  
  - Heal the Bay  
  - Audubon Society
### Public Support
- Public comments, and comments from Federal, State and local agencies, and political bodies, were received.
  - 84% of individual public comments received expressed support of a large scale restoration project
  - 3 petitions totaling 8494 petition signatures supported the project
  - Remaining comments were technical in nature

### Collaborative Perspective
- Alternative 13 stops short of developing “Return on Investment” that captures benefits for all Federal partners that have stake in LAR restoration.
- Alternative 20 provides opportunities to achieve goals and support missions of other Federal, State, and local agencies.
- Impact LAR Restoration Project has on a full docket of federally-engaged or funded projects cannot be overstated.
- Project aligns the billions of dollars of Federal investment that has been and is being invested into other aspects of the LA River and River-community revitalization.

### Public Involvement and Collaboration
- Federal Elected Officials:
  - Senate Committee
  - Congress members Becerra, Roybal-Allard, Schiff, Bass
  - State Agencies:
    - Santa Monica Mountains Conservancy
  - State Elected Officials:
    - California State Assembly
    - State Senator de Leon
  - Federal Agencies:
    - USFWS
    - USEPA
    - DOI
    - Urban Waters Federal Partnership
  - Federal Elected Officials:
    - US Senate Committee on Environment and Public Works
    - Congress members Becerra, Roybal-Allard, Schiff, Bass
  - State/Regional Agencies:
    - Regional Water Quality Control Board
    - California State Parks
    - Mountains Recreation and Conservation Authority
  - Federal Elected Officials:
    - US Senate Committee on Environment and Public Works
    - Congress members Becerra, Roybal-Allard, Schiff, Bass
    - State Senator de Leon

- Local Elected Officials:
  - Mayor Garcetti
  - former Councilman Ed Reyes
  - Councilman Tom LaBonge
  - Councilman Mitch O’Farrell
  - City Council of Glendale
  - General Public

- Petitions

- State Elected Officials:
  - California State Assembly
  - Assembly Member Bloom
  - State Senator de Leon

- Local Agencies:
  - City of LA Dept of Planning
  - City of LA Bureau of Sanitation

- Local Elected Officials:
  - Mayor Garcetti
  - former Councilmember Ed Reyes
  - City Council of Glendale

- Stakeholders:
  - LA River Revitalization Corporation
  - Audubon Society
  - Arroyo Seco Foundation
### Reasonableness of Cost

- Additional outputs beyond what was in the CHAP (EQ, RED, OSE, NED)
- Study already reduced in scale to focus on a small segment of the river (32 miles reduced to 11 miles), therefore restoration is even more valuable.
- Options for more significant restoration within the study area (more concrete removal, plans including tunnels) were not carried forward to the Final Array.
- Location of the project
  - Restoration within the highly urbanized L.A. environment will be more costly due to higher real estate costs.
  - Restoration within this urban setting benefits not just the environment, but a very large and diverse population.

### Regional Economic Development

- One of the Principles & Guidelines 4 Accounts, which should be given consideration in plan selection.
- Includes regional income and employment benefits created by the project.
- Significantly greater regional economic development benefits for larger scale alternatives from:
  - Project Construction expenditures
  - Study Area redevelopment

- Federal Agencies:
  - Urban Waters Federal Partnership
- Federal Elected Officials:
  - Senate Committee
- State Agencies:
  - Santa Monica Mountains Conservancy
- State Elected Officials:
  - State Senator Pavley
- Stakeholders:
  - Council for Watershed Health
  - Friends of the LA River

- Federal Elected Officials:
  - Senate Committee
  - Congresswoman Roybal-Allard
- State Agency:
  - Santa Monica Mountains Conservancy
- State Elected Officials:
  - State Senator de Leon
- Local Agencies:
  - City of LA Economic & Workforce Development Department
- State Elected Officials:
  - Mayor Garcetti
  - former Councilman Ed Reyes
- Stakeholders:
  - The City Project
  - Council for Watershed Health
  - LA River Revitalization Corporation
### Other Social Effects/ Environmental Justice
- Other Social Effects are also one of the Principles & Guidelines 4 Accounts, which should be given consideration in plan selection.
- Project area has a large minority and lower income population.
- Larger scale alternatives will create greater benefits to this local population.
  - Public access to enjoy the restored environment.
  - Enhanced recreation opportunities.
  - Access to local jobs created by project construction and local redevelopment.
  - Enhanced local area aesthetics, public safety, public health benefits, and community cohesion.

### Recreation
- Recreation benefits are considered National Economic Development benefits – one of the Principles & Guidelines 4 Accounts, and should therefore be given consideration in plan selection.
- Larger scale restoration alternatives provide more locations and greater opportunities for development of compatible passive recreation features, as well as better connectivity to recreation features maintained by other agencies.
- Project Area has a large minority and lower income population, which has disproportionate lack of access to natural open space and recreation facilities.
- Recreation facilities also generate public health benefits.

### Federal Agencies:
- USFWS
- USEPA
- Federal Elected Officials:
  - Senate Committee
  - Congress members Becerra, Roybal-Allard, Schiff, Bass
- State/Regional Agencies:
  - CA State Parks
  - Santa Monica Mountains Conservancy
  - Mountains Recreation and Conservation Authority
- State Elected Officials:
  - State Senator de Leon

### Local Agencies:
- City of LA Economic & Workforce Development Dept.
- Elected Officials:
  - Councilman Mitch O’Farrell
- Stakeholders:
  - LA River Revitalization Corporation
  - Trust for Public Land
  - The City Project
  - Audubon Society
  - Arroyo Seco Foundation
  - Neighborhood Council

### Federal Agencies:
- USFWS
- DOI
- Urban Waters Federal Partnership
- Federal Elected Officials:
  - Congress members Becerra, Roybal-Allard, Schiff, Bass
- State/Regional Agencies:
  - Regional Water Quality Control Board
  - Santa Monica Mountains Conservancy
  - Mountains Recreation and Conservation Authority

### Local Agencies:
- LA Unified School District
- City of LA Economic & Workforce Development Dept.
- Local Elected Officials:
  - Councilman Mitch O’Farrell
- Stakeholders:
  - LA River Revitalization Corporation
  - Trust for Public Land
  - Audubon Society
  - Arroyo Seco Foundation
8.6 COLLABORATION AND OUTREACH EFFORTS

In addition to the public outreach described above, on behalf of the Study, the City and USACE engaged in numerous meetings to ensure ongoing dialogue with respect to the study.

The Study team was able to piggyback onto the City’s River Update Meetings (RUMs), which are public workshops to discuss the status of activities and implementation of features related to the LARRMP. At RUM workshops, City and USACE staff also provided progress reports and gathered public feedback on the Draft IFR. This has provided valuable input during the study’s plan formulation efforts.

Overall RUM topics include the following:

- The Los Angeles River Improvement Overlay District (Adopted by the City of Los Angeles on July 11, 2014)
- The North East Los Angeles Riverfront Collaborative and Vision Plan (2014)
- The Los Angeles River Memorandum of Understanding with the Los Angeles County Flood Control District, which establishes a joint City-County River Cooperation Committee (RCC), with the USACE at an advisory capacity (Executed in 2009); the RCC has met 11 times since 2009, and continues to hold regular public meetings (the first public meeting was held in 2011)
- The Los Angeles River Revitalization Corporation (Established in 2009)
- The Los Angeles River Foundation
- The status of River projects, grant applications, and achievements/awards

Since 2007, there have been a total of seven RUM meetings. The meetings are summarized online and include minutes and presentation materials for the following meeting dates:

- October 30, 2007
- April 30, 2008
- December 4, 2008
- July 28, 2009
- June 24, 2010
- February 10, 2011
- February 23, 2012
- October 17, 2013, (Joining RUM and Draft IFR Release Meeting)

The City of Los Angeles’ Bureau of Engineering also briefed its Board of Public Works and Elected Offices over the course of the development of the IFR:

- June 2012: Coordination with Mayor’s Office Staff and Study Briefing
- February 2013: Board of Public Works Study Briefing
- April 2013: Briefing to Mayor’s Office Staff on Alternatives
- April 2013: Briefing Call and LA River Policy Conference for Congressional Staff
- June 2013: Mayor’s Office attended the Alternative Formulation Briefing
- June 20, 2014: LA River Day, joint City-USACE public presentation to City Council

The Los Angeles River Watershed was one of seven pilot projects chosen in 2011 as part of the Urban Waters Federal Partnership (UWFP). As part of this effort, the City and USACE attended regular conferences and meetings to discuss how to work together and coordinate resources to help aid in the River revitalization effort. Specific meetings were held on the following dates:

- October 22, 2012: UWFP Briefing held in Washington, D.C.
USACE and City staff also participated in LA River stewardship opportunities, specifically the Friends of the Los Angeles Rivers’ Annual River Clean-up, La Gran Limpieza, which celebrated its 25th year in 2014. This annual River event fosters stewardship among Corps and City staff that work on the River and the general public, who are all working together towards the same task of removing trash and beautifying the River.

USACE staff have attended and presented at several conferences over the past seven years, to both local and international groups, elected bodies, and academia, focusing their discussion on the LA River Ecosystem Restoration Feasibility Study.

8.7 AGENCY AND STAKEHOLDER COLLABORATION

Information regarding agency and stakeholder involvement, including any permitting completed, agreements reached, and restrictions that will apply during construction and/or operation, are included in this IFR.

The Corps and City consulted with the California State Historic Preservation Officer (SHPO) by telephone in June of 2013 regarding the level of effort for the EIS. The SHPO is satisfied with the use of existing information and a records and literature search to compare alternatives for the purposes of the EIS. The SHPO was provided an opportunity to review the Draft IFR including EIS, but did not provide comments. The Corps and SHPO determined that some cultural resource identification efforts and assessment of project effects will occur during the next phase of the study. The Corps, in consultation with the SHPO, has developed a Programmatic Agreement (PA) which lays out how the Corps will satisfy its requirements under Section 106 of the National Historic Preservation Act. The following agencies and groups have been invited to be concurring parties to the agreement: the City of Los Angeles, the California Department of Parks and Recreation, the Gabrieleno Band of Mission Indians, Fernandeno Tataviam Band of Mission Indians, Gabrieleno Tongva Indians of California, Gabrielino –Tonga Tribe, Gabrielino Tongva Nation, Los Angeles City and County Native American Indian Commission, Ti’At Society/Inter-Tribal Council of Pima, and San Gabriel Band of Mission Indians.

The Corps and City are also coordinating with California State Parks due to land ownership and potential interests in the project area. The Corps met with California State Parks in August of 2014, to discuss the project and upcoming coordination efforts. The City is working with State Parks to secure real estate rights and interests needed to construct, operate and maintain restoration features on State Parks-owned land.

The Los Angeles District Ecosystem Planning Section has been coordinating with the USFWS regarding the Los Angeles River Ecosystem Restoration Study since the Planning Charettes that took place in December 2009. USFWS attended the Charettes and provided input on project measures through that forum. USFWS also contributed to the weighting of objectives during the early Plan Formulation process by providing input to an objectives comparison matrix. USFWS participated on the CHAP (Combined Habitat Assessment Protocols) Habitat Evaluation Team that took place in January 2010. The Habitat Team meetings solicited input on existing conditions, future without project conditions, and project alternatives. The input provided focused on existing species and habitat value, factors that degrade habitat value on the River, the viability of the measures and alternatives, and the habitat value that would be derived from these measures and alternatives. The Corps presented the preliminary final array of alternatives to resource agency contacts in September 2012.
The Corps further coordinated with USFWS during development of the Coordination Act Report (CAR) under the Fish and Wildlife Coordination Act (FWCA) from November 2013 to January 2015. The Corps met with USFWS regarding the CAR recommendations on September 29, 2014 and on October 30, 2014. Through this coordination on the CAR recommendations, the Corps committed to continued coordination with USFWS during the detailed design phase of the project. The Corps received the revised Final CAR in January 2015 and has responded to its recommendations in this Final IFR in Appendix N. A summary of the recommendations and responses is in Section 8.7.1.

The Corps will continue to work with USFWS as well as other resource agencies and wildlife experts during PED to refine project designs and incorporate the specificity needed to achieve restoration goals and including connectivity in the context of the project’s complex constraints.

The Corps will develop detailed designs for the widened reaches (i.e. Verdugo Wash, Taylor Yard, LATC) during PED that consider the USFWS CAR recommendations, to ensure that restoration design in widened reaches mimics a more natural hydrologic regime and fluvial processes to the extent possible, allowing for channel migration and reworking of restored widened areas following flood events, while not compromising flood risk management. Additional H&H (hydrology and hydraulics) modeling will be conducted during the detailed design phase to inform design refinements that will provide for natural hydrologic functioning as well as ensuring flood damage reduction. The Corps will work with USFWS to ensure that restored widened areas achieve the maximum level of ecological function, focusing on passive restoration, proper hydrologic regime, and a more natural geomorphic character. The Corps is committed to restoring the maximum ecological function and reducing stressors while meeting flood conveyance requirements.

The Corps will continue coordination with USFWS to identify restoration methodologies that may be appropriate in specific locations or circumstances, and specific habitat elements that may be required in restored areas to support target species, such as native fish (Santa Ana sucker, arroyo chub). Detailed designs will provide more specificity in terms of habitat, ecological, and hydrologic features to be created and restored based on the necessary habitat components for such recommended target species.

The Corps will continue to coordinate with USFWS during the development of detailed designs (PED) to ensure that the passive recreation features are compatible with restoration. The Corps will ensure that recreational use is compatible with the more in depth design of restoration features.

The Corps will continue to review conditions to determine if endangered species may be present, and coordinate or consult with USFWS as necessary through the design and construction of each project phase/feature. Endangered species surveys will be conducted during the detailed design phase and in the nesting season(s) immediately prior to construction within any potentially suitable areas to confirm presence or absence of federally and state listed threatened and endangered species. The Corps will continue to coordinate with the USFWS throughout the design and construction period, and consult under ESA if conditions change such that the Corps determines the project may affect the vireo or other listed species.

The Corps also received feedback and responded to comments from transportation agencies that have facilities in the Study’s project area. The Corps will continue to address any agency concerns throughout the detailed design and construction phase to ensure that impacts to their operations are minimized before and after the project is complete.
8.7.1 **CAR Recommendations and Responses Summary**

The following highlights key points from the CAR recommendations provided by the USFWS under the FWCA, as well as key points from the Corps’ response to these recommendations. The complete responses to the CAR recommendations are included in Appendix N.

**RECOMMENDATIONS SUMMARY**

- We generally suggest that the designs for proposed Project be developed with a stronger focus on principles of restoration of stream natural communities and processes.
- We expect that full or partial restoration also includes a self-sustaining component as essential to the definition of restoration, even in highly constrained project areas.
- We continue to stress the essential long-term importance of at least partial recovery of self-sustaining ecological functions for restoration projects. For example, this would mean evaluating whether proposed native vegetation in some planting areas would not only survive in the long-term without permanent irrigation, but would it also effectively reproduce and replace itself (or naturally succeed) both over time and following expected disturbances such as periodic flooding events.
- In part, the current proposed Project designs (all alternatives) appear substantially compromised by proposed recreational and aesthetic features, often at the expense of otherwise practicable ecological restoration potential.
- The current designs in many locations are also heavily compromised by the lack of channel widening; this is understandable given the consistent need to maintain channel flood flow capacity and the surrounding constraints.

**RESPONSE TO SUMMARY:**

- As the USFWS has noted, channel widening throughout all project reaches in order to restore ecological functions is constrained by the need to maintain the flow capacity requirements of the existing flood damage reduction project.
- The project restores native vegetation, wildlife habitat, and ecosystem functions within each reach at varying levels. Wherever possible with available lands, river widening has been included as a project measure to maximize restoration of natural hydrologic functions and support self-sustaining ecologic functions. Other areas rely on surface flows to support native vegetation on the overbank.
- Opportunities for additional connectivity have been identified in Reaches 1, 3, and 7. The Corps has committed to further evaluate these areas in the design phase, in partnership with USFWS, to ensure that opportunities for wildlife movement are provided throughout the project area.
- The proposed project would restore self-sustaining riverine and riparian functions in widened areas and provide opportunities for both aquatic and terrestrial wildlife foraging, shelter, and movement between widened areas in order to meet the Corps’ criteria for ecosystem restoration.
- The Corps disagrees that the project is compromised by recreational and aesthetic features. As required by Corps policy, the project’s Recreation Plan was developed after restoration features were planned and is designed to be compatible with restoration features.
RECOMMENDATION 1

- We promote the restoration and enhancement of fully functioning and self-sustaining ecosystems, where and to the extent practicable.
- The proposed Project has good basic goals and objectives in relation to general fish and wildlife resources, though they (combined with the Project description and figures) are currently too vague for us to assess the fundamental ecological functions and values of restoration and enhancement that would be implemented.
- Pursuant to the current Project goals and objectives (to the extent practicable), we suggest the Project designs be modified to more clearly focus on restoration of substantially more natural function of riverine and riparian natural communities in the Project, including designing in greater channel/aquatic and riparian area complexity and utilizing natural community compositions and substrates that support higher sensitive taxa richness. The current proposed designs and descriptions for restoration areas read more like landscaping plans than restoration plans.

RESPONSE 1:

- The objectives as currently defined are appropriate and reflective of the naturally occurring habitat that the project is proposing to achieve. Objectives are described in Section 4.2 of the IFR, with measurable objectives criteria outlined in Section 4.2.2. The final array of alternatives meets these objectives’ criteria based on Corps standards as described in Section 6.2, Tables 6-2 and 6-3.
- In the design phase, the next phase in the process, the Corps will elaborate on the current conceptual plans and further delineate the complexities of the proposed habitats.
- The Corps has proposed full functioning ecological restoration wherever it can be achieved, which because of the urban context of the study area, occurs primarily in widened areas of the river where properties containing historic floodplain adjacent to the river can be acquired. In planning these features, the Corps strived to use any available lands within and outside the river to provide opportunities for restoration of a more natural hydrologic regime that will support complex, self-sustaining native southern California river habitat.
- Reference sites to be considered for detailed design, particularly for design of habitat for Santa Ana sucker and least Bell’s vireo, may include portions of the Santa Ana River which currently supports target habitats and populations of both species.
- The plans provided are at a conceptual level and contain planting plans and habitat configurations for the purposes of restoration; the plans are not appropriate for nor do they contain the specificity of landscape plans.
- The plans provided in the report are indicative of the planting to be implemented initially; however, over time, storm events will bring seed material from upstream, actively planted vegetation will establish a new seed bank in the soil, the restored natural hydrologic regime will develop dynamic braided channels will form, and areas denuded through scour or other disturbance are expected to naturally re-establish. Once these processes are reestablished, O&M consisting mainly of invasives removal can be implemented as necessary to support passive restoration in widened areas.
- Information regarding acreages of habitats created is provided in Table 6-7 of the IFR. Chapter 7 of the IFR describes the Recommended Plan and NER Plan in terms of features restored by reach.
RECOMMENDATION 2

- We recommend Alternative 20, with modifications (as noted below). Alternative 20 has the highest potential of the proposed alternatives to restore considerable ecological functions of the River. In order to perform any substantial riverine and riparian restoration or enhancement on the River (and maintain current flood flow capacities for flood risk management), the right-of-way (ROW) and floodplain currently utilized by the River will need to be re-widened in considerable River reaches (as noted in the 2013 EIS/EIR). Truly effective ecological restoration of the River (partial restoration) can only occur in areas of widened River ROW.

- We recommend substantive modification of any approved Project alternative to increase the focus of proposed Project resources on practicable levels of restoration of River hydrology and geomorphology. We expect that the current proposed designs (all proposed alternatives), if implemented, would result in improvements, but relatively small native fish and wildlife resource net gains and overall low ecological integrity and function for these species within Project restoration and enhancement areas, due to very important remaining stressors.

- We suggest that riverine and riparian ecological (partial) restoration be more clearly the primary goal within the specific River reaches to be widened. For instance, most widened floodplain areas should be designed for riparian scrub-woodland-forest communities relatively similar to those that existed historically in the Project reaches, including providing for cyclical and episodic succession of riparian natural community age classes over time following denudation events (floods).

- Restoration of widened floodplain areas should also be designed with the expectation of some channel form changes over time.

RESPONSE 2:

- Alternative 20 is the Locally Preferred Plan (LPP) and the Corps’ recommended plan. The Corps agrees that it has the potential to restore considerable ecological functions of the River.

- As outlined in the feasibility study, aquatic ecosystem restoration is the primary goal and the driver for development of all alternatives.

- The Corps has proposed full functioning ecological restoration wherever it can be achieved, which because of the urban context of the study area, occurs primarily in widened areas of the river where properties containing historic floodplain adjacent to the river can be acquired.

- The Corps strived to use any available lands within and outside the river to provide opportunities for effective restoration of a more natural hydrologic regime that will support complex, self-sustaining native southern California river habitat while maintaining the necessary flood protection.

- The Corps’ intent is that the stressors described will be addressed in widened areas, where increased flood capacity will allow for varied substrates and a more natural hydrologic regime, high vegetative cover and structural diversity of historically occurring riparian communities, and very limited and well-buried hard structures.

- In widened areas, it is expected that the active channel will migrate and change form and that sediments will be redistributed with storm events. Vegetation is expected to be denuded with natural episodic higher flows and velocities, and be re-established naturally.

- Given the constraints of this highly urbanized system, all stressors may not be entirely removed from the restored areas of the channel; however, high ecological
function and integrity sufficient to support these objectives can be achieved.

- Alternative 20 will provide large restored widened areas (such as Verdugo Wash, Taylor Yard, and the LATC site) to serve as riparian habitat patches with a more natural hydrologic regime. Vegetation and habitat elements in these widened areas will be restored with the goal to support a large number of territories for various riparian obligate birds, including least Bell’s vireo, yellow warbler, and yellow-breasted chat, stop over habitat for migrants, as well as habitat and refugia for amphibians, reptiles, and mammals, including larger carnivores such as coyote and possibly bobcat. River channels in widened areas will be designed to support habitat for Santa Ana sucker and arroyo chub.

- The Corps will develop detailed designs for the widened reaches during the PED phase that will carefully evaluate and consider USFWS recommendations. The Corps will continue to coordinate with USFWS during the PED phase and development of detailed designs to ensure that restoration in widened reaches achieves the maximum level of ecological function, focusing on passive restoration, a more natural hydrologic regime, and more natural geomorphic character. The Corps is committed to restoring the maximum ecological function while meeting flood conveyance requirements.

RECOMMENDATION 3

- Project recreation/access features involving hard structures should be limited to the outside periphery of widened/restored River stretches.

- The proposed construction of instream and floodplain hard structures that are out of context with naturally functioning systems (e.g., retaining walls, curbs, formal paved or heavily compacted or surfaced paths, boardwalks, grade control structures, etc.) should be minimized within restored areas in widened reaches (Kauffm an et al. 1993).

RESPONSE 3:

- Recreation features are proposed for passive activities such as hiking, walking, and wildlife viewing where they will not conflict with the restored habitat. Widened areas supporting restoration of a more natural hydrologic regime such as Taylor Yard and LATC will support a limited length of dirt/gravel trails that will not impede hydrologic and ecologic functioning. Hard structures such as restrooms and parking lots will be limited to the outside edges of widened areas.

- The Recreation Analysis in Appendix B (Economics) of the IFR showed a restroom located in the middle of the LATC site. This restroom has been moved to the edge of the site in the Final IFR to be consistent with Corps policy. Section 4.16, Recreation Plan, of the IFR also has been revised to further emphasize that recreation features are designed after restoration features are planned, and per Corps policy must be compatible with the restoration function.

RECOMMENDATION 4

- We suggest that the potential ecological interactions between the riparian and aquatic ecosystems be reflected more fully in the Project restoration and flood damage reduction features proposed. We suggest minimization of instream flow-control hard structures and unburied hard stream bank slope protection in widened reaches, particularly along the riverine-
The hydrology designs for widened River reaches to be restored (such as Taylor Yard and Piggyback Yard) should accommodate, to the maximum extent practicable, the dynamic and episodic nature of surface low and high River flows and the fluvial processes that were natural to the River.

Restoration designs should reflect and emulate the fact that the natural River channel and riparian zones were (historically) dynamic both spatially and temporally, and that episodic denudation flood flows are natural and necessary to riparian integrity (e.g., cycling of seral stages) in the Study Area.

We suggest that the current proposed Project designs (even though an improvement over existing conditions) would retain many of the existing rather simplified (“naturalistic”) features of the River in widened/restored areas.

In areas where the River would be substantially widened, we suggest that Project designs should not intend to fully “lock” the low-flow channel in one place, but instead should allow for some limited amount of channel migration over time.

Restored floodplain terrace ground surfaces should be well within the distances to groundwater that can be utilized naturally by the expected native riparian vegetation.

**RESPONSE 4:**

- We agree that the widened areas should be designed to support high levels of heterogeneity, and the existing plan provides for that. The active channel will be allowed to migrate and change form, and terraces and sediments will be redistributed with storm events. Initial grading during construction of widened areas will create diverse topography. The dynamic and episodic nature of the River flows will be accommodated in these areas, allowing the River to carve new channel configurations over time, creating the complexities of a natural river system. The Final IFR document includes these clarifications regarding provisions for natural hydrologic functioning.

- The Corps will continue to coordinate with USFWS during the development of detailed designs to ensure that restoration in widened reaches mimics a natural hydrologic regime and fluvial processes to the extent possible, allowing for channel migration and reworking of restored widened areas following flood events, while not compromising existing levels of flood protection. Flood damage reduction features are not proposed as part of this project.

**RECOMMENDATION 5**

- Within the Project portions of the River that would not be widened by the proposed Project, we suggest that ecological enhancement, native landscaping, recreation, buffer, and/or stream water shading be the stated goals for and focus of Project activities in most of these areas. While providing some ecological improvement, we suggest that these features be treated as ecological enhancement because the substantial constraints in these reaches preclude self-sustaining full or partial restoration of most of the important riverine or riparian ecological functions of the River.

**RESPONSE 5:**

- The project provides native vegetation, wildlife habitat, and ecosystem functions
within each reach at varying levels, within existing constraints. Each project
feature is designed for restoration benefit. The Corps recognizes that in some cases
the possible features are highly constrained by the need to maintain flood
conveyance or to work within existing major infrastructure constraints such as
freeways, railroad, and residential uses.

- The proposed project maximizes ecological restoration where it can be achieved,
  primarily in widened areas of the river where floodplain property adjacent to the
  river can be acquired. In other portions of the project area, the Corps has planned
  for construction of features that would improve value for wildlife in the vicinity
  and for connectivity between restored widened areas.
- The Corps disagrees that individual project features should be parsed out as
  restoration versus enhancement. While the definition of “restoration” as provided
  by USFWS is not achievable in every portion of the project area, the project as a
  whole meets the Corps’ criteria for ecosystem restoration, in that all features
  collectively contribute to habitat and connectivity restoration and improvement
  throughout the project area.

**RECOMMENDATION 6**

- We suggest that the Project ecological guidelines and designs for restoration be based on
typical restoration ecology science and terminology, and less on landscape architecture science
and terminology.
- Baseline and post-Project implementation surveys/assessments for fish, amphibians, reptiles,
  and the associated parameters of potential habitats for target species should be performed in the
  Study Area.
- Water quality parameters of specific Project reaches should be evaluated and mapped as part of
  Project planning and implementation.
- Survey information should be used to inform basic Project design development (e.g., to provide
  functional habitats for specific native fish and aquatic wildlife species), as well as post-
  construction adaptive management decisions, and future restoration projects in the watershed.

**RESPONSE 6:**

- The Corps ecosystem restoration guidance and policy followed by this study is
  grounded in restoration science and terminology; recreation features are designed
  after restoration plans are in place, are designed to be compatible with restoration
  plans, and utilize standard landscape architecture principles.
- The MAMP included in Appendix H of the Final IFR includes restoration
  monitoring to evaluate the performance of restoration actions. As described in
  Section 5.5.4 of the Final IFR, pre-construction surveys would be performed for
  at least Bell’s vireo and for special status plant and wildlife species, and the Corps
  would continue to coordinate with the USFWS throughout the project design and
  construction period.
- Monitoring includes an inventory of wildlife species based on observations of
  wildlife and signs of usage, mapping of habitat, as well as inventory of habitat
  elements present within the project footprint.
- Monitoring of riparian, marsh, and fish habitat is outlined in the MAMP, which
  evaluates various habitat parameters. The water quality parameters suggested in
this recommendation will be monitored as part of the MAMP.

- Non-native plant species will also be removed as part of construction and managed as part of operation and maintenance of the project.

RECOMMENDATION 7

- The Project ecological restoration designs should provide higher priority to creating the natural parameters and conditions needed for the restoration of at least one specific native fish species, to the extent practicable, so as to both support their basic survival and to give them competitive advantages over exotic species that would likely continue to occupy the Study Area following Project implementation.

RESPONSE 7:

- The design drawings at the feasibility level are conceptual and will be revised and refined during the detailed design stage to include the necessary parameters that would support native fish habitat in widened areas and in overbank areas during the detailed design phase. In concrete reaches, where features are more limited by maintenance of flood capacity, designs will focus on providing refugia and passage.
- Designs will focus on providing the hydrologic regime, substrates, and habitat elements required by arroyo chub and Santa Ana sucker.

RECOMMENDATION 8

- Considering the heavy constraints of the Study Area, some excellent opportunities exist for artificial enhancement measures, particularly where restoration is not practicable.
- Additionally, these types of features (e.g., large hollow snags, tall steep river banks) are not likely to otherwise develop in the short-term or over time in significant number/area within the Study Area due to the limited floodplain widths and modified hydrology in even the widest proposed restoration sites of the Project. The directed artificial measures suggested below would likely be substantially and quickly utilized by some uncommon or sensitive bird and bat species and could provide very attractive and important watchable wildlife opportunities along the River for residents and visitors.

RESPONSE 8:

- Installation of artificial habitat features as recommended could be considered in the detailed design stage in coordination with USFWS, as practicable in relation to meeting project objectives.

RECOMMENDATION 9

- If brown-headed cowbird parasitism levels are still likely to be problematic for sensitive birds potentially occurring within the Project area, then management of cowbird numbers should be performed by the Project for the life of the Project.

RESPONSE 9:
o General wildlife surveys are included as part of monitoring in the Monitoring and
Adaptive Management Plan. If surveys document a large population of cowbirds
in the project area and the presence of vireo, the Corps would inform the Adaptive
Management Team member agencies, one or more of which may implement a
program for removal separate from this project or identify an entity interested in
doing so. If a removal program were to be proposed, the Corps and non-Federal
sponsor would coordinate with the proponent and the agencies with jurisdiction
over such removals to ensure compatibility of the program with the restoration
project, including project operation and maintenance.

**RECOMMENDATION 10**

- We suggest that riparian and riverine native fish restoration designs within the Project’s
  widened reaches include specific measures (where practicable) for development of: a) water
  shaded by riparian woody vegetation; b) sediment and leaf-fall inputs to aquatic areas; c)
  channels with steep native-soil stream banks and in-channel woody debris; d) substantial
  channel diversity including riffle-run-pool-glide sequences, point bars; e) back channel
  refugia that utilizes upwelling groundwater (low temperature water of higher quality) and
  provides protected waters during larger flood flow events; f) appropriate channel substrates,
  including sand, gravel and cobble; g) potential for some channel movement/meander over
time in widened channel areas; h) minimal areas of wide ponded or open water; i) riparian
  hiding cover for native fish (e.g., herbaceous plants and woody shrubs providing overhanging
  vegetation on stream banks for hiding cover); and j) target fish species passage and
  appropriate water temperatures and oxygenation levels, including shading of water surfaces
  through native tree landscaping on the south side of non-widened channel reaches, where
  practicable and appropriate.
- Periodic artificial substrate import (e.g., sand and gravel) into the upper end of the Study Area
during the Project life will likely be necessary to maintain some important fluvial processes
and conditions for native fish through the Study Area.
- The Project should initiate an aquatic exotic species control program for the Study Area.

**RESPONSE 10:**

- Detailed designs will focus on providing the hydrologic regime, substrates, and
  vegetation required by arroyo chub and Santa Ana sucker. Detailed designs will
  also consider the incorporation of opportunities for aquatic and terrestrial
  passage in hard bottom reaches.
- Sediment import is included as a potential adaptive management action in the
  Monitoring and Adaptive Management Plan.
- Removal of non-native fish could be implemented by resource agencies or other
  interested entities separate from this project. If a removal program were to be
  proposed, the Corps and non-Federal sponsor would coordinate with the
  proponent and the resource agencies with jurisdiction over such removals to
  ensure compatibility of the program with the restoration project, including project
  operation and maintenance.

**RECOMMENDATION 11**

- Feral mammal populations should be controlled in Project restoration areas, as practicable and
  appropriate.
RECOMMENDATION 12

- Project designs and objectives should include greater specificity regarding minimum levels of ecological functions and values to be created or enhanced.
- We suggest the use of appropriate umbrella species to help briefly outline/translate minimum ecological functions to be restored in meaningful ways, and for planning, design, and implementation purposes.
- As such, we suggest that the Project include restoration of specified minimum acreages of functional habitats in the long-term for typical restoration planning species for southern California riparian areas, including vireo, chat, and yellow warbler.

RESPONSE 12:

- The objectives as currently defined are appropriate and reflective of the naturally occurring habitat that the project restoration is proposing to achieve. Objectives are described in Section 4.2 of the IFR, with measurable objectives criteria outlined in Section 4.2.2. The final array of alternatives meet these objectives criteria based on Corps standards as described in Section 6.2, Tables 6-1 and 6-2.
- Detailed designs will provide more specificity in terms of habitat, ecological, and hydrologic features to be created and restored based on the necessary habitat components for such recommended target species.

RECOMMENDATION 13

- Any federally listed species occupying the Project footprint should be the subject of consultation under the Endangered Species Act, as appropriate. An unknown number of vireo likely occupy the Project direct activity footprint and would likely be positively affected by the beneficial aspects of the Project and temporarily adversely affected (through loss of habitat and function) by the action’s construction activity of riparian vegetation clearing within seasonally occupied habitat in the River. As such, the action would likely warrant consultation. Appropriate surveys should be performed to determine occupation and usage areas.

RESPONSE 13:

- Section 5.5.1 of the IFR outlines that Section 7 of the ESA requires consultation with USFWS if the project would affect listed species. As documented in Section
10.1 of the IFR, the Corps determined that the proposed project would have no
effect on federally listed threatened or endangered species.

- The recommended plan will avoid impacts to least Bell’s vireo. Least Bell’s vireo are
  not expected to be present in the study area and are not known to nest in the study area
due to the marginal existing habitat.
- Protocol level surveys for least Bell’s vireo would be performed during the detailed
design phase and in the nesting season(s) immediately prior to construction of each
feature within any potentially suitable areas to confirm presence or absence of this
species within the study area. The Corps will continue to coordinate with the U.S. Fish
and Wildlife Service and the California Department of Wildlife throughout the design
and construction period, and would consult under the Endangered Species Act if
conditions change such that the Corps determines the project may affect the vireo or
other listed species.
- No other special status species, including the southwestern willow flycatcher and
  coastal California gnatcatcher, are expected to occur due to the degraded conditions
within the study area and lack of suitable habitat.
- The Corps will continue to coordinate with the U.S. Fish and Wildlife Service and the
  California Department of Wildlife throughout the design and construction period.

**RECOMMENDATION 14**

- A table describing the various acreages of all of the existing conditions in the Project
alternatives’ direct activity footprints should be developed.

**RESPONSE 14:**

- Information regarding acreages of habitats created is provided in Table 6-7 of the
IFR. Chapter 7 of the IFR describes the Recommended Plan and NER Plan in
terms of features restored by reach. The Corps will continue to provide detailed
restoration and habitat information during the PED (Pre-Construction Engineering
& Design) phase as coordination with USFWS on detailed project features
continues.
9 REMAINING REVIEWS, APPROVALS, IMPLEMENTATION, AND SCHEDULE

Section 7.5.12 describes the remaining reviews and approvals required for this report. The following major milestones are currently scheduled.

- Major Subordinate Command (MSC) Commander Endorsement May 2015
- Civil Works Review Board (CWRB) July 2015
- Final Report State and Agency Review September-October 2015
- Chief of Engineers Report December 2015
- CEQA Notice of Determination January 2016
- Record of Decision March 2016
- Assistant Secretary of the Army for Civil Works (ASA (CW)) June 2016

9.1 PROJECT PARTNERSHIP AGREEMENT

Prior to advertisement for the construction contract, a Project Partnership Agreement (PPA) will be required to be signed by and between the Federal Government and the City of Los Angeles, requiring formal assurances of local cooperation from the City. This agreement will be prepared and negotiated during the PED (Plans and Specifications) Phase.

9.2 APPROVAL AND IMPLEMENTATION

The necessary reviews and activities leading to approval and implementation of the recommended plan are listed below:

a. Environmental Impact Statement Filing – the IFR, including Feasibility Report, FEIS/EIR, and appendices, along with the proposed report of the Chief of Engineers, will be circulated to state and Federal agencies as directed by HQUSACE for the 30-Day State and Agency review. The District will concurrently distribute the IFR to parties not included on the HQUSACE mailing list and file the IFR together with the proposed report of the Chief of Engineers with the EPA.

b. Chief of Engineers’ Approval – the Chief of Engineers will sign the report signifying approval of the project recommendation and will submit the Chief of Engineers’ Report, the IFR, and the unsigned ROD to the ASA(CW).

c. ASA(CW) Approval – The ASA(CW) will review the documents to determine the level of Administration support for the Chief of Engineers’ recommendation. The ASA(CW) will formally submit the report to the Office of Management and Budget (OMB). OMB will review the recommendation to determine its relationship to the program of the President. OMB may clear the release of the Chief of Engineers’ report to Congress.

d. The Recommended Plan requires congressional authorization for project construction.

e. Funds could be provided, when appropriated in the budget, for preconstruction, engineering and design (PED), upon the Division Commander’s endorsement of the District Engineer’s report and submittal to HQUSACE announcing the completion of the final report and pending project authorization for construction.

f. Surveys, model studies, and detailed engineering and design for PED studies will be accomplished first, and then plans and specifications will be completed, upon receipt of funds.

g. Construction would be performed with Federal and non-Federal funds in accordance with the PPA.
10 ENVIRONMENTAL COMPLIANCE

The status of the project’s compliance with applicable Federal, State, and local environmental requirements is summarized below. Prior to initiation of construction, the project will be in compliance with all applicable laws, regulations, and Executive Orders.

10.1 FEDERAL LAWS, REGULATIONS, AND POLICIES

10.1.1 Clean Air Act of 1972, as amended (42 U.S.C. 7401, et seq.)

Section 5.2 and Appendix F of this IFR characterize the estimated air emissions associated with all action alternatives for both construction and operations. As fully documented in Appendix F, the estimated emissions for all action alternatives would not require a General Conformity Determination under the Clean Air Act. The project is in compliance with the Clean Air Act.


The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.4. Those sections of the CWA most relevant to this project are described as follows:

Section 401 requires compliance with water quality standards. The Corps has applied to the Los Angeles RWQCB for Section 401 certification, pursuant to 33 CFR 336.1(a)(1). The Corps will continue to coordinate with the RWQCB throughout the remaining study, design and construction phases of this project. This IFR contains sufficient information regarding water quality effects, including consideration of the Section 404(b)(1) Guidelines, to meet the EIS content requirements of Section 404(r), should that exemption be invoked.

Section 404 addresses discharges of dredged or fill material to waters of the United States. The Corps does not issue itself permits for Corps Civil Works projects but must comply with the 404(b)(1) guidelines. A Section 404(b)(1) evaluation has been prepared and is found in Appendix M. With implementation of the avoidance and minimization measures listed therein, the proposed discharges of fill will be in compliance with Section 404 of the Clean Water Act.


A list of threatened and endangered species that have the potential to occur in the study area was obtained from USFWS on April 29, 2012. Based on the analysis contained in this document, including Section 5.5.3, the Corps has determined that the project would have no effect on Federally listed threatened or endangered species, and therefore no consultation is required with USFWS or NMFS at this time. The project is in compliance with the Endangered Species Act.

Endangered species surveys will be conducted during the detailed design phase and in the nesting season(s) immediately prior to construction of each feature within any potentially suitable areas to confirm presence or absence of federally and state listed threatened and endangered species. The Corps will continue to coordinate with the USFWS throughout the design and construction period, and consult under ESA if future surveys conducted during PED or construction indicate that conditions have changed such that the Corps determines that listed species may be affected.

10.1.4 Executive Order 11988, Floodplain Management

The objective of this Executive Order is the avoidance, to the extent possible, of long-and short-term adverse effects associated with the occupancy and modification of the base floodplain (1 in 100 annual
event) and the avoidance of direct and indirect support of development in the base floodplain wherever there is a practicable alternative. Under the Order, the Corps is required to provide leadership and take action to:

a. Avoid development in the base flood plain unless it is the only practicable alternative;
b. Reduce the hazard and risk associated with floods;
c. Minimize the impact of floods on human safety, health and welfare; and
d. Restore and preserve the natural and beneficial values of the base flood plain.

The proposed project does not contribute to increased development in the floodplain and does not increase flood risk, but rather it restores “natural and beneficial values” and thus is in compliance with the executive order.

The Water Resources Council Floodplain Management Guidelines for implementation of EO 11988, as referenced in USACE ER 1165-2-26, require an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. The eight steps reflect the decision-making process required in Section 2(a) of the EO. The eight steps and project-specific responses to them are summarized below.

1. Determine if a proposed action is in the base floodplain (that area which has a one percent or greater chance of flooding in any given year). The proposed action is located within the Los Angeles River channel and immediate overbank areas and therefore is partially within the base floodplain.

2. If the action is in the base flood plain, identify and evaluate practicable alternatives to the action or to location of the action in the base flood plain. Chapter 4 of this document presents an analysis of alternatives. Practicable measures and alternatives were formulated, and potential impacts and benefits were evaluated in Chapter 5. As the primary objective of the project is aquatic ecosystem restoration, there are no practicable alternatives completely outside of the base floodplain that would achieve this objective.

3. If the action must be in the flood plain, advise the general public in the affected area and obtain their views and comments. Because the primary objective of the project is aquatic ecosystem restoration, the action must be in the flood plain. The proposed project has been fully coordinated with the general public, governmental agencies, organizations and interested stakeholders. As described in Chapter 8 of this document, public outreach on restoration concepts began in 2005 with a series of workshops aimed at soliciting input for the Los Angeles River Revitalization Master Plan. A three-day planning charrette was held in December of 2009 to introduce the Los Angeles River Restoration study and solicit feedback on the study area’s problems and opportunities, objectives to address them, and measures that could be used to meet the objectives. Participants included staff from the USACE, County, City, resource and municipal agencies, and non-governmental organizations, as well as local community members and consultants. The Draft IFR was released in September 2013, posted by EPA in the Federal Register on October 4, 2013, and a public meeting was held on October 17, 2013. Numerous comments were received on the Draft IFR, which have been included and responded to in this Final IFR (see Appendix L). In addition, a Coordination Act Report was received from the USFWS and is included in Appendix N, along with the Corps’ responses to their recommendations.

4. Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial flood plain values. Where actions proposed to be located outside the base flood plain but will affect the base flood plain, impacts resulting from these actions should also be identified. The anticipated impacts associated with the Recommended Plan are summarized in Chapters 5, 6 and 7 of this report. While construction of project features would result in mostly minor and temporary adverse impacts to the natural environment, the proposed restoration would result in a substantial and long-term increase in
habitat values, including an increase in the quantity and quality of riparian and aquatic habitat. The project will also result in a widening or expansion of the existing floodplain within the project footprint in certain reaches, restoring natural and beneficial floodplain functions which had been lost to development.

5. If the action is likely to induce development in the base flood plain, determine if a practicable non-flood plain alternative for the development exists. An evaluation of practicable measures and alternatives is presented in Chapter 4 of this report. The project will not induce development in the floodplain. There are no or very limited opportunities for additional development within the historic floodplain due to the existing “full buildout” condition along most of the study area. However, as identified in the Economic Appendix (Appendix B of this IFR) there are anticipated redevelopment opportunities within certain river-adjacent parcels, and river restoration may spur transition from industrial use to residential, retail or mixed-use zoning.

6. As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impacts of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve the natural and beneficial flood plain values. This should include reevaluation of the “no action” alternative. For each resource analyzed in Chapter 5, wherever there is a potential for adverse impacts, appropriate Best Management Practices or other environmental commitments were identified and listed at the end of each section. As there is a net benefit to biological resources, no biological mitigation is required for the Recommended Plan. The project would not induce development in the flood plain. The project would restore natural and beneficial flood plain values by widening the river and flood plain within the project footprint without increasing flood risk to adjacent areas. Chapter 4 of this report summarizes the alternative identification, screening and selection process. The “no action” alternative was carried through the entire assessment and selection process.

7. If the final determination is made that no practicable alternative exists to locating the action in the flood plain, advise the general public in the affected area of the findings. The Draft IFR was released in September 2013, posted by EPA in the Federal Register on October 4, 2013, and a public meeting was held on October 17, 2013. Numerous comments were received on the Draft IFR, which have been included and responded to in this Final IFR (see Appendix L).

8. Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of the Executive Order. The Recommended Plan is the most responsive to all of the study objectives described in Chapter 4, and it is consistent with the requirements of EO 11988.

10.1.5 Executive Order 11990, Protection of Wetlands

This Executive Order directs Federal agencies, in carrying out their responsibilities, to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Wetland vegetation within the study area would be disturbed during construction but much more wetland habitat would be established as a result of the proposed project; therefore the project is in compliance with the executive order.

10.1.6 Executive Order 12989, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

This Executive Order states that Federal agencies are responsible for conducting their programs, policies, and activities that substantially affect human health of the environment in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination under such programs, policies,
and activities because of their race, color, or national origin. The required analysis has been conducted, and impacts have been avoided to the extent possible. Significant impacts to environmental justice communities are not anticipated with the project. The project is in compliance with the Executive Order.

10.1.7 **Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)**

There are no designated prime or unique farmlands within the study area; therefore there would be no adverse effects to farmland and the project is in compliance with this Act.

10.1.8 **Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)**

Federal agencies undertaking water projects are required to fully consider recommendations made by the USFWS in the provided Coordination Act Report (CAR) or Planning Aid Letter associated with the project. USFWS and CDFW have had full participation in planning and evaluating the proposed project, and USFWS was funded to prepare a CAR.

The Corps coordinated with USFWS during development of the CAR from November 2013 to January 2015, in addition to the general coordination that occurred throughout the development and evaluation process. The Corps met with USFWS regarding the CAR recommendations on September 29, 2014 and on October 30, 2014. The Corps fully considered the CAR recommendations and committed to continued coordination with USFWS during the detailed design phase of the project. The Corps received the revised Final CAR on January 5, 2015. The CAR and the Corps’ responses to the CAR’s recommendations are included in this Final IFR in Appendix N. The project is in compliance with the Fish and Wildlife Coordination Act.

10.1.9 **Migratory Bird Treaty Act of 1936, as amended (16 U.S.C. 703, et seq.)**

The Migratory Bird Treaty Act implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 U.S.C. 715. Under the act, taking, killing or possessing migratory birds, their nests or eggs is prohibited. The proposed action is located primarily in a highly developed area, although some nesting habitat persists within the study area. To ensure that the project does not result in take of migratory birds, their eggs, or nests, to the maximum extent practicable vegetation clearing activities would not occur during the breeding season. If vegetation removal must occur during the breeding season, a qualified biologist would perform nesting bird surveys following established protocol prior to construction. If nests are detected during these surveys, a construction buffer would be delineated around the nest.

10.1.10 **National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321, et seq.)**

NEPA applies to all Federal agencies and most of the activities they manage, regulate, or fund that affect the environment. This act requires full disclosure of the environmental effects, alternatives, potential mitigation, and environmental compliance procedures of proposed actions. NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law’s purposes. Full compliance with NEPA is achieved with the filing of the final EIS/EIR with USEPA and with the Corps’ issuance of a Record of Decision.

10.1.11 **CEQ Regulations for Implementing the Procedural Provision of NEPA (40 CFR Part 1500 et seq.)**

The Council on Environmental Quality has prepared regulations for implementing NEPA, including those pertinent to NEPA and agency planning, preparation and distribution of an EIS, procedures for the open
comment period, resolution of environmentally unsatisfactory actions, agency responsibilities, and other requirements of NEPA. This document has been prepared in compliance with these regulations.

10.1.12 U.S. Army Corps of Engineers Procedures for Implementing NEPA (33 C.F.R., part 230, ER 200-2-2)

This regulation provides guidance for implementation of the procedural provisions of the National Environmental Policy Act (NEPA) for the Civil Works Program of the U.S. Army Corps of Engineers. It supplements Council on Environmental Quality (CEQ) regulations 40 CFR 1500-1508, in accordance with 40 CFR 1507.3, and is intended to be used in conjunction with the CEQ regulations. This regulation is applicable to all HQUSACE elements and all Field Operating Activities (FOAs) having responsibility for preparing and processing environmental documents in support of Civil Works functions. This IFR has been prepared in compliance with ER 200-2-2.


The impacts of Federal undertakings on cultural resources are formally assessed through a separate process mandated by the National Historic Preservation Act (NHPA) of 1966, as amended (54 U.S.C. Section 300101), and its implementing regulation, Protection of Historic Properties (36 CFR 800). Section 106 of the NHPA describes the process for identifying and evaluating historic properties, for assessing the effects of Federal actions on historic properties, and for consulting to avoid, reduce, or minimize adverse effects. Historic properties are cultural resources that are either “included in”, or are eligible for inclusion in the National Register of Historic Places (NRHP). The Section 106 process does not require historic properties to be preserved but ensures that the decisions of Federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

The USACE consulted with the SHPO staff by telephone in June of 2013 regarding the level of effort for the analysis in the IFR EIS/EIR. The SHPO has concurred with the use of existing information from the records and literature search. The Corps, in consultation with the SHPO, has developed a PA which lays out how the Corps will satisfy its requirements under Section 106 of the National Historic Preservation Act. The following agencies and groups have been invited to be concurring parties to the agreement: the City of Los Angeles, the California Department of Parks and Recreation, the Gabrieleno Band of Mission Indians, Fernandeno Tataviam Band of Mission Indians, Gabrielino Tongva Indians of California, Gabrielino –Tongva Tribe, Gabrielino Tongva Nation, Los Angeles City and County Native American Indian Commission, Ti’At Society/Inter-Tribal Council of Pima, and San Gabriel Band of Mission Indians.

10.1.14 Executive Order 13112 Invasive Species

This EO states that each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them. This project includes removal of invasive species and establishment of native habitat, and is therefore in compliance with this Executive Order.
10.2 STATE OF CALIFORNIA LAWS, REGULATIONS, AND POLICIES

10.2.1 California Clean Air Act

Section 5.2 of this document discusses the effects of the proposed project on the local and regional air quality. SCAQMD determines whether project emissions sources and emissions levels significantly affect air quality based on Federal Standards established by the U.S. EPA and State standards set by the California Air Resource Board.

Estimated operational emissions including maintenance and increased daily visitations for the proposed project would not exceed SCAQMD Regional Significance Thresholds and Localized Significance Thresholds. Estimated construction emissions for Alternative 20 would not exceed SCAQMD Regional Significance Thresholds. NOx emissions would exceed SCAQMD Localized Significance Thresholds during construction in 2022, 2023, and 2024. However, emissions reduction measures and other BMPs recommended by the SCAQMD would be implemented.

Total GHG emissions for construction and operations would not exceed the SCAQMD GHG threshold. Based on the above, construction and operation of either alternative would be in compliance with the California Clean Air Act.

10.2.2 California Endangered Species Act

This EIS/EIR has considered the potential effects to State-listed species and has determined that the project would have no effect on State-listed species. As a result, this project is in compliance with the California Endangered Species Act. The Corps will continue to coordinate with the CDFW throughout the design and construction period, and the non-Federal sponsor will coordinate and consult under CESA if future surveys conducted during PED or construction indicate that conditions have changed such that state-listed species would be affected.

10.2.3 Porter-Cologne Water Quality Control Act

The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.4. This project expects to achieve full compliance with the Water Quality Control Act by achieving compliance with RWQCB certification mandates for Section 401.

10.2.4 California Fish and Game Codes 1600-1607

The California Department of Fish and Wildlife, under California Fish and Game Code Sections 1600 through 1607, regulates work that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; that would substantially change the bed, channel, or bank of a river, stream, or lake; or that would use material from a streambed. Under Section 1602, prior to construction, the City will enter into a Streambed Alteration Agreement (SAA) with the CDFW that will include conditions to ensure impacts on fish and wildlife or habitat are avoided, minimized. As this is an ecosystem restoration project, it is anticipated that no mitigation will be required.
11 RECOMMENDATIONS

I recommend that the selected plan for ecosystem restoration and recreation along the Los Angeles River within the corporate boundaries of the City of Los Angeles, California as described in this report be authorized as a Federal project, with such modifications thereof as in the discretion of the Commander, HQUSACE, may be advisable. I have given full consideration to all significant aspects of this recommendation in the overall public interest including environmental, social, and economic effects; and engineering feasibility. The recommended plan includes monitoring until ecological success criteria are met, for no more than 10 years, and adaptive management as described in this document. An Operations, Maintenance, Repair, Replacement, and Rehabilitation Plan will be developed following project implementation. The recommended plan is estimated to have a total first cost for ecosystem restoration and recreation of $1,356,608,000 (Program Year 2016 –Effective Price Level 1 Oct 2015).

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

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55 Final Integrated Feasibility Report
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