LOS ANGELES RIVER BIKE PATH GAP CLOSURE

Feasibility Study *May 31, 2016* *updated July 12, 2017*

Metro®

ACKNOWLEDGMENTS

Metro Staff
Julia Salinas
Metro Lead Manager,
Transporation Planning

Diego Cardoso
Executive Officer

Laura Cornejo
Deputy Executive Officer

Anthony Jusay
Manager, Transportation Planning

Jingyi Fan
Transportation Planner

Consultant Team
Frank Benavidez
Consultant Project Manager
KOA Corporation

Joel Falter
Safety and Operations
KOA Corporation

Carlos Velasquez
Urban Planning
KOA Corporation

Allan Crawford
Active Transportation Manager
KOA Corporation

Mark Hanna
Senior Anaylst
Geosyntec

Kathleen Harrison
Permitting
Geosyntec

Jai Panthail
Hydraulic Modeling
Geosyntec

Al Preston
Hydraulics
Geosyntec

Diego Cadena
Agency outreach,
O&M Geosyntec

Tamseel Mir
Environmental
ICF International

Patrick Wong
Cost Estimating
W2 Design

Armando Abad
Right of Way
Wagner Engineering and Survey

Members/Participants of the Technical Advisory Committee
Tim Brick
Arroyo Seco Foundation

Yuval Bar-Zemer
Friends of the Los Angeles River

Michael Affeldt
City of Los Angeles

Marcelino Ascensio
City of Los Angeles

Carol Armstrong
City of Los Angeles

Maria Camacho
River LA

Richard Gomez
Los Angeles County Department
of Public Works

Kevin Kim
Los Angeles County Department
of Public Works

Walt Young
MRCA

Fernando Gomez
MRCA

Alan Thompson
SCAG

Pauline Louie
Urban Waters Federal Partnership

Felix Velasco
City of Vernon

Eric Bruins
Los Angeles County
Bicycle Coalition

Sergio Infanzon
City of Los Angeles
Council District 1

Dale Benson
Caltrans

Michelle Mowery /
Rubina Ghazarian
LADOT

Nate Hayward
City of Los Angeles
Council District 14

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ABBREVIATIONS/ACRONYMS

Alternatives Analysis	AA
Arts District Los Angeles	ADLA
California Department of Transportation	CALTRANS
California Environmental Quality Act	CEQA
Environmental Impact Report	EIR
Environmental Impact Statement	EIS
Friends of the Los Angeles River	FoLAR
Los Angeles County Bicycle Coalition	LACBC
Los Angeles County Department of Public Works	LACDPW
Los Angeles County Flood Control District	LACFCD
Los Angeles County Fire Department	LACFD
Sanitation Districts of Los Angeles County	LACSD
City of Los Angeles Department of City Planning	LADCP
City of Los Angeles Department of Transportation	LADOT
Los Angeles (City) Department of Water and Power	LADWP
Los Angeles (City) Fire Department	LAFD
Los Angeles (City) Police Department	LAPD
Los Angeles LA River Project Office	LARPO
Los Angeles River Revitalization Corporation	LARRC
Los Angeles River Revitalization Master Plan	LARRMP
Los Angeles County Metropolitan Transportation Authority	Metro
Mountains Recreation and Conservation Authority	MRCA
National Environmental Policy Act	NEPA
Southern California Association of Governments	SCAG
Technical Advisory Committee	TAC
United States Army Corps of Engineers (Corps)	USACE

EXECUTIVE SUMMARY

Introduction

The purpose of the Los Angeles River Bike Path Gap Closure Feasibility Study (Study) is to determine the feasibility of designing, constructing and operating a bike path along an eight-mile stretch of the Los Angeles River (River) through Downtown Los Angeles and the City of Vernon with a connection to the City of Maywood (Project). The Project will close an existing gap in the LA River Bike Path, providing a seamless bike route between the San Fernando Valley in Los Angeles and the LA River Bike Path in Long Beach. The northern and southern limits of this Study are the terminus of the LA River Greenway Trail at Riverside Dr, and Atlantic Bl where the LA River Bike Path begins in Vernon. The Study includes conceptual designs, identification of potential access points, operations strategies, identification of environmental issues, and cost estimates.

The River, which extends 51 miles from Canoga Park to Long Beach, was channelized in the 1930s by the Army Corps of Engineers (Corps) for the primary purpose of flood protection. The result was a concrete-lined channel designed to prevent flooding by rapidly moving rain water and runoff to the ocean.

Over the past several years public agencies and non-profits have undertaken a number of initiatives to reimagine the River. Public agency studies include the Army Corps of Engineers ARBOR Study, the LA River Master Plan and the LA Bike Master Plan. Non-profit groups such as River LA (formerly LA River Revitalization Corporation, formed with the backing of the City of Los Angeles) and Friends of the Los Angeles River (FOLAR), founded in 1986, have also been working to transform the River. This transformation envisions making the River an integral part of the community and includes a regional active transportation corridor for biking and walking. The regional corridor connects portions of coastal and inland Los Angeles County and provides important local connections to places of employment, parks, schools, retail and entertainment venues, as well as mass transit.

In the past 10 to 15 years, in a precursor to the overall River redesign effort, high-quality biking and walking paths have been added along the River in both the coastal and inland areas. **Figure ES-1** shows a typical example of a recent bike/pedestrian path along the River.

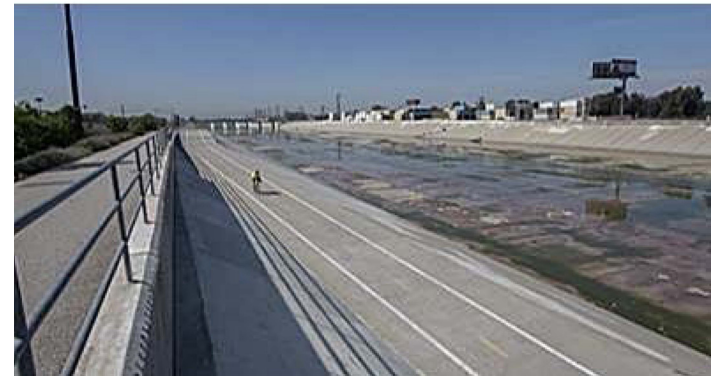


Figure ES-1: LA River Bike Path (Lower LA River Section)

However, a barrier exists between the coastal and inland areas to date, precluding the envisioned seamless connection between the San Fernando Valley and Long Beach. The eight-mile stretch of River in the Project Area **(Figure ES-2)** traverses a largely industrial section of the County where much of the top of bank (where a bike path would normally be placed) is obstructed by electrical towers, bridge structures and active railroad tracks. These obstructions, along with vertical walls on parts of the River, have made creating a bike and pedestrian path along this stretch of the River challenging. **Figure ES-3** shows the obstructed character of the top of bank in the Project Area and illustrates the types of barriers that have prevented the path's completion thus far.

This Study finds that, in spite of the challenges, it is feasible to close this gap, and explores several options for doing so.

Figure ES-3: Image of a highly obstructed section of the River. Obstructions, such as this one near the 101 freeway, have made it difficult to create a bike and pedestrian path along this section of the River.

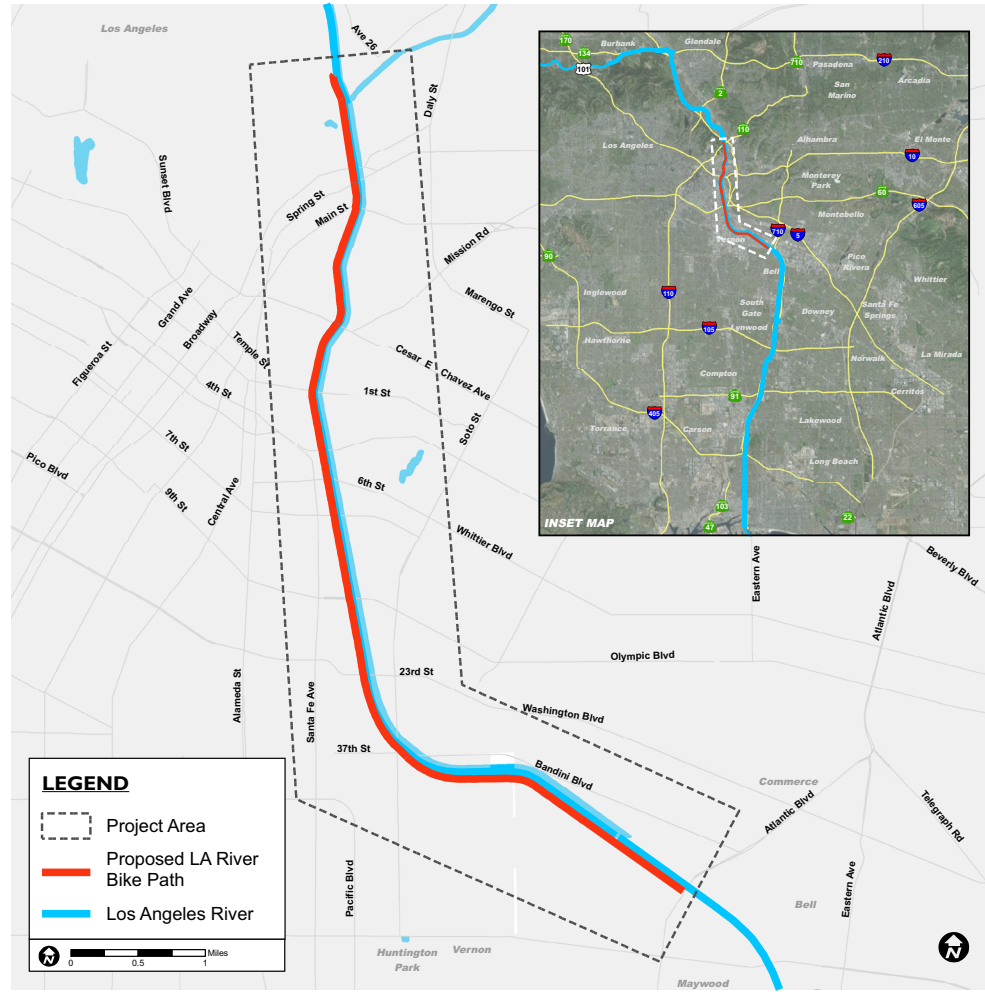


Figure ES-2: Project Area

Study Background

Community advocates, local agencies and business associations have studied, supported and invested in the completion of a bike path along the stretch of the River as identified in this Study. Active supporters include the City of Los Angeles, the County of Los Angeles, Southern California Association of Governments (SCAG), the Los Angeles County Metropolitan Transportation Authority (Metro) and the Corps, as well as nonprofit groups River LA, FOLAR, The Arroyo Seco Foundation, Business Improvement District Arts District Los Angeles, and Arts District Community Council LA.

Their respective efforts are discussed in Chapter 1.

Based on encouragement from the wide variety of communities and organizations supporting this eight-mile path, the Los Angeles City Council and Metro Board of Directors (P&P Item 27) passed related motions in September 2014, directing staff to study alternatives for implementing a bike path along this portion of the River. In response to these motions, this Study was commissioned to address the needs of the communities adjacent to the River by providing them with a safe and convenient transportation option.

Existing Conditions

Some of the 51-mile long River is already served by bike paths; this Project would close the largest remaining gap through the Downtown Los Angeles metropolitan area and the City of Vernon. A 16.5-mile long bike path connects Atlantic Bl in Vernon with Long Beach and the ocean; a 7.25-mile long bike path connects Elysian Valley near Dodger Stadium and Griffith Park to the City of Glendale. By closing this 8-mile gap, the Project would create a continuous 32-mile section of grade-separated bike path along the River from Griffith Park to Long Beach.

Project Area

As illustrated by **Figure ES-2**, this Study focuses on a potential new bicycle facility to fill the gap in the LA River Bike Path between Riverside Dr in Elysian Valley and Atlantic Bl in Vernon and neighboring Maywood.

Many of the neighborhoods in the area surrounding the Project corridor are predominately industrial in nature with high volumes of truck traffic, deteriorated roadways, a lack of sidewalks and street lighting, and at-grade rail crossings. Additionally, there are freight and passenger train movements on tracks adjacent to the River along several segments of the corridor, which inhibit local mobility.

There is a population of just over 200,000 people within three miles of the Project Area. The area qualifies as a disadvantaged community based on the median household income of $31,695, which is well below the county average of $55,870. Approximately 34% of the area's population lives below the poverty line.

People in these neighborhoods routinely walk or use a bike as their primary means of transportation. According to the 2014 American Community Survey, most of the Project Area's population has limited or no access to privately-owned transportation, increasing the demand for alternate modes of transportation, including biking and walking. Of the 70,000 people in the Project Area of working-age, 26% (approximately 18,000) walk, bike or take transit to work.

Study Approach

The Study includes analysis of all feasible options for the LA River Bike Path in the Project Area along the top of bank, channel bottom and channel wall, as well as access points to the path. The study assumes a standard width Class I bikeway on the west bank of the River.

The Study team prepared conceptual design plans, identified technical challenges, opportunities and constraints, and developed assumptions and potential solutions in the following areas:

> Engineering feasibility
> Neighborhood connectivity
> Public safety
> Environmental
> Permitting
> Hydraulic capacity
> Real Estate (property ownership)
> Maintenance
> Cost – for both design and construction

Summary of Findings

The Study concludes that a new bike path along the eight-mile Project corridor is feasible. Although there are physical constraints, including electrical towers, bridge structures and railroad tracks at the top of bank along the Project corridor, the Study shows these constraints can be overcome through creative engineering solutions. The various Project options discussed in the report range in construction cost from approximately $243 million to $348 million, including contingency, planning, engineering and permitting costs.

The solutions involve:

1. **Top of Bank Paths:** A top of bank path will accommodate a 12-foot wide bike and pedestrian path along the top of the River's bank. In areas where there is insufficient top of bank right-of-way, such as where rail tracks or eletrical towers are located, an elevated or cantilivered structure could be considered. See **Figure ES-4**.

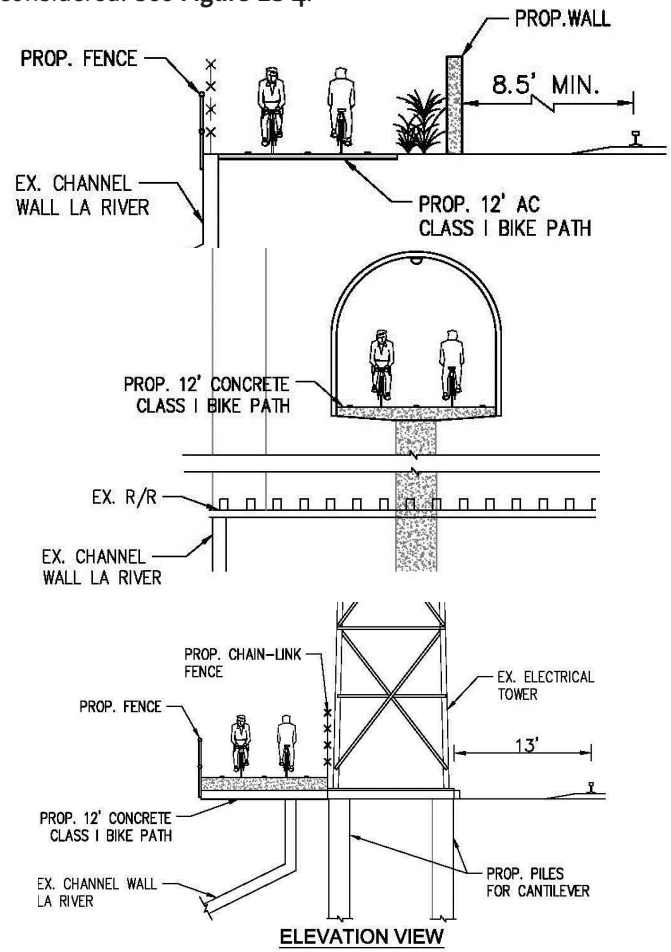


Figure ES-4: Typical Top of bank detail

2. **Channel Bottom Bike Paths:** A channel bottom path would consist of an elevated path six inches above the river bed in the low-flow portion of the River. See **Figure ES-5**. Based on a study commissioned in 2013 by downtown developer Linear City Development, LLC in partnership with FOLAR, channel bottom facilities could be open up to 330 days per year.

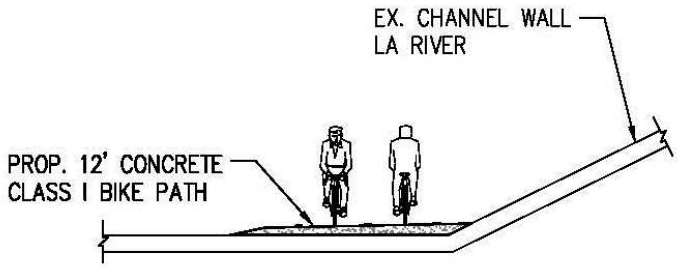


Figure ES-5: Typical Channel Bottom Detail

3. **Channel Cut Alignment:** This alignment places the path along a terrace cut into the channel wall of the River. See **Figure ES-6**. The terrace would be similar to many of the bridge undercrossings on other bike path facilities in the Los Angeles area.

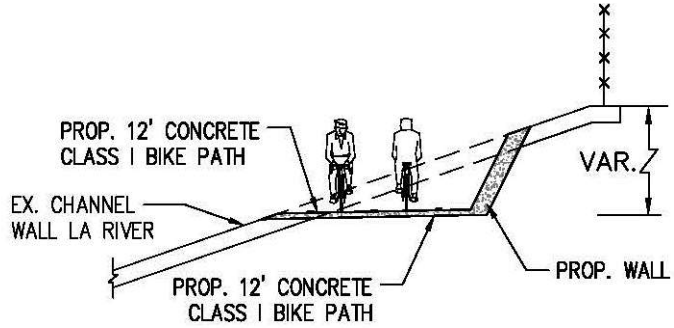


Figure ES-6: Typical Channel Cut Detail

Reach 1: Between Riverside Dr and SR-110: Reach 1 is the shortest and one of the least obstructed reaches with only one bridge crossing (Union Pacific Railroad), which is located just north of Arroyo Seco Parkway (SR-110). It has a vertically walled channel with available right-of-way along the top of bank.

There are two options for the path along this reach: (1) top of Bank path with an elevated bridge over the railroad crossing, or (2) a ramp immediately south of Riverside Dr leading to a channel bottom alignment. The River in this section has vertical walls, thus a channel cut is not feasible.

Reach 2: Between SR-110 and Spring St: Reach 2, which is approximately 0.6 miles long, is relatively short and unobstructed with available top of bank right-of-way except at two locations where there are large electrical towers. The Reach includes the study *Bending the River Back Into the City* by Lauren Bon and Metabolic Studio (**Figure ES-7**) that, once completed, will flood the channel to a depth of approximately eight feet.

A channel bottom option is precluded in the segment that will be flooded as part of the study. A floating path, similar to the Esplanade Path in Portland, OR, could be considered, although such a treatment may be difficult due to the hydrologic conditions when the River is in flood conditions with fast-flowing, rough water.

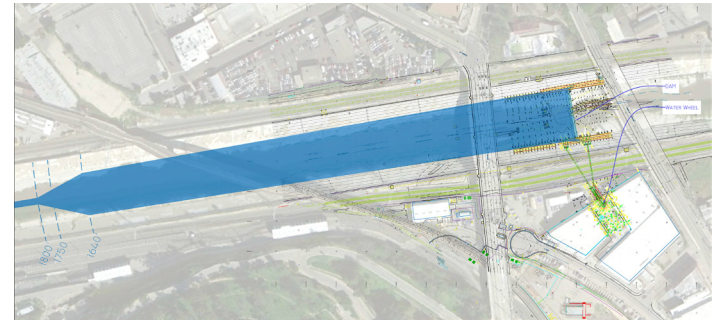


Figure ES-7: Bending the River Back Project

The path can be constructed along the top of bank. However, at two locations cantilevered structures will need to be constructed to detour around electrical towers.

Reach 3: Between Spring St and Cesar Chavez Av: Reach 3 is more complicated than Reach 1 or 2, with four bridge abutments (Main St, Cesar Chavez Av and two railroad crossings) and limited space along the top of bank. This reach is approximately one mile long.

The path in this section could consist of a top of bank path with channel cuts to traverse under the bridges at Main, Cesar Chavez and the two railroad crossings, or a channel bottom path with channel cuts to access surface streets.

Reach 4: Between Cesar Chavez Av and Bandini Bl: Reach 4 is obstructed along the top of bank by electrical towers, bridge abutments, adjacent rail lines, and industrial land usage. This reach is approximately 3.4 miles long.

This is the most complicated and longest reach, with over a dozen bridge crossings and water divergence at the channel bottom. The path could consist of a combination of channel cut, channel bottom, elevated structures and cantilevered sections along the river bank.

All of the potential access points in Reach 4 provide connectivity to a dense network of transportation, including Union Station, the regional heart of rail for Southern California. Also, the Connect Union Station Action Plan (Connect US) will greatly improve walking and biking around Union Station and Little Tokyo.

The LA River Bike Path and the Link US project will provide opportunities to connect surrounding communities through walking and biking to this regional transportation hub, and the numerous historic, cultural, and economic centers neighboring it.

Reach 5: Between Bandini Bl and Atlantic Bl: Reach 5 has extremely limited usable top of bank space, two roadway crossings and one railroad crossing. The top of bank is obstructed by electrical towers, adjacent parallel rail lines, one railroad crossing, and bridge abutments at Downey Rd and Atlantic Bl. This reach is approximately 2.4 miles long and located entirely in the City of Vernon.

Due to the numerous obstructions along the top of bank, the LA River Bike Path would consist of channel cuts, a channel bottom path or cantilevered sections along the river bank.

Details for each of these sections are shown in Chapter 7.

Conclusions: When the Project is completed, the LA River Bike Path will allow people to travel by bicycle between the San Fernando Valley and Long Beach and link to the many communities in between. The Project will provide countywide mobility and much needed low-cost transportation options. It will provide first mile-last mile transportation connections to Metro's bus and rail network. The path will provide greater accessibility to employment, entertainment, commercial, education and recreational centers and will provide more active lifestyle choices to largely disadvantaged communities. The gap closure will complement projects that have already been built or are underway by closing critical gaps in the bike network, and integrating and synchronizing plans for the path. It will reutilize existing infrastructure in an innovative way, resulting in new active transportation options and environmental benefits like reduced greenhouse gas (GHG) emissions and criteria air pollutants, and create opportunities for storm water capture and treatment.

Design, permitting approval and construction of the Project will require close coordination with key agencies and organizational partners. The Corps is responsible for managing and maintaining this portion of the river, and has the ultimate authority over any uses of the River. Close coordination and project buy-in with the Corps, partner agencies and local jurisdictions will be crucial to the success of the Project.

The findings and recommendations in this Study should provide the information needed for decision makers to consider proceeding to the next stage, Project Approval/Environmental Documentation (PA/ED), in constructing a path that will close the eight-mile gap in the LA River Bike Path. This Study and the more detailed studies to follow will serve as the basis for design to request the requisite permits for closing the eight-mile gap in the LA River Bike Path.

1. INTRODUCTION

Los Angeles County Metropolitan Transportation Authority (Metro), along with a number of local and regional organizations, has identified closing the gap in the LA River Bike Path between Elysian Valley and Vernon as a high priority walking and biking infrastructure project (Project). When complete, this facility will provide a seamless 32-mile grade-separated regional corridor for walking and bicycling through the heart of Los Angeles County, connecting Long Beach to the San Fernando Valley along the Los Angeles River (River).

The Project will implement the goals of the 2016 Active Transportation Strategic Plan and 2009 Long Range Transportation Plan. It will enhance mobility, provide commute options and access to large employment centers, and provide a safer, more comfortable environment for people biking and walking. Additionally, the Project will provide regionally significant network connectivity for people walking, biking, and connecting to transit.

The Project also supports the goals set forth in the Southern California Association of Governments (SCAG) 2016 - 2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), especially as it pertains to sustainable development, environmental quality, active transportation, and public health.

Table 1-1 outlines some of the key agencies and organizations that have studied this section of the River and their findings.

ORGANIZATION	PLAN/STUDY	CONCLUSIONS/ RECOMMENDATIONS
Linear Cities Development, LLC and FOLAR	Proof of concept study of the feasibility of an in-channel bike path.	An in-channel path would be possible without negatively affecting the flood control capabilities of the river.
The City of Los Angeles	Los Angeles River Revitalization Master Plan (LARRMP)	This plan incorporates active transportation infrastructure as a key element of accessibility and mobility for the River. A key objective of the LARRMP is to close this eight-mile gap for people biking or walking.
The City of Los Angeles	Mobility Plan 2035, 2010 Bicycle Master Plan, Department of Transportation (LADOT) 2014 Strategic Plan and Sustainable City Plan, and Los Angeles County's 1996 LA River Master Plan and 2012 Bicycle Plan.	All plans recognize the significant role that the River plays in the region's bicycle infrastructure and connectivity, and recommends that a continuous bike path be provided along the River.
City of Vernon	ATP Grant application (2016) looking at Reach 5 for a path along the LA River and Bicycle Master Plan to be developed in 2017.	The ATP Grant Project examines and presents recommendations for a pedestrian and bicycle path within the City's portion of the LA River.
Community Plans	Silver Lake/Echo Park/ Elysian Valley Community Plan, the Northeast Community Plan, and the recently-adopted Cornfield Arroyo Seco Specific Plan.	Specific Plans all support the implementation of a continuous bike path along the River through the downtown area.
US Army Corps of Engineers	LA River Ecosystem Restoration Integrated Feasibility Report (ARBOR plan)	The ARBOR Plan/Alt 20, located just north of the Project, includes a recreation plan for new multiuse trails, bicycle and pedestrian bridge crossings, and 28 access points. The Project is consistent with the ARBOR plan goals and designs and will provide connectivity to this area from downtown and areas to the south along the River.

Table 1-1: Organizations that have studied and recommended a bike path in the Project area

The Project is consistent with the goals of the recently adopted City of Los Angeles Mobility Plan 2035, the City of Los Angeles Bicycle Plan (2010), the Los Angeles County Bicycle Master Plan (2012), the Los Angeles River Revitalization Master Plan (City), the Los Angeles River Master Plan (County), the Metro Long Range Transportation Plan, the Silver Lake/Echo Park/ Elysian Valley Community Plan, the Northeast Community Plan, and the Cornfields-Arroyo Seco Specific Plan.

These plans have the common goal of creating safe, connected infrastructure that provides better mobility options for all Angelenos and alternatives to the automobile for transportation. In turn, this will contribute to healthier communities where people are able to walk and bike, reducing their reliance on automobiles.

These studies and a growing political will following from community input led the Los Angeles City Council and Metro Board of Directors to pass related motions in June 2014, directing staff to study alternatives to close the gap in the LA River Bike Path.

1.1 Los Angeles River – Paths and Background

Along the 51-mile length of the River, from its headwaters in Canoga Park in the San Fernando Valley to its terminus at the Pacific Ocean in Long Beach, there are approximately 24 miles of existing bike path segments.

The section just north of the Project area, along the River through the Glendale Narrows, is approximately 7.25 miles long. It is located between the southeast Burbank city limit near Forest Lawn Dr and Riverside Dr in Elysian Valley. The existing LA River Bike Path is located along the top of the west bank of the river ("River Right").

The southern section of the existing path, known as the Los Angeles River Bikeway, is approximately 16.5 miles long and runs from the City of Vernon to the City of Long Beach. At Imperial Highway, the LA River Bike Path joins with the Rio Hondo River Bike Path to form the final leg of the path which is located on the east side of the river along its upper bank.

Between those two sections of bike paths along the River is an approximately eight-mile-long gap. While the top of banks along the sections to the north and south are relatively free of obstructions, the banks along this eight-mile gap contain electrical towers, active railroad tracks, railroad maintenance yards, manufacturing, and industrial related uses. This Study takes into account these challenging land uses and the physical constraints of the River and its flood control functions to evaluate the feasible options for closing the gap in the LA River Bike Path.

Anyone biking the entire length of the River today must navigate approximately 9 miles of city streets through downtown and east Los Angeles, and the City of Vernon instead of staying on a grade-separated path along the River in the Project area. While there are numerous routes riders can choose, one of the most well known is the route used by the annual Los Angeles River Ride hosted by the Los Angeles County Bike Coalition (LACBC). This route, shown in **Figure 1-1,** follows a circuitous path along Riverside Dr, San Fernando Rd, Avenue 19, North Spring St, Alpine St, Cesar Chavez, Boyle Blvd, Olympic Blvd, Grande Vista Av, and District Blvd. The route then re-enters the LA River Bike Path just east of Atlantic Blvd in the City of Vernon. Through necessity, much of this route involves riding through heavily industrialized areas with high volumes of truck traffic, railroad crossings, and deteriorated roadways.

Because of the built-out, industrialized streetscape of the fragmented on-street route through the Project area, an on-street alternative is not considered to be a viable alternative to completing the LA River Bike Path. The Project will provide an uninterrupted path along the River, away from car and truck traffic. Additionally, closing the gap in the path will create a safe, direct backbone for high quality walking and biking infrastructure both within the Project area and beyond it.

Figure 1-1: Current LACBC River Ride Route

1.2 Community Character

The path will serve adjacent neighborhoods consisting of mixed industrial and residential use wherein over one-third of the population lives below the poverty line and many residents do not own automobiles. Neighborhoods with this character tend to have a high percentage of people who walk and bike, often because these low cost transportation modes are their only options. Despite this, these neighborhoods have been historically under-served by high quality walking and biking infrastructure.

In spite of a lack of significant bicycle infrastructure, residents in the project area already walk, bike and take transit more than most Angelenos. According to the City of Los Angeles' Mobility 2035 Plan, over 26% of the working age people who live in the area bike, walk or take transit to work. Many do not own vehicles. In contrast, of the overall population of Los Angeles, 11% use mass transit, less than 1% bicycles, and roughly 4% walk. Most residents own or at least have access to privately owned vehicles.

Demographics/Income Levels

According to the most recent year of fully processed data from the American Community Survey (2014), a product of the United Stated Census Bureau, the neighborhoods within three miles of the corridor have the following characteristics:

- There is a population of approximately 208,000 persons
- The median household income is $31,695, which is well below the county average of $55,870
- Approximately 34% of the area's population or 70,800 people live below the poverty line (**Figure 1-2**)
- Half of the area's population has a high-school diploma.
- Approximately 75 percent of the area's population is Latino, 14 percent is Asian, 6 percent is White, and 4 percent is Black
- 46 percent of the area's population is foreign-born

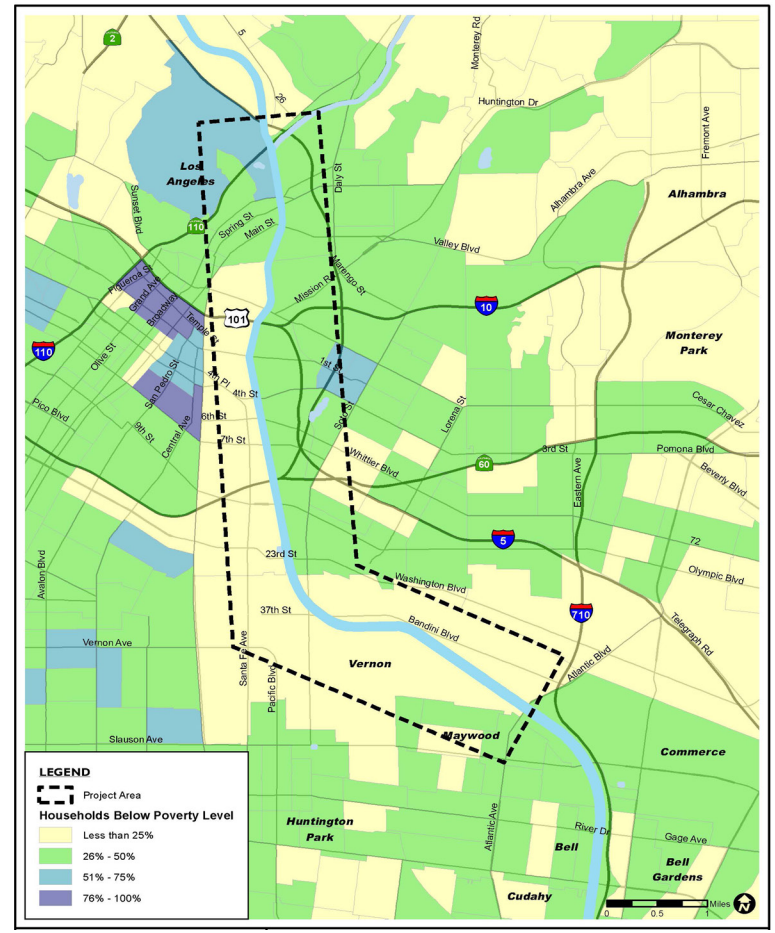


Figure 1-2: This figure illustrates the percentage of households in the area that are below the poverty level. These households generally have difficulty affording transportation options other than walking, transit, or riding a bike

Some areas west of the Project area have an average number of vehicles per household within the 0.0 to 0.5 and 0.5 to 1.0 ranges (see **Figure 1-3**), implying that many households do not have access to a vehicles. A majority of the Study area is within the range 1.01 to 1.50 vehicles per household, indicating that many households have access to only one car. The average for urbanized Los Angeles County is 1.67 vehicles per household.

Thus, much of the Project area's population has no or limited accesses to privately owned vehicles, increasing the demand for alternative modes of transportation like walking and biking.

The Project would provide this largely low income population with a safe and convenient transportation option for their daily travel needs and improved quality of life by providing safe and affordable access to jobs, schools, parks, and commercial areas.

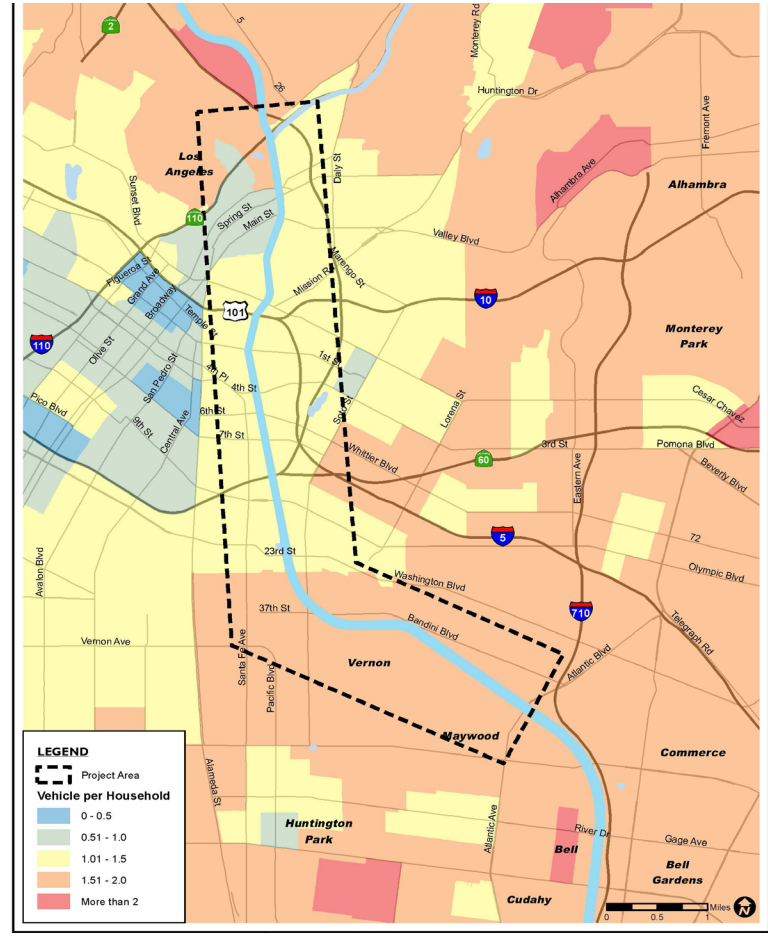


Figure 1-3: Vehicles per Household

Traffic Safety

One of the most frequently cited reasons for why people don't bike and walk is that they don't feel safe on the city streets. In a 2012 Study from Portland State University, researchers found that nearly 90% of people are uncomfortable riding on city streets due to their fear of traffic. Participants in the study indicated that they were more comfortable riding on separated bicycle facilities such as the LA River Bike Path.

The City of Los Angeles has recognized that to get more people to walk and bike they need to create an infrastructure network where people feel safe. To this end, the Los Angeles City Council recently adopted a Vision Zero policy that envisions roads and pathways "that anticipate mistakes so that collisions do not result in severe injury or death." As part of the Vision Zero initiative, the City has developed a High Injury Network (HIN) that identifies roadways with a high concentration of traffic collisions that have resulted in severe injury or death across all transportation modes, with a higher emphasis placed on people on bicycles and people on foot.

There are several HIN roadways located within the Project area that parallel or intersect the proposed LA River Bike Path (**Figure 1-4**). Some of the key streets are:

> Soto St
> Alameda St
> Central Av
> Cesar Chavez
> Olympic Blvd/9th

The Project could make a significant contribution to Vision Zero by providing walking and biking infrastructure separated from traffic, providing a safe and convenient way to reach local parks, jobs, schools, shopping, entertainment and mass transit.

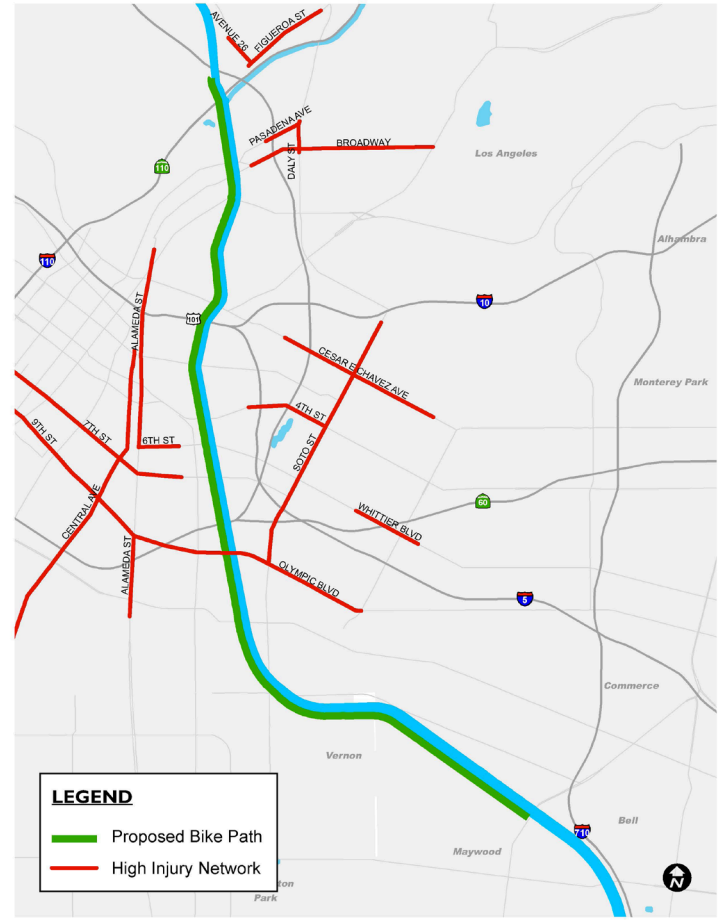


Figure 1-4: High Injury Network

Air Quality

As outlined in Mobility 2035 Plan, despite significant improvements over the past several decades, the Los Angeles area continues to suffer from the worst air quality in the nation.

Air pollution levels in the Project area are high even by Los Angeles standards as demonstrated by the CalEnvironScreen scores shown in **Figure 1-5**. Much of the area is in the worst 10% of state-wide scores.

As the American Community Survey and CalEnvironScreen data show, residents along the proposed path are disproportionately burdened socioeconomically and by air quality. The proposed completion of the LA River Bike Path through this area would provide these residents a safe, convenient, low-cost, and emission-free transportation option that would reduce air pollution originating in the area.

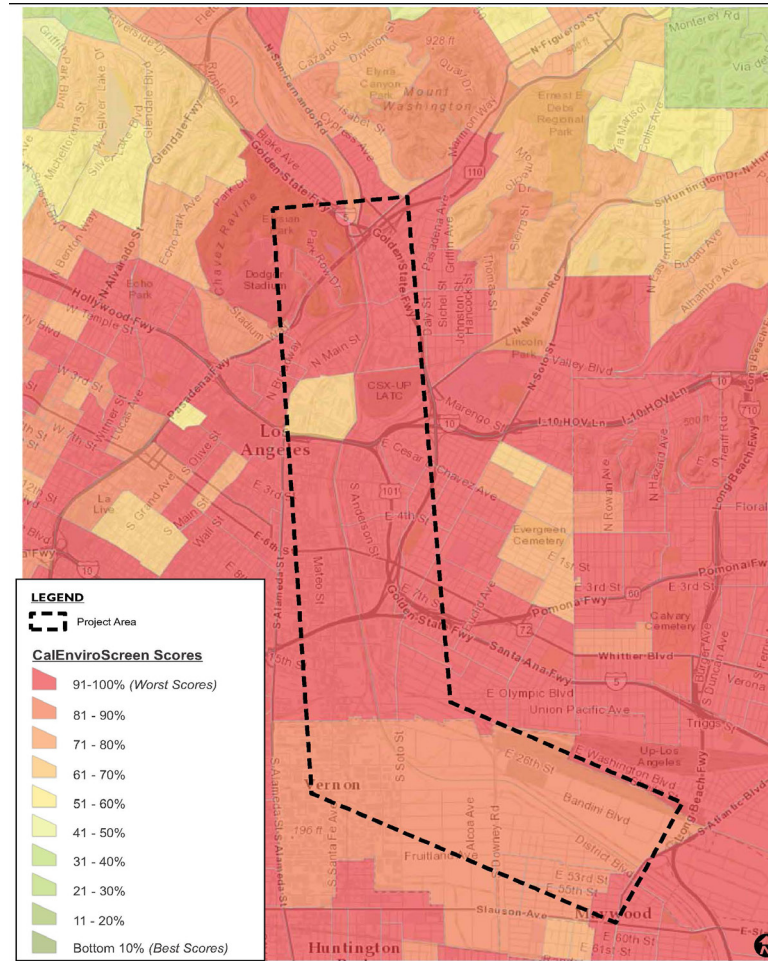


Figure 1-5: Air Pollution Level

1.3 Multijurisdictional Coordination

Implementation of the Project will require coordination with a number of agencies and jurisdictions at the Federal, County, regional, and local levels for the planning, permitting, and operations processes.

For this Study, Metro formed a Technical Advisory Committee (TAC) comprised of representatives from each of the following agencies or organizations:

- USACE (Corps)
- Caltrans
- SCAG
- City of Los Angeles: LAFD, LAPD, LADCP, Engineering, LADOT, Mayor's Office (LARiverWorks)
- County of Los Angeles (LACDPW, LACFD, LACSD)
- City of Vernon (DPW)
- City of Maywood (DPW)
- Los Angeles County Flood Control District (LACFCD)
- Mountains Recreation and Conservation Authority (MRCA)
- Urban Waters Federal Partnership
- Friends of the Los Angeles River (FoLAR)
- Los Angeles River Revitalization Corporation (LARRC)
- Los Angeles County Bicycle Coalition (LACBC)

The Project team met with the TAC at regular intervals to receive input on the status of ongoing Los Angeles River projects, and to discuss Project progress including potential alignments, access points, and costs. The following is a summary of some of the TAC meeting discussions.

August 11, 2015 - The Project team made a presentation of a possible Project alignment. The alignment was presented on large wall maps spanning nearly 30 feet. The TAC was provided with colored markers and Post-it notes to provide comments. A summary of the comments is included in the Technical Appendix F. In general, the TAC commented on bike path connectivity, safety considerations, and other possibilities to improve ridership and use of the path. See **Figure 1-6**.

Figure 1-6: August 11, 2015 TAC presentation of a possible Project alignment

September 15, 2015 - The Project team presented to the TAC a summary of the access point evaluation. The evaluation was presented as a matrix that identified nearby destinations and connectivity opportunities at each roadway bridge crossing along the proposed bike path. The TAC provided input and identified additional possible opportunities. The access point evaluation matrix is included in the Technical Appendix H.

November 17, 2015 - The Project team made a presentation on the possible Project alignments, access points, hydraulic findings, and construction costs, concluding that a bike path is feasible. In developing Project alignments and to determine the bike path's feasibility, the team described three types of Project alignments, 1) a top of bank alignment, 2)

channel bottom or in-channel alignment, and 3) a channel cut alignment consisting of a bike path cut into the sloped channel walls. These alignments are further described in Chapter 7.

1.4 Ongoing Los Angeles River Projects

There are over a dozen ongoing projects and planning efforts along the River that either support the construction of the Project or would directly benefit from it. These projects are briefly outlined below and shown in **Figure 1-8**, which shows the locations of these projects.

The LA River Master Plan: The City of Los Angeles has devoted significant time and resources to the development of the Los Angeles River Revitalization Master Plan (LARRMP). The plan, published in 2007, raises the issue of need for a regionally connected bike path network. A key objective in the implementation of the LARRMP is to close this 8-mile gap for people walking and biking along the River between Riverside Dr in Elysian Valley and Atlantic Blvd in Vernon and neighboring Maywood.

LA River Valley Bike Path and Greenway Completion Project: The $6M joint effort between the City and County of Los Angeles will create design documents for the bike path gaps in the San Fernando Valley section of the River. The partnership project was first announced by Mayor Garcetti's office in June 2015. **Figure 1-7** is an excerpt from the announcement.

The Project will complement the Greenway Project by further completing the LA River Bike Path.

LOS ANGELES—Mayor Eric Garcetti and County Supervisor Sheila Kuehl today announced a joint investment of $6 million in the Los Angeles River Valley Greenway. The funding will make the project shovel-ready by enabling completion of design on 12 miles of gaps in its Valley portion. Once completed, the greenway will make it possible for Angelenos to walk and bike from Canoga Park to Elysian Valley.

"With this investment, we take one more step in linking our communities to each other and to the backbone of our region – the Los Angeles River," said Major Garcetti. "By expanding the parks and paths along our river, we can breathe new life into the surrounding neighborhoods and give our residents more access to nature and recreation while providing safer commuting options between homes, schools, and jobs."

"The same L.A. River that protects Angelenos from catastrophic flooding is rapidly becoming a social hub that connects communities to public transportion, provides habitat for plants and animals, and introduces children and families to much-needed open space for recreation," said Supervisor Kuehl. "L.A. County is proud to be a part of that change."

Figure 1-7: Mayor Garcetti's partnership project was first announced by office in June 2015

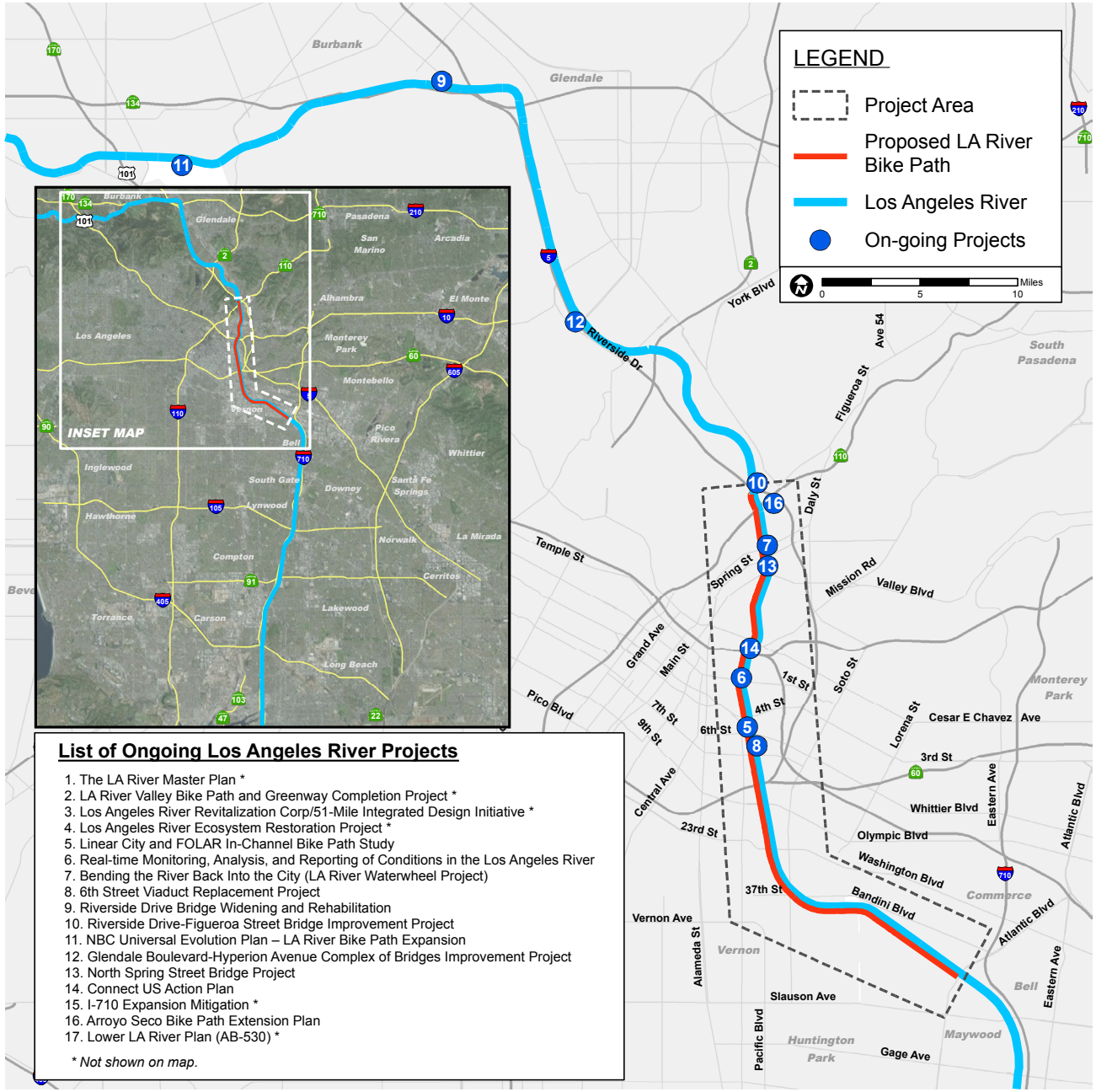


Figure 1-8: Ongoing Los Angeles River Projects

Los Angeles River Revitalization Corp/51-Mile Integrated Design Initiative: The Los Angeles River Revitalization Corporation (rebranded as "River LA") is a nonprofit focused on "integrating design and infrastructure to bring people and nature together over the 51-mile course of the River." The organization believes that the 51-mile River is integral to quality of life in the region and essential to building the healthy, vibrant, and resilient region in which people want to live.

Through its Greenway 2020 campaign, the organization supports the connection of all 51 miles of the River, from Canoga Park in the San Fernando Valley to Long Beach, by the year 2020. The vision is to establish an active transportation and recreational corridor, with connections to the broader bike and pedestrian networks within river-adjacent communities.

Looking at all 51-miles of the River through the lens of connectivity, the organization commissioned architect Frank Gehry, along with technical experts from Geosyntec and Olin studio, to conduct an independent, data-driven study of the uses within the 51-mile River corridor. The vision is to create a plan that will transform the entire 51 miles into a public resource and destination worthy of the Los Angeles region.

The project will build upon current plans and projects already underway along the River and ultimately create a digital toolkit to make the analysis performed accessible and useful for the public and policymakers. Through their work and public engagement process, the organization aspires to assist the communities along the River to directly address the wide range of issues that impact the River such as hydrology, ecosystem services, infrastructure resilience, recreation, public health, affordability, equity, and quality-of-life.

Los Angeles River Ecosystem Restoration Project: In 2006, the US Army Corps of Engineers (Corps) initiated the Los Angeles River Ecosystem Restoration Study, known as the ARBOR Study (Area with Restoration Benefits and Opportunities for Revitalization). The primary purpose of the study was to evaluate alternatives to restore the ecosystem along approximately 11 miles of the River from Griffith Park to downtown Los Angeles. The ARBOR project area includes the northern edge to the 1st St Bridge in the Project area.

The project proposes to restore the River by reestablishing riparian strand, freshwater marsh, and aquatic habitat communities, and reconnecting the River to major tributaries and its historic floodplain while maintaining existing levels of flood risk management. The study also explored recreational opportunities consistent with the restored ecosystem within the 11-mile reach of the river.

The Corps has recommended a $1.356 billion project to restore 719 acres of ecosystem and provide active transportation infrastructure complementary to the Project.

The Corps, in cooperation with the City of Los Angeles, released the Integrated Feasibility Report (IFR) and Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) in September 2015 for the Preferred Alternative.

Certification of the Final IFR and approval of the project require consideration by the City's Board of Public Works and City Council, which is expected to occur in the first half of 2016.

In-Channel Bike Path Study: Linear City Development, LLC, a Downtown Los Angeles-based real estate developer of mixed use, urban infill communities, in partnership with the non-profit group FOLAR, commissioned a study of a bike path in the River in 2013. This was the first technical analysis

investigating the hydraulic impacts of placing a bike path on the channel bottom of the River. This analysis was performed to understand the number of user days possible for a bike path in the bottom of the channel, and to understand the impact on the water surface elevation (WSE) within the River during peak design storm flows.

This study focused on a 1.6-mile trapezoidal-shaped, straight stretch of river centered near 6th St. The concept included a single access point through the tunnel under the 6th St Bridge, and the placement of a bike path raised six inches on the channel bottom.

Results showed that within the study's constraints, the bike path would not impact water flow and could be used for more than 330 days in an average year without changing the flood control capabilities of the river.

Real-time Monitoring, Analysis, and Reporting of Conditions in the Los Angeles River: This monitoring project is under development by the Arts District Community Council Los Angeles (ADCCLA), in partnership with the Urban Water Federal Partnership (UWFP) and the Aileen Getty Foundation. The project, led by Geosyntec, collects current and forecasted hydrologic information, along with operational data from LACFCD and the Corps, to provide real-time conditions reporting. The system is being designed to also serve as the central information hub to help support the operation of safety beacons, gates and signage, loudspeakers and sirens, and smartphone application notifications for current and forecasted conditions.

Bending the River Back Into the City (LA River Waterwheel Project): Designed and funded by Metabolic Studios, the $10 million project proposes to erect a water wheel in the River under the North Broadway Bridge, near Chinatown's Los Angeles State Historic Park. It is completely privately funded by the firm, which has begun permitting the project.

The project consists of an inflatable rubber dam within the River, a 72-foot diameter water wheel on the west bank of the river, and a water treatment and distribution facility. The eight-foot high inflatable rubber dam will be installed across the entire bottom of the River between the Broadway and Spring St Bridges. During the dry season, the project will inflate the dam, flooding the River between Broadway and Spring St to a depth of eight feet and extending nearly 1,600 feet upstream, creating a tall engineering challenge for a channel bottom bike path in this section.

6th St Viaduct Replacement Project: This project will replace the historic 6th St bridge that connects the growing Arts District on the west side of the River to the neighborhood of Boyle Heights on the east side. The bridge was built in 1932 and spans approximately 3,500 feet across the river. Due to seismic vulnerability and a deterioration of the concrete supports, the bridge will be demolished and replaced. The demolition of the bridge commenced in early 2016. In early 2019, the bridge will open for traffic and later that year landscaping and other improvements will be completed.

The $449-million project will provide safer access for people walking and biking traveling into and out of Downtown Los Angeles from the east by installing protected bike lanes. The project will include wider sidewalks, stairway access, and bicycle infrastructure that will connect to nearly eight acres of drought tolerant open space under the bridge, including a soccer field and existing segments of the LA River Bike Path.

The bicycle and pedestrian facilities associated with the 6th St Bridge can connect to the Project and will be complementary to it. Designs to improve the existing tunnel are in progress and should be coordinated into the design of the Project.

Riverside Dr Bridge Widening and Rehabilitation: The City of Los Angeles and Caltrans propose to rehabilitate and widen the Riverside Dr Bridge over the River. The project will extend the current LA River Bike Path under the bridge with a new 14-foot wide mixed-use path, as well as provide better accommodations on the bridge for people walking and biking.

The bridge is approximately 8 miles north of the Project area, just north of the T-intersection of Riverside Dr and Zoo Dr. The bridge, which was built in 1938, has four vehicular travel lanes and five-foot sidewalks. It does not have shoulders or bike lanes. The redesigned bridge would have four 11-foot travel lanes, a two-foot median, two five-foot shoulders that can be used by people on bikes, two eight-foot sidewalks, and two one-foot barrier railings.

The bridge project will extend the existing LA River Bike Path with a new 14-foot wide bike path crossing under the bridge. The existing bike path terminates at street level on the eastern side of the bridge. The new bike path under the bridge will connect the existing path east of the bridge to the area west of the bridge, where there are plans to extend the path to the west into the San Fernando Valley (see NBCUniversal Evolution Plan below).

Riverside Dr–Figueroa St Bridge Improvement Project: At the northern end of the Project the City of Los Angeles is completing the replacement of the Riverside Dr Bridge over the River. When complete, the new Riverside Dr – Figueroa St Bridge will be a two-lane, standard-curvature viaduct with a 10-foot sidewalk and a 12 foot-wide Class I bike path.

To connect to the LA River Bike Path, an asphalt 291-foot long, 12 foot-wide bike path from the Egret Park entrance to the proposed Riverside Dr Bridge will be built. This will improve people walking and biking safety and connectivity at the San Fernando Rd/Riverside Dr intersection.

The bridge is partially completed, with one lane of traffic open. The bike path will be completed within the next year.

NBC Universal Evolution Plan – LA River Bike Path Expansion: As part the $1.6-billion NBC Universal Evolution Plan, which will expand the Universal Studios theme park and back lot, NBCUniversal will provide $13.5-million for a 6.4-mile extension of the LA River Bike Path leading to and from the San Fernando Valley. The proposed extension will run between Whitsett Av in Studio City to Griffith Park at Riverside Dr, the current northern terminus of a section of existing bike path.

According to the LACDPW, $13.5-million will be sufficient to complete all of the planning, engineering, and environmental clearance for the entire 6.4-mile stretch as well as fund the construction of a 1.2-mile stretch between Lankershim Blvd and Barham Blvd, adjacent to the NBCUniversal property. NBCUniversal also plans to build a one-acre trailhead park along the river. Construction is expected to be completed in 2017.

Glendale Blvd–Hyperion Av Complex of Bridges Improvement Project: The City of Los Angeles and Caltrans propose to rehabilitate and widen the Glendale Blvd-Hyperion Av Viaduct Complex Bridge over the Los Angeles River and the I-5 freeway. The bridge was built in 1929 and is 1,190 feet long and 54 feet wide.

The project will rehabilitate the viaduct complex by reducing seismic vulnerability, resolve design deficiencies, and improve traffic safety and traffic circulation to increase the operational efficiency of the complex.

The viaduct complex over the River will be widened approximately 16 feet on both sides providing room for a widened sidewalk and curb lane, as well as the addition of a curbside shoulder. The shoulders will allow a bicycle lane to be added, as outlined by the City's Mobility Plan 2035 and 2010 Bicycle Plan.

The project will include the construction of a new access point to the LA River Bike Path from northbound Glendale Blvd.

Access to the LA River Bike Path is currently available from southbound Glendale Blvd.

North Spring St Bridge Project: In cooperation with Caltrans, the City of Los Angeles proposes to improve the North Spring St Viaduct and a portion of North Spring St between Baker St and Avenue 18 in the communities of Chinatown and Lincoln Heights. The project will eliminate design deficiencies and seismic vulnerability issues associated with the bridge. In addition, the project proposes to widen the existing 50-foot bridge by approximately 20 feet on each side. The improved bridge will provide pedestrian access with new sidewalks, two new bike lanes, and four lanes of traffic.

Connect US Action Plan: The Connect US Action Plan (Plan) (formerly Union Station and 1st/Central Station Linkages Study), which extends from El Pueblo to the Civic Center, and from Little Tokyo to the Historic Core, will improve historical and cultural connections in Downtown Los Angeles by enhancing pedestrian and bicycle travel options through and between communities. The Plan includes a neighborhood-level assessment of arterial and collector streets, with an emphasis on bicycle and pedestrian mobility. The Plan provides a community-prioritized list of improvement projects to strengthen bicycle and pedestrian connectivity between communities, destinations, and public transit.

I-710 Expansion Mitigation: Metro is preparing an EIR/EIS to evaluate improvements to the I-710 between Ocean Blvd. and State Route (SR)-60, which parallels and crosses the LA River south of the Project area. The project may lead to improvements in the existing LA River Bike Path as part of mitigation opportunities.

Alternatives are currently being evaluated, including adding bicycle lanes and improving interchanges for walking and biking adjacent to the River.

Most of the arterial street bridges that cross the LA River in this area will be reconstructed as part of the project, offering opportunities to improve streets and intersections for people walking and biking. Metro is working with the Corps, LACFCD, the SG & LA Rivers and Mountains Conservancy, and other stakeholders to identify mitigation and enhancement opportunities along the River. Improvements to the existing LA River Bike Path, such as safety enhancements and landscaping, have been identified as likely mitigation opportunities. The Draft EIR/EIS is expected to be released in late 2016.

Arroyo Seco Bike Path Extension Plan: The County of Los Angeles plans to extend the existing Arroyo Seco Bike Path from its southern terminus to the confluence of Arroyo Seco and the River at Avenue 19. The first phase of the bike path extension will extend the path 2.5-miles south to Avenue 26 with a 10-12 foot wide, 8-inch thick slab of concrete in the streambed. The second phase, which is currently unfunded, will extend the in-stream path to Avenue 19.

A bridge across the River would be needed to connect this path to the Project in the future. The feasibility of such a bridge is outside of the scope of this study. The Arroyo Seco Foundation notes that the channel-bottom bike path in the Arroyo Seco has made it more costly, and thus more prohibitive, to rehabilitate the channel bottom because any revitalization would require removal of the path and replacement in an alternate location.

Lower LA River Plan (AB-530): The State of California approved AB-530 in October 2015, to form a local working group to develop a revitalization plan for the Lower Los Angeles River Watershed, which starts in Downtown Los Angeles and extends to the River mouth in Long Beach. On or before March 1, 2017, the working group must develop, through watershed-based planning methods, a revitalization plan that addresses the unique and diverse needs of the Lower River and the communities through which it passes. The plan must be consistent with and enhance, and may be incorporated into, the County of Los Angeles' Master Plan for the entire River.

1.5 Examples of Existing Paths along and within Urban Rivers

Several existing bike paths along urban rivers can serve as examples for what treatments are possible for this Project.

In the greater Los Angeles area, these include the other segments of the LA River Bike Path but also the Arroyo Seco, Ballona Creek, Rio Hondo, San Gabriel River and Santa Ana River Bike Paths as well as several others in the Orange County area including Peters Canyon and San Diego Creek.

Most of the rivers in the Los Angeles area are channelized, like the Project area. In these examples, most of the paths are along the bank top and use channel cuts to traverse under bridges and other bank top obstructions. The single regional exception is the Arroyo Seco Bike Path.

Outside of the Southern California region, there are other informative domestic and international examples including urban river bike trails in Denver, Portland, Albuquerque and Barcelona, Spain. Some of these, such as the two examples from Denver, are along rivers with natural levees, in contrast to the concrete-lined character of most of the Los Angeles region examples. The Portland example shows a pier-supported path, similar to sections of the Project that could be cantilevered, as well as a floating path. The Barcelona example shows a river floor path with inflatable dams, similar to those proposed for the Waterwheel Section of the River.

Table 1-2 provides a summary of the bike path examples, followed by descriptions of each bike path.

NAME	LOCATION	LENGTH	TREATMENT ALIGNMENT*			# OF ACCESS POINTS**	AVERAGE # OF ACCESS POINTS PER MILE	AVERAGE # OF MILES PER ACCESS POINT
			TOP OF BANK	CHANNEL BOTTOM	CHANNEL CUT			
Arroyo Seco Bike Path	LA County	1.75	❖	⌘		4	2.3	0.4
Ballona Creek Bike Path	LA County	6	⌘		❖	14	2.3	0.4
LA River Bike Path (Elysian Valley section)	LA County	7.25	⌘			23	3.2	0.3
LA River Bike Path (Lower LA River section)	LA County	17	⌘		❖	27	1.6	0.6
LA River Bike Path (San Fernando Valley section)	LA County	3.6	⌘			10	2.8	0.4
Rio Hondo Bicycle Path	LA County	17	⌘		❖	33	1.9	0.5
San Gabriel River Bike Trail	LA County	28	⌘		❖	48	1.7	0.6
Santa Ana River Trail	Orange County	30	⌘		❖	39	1.3	0.8
North Diversion Channel Trail	Albuquerque	8.7	⌘		❖	14	1.6	0.6
Cherry Creek Trail	Denver	24.6	⌘			Intergrated with urban fabric	Easily Accessible	Easily Accessible
South Platte River Trail	Denver	17.8	⌘			39	2.2	0.5
Vera Katz Eastbank Esplanade	Portland	1.5	⌘	⌘		Intergrated with urban fabric	Easily Accessible	Easily Accessible
Besos River Bike Path	Barcelona, Spain	3	⌘			NA	NA	NA

*Description of the treatment alignment categories can be found in Section 7. Project Alignments. "⌘" means the majority of the path uses this type of treatment alignment. "❖" means that some segments of the path use this type of treatment alignment.
** Data was based on 2014 Metro Bike Map and Google Map Satellite Images accessed in April, 2016

Table 1-2: Summary of Existing Bike Paths Examples along Urban Rivers

1.5.1 Los Angeles Regional Bike Paths

Arroyo Seco Bike Path

The Arroyo Seco Bike Path is a 1.75-miles Class I Bike Facility/ Shared Use Path that extends from York St to Avenue 42 in Northeast Los Angeles. It runs along the Arroyo Seco River, which is a 25-mile long seasonal river between the San Gabriel Mountains near Mt. Wilson, through Pasadena, South Pasadena, and the neighborhoods of Highland Park and Lincoln Heights in Los Angeles.

The path runs mostly at the channel bottom of the Arroyo Seco River from its northern terminus to the south. It then ascends onto the top of bank for about 0.25 miles until it reaches its southern endpoint. Following the channel hydraulics, there is a slight and consistent downhill grade in the downstream direction, with some sections under overpasses having slightly greater slopes. The path has 4 access points from nearby parks and surface streets, which average about one access point every 0.44 miles. For safety reasons, if rain is predicted or if water release is expected from the upstream dam, the bike path will be closed to the public. Bike count data is not available for this facility.

Photo of Arroyo Seco Bike Path

Ballona Creek Bike Path

The Ballona Creek Bike Path starts from Culver City on the east and runs about 6 miles along the Ballona Creek to the Pacific Ocean. It is currently the only Class I bicycle path on the west side of Los Angeles. It connects Mid City communities with the beaches as well as job centers in the Silicon Beach area and the South Bay area.

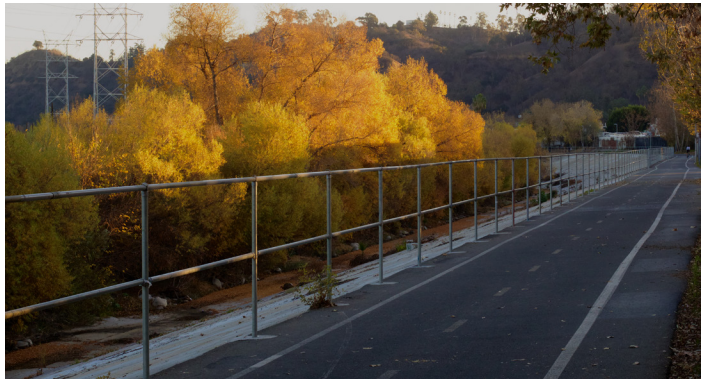
The path is mostly flat and runs on top of bank with some channel cuts to provide underpasses at street crossings. The path has 14 access points from nearby parks and surface streets, which average about one access point every 0.43 miles. The path is very well used with its high hourly volume people biking ranging from approximately 170 near Downtown Culver City to 220 at the western end of the path in Marina Del Rey, according to the Bike Data Clearinghouse jointly owned by SCAG and Metro.

Photo of Ballona Creek Bike Path

LA River Bike Path (Elysian Valley Section)

The Elysian Valley section of the L.A. River bike path runs 7.25 miles along the Glendale Narrows through Elysian Valley, Atwater Village, Griffith Park and the City of Glendale.

The path is mostly flat and runs on top of the bank. The path has at least 23 access points from nearby parks, recreational areas and surface streets, averaging about one access point every 0.3 miles. There are additional openings for nearby residents at side streets such as Rivedale, Shoredale Av and Harwood St. Approximately 50 bicyclists were observed during the highest period counted using the facility near Los Feliz Blvd in the Bike Data Clearinghouse.



LA River Bike Path (Elysian Valley Section)

LA River Bike Path (Lower LA River Section)

The Lower LA River section of the LA River Bike Path extends about 17 miles from Atlantic Blvd. in Vernon down to the mouth of the river at Long Beach.

The path runs mostly on top of bank with some channel cuts to provide underpasses at street and freeway crossings. Following the channel hydraulics, there is a slight and consistent downhill grade in the downstream direction. In Long Beach, the bike path runs on the east side of the river bed. When the river intersects with Imperial Highway, people on bikes wishing to continue riding north must cross over the river on the Imperial Highway roadway bridge, and re-enter the bike path on the west side of the river. The path has at least 27 access points from nearby parks, recreational areas and surface streets, averaging about one access point every 0.6 miles, with additional entrance such as stairs or fences opening for pedestrians and nearby residents. Bike count data is not available for this facility.

LA River Bike Path (Lower LA River Section)

LA River Bike Path (San Fernando Valley Section)

Much of the San Fernando Valley section of the LA River Bike Path is still being developed. The segments that have been completed include Mason Av to Vanalden Av (1.9 miles), Sepulveda Blvd. to Kester Av (0.6 miles), and Coldwater Canyon to Laurel Canyon Blvd. (1.1 miles).

All three segments are almost flat and run on top of the bank. They have a total of 10 access points, which average about one access point every 0.36 miles. Bike count data is not available for this facility.

LA River Bike Path (San Fernando Valley Section)

Rio Hondo Bike Path

The Rio Hondo Bike Path runs 17 miles along the Rio Hondo River, which is a tributary of the Los Angeles River from Arcadia to South Gate, where it joins the Los Angeles River.

The path runs mostly on top of the bank with some channel cuts to provide underpasses at street crossings. Following the channel hydraulics, there is a slight and consistent downhill grade in the downstream direction. The path has at least 33 access points from nearby parks, recreational areas and surface streets, averaging about one access point every 0.5 mile, with additional entrances such as fence opening for pedestrian and nearby residents. Bike count data is not available for this facility.

Rio Hondo Bike Path

San Gabriel River Bike Trail

The San Gabriel River Bike Trail is a 28-miles Class I Bike Facility/shared use path that runs along the San Gabriel River from Azusa in LA County to Seal Beach in Orange County.

The path runs mostly on top of the bank with some channel cuts to provide underpasses at street crossings. Following the channel hydraulics, there is a slight and consistent downhill grade in the downstream direction. The path has at least 48 access points from nearby parks, recreational areas and surface streets, averaging about one access point every 0.6 mile. There are additional entrances such as fence openings for pedestrian and nearby residents. Bike count data is not available for this facility.

San Gabriel River Bike Trail

Santa Ana River Trail

The Santa Ana River Trail runs alongside the Santa Ana River and extends approximately 30-miles from the Orange/ Riverside county line in Corona to Huntington Beach.

The multi-use trail runs mostly on top of the bank with some channel cuts to provide underpasses at street crossings. Following the channel hydraulics, there is a slight and consistent downhill grade in the downstream direction. The path has at least 32 access points at locations where the river trail intersects with the surface streets, averaging about one access point every 0.8 mile. There are additional entrances from nearby parks, recreational areas or fence openings for pedestrians and nearby residents. Bike count data is not available for this facility.

Santa Ana River Trail

1.5.2 Bike Paths outside the Great Los Angeles Region

Albuquerque North Diversion Channel Trail

Albuquerque North Diversion Channel Trail is an 8.7-mile bike path that stretches from the University of New Mexico to Balloon Fiesta Park near the northern edge of Albuquerque. The route begins at the paved bike trail along the Campus Wash. The Campus Wash joins the North Diversion Channel which the bike path follows for the rest of the route. The North Diversion Channel and its tributaries have been designed to carry flood waters safely from the University area and the northern part of the city into the Rio Grande.

The bike path runs mostly on top of the bank along the flood control channel with some channel cuts to provide underpasses at street crossings. The path has at least 14 access points from nearby surface streets, averaging about one access point every 0.6 mile. There are additional entrances from nearby campus, parking lots, properties and side streets. Bike count data is not available for this trail.

Albuquerque North Diversion Channel Trail

Cherry Creek Trail

The Cherry Creek Trail is a 24.6 mile recreational trail for pedestrian and cycling activity that runs along Cherry Creek. The trail begins in Downtown Denver at Confluence Park, which is at the confluence of Cherry Creek and the South Platte River and extends down south to the City of Parker. The trail is surrounded by residential areas, bridges, viewing areas, shopping centers, parks and rest areas.

The trail runs on top of the bank and is easily accessible from nearby parks, recreational and commercial areas and surface streets as the trail is open and well integrated with the urban fabric. Based on counts conducted by the Colorado Department of Transportation (CDOT) in 2014, there are approximately 1,275 combined bicycle and pedestrian users per day.

Cherry Creek Trail

South Platte River Trail

The South Platter River Trail is a 17.8-mile trail that runs alongside the South Platte River from Thornton in the north, through downtown Denver and down to Englewood in the south.

The trail runs on top of the bank with gentle grades of less than 1% most of the way. The trail runs through parks, industrial areas, viewing areas, and other attractions in Downtown Denver such as Mile High Stadium, Pepsi Center, Elitch Gardens Amusement Park, and the Children's Museum of Denver. The trail has at least 39 access points from surface streets, averaging about one access point every 0.5 mile. There are additional entrances from nearby parks and recreational areas. Based on counts conducted by Colorado Department of Transportation in 2014, there are approximately 175 bicycle users per day and 220 people on foot per day.

South Platte River Trail

Vera Katz Eastbank Esplanade, Portland, OR

The Eastbank Esplanade Bike Path extends 1.5-mile along Portland's Willamette River and provides views of the city. The esplanade connects to the seawall at Waterfront Park via the Steel Bridge and the Hawthorne Bridge. Seating walls, benches, overlooks and small plaza areas along the path offer places to stop and rest.

The bike path runs mostly on top of the bank, except for a 0.3-mile section where the esplanade descends to the bottom of the river channel. The path is the most accessible path of all the examples studied as the path is highly integrated into the urban frabric. Based on estimates conducted by Oregon Metro, there are approximately 2.1 million bicycle and pedestrian users per year, which is about 5,700 users per day in 2014.

Vera Katz Eastbank Esplanade, Portland, OR

Besos River Bike Path, Barcelona

Besos River Bike Path is a 3-mile bike path that follows the Besos River, which flows through the industrialized area of northern Barcelona.

The bike path is almost flat and runs along both the top of bank and bottom of the channel. It is one of the few examples of a path sharing infrastructure with urban flood management. The Besos River contains a system of floating dams that capture regular flows and deflate rapidly during rain events. In order to help river managers restrict user access to the bicycle and pedestrian paths for safety reasons, the river has a storm surge warning system in place. Access point data and bike count data is not available for this path.

Besos River Bike Path in Barcelona

2. HISTORICAL CONTEXT

The Los Angeles River was channelized beginning in the 1930's by the Corps for the primary purpose of providing flood protection, which took about twenty years to complete. This included the channelization of the tributaries, and is now considered to be the most extensive flood risk management system in a U.S. major metropolitan area.

Since the completion of the Corps project, the River has been primarily managed for flood control. However, there have been other ideas for use of the river. In the 1980's there was a proposal to use the river as a freeway. "The Times outlined the plan in 1988: The freeway would consist of two segments: a stretch running from the west San Fernando Valley to Downtown Los Angeles reserved for buses, vans and carpoolers; and a stretch extending south from Downtown Los Angeles to Long Beach for trucks." (LA Times, August 13, 2015)

Today the vision has changed. As outlined in the Los Angeles River Revitalization Master Plan the "long-term vision is for a continuous, functioning riparian ecosystem along the river corridor. In the near-term channel walls are modified to provide green landscaped terraces for wildlife habitat, water quality treatment, and public enjoyment. A system of pathways and overlooks provides public access." Mayor Garcetti sees "the river as the anchor of a major policy and civic-design initiative. It offers the chance to tackle several major issues in a single project, including public health, thanks to new riverside parks and walking and biking paths, climate change and affordable housing." (LA Times, August 13, 2015)

1.1 Existing Historical Elements

Constructing a bicycle and pedestrian path along the Downtown Los Angeles and Vernon reaches of the LA River will involve structures that are of historic significance, including several bridges that were built in the 1930's and 1940's, such as the Broadway Bridge shown in **Figure 2-1**.

Historic structures may also include containment and flood risk management facilities that may be eligible for listing in the National Register of Historic Places (NHRP).

Several historical structures, such as the Broadway Bridge shown in **Figure 2-1**, span the Los Angeles River. Any modifications or connections to these structures will be covered by CEQA and will require review by the City of LA's Office of Historic Resources.

The following bridges spanning the River have been designated by the City of Los Angeles as Historic-Cultural Monuments:

1. North Broadway – Buena Vista Bridge
2. North Spring St Bridge
3. North Main St Bridge
4. Cesar Chavez Av – Macy St Viaduct
5. First St Bridge
6. Fourth St Bridge
7. Sixth St Bridge
8. Seventh St Bridge
9. Olympic Blvd Bridge
10. Washington Blvd Bridge

These bridges have been designated as eligible for listing in the National Register of Historic Places (NRHP) and are listed in the California Register of Historical Resources (CRHR). The LA River Bike Path Project may include modifications to the river channel and/or bridges, which would result in the alteration of these historically significant structures and would need to be reviewed by State Office of Historic Preservation under CEQA.

1.2 Project Limitations Resulting from Historical Elements

As a consequence of the existing historical elements in the Project area, improvements may need to be implemented in a manner that preserves the unique characteristics of any element identified as having historical significance. Particularly, access ramps to historical bridges may need to be designed to preserve the unique characteristic of the bridge as well as include architectural detailing similar to that of the existing bridge.

The City of Los Angeles Office of Historic Resources (OHR) will need to be contacted to discuss possible alterations to these historical resources. The OHR reviews alterations to historical structures on a case-by-case basis.

CEQA regulations also cover historic structures. If a property is determined eligible for or listed on the National Register, it is considered a historical resource for the purposes of CEQA and is automatically listed on the California Register of Historical Resources.

Section 15064.5[b] of the CEQA Guidelines outline the process and criteria for "Determining the Significance of Impacts to Archaeological and Historical Resources." CEQA requirements are further discussed in Chapter 4.

Figure 2-1: Photo of historical Broadway Bridge

3. ENVIRONMENTAL CONSIDERATIONS

Environmental considerations assesses potential environmental impacts of the Project as well as the potential for environmental restoration and greening. The scope of the environmental assessment is governed by the CEQA and the National Environmental Policy Act (NEPA).

CEQA analysis includes water quality, air quality, biological resources, hazardous waste and noise, as well as archeological, paleontological and historical resources. NEPA covers similar topics, but from a Federal perspective.

For this Study the preliminary environmental analysis included examination of:

- Archeological and Paleontological Resources
- Historical resources
- Biological Resources
- Air Quality
- Noise
- Water Quality
- Hazardous Waste
- Visual/Scenic Resources

Each topic was analyzed to identify its impacts on Project design, alternatives, cost, and schedule.

Analysis for each of these topics was done by reach, with conditions and recommendations summarized for each reach. The analysis and recommendations are included in Appendix A.

Findings and Conclusions

3.1 Environmental Constraints

Project design, schedule, cost, and the viability of alternatives may be impacted by: Native American Tribal Cultural Resources (TCRs); potential construction-related modifications and alterations to historic River bridges; seasonal restrictions on biological studies and/or minimization measures to reduce potential impacts to roosting bats and nesting birds; hydrological conditions that could affect Project design, scheduling, or construction techniques; and the potential contamination of surficial soils in the industrial and commercial portions of the Project alignment. Additionally, the level of environmental documentation required for the Project may depend on whether the lead agency considers the proposed bike path to be a noise-sensitive receptor.

Requirements from each of these potential constraints are described by reach in Appendix A.

3.2 Environmental Documentation

The Project will require both CEQA and NEPA documentation.

To ensure compliance with these two Acts, this Study recommends that once project plans are developed to a conceptual design level, the lead agency prepare an Initial Study (IS) pursuant to CEQA to determine whether the Project has the potential to result in significant environmental impacts. The IS will determine whether the Project is eligible for a Categorical Exemption (CE), a Negative Declaration (ND), Mitigated Negative Declaration (MND), or an Environmental Impact Report (EIR). Chapter 4 outlines the requirements for each of these categorizations.

Based on the results of this Study, it is likely that the IS will show that further technical studies and analyses are required to confirm the significance of potential environmental impacts. These studies and analyses include:

> Jurisdictional Delineation;
> Biological Resources Survey and Evaluation including nesting bird surveys, burrowing owl surveys, and emergent bat surveys;
> Historical Properties and Archeological Resource Survey and Evaluation, Consultation;
> Hydrologic and Hydraulic Evaluation and Modeling;
> Geologic Resource Study and Evaluation, and
> Hazardous Materials Environmental Site Assessment

Section 408 Permits (see Chapter 5 for discussion of 408 Permits), which authorize the Corps to grant permission for the alteration, occupation or use of a Corps civil works project, require compliance with NEPA. Therefore, it is likely an Environmental Assessment (EA) or an Environmental Assessment Compliance Addendum (EACA) to supplement the CEQA environmental documentation will be required. An Environmental Impact Statement (EIS) may be required depending on the results of the technical analyses conducted for this Study (see Appendix A).

3.3 Planned Restoration and Greening

The Corps ARBOR project, discussed in Chapter 1, proposes to restore the ecosystem in and along approximately 11 miles of the River from Griffith Park to downtown Los Angeles. Restoration will include reestablishing riparian strand, freshwater marsh, and aquatic habitat communities and reconnecting the River to major tributaries and its historic floodplain, while maintaining existing levels of flood risk management.

Given the future plans to restore the River, an in-channel bike path may create a cost burden on future restoration efforts. Any bike path existing along the channel bottom at the time of restoration would need to be relocated outside of the restoration area, thereby increasing the cost of restoration efforts.

The proposed LA River Bike Path can accommodate opportunities for greening adjacent to the bike path along the bank top where there is available right-of-way. Greening should be consistent with the Los Angeles River Revitalization Master Plan typologies. Greening within the riverbed adjacent to an in-channel bike path may be more difficult, as partially modifying the riverbed and potentially obstructing river flows has historically been discouraged by the Corps.

See Appendix A-2 for additional discussion on planned restoration and greening opportunities.

4. PERMITTING PROCESS

The Project will require easements, approvals, and environmental permits from a variety of organizations and agencies. Determining which permits are required depends on the jurisdictional control of the land, waterways and properties involved. The jurisdictions include Los Angeles County, the City of Los Angeles, the City of Vernon and the Corps, railroads, Native American agencies and the Fish and Game Service.

The permits and agencies that may need to grant Project approval are listed below. A more comprehensive description of the permits and the permit process is described in Appendix B.

- 33 USC 48 -Section 408 Permit – Los Angeles USACE
- Easements and Access Agreements
- Regional, County and City Approvals
- California Environmental Quality Act (CEQA) - Initial Study (IS) /Mitigated Negative
- National Environmental Policy Act (NEPA) – Environmental Assessment (EA)
- CWA Section 401 Water Quality Certification (WQC) - Los Angeles Regional Water Quality Control Board
- CWA Section 404 Nationwide Permit - Los Angeles USACE;
- Native American consultation;
- Fish and Game Code Section 1602 Lake and Streambed Alteration Agreement
- National Pollutant Discharge Elimination System (NPDES) Construction General
- Demolition Permit – City of Los Angeles Department of Building and Safety
- Grading Permit – LADBS

The River channel (bottom and associated walls) is a Corps built facility and any modification to these facilities requires Corps approval. The Corps authority and responsibilities are governed by 33 USC Section 408, which "authorizes the Secretary of the Army to grant permission for the alteration or occupation or use of the project if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project." The section 408 process is described in "Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408." A Section 408 Permit triggers NEPA requirements. The other requirements are largely triggered by CEQA.

Permit scoping meetings should be conducted with each of the applicable regulatory agencies to solicit comments, discuss regulatory requirements and identify issues of concern to gain preliminary approval prior to environmental document and permit submittal.

5. CEQA/NEPA CONSIDERATIONS

CEQA and NEPA are environmental reviews required by the State of California and the US Federal Government, respectively. In the State of California, development projects undertaken by Government Agencies mandate a CEQA review. At the Federal level, modification of a Corps-controlled facility will trigger NEPA.

The Project will require preparation of an (IS) in accordance with CEQA (Public Resources Code Section 21000 et seq.), the State CEQA Guidelines (Title 14, California Code of Regulations, Section 15000 et seq.) and the City of Los Angeles CEQA Guidelines (1981, amended July 31, 2002). An IS is a preliminary analysis to determine if there is substantial evidence that a project may have a significant effect on the environment. If the IS concludes that the Project, with implementation of mitigation measures, may still have a significant effect on the environment, an Environmental Impact Report (EIR) will be required. If the IS concludes that the proposed project will not have a significant effect on the environment, or if identified effects can be mitigated to less than significant, the lead agency may adopt a negative declaration (ND) or a mitigated negative declaration (MND).

The proposed project will modify or alter a portion of a Corps built facility. As a consequence, a Section 408 Permit, which requires compliance with NEPA, will be required. Based on observation of the 408 permit process for the Metabolic Water Wheel Project, the Corps may review the CEQA document and use it to determine whether the IS/MND is adequate for their assessment of the potential environmental impacts. The Corps will likely require preparation of an Environmental Assessment (EA) Compliance Addendum to supplement the CEQA IS/MND to address identified resources not evaluated, or not part of the IS/MND. The NEPA document will be prepared in compliance with applicable Federal laws, Executive Orders, and regulations and policies of the Corps. A Finding of No Significant Impact (FONSI) is most likely. Completion of NEPA is necessary prior to Corps District Engineering making a decision on the 408 Permit application.

See Appendix B for detailed discussion on CEQA and NEPA requirements as it relates to this Project.

Construction permits will be required by each affected jurisdiction. See Appendix B for detailed discussion on permitting requirements.

6. REAL ESTATE ASSESSMENT

6.1 Overview

Access to and from the Project will require easements within properties controlled by private owners and public agencies for construction and maintenance of the path with covenants to allow access to the public for bicycling and walking.

The River channel and much of the land along the top of bank in the Project area are owned by the City of Los Angeles and the Los Angeles County Flood Control District (LACFCD). However, most of the land adjacent to the river is either built out with industrial facilities on private property or with rail facilities on publicly owned lands, some of which is controlled by Metro.

Records from the Los Angeles County Assessor's office and on-line maps show that:

> **Within the river:** 60% is owned by the City of LA, 20% by LACFCD and roughly 20% is controlled by private owners with a LACFCD easement

  This ownership and easement profile should allow a bike path to be constructed in the study area.

> **Top of bank: Similarly the top of bank is 60% owned by the City and 20% by the LACFCD. However much of this land is leased for industrial use or used for rail operations**

  Approximately 20% of the top of bank property is owned or managed by private land owners, private entities, and/or public agencies including railroads, public utilities, and individuals.

Rail Right-of-Way Considerations

Several sections of the Project are in close proximity to rail facilities that run immediately adjacent to or directly along the top of bank. Due to potential safety issues the CPUC has issued guidelines for pathways adjacent to railroad tracks (CPUC's General Order No. 118-A). Guidance on pathways that cross tracks is provided by the CPUC's General Order No. 26-D. Paths that parallel rail facilities, such as the alignment alternative at the top of bank, will require a barrier between the path and rail lines. The barrier needs to be placed with a minimum 8.5 feet of horizontal clearance to the outside of the railroad track per CPUC's General Order No. 118-A.

The CPUC General orders for guidance on constructing and operating bicycle and pedestrian facilities require that the railroad authority operating the tracks (in this case SCRRA) file with the Consumer Protection and Safety Division's Railroad Operations and Safety Branch their standards for the construction, reconstruction and for subsequent maintenance of walkways. The standards contain provisions for reasonably safe and adequate walkways or bikeways adjacent and crossing tracks that must be maintained and kept reasonably free from vegetation.

Right-of-Way Acquisition

Right-of-way and/or property acquisition requirements will be identified during the design process. Special note will need to be made for:

> Right-of-way for ramps at the various access points. This right-of-way will, in some cases, be controlled by private owners or railroad corporations.
> Right-of-way through easements for the top of bank alignment in Reach 4.
> Right-of-way where the path crosses under the existing LADWP transmission lines will require unrestricted accommodations for maintenance purposes.

The following **Table 6-1** and **Figure 6-1** summarize the land uses along the proposed bike path.

Appendix G contains a list and detailed maps showing the parcel ownership along the project route.

SEGMENT	LENGTH (MI.)	OWNERSHIP (WITHIN RIVER)
Interstate-5 to Washington Blvd	4.6	City of Los Angeles
Washington Blvd to Downey Rd	1.5	Private owners with LACFCD/Corps easement Small portions owned by LACFCD, and there is a strip owned by LADWP
Downey Rd to Atlantic Blvd	1.7	LACFCD

Table 6-1: Land Use Summary Chart

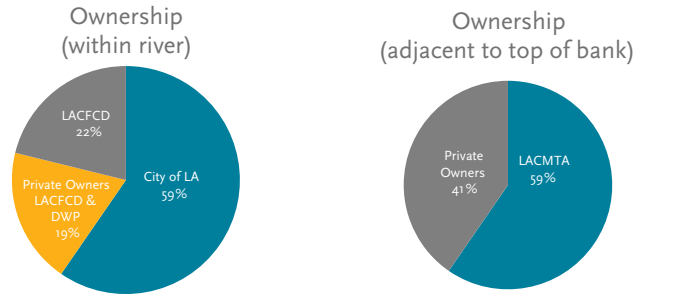


Figure 6-1: Land Use Summary Chart

7. PROJECT ALIGNMENTS

The Study examined path width, possible physical locations of the proposed path along the River (channel bottom, channel cut, top of bank), access points, bridge under-crossings/ over-crossings and constructability. The possible locations for the path and the access points are described below with a summary of the site assessment in Appendix D.

Although the City of Los Angeles has installed some bike paths as wide as 17 feet, the Study assumes a path constructed to Caltrans minimum standards of 12 feet in width. This width provides sufficient space for two-directional bicycle travel as well as walking. In the next phase of this Project's development, a wider path may be evaluated along the entire length of the Project or parts of it, especially where high levels of pedestrian traffic are expected or as needed for maintenance access.

From anecdotal and Study team observations along existing sections of the LA River Bike Path, people walking and biking regularly use the path. The existing path functions as a shared-use path and the Study assumes that the Project will function the same way with access points serving both people walking and biking.

The feasibility assessment of each alignment treatment along the Project length includes an inventory of the existing land uses, physical constraints, and access point needs, as well as the ability to maintain flood control functionality and railroad operations while providing a functional and safe bicycle and pedestrian facility. Constraints include obstructions from existing bridge structures, electrical towers, rail lines, existing and future conditions in the River, and rectangular channel cross sections.

Throughout the Project area the River channel, consisting of the side walls and riverbed (or channel bottom), has a cross section that is either trapezoidal, where the sides of the River are sloped, or rectangular, where the channel walls are vertical. Modifications to vertical walls (rectangular cross section) are structurally challenging and not considered a viable option in the Study.

The Study assumes a fully grade-separated path with no at-grade crossings with vehicles or trains along the length of the Project. This is consistent with the existing sections of the LA River Bike Path.

7.1 Path Alignment

In developing alternatives and evaluating the Project's feasibility, the team considered three types of alignments: 1) top of bank 2) channel bottom or in-channel and 3) channel cut consisting of a path cut into the sloped channel wall.

A. Top of bank alignment

This alignment places the path outside of the channel along the River's bank as shown in **Figure 7-1**. A top of bank alignment is the most common river path treatment used along the vast majority of existing LA River Bike Path segments and other regional river paths. Both of the existing path segments that connect to this potential Project use this treatment.

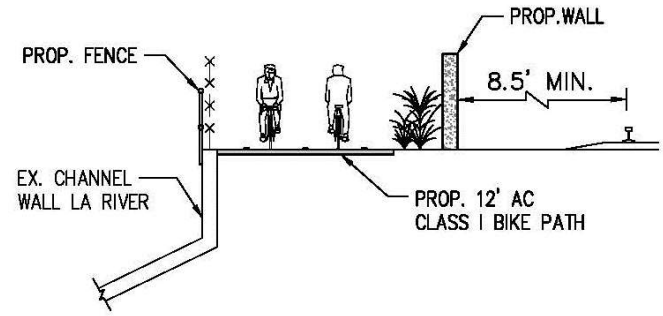


Figure 7-1: Top of bank detail adjacent to rail

The top of bank alignment allows direct access from surface streets to the path. This alignment also allows the path to be used as a maintenance road and for emergency access. Currently very few access roads exist along the Project's 8-mile length. If maintenance vehicles frequently use the path, a width wider than the minimum standard is needed to allow safe flow of bicycle and pedestrian traffic.

The conditions of the top of bank along the Project's length vary from areas with ample right of way suitable for a path to areas that are heavily obstructed by existing land uses and infrastructure. Along much of the Project's length, rail facilities exist adjacent to the River. Where adjacent rail lines are present, the path would need to be located at least eight and one half feet away from the center line of the nearest rail as in **Figure 7-1.**

Where there is insufficient top of bank right-of-way, such as where rail is located directly at the top of bank, at electrical towers or bridge abutments, an elevated structure or cantilevered structure protruding from the bank, as illustrated by **Figures 7-2 and 7-3**, or a channel cut, as discussed under Section 7C Channel Cut Alignment, could be used to traverse these obstructed areas. Because of the high cost of these treatments, the Study considered elevated structures or cantilevering the path only for short distances between relatively unobstructed top of bank conditions.

Relocation of electrical towers, bridge abutments, and railroad tracks were not considered in the Study. New at-grade railroad crossings were not considered due to the CPUC's policy to reduce the number of at-grade crossings at passenger or freight railroad mainlines in California. (CPUC General Order 75-D).

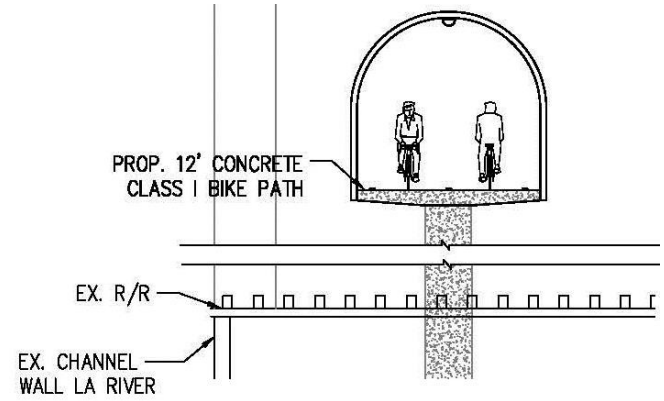


Figure 7-2: Top of bank detail at obstructions, elevated path.

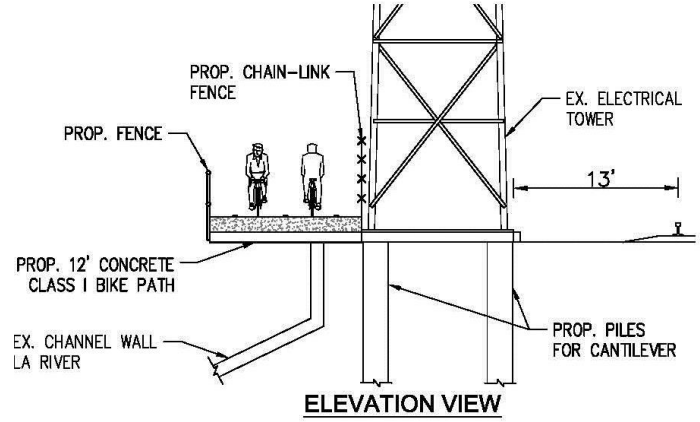


Figure 7-3: Top of bank detail at obstructions, cantilevered path.

B. Channel Bottom/In-Channel Alignment

This alignment places the path along the edge of the riverbed, as illustrated by **Figure 7-4**. The Study evaluated a path elevated six inches above the riverbed, consistent with the 2013 In-Channel Bike Path Study of a section of river and path within the Project's length.

A channel bottom alignment would not be open for use during or shortly after rain events because of the dangerous conditions resulting from the fast-flowing runoff that fills the River channel. Before reopening a channel bottom path for public use following a rain event, maintenance crews would need to inspect and clear the path for safety. An investigation of the channel's ability to maintain flood control functionality is discussed in Section 8 of the Study.

Currently water flows in the channel year-round but dry weather flow is generally confined to the low-flow channel, usually located at the center of the riverbed. The low-flow channel is diverted to the outer channel walls only between Washington Blvd and Bandini Blvd in the Project area. In this section, a channel bottom path could be directed to the center of the riverbed. However, this treatment may not be possible as it would require building structures within the flood channel to go over the water divergence and to access surface streets, which would be challenging to obtain approval from the Corps.

At many places along the Project length, storm drain outfalls contribute dry weather flow to the River year round and emit significant storm water flow related to rain events. At these places, a channel bottom path could traverse above outfalls with channel cuts or would require ongoing maintenance to ensure continuous drainage and safe path conditions as discussed in Section 10 of the Study.

A channel bottom alignment would require infrastructure and operations measures to ensure personal safety of path users. Because a channel bottom path is out of the sight of street-level road users, such a path would require measures to eliminate the risk of isolation to path users. Restricted access in or out of the channel bottom would also pose a risk to path users and would need to be addressed through additional access, communication facilities, or other measures.

From approximately 1,500 feet north of Broadway to 300 feet south of Broadway, the "Bending the River Back" project will introduce an inflatable dam into the River, which would inundate a channel bottom path by up to eight feet. A 1,800 foot-long floating bridge in this section, as illustrated by **Figure 7-5**, would allow a channel bottom path to traverse this section of inundated river. Such a path alignment treatment is used on a portion of the Vera Katz Eastbank Esplanade in Portland, Oregon. However, because the River is subject to high velocity, turbulent water flows, this treatment may not be possible and would require detailed study as well as approval by the Corps.

The LARRMP proposes restoring a portion of this section of the River with riparian strand, freshwater marsh, and aquatic habitat. A channel bottom alignment would interfere with the restoration. Any existing channel bottom path would need to be removed and relocated during restoration, greatly inflating the cost of restoration.

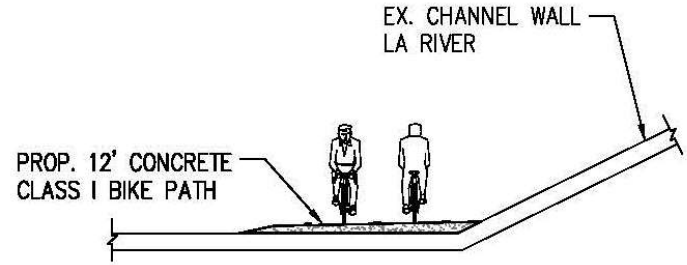


Figure 7-4: Typical Channel Bottom Detail

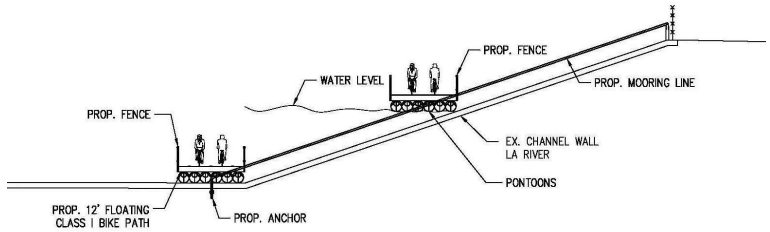


Figure 7-5: Floating Bridge Detail

C. Channel Cut Alignment

This alignment would cut into the channel wall and create a flat pad containing the path within the sloped channel wall as illustrated by **Figure 7-6**. Along other river bike paths in the region, this treatment is commonly used under bridge crossings.

A channel cut alignment is possible in sections of the River with trapezoidal cross sections, which comprise the majority of the river channel in the Project area. Rectangular channel cross sections not suitable for this treatment exist between Riverside Dr and the SR-110 freeway, and between Washington Blvd and Bandini Blvd. Aside from these areas, this alignment is relatively unobstructed along the Project's length.

A channel cut alignment could be used in combination with either of the other two alignments, for bridge under-crossings, to avoid obstructions or to provide access to a channel bottom path.

Similar to a channel bottom alignment, a channel cut alignment would require infrastructure and operations measures to ensure personal safety of path users where the path is out of sight of street users or where access is restricted for any significant length.

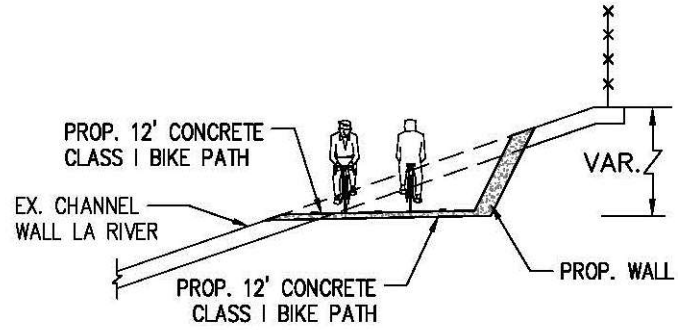


Figure 7-6: Typical Channel Cut Detail

Access Points

The Study considered access to the path at 16 points (i.e., every bridge crossing) along the Project length or an access point approximately every one-half mile (**Figure 7-7**). Such frequency of access is consistent with other similar river paths as in Section 1.5. Only three access points along the Project's length currently exist and the Study assumes that they will remain available for future use. The existing access points are located at the River's crossings with Main St, 6th St, and Downey Rd. The Main St and Downey Rd locations are at the top of bank while access at 6th St reaches the channel bottom via an existing maintenance tunnel. Some reconstruction of existing access points will be required to provide a suitable path for people walking or biking as part of this Project.

Access points connect the path to surrounding communities. The path will only serve the communities through which it passes if access points allow people walking and biking to reach it. Connecting the path to surrounding walking and biking infrastructure increases the effectiveness of both the path as well as the surrounding infrastructure by creating a more complete network. The regional significance of closing the gap in the LA River Bike Path between Riverside Dr and Atlantic Blvd is dependent upon connecting communities within the gap to the communities already served by the existing sections of LA River Bike Path.

The land adjacent to the River along the Project's length is almost entirely built out with industrial land uses on private property and rail alignments on publicly owned lands (see Chapter 6, Real estate assessment). Thus, this study assumes that any access in addition to the three existing access points is possible only at existing bridges.

The Study assumes access to the path will be provided primarily by bridge structures connecting to existing bridges as illustrated in **Figure 7-8**. This would require modifying

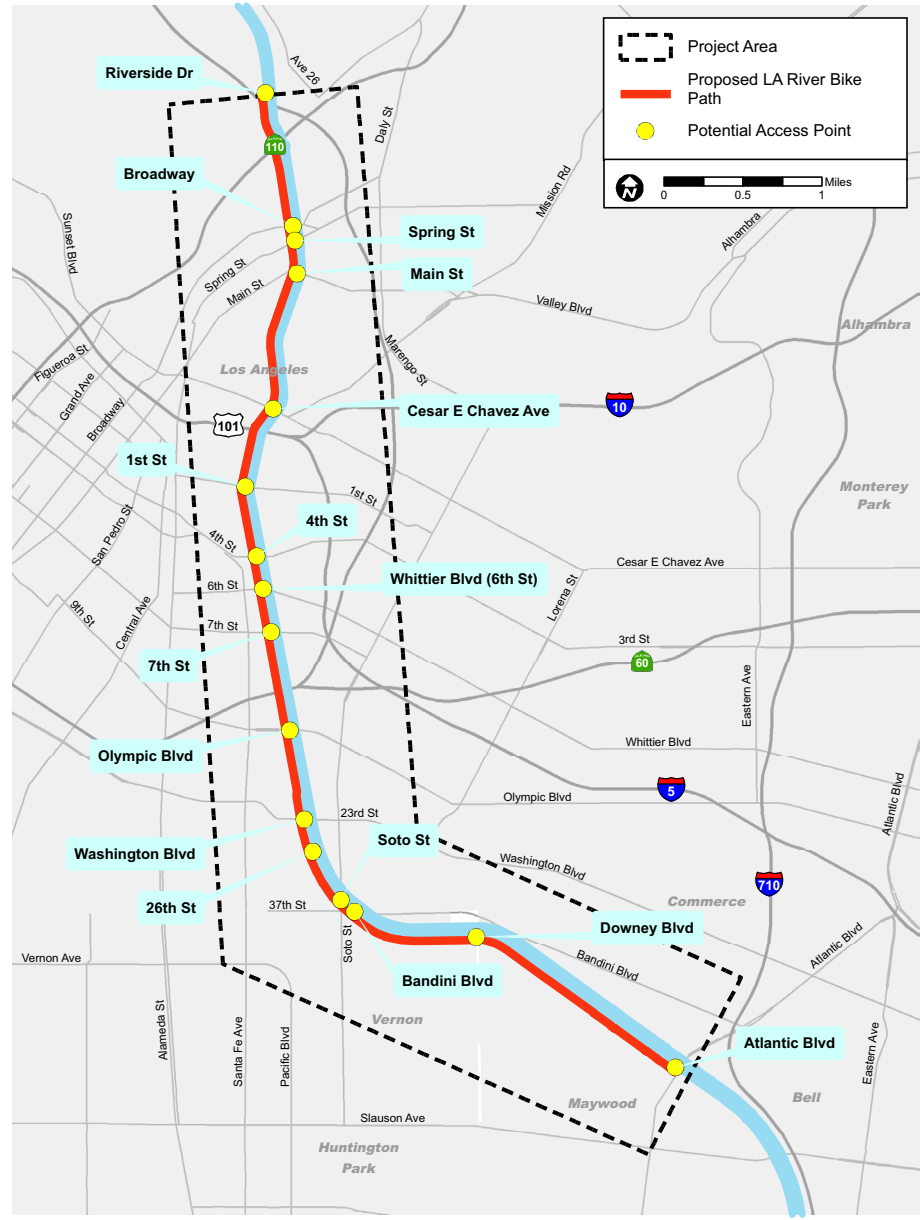


Figure 7-7: Access Points Along Project Length

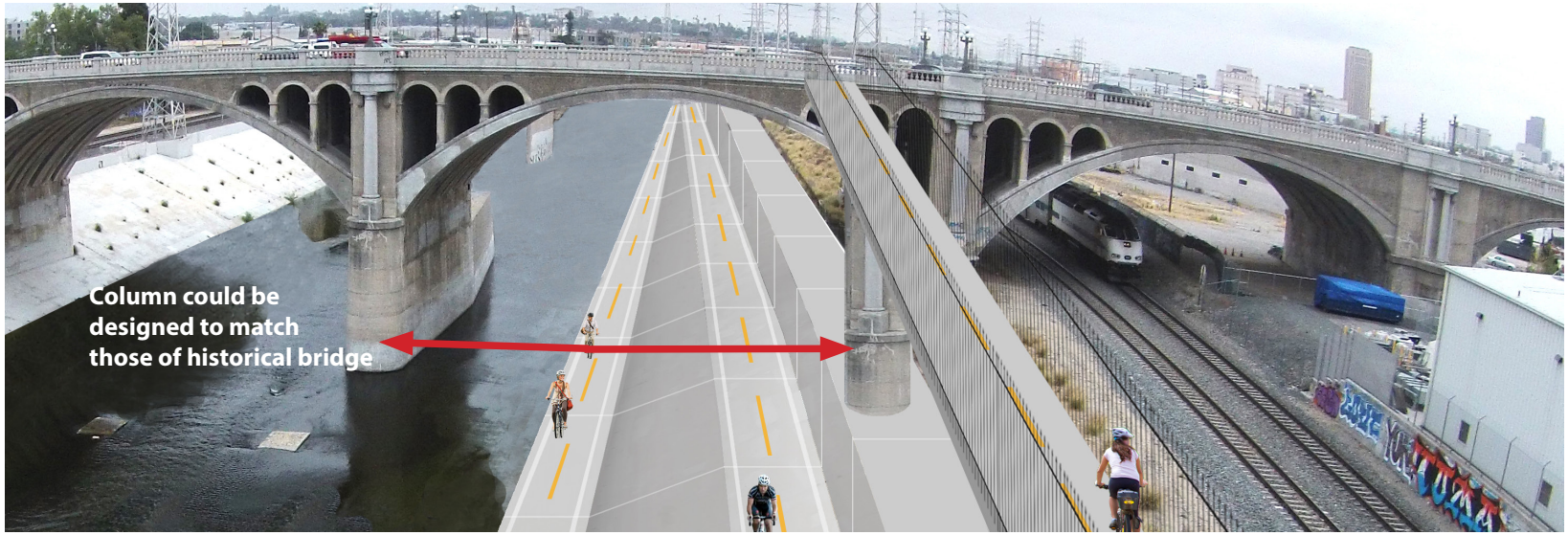


Figure 7-8: Access Bridge Structure: Conceptual Rendering

existing bridges, some of which are historical. Channel wall modifications may be required in areas where there exists insufficient right of way at the top of bank to accommodate bridge columns.

For channel bottom alignments, the path would ramp out of the riverbed through a channel wall cut for a distance of approximately 600 feet before transitioning to an access bridge structure at the top of bank. This additional construction at access points significantly increases the overall cost of a channel bottom alignment.

Reaches

The following section describes possible path alignments along each of five segments or "reaches" of the River. A "reach" is a hydrology term used to describe a stretch of river between two bends, locks, or turns in a river. The Study breaks up the eight-mile Project length into five reaches, as illustrated in **Figure 7-9**.

The reaches in the Study were largely defined based on the character of the top of bank: unobstructed, obstructed, or highly obstructed/vertical walled.

> **Unobstructed with sloped channel walls:** The reach is relatively free of bank-top obstructions. The path could be constructed along the "top-of-bank" with only minor deviations. Channel walls are slopped and a channel cut path could be easily constructed.

> **Obstructed:** Top of bank has some electrical towers, bridge abutments, or rail facilities. Portions of the path would require channel cuts or elevated/cantilevered structures to avoid the obstructions.

> **Highly obstructed / Vertical Walled:** The top of bank has little or no open space. It is obstructed by electrical towers and/or rail facilities. Majority of the alignment would need to be constructed with channel cuts, elevated or cantilevered structures. Channel cuts are not feasible in areas with vertical walls.

The Reaches, as shown in **Figure 7-9**, are numbered North to South from 1 to 5. Reach 1 begins at Riverside Dr at the northern edge of the Project area and Reach 5 ends at Atlantic Av in the City of Vernon.

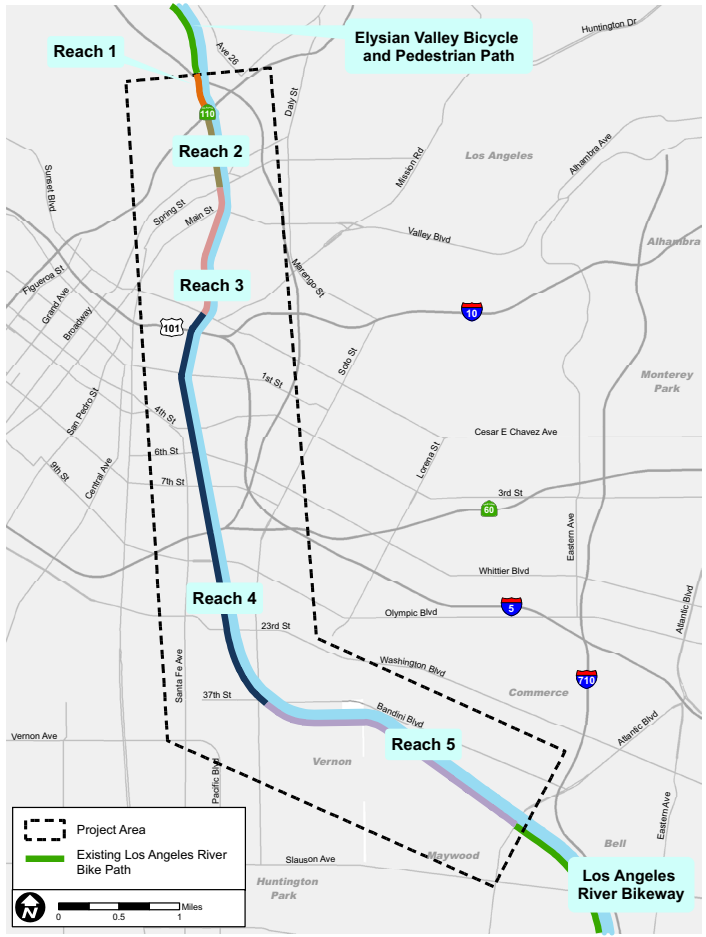


Figure 7-9: Project Area by Reach

The following describes the extents of each of the reaches:

Reach 1: Between Riverside Dr and SR-110 - Reach 1 has unobstructed right of way along the top of bank but transitions to a rectangular shape that begins just north of the I-5 overpass. There is a Union Pacific Railroad crossing just north of the Arroyo Seco Parkway (SR-110) overpass. This reach is approximately 0.4-miles long with one potential access point at Riverside Dr.

Reach 2: Between SR-110 and Spring St - Reach 2 is characterized by unobstructed to obstructed top of bank. The top of bank is obstructed at five locations by electrical towers. A portion of this reach will be flooded by the "Bending the River Back" project, making a channel bottom path impractical. The reach is approximately 0.6-miles long with one potential access point at Spring St.

Reach 3: Between Spring St and Cesar Chavez Av - Reach 3 is characterized as obstructed. It has limited space along the top of bank but is obstructed by bridge abutments at Main St, Cesar Chavez Av and two railroad crossings. This reach is approximately 1-mile long with two potential access points at Main St and Cesar Chavez Av.

Reach 4: Between Cesar Chavez Av and Bandini Blvd Reach 4 is largely characterized by a highly obstructed top of bank due to electrical towers, bridge abutments, adjacent rail lines and industrial land usage. In the channel, the low-flow water is diverted from the center to run along the channel wall. This reach is approximately 3.4-miles long with seven potential access points.

Reach 5: Between Bandini Blvd and Atlantic Blvd Reach 5 is characterized as obstructed. It has limited space along the top of bank due to adjacent rail lines, a rail crossing, electrical towers, and bridge abutments at Downey Rd and Atlantic Blvd. This reach is approximately 2.4-miles long with access points at Bandini Blvd, Downey Rd and Atlantic Blvd.

Each reach is described in detail in the following sections.

7.2 Reach 1: Between Riverside Dr and SR-110

The 0.4 mile-long Reach 1 begins at the southern terminus of the Los Angeles River Greenway Trail where the soft-bottomed trapezoidal channel containing vegetation and wildlife comes to an end.

Though this reach is relatively short and has a largely unobstructed top of bank, it poses one of the most complex challenges to closing the gap in the LA River Bike Path due to a the Union Pacific railroad bridge crossing and the rectangular channel cross section that begins just north of the I-5 overpass and runs south to Reach 2.

Access Points

Access to the path would be provided at Riverside Dr by connecting to the existing "Los Angeles River Greenway Trail" to the north (**Figure 7-10** Photo 1). Riverside Dr provides access to many regionally significant activity centers including Dodger Stadium, Elysian Park, the Elysian Valley neighborhood, and new public space to be created at the historic Riverside Dr Bridge landing. Access would also be provided to the Metro Local Line Local 96 bus stops along Riverside Dr and the proposed Riverside Dr Bike lanes.

Alignment

The top of bank area is generally wide enough for a path and not obstructed for most of the length of the reach, as illustrated by **Figure 7-10**.

The Union Pacific railroad bridge just north of the SR-110 crossing combined with the rectangular channel geometry will require an elevated bridge structure to traverse over the rail line. A channel cut allowing the path to traverse under the railroad crossing was deemed not be feasible due to the channels rectangular cross section in this area.

A channel bottom alignment would be possible for this reach but would lead to an engineering challenge at the transition to Reach 2 due to the Bending the River Back project. The trapezoidal channel wall would allow the path to transition to the channel bottom via a channel cut just south of Riverside Dr (Photo 1). However, the path would be committed to a channel bottom alignment, and subsequent innundation of the river bed, until just south of the confluence of the Arroyo Seco because the channel cross section is rectangular through this area.

This section of the River is part of the LA River Revitalization project. Restoration of the channel bottom would necessitate the removal and relocation of an in-channel path.

REACH 1 - EXISTING CONDITIONS

Looking South. Terminus of existing path at Riverside Drive.

Looking Northwest along Riverside Drive.

Top of bank area. Looking South under I-5 overpass.

Top of bank area at historic Riverside Drive bridge footing.
Taken during Riverside Drive Bridge replacement, looking South.

Location of the existing Union Pacific railroad crossing
North of SR-110, looking South to the confluence with Arroyo Seco.

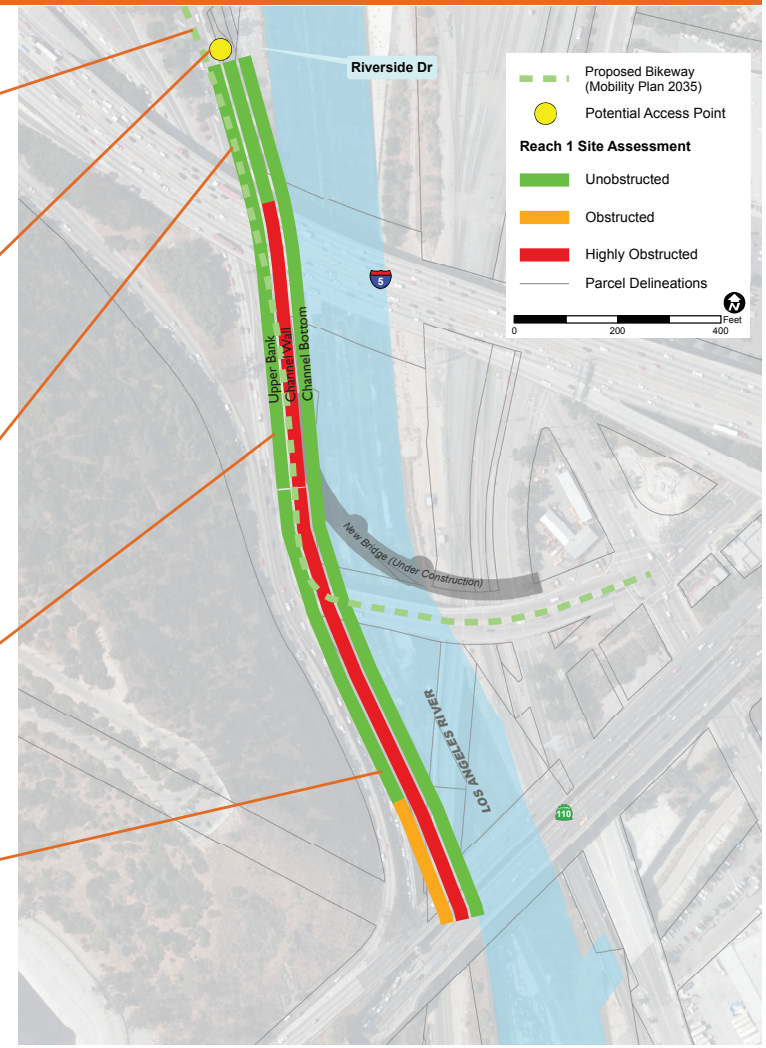


Figure 7-10: Reach 1 Alignment Assessment

7.3 Reach 2: Between SR-110 and Spring St

The 0.6 mile-long Reach 2, which begins at the 110 Freeway, is characterized by a trapezoidal-shaped channel with available top of bank right of way and few obstructions. The Bending the River Back project will be constructed along this reach, flooding much of the channel to a depth of 8 feet.

Access Points

Access points at both the Spring St and Broadway overcrossings will require elevated bridge structures extending from the path to the bridge. In the future, both Spring St and Broadway are proposed to have bike lanes. Spring St provides connections to Chinatown, Lincoln Heights, and the Los Angeles State Historic Park, among other attractions. The Metro Gold Line Chinatown station provides regional connectivity via Spring St. Broadway provides additional access to activity centers in Chinatown and Lincoln Heights, as well as access to Elysian Park and the future Albion Park. Metro and LADOT DASH buses make stops on Broadway.

Alignment

The top of bank right of way in Reach 2 is relatively wide but contains five electrical towers. At only one of the towers, the right of way appears to be wide enough to accommodate the path adjacent to the tower. The other four towers occupy enough of the available right of way that a top of bank path would need to be cantilevered over the River around each tower. See **Figure 7-11**.

A channel bottom path would need to navigate the almost 2000 feet of flooded channel around the Bending the River Back project near Broadway. A path such as a floating bridge would require extensive engineering and permits through the Corps. Another solution would be to construct a channel cut above the flooded area.

Arroyo Seco Connection

Just south of where Reach 2 begins at SR-110, the Arroyo Seco joins the Los Angeles River. As discussed in Section 1.5, the Arroyo Seco Bike Path runs along the channel bottom extending for 1.75-miles from York St to Avenue 43 in Northeast Los Angeles. While the Study does not include a connection to the Arroyo Seco Bike Path, access between the paths on the Arroyo Seco and the River would greatly enhance the utility of both.

LA River Water Wheel Project

The future Bending the River Back project will install an inflatable dam in this reach just south of the Broadway crossing. The dam will create standing water up to eight feet deep, which will inundate the channel bottom for almost 2000 feet upstream to just south of the Arroyo Seco confluence.

REACH 2 - EXISTING CONDITIONS

Top of bank area South of SR-110, looking West.

Top of bank area at Metro railroad crossing
North of Broadway, looking North.

Looking South under historic Broadway Bridge.

Top of bank area under Spring Street Bridge, looking South.

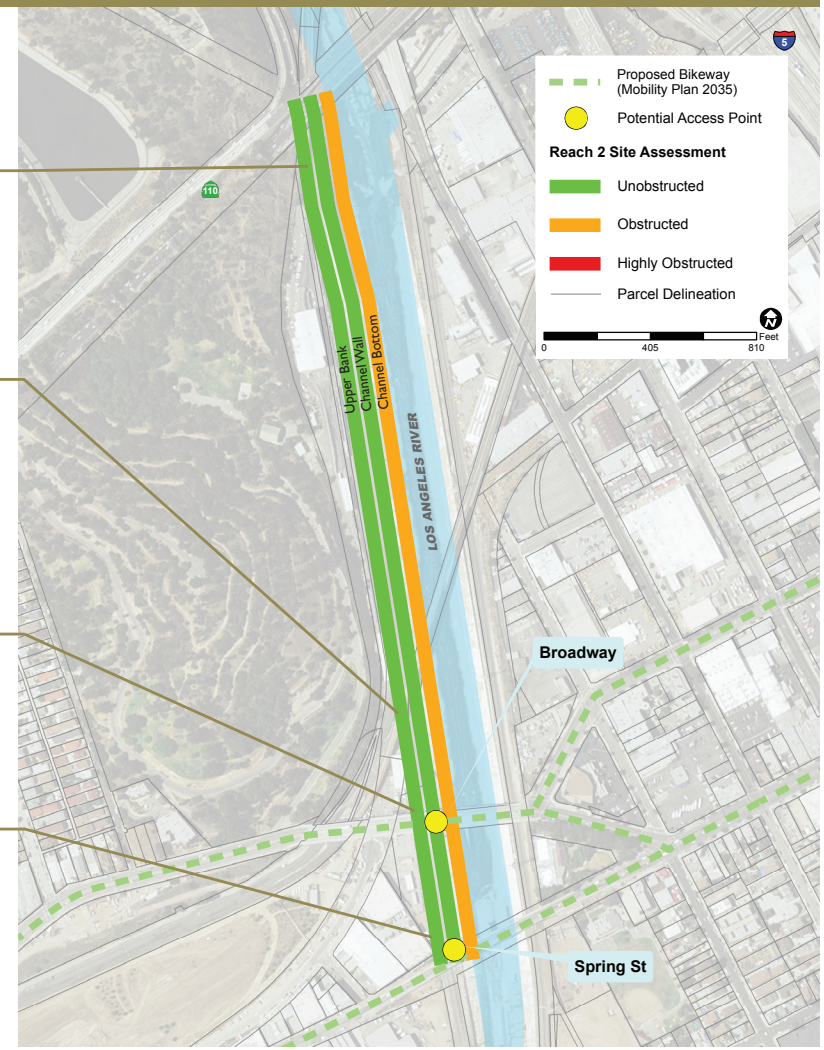


Figure 7-11: Reach 2 Alignment Assessment

7.4 Reach 3: Between Spring St and Cesar Chavez Av

Throughout the one mile-long Reach 3, the channel cross section is trapezoidal and relatively consistent. The ARBOR study identifies Piggyback Yard, adjacent to this reach, as a future site for river revitalization. Redevelopment of Piggyback Yard, east of the River, would include infrastructure for people walking and biking and would best connect to the LA River Bike Path in this reach. This connection is not considered in the Study but would increase access and connectivity for this potentially regionally significant development.

Access Points

Two access points via bridge crossings are within Reach 3. Main St provides connections to attractions such as the San Antonio Winery and Angel City Brewery, the expanded Los Angeles County/USC Medical Center, and the renowned historic Olvera St. Main St provides additional access to the Chinatown and Lincoln Heights neighborhoods, which will be enhanced by the proposed protected bike lanes along Main St. These facilities are part of the Connect US Action Plan, which was developed to improve historical and cultural connections in downtown Los Angeles by enhancing pedestrian and bicycle travel options through and between communities. Metro and LADOT DASH buses have several lines and stops along Main St. Cesar Chavez Av provides additional access to Olvera St, El Pueblo de Los Angeles, and Chinatown, as well as Evergreen Cemetery, Boyle Heights and White Memorial Medical Center. Cesar Chavez Av is proposed to have bike lanes and most significant to the region, connects the River with Los Angeles Union Station.

A LADWP-owned parking lot exists adjacent to the River near Main St. If the City of Los Angeles chooses to reallocate its use, this right of way would provide ample space for the path, an at-grade access point at Main St, as well as river-adjacent public space. Connecting the path to this parcel would require only minor grading and pavement work. Access to the Cesar Chavez Av bridge would require a bicycle and pedestrian bridge from the path to the street/on the bridge.

Union Station is the heart of public transportation for Los Angeles County and would provide path users with transit connections around the region and beyond via Metro Rail and Metro Bus lines, as well as Metrolink and Amtrak. Multiple interregional bus systems also have stops at Union Station, as well as Flyaway bus service to Los Angeles International Airport. Walking and biking infrastructure around Union Station and Little Tokyo will be greatly improved through the Connect US project in the near future.

Alignment

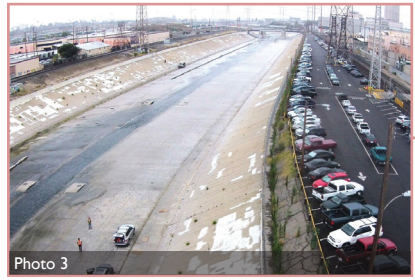
A top of bank path appears feasible in this reach but would need to traverse low overcrossings at Main St, two rail bridges, and Cesar Chavez Av. The path could traverse under these overcrossings with channel cuts (**Figure 7-12**), as is done on other paths in the region. Alternatively, the path could pass over the crossings with bridge structures. This option would require more elevation change for people on bicycles to get up and over the existing bridges. The bridge option would also likely require reconstruction of channel walls and additional right-of-way while providing an inferior bicycling experience to the channel cut option. Thus, it is the less feasible of the two top of bank alternatives. In addition to the overcrossings, two electrical towers exist in the top of bank right of way and would require the path to cantilever over the River to pass around them.

A channel bottom path is possible in this reach but would require ramps at each access point.

REACH 3 - EXISTING CONDITIONS

Looking South.

Location of existing Main Street crossing, looking Northwest.



Location of existing City of Los Angeles Water and Power parking lot South of Main Street, looking South.

Location of existing Metro railroad crossings, looking Southwest.

Location of existing Cesar Chavez Avenue crossing, looking South.

Figure 7-12: Reach 3 Alignment Assessment

7.5 Reach 4: Between Cesar Chavez Av and Bandini Blvd

Reach 4, at 3.4 miles, is the longest of the five reaches. The channel character, which is trapezoidal in shape, changes little along its length, only becoming rectangular between Washington Blvd and Bandini Blvd. There are nine bridge under crossings including one freeway under crossing and three rail line crossings. Much of the top of bank has rail immediately adjacent to within a few feet of the River edge.

Access Points

Sixth St/Whittier Blvd connects to the Arts District, the Jewelry District, and further west, to Historic Downtown Los Angeles and Pershing Square. To the east, Whittier Blvd connects to Boyle Heights, the southern end of Hollenbeck Park, and several schools. Protected bike lanes are proposed on 6th St as part of the City of Los Angeles Mobility 2035 Plan.

The new 6th St Bridge, which will be competed in 2019, will provide world-class bicycle and pedestrian facilities for crossing the River and adjacent rail yards as well as for enjoying the surrounding environment underneath the bridge. Once completed, the new bridge will maintain access to the River channel bottom through the preservation of an existing maintenance tunnel. The new bridge will also include ramps from the channel bottom to the top of the bridge, wider sidewalks, separated bike lanes, and improvements to bring natural light into the existing tunnel. The Sixth St Viaduct website (www.sixthstreetviaduct.org) presents a simulation showing the future bicycle and pedestrian facilities, pictured in Figure 7-13.

Figure 7-13 Sixth St Viaduct Simulation

The other six access points within this reach would require elevated bridge structures. Existing bike lanes on 1st St provide connections to Little Tokyo, the Arts District, and Boyle Heights as well as many transit connections. First St, to the west of the River, will provide access to Union Station from the south and is included in the Connect US Action Plan. The Metro Gold Line is aligned in the median of 1st St with the nearest stations at Pico/Aliso on the east side of the River and Little Tokyo/ Arts District on the west side of the River.

Fourth St connects to Little Tokyo, the Arts District, and Boyle Heights as well as to Hollenbeck Park on the east side of the River.

Seventh St connects the southern end of the Arts District, the Fashion District, Jewelry District, and, further west, the major transit transfer point in the Financial District of Downtown Los Angeles, the 7th St/Metro Center Metro station. Seventh St is a major bicycle route with lanes running from Koreatown east into the heart of Downtown Los Angeles. The City of Los Angeles Mobility 2035 Plan proposes to make this street part of the Enhanced Bicycle Network with protected bike lanes from Central Av, west. On the east side of the River, 7th St connects to Boyle Heights. Directly adjacent to the River on either side at this point, there are many industrial and warehouse spaces which are potential commute destinations for blue-collar workers.

Olympic Blvd connects to the Fashion, Produce, and Warehouse Districts, including major manufacturing facilities; all potential destinations for workers commuting by bicycle. Further west, Olympic Blvd provides access to LA LIVE, Staples Center, the Los Angeles Convention Center and South Park community. Bike lanes are proposed on Olympic Blvd in the 2010 Los Angeles Bike Master Plan. The historic Wyvernwood Garden Apartments, the Sears building, Estrada Courts housing, and Los Angeles Community Hospital are all along Olympic Blvd east of the River in southern Boyle Heights and East Los Angeles.

Washington Blvd connects with the LA MART, Los Angeles Trade Tech College, the Los Angeles Traffic Court, several schools in the South Park community, and South Los Angeles to the west. The Metro Blue Line runs down the center of Washington Blvd from Flower St to Long Beach Av, providing regional connectivity. 26th St connects with Adams Blvd, which has existing bike lanes, to the west, providing access to South Los Angeles and several schools including the north of the University of Southern California campus. Industrial centers in this area, especially in Vernon and the large BNSF Hobart rail yard, may have many workers commuting by bicycle. The 2010 Los Angeles Bike Master Plan proposes bike lanes on Washington Blvd but no bicycle improvements are proposed on 26th St.

Soto St runs north-south and provides a connection to Huntington Park, though bicycle improvements are currently proposed along the street only in the City of Los Angeles. Soto St and Bandini Blvd both provide connections to the extensive industrial economy in this area, including major FedEx and UPS distribution centers and the Vernon Civic Center. There are currently no existing or proposed bicycle facilities on Bandini Blvd but the City of Vernon is expected to complete its first bicycle master plan in 2017, which may address this issue.

Alignment

Most of the top of bank right of way in Reach 4 is highly obstructed by rail, electrical towers, and bridge abutments. There are nine street crossings and four railroad crossings in the Reach. Only one 0.4 mile long section of the Reach between Olympic Blvd and Washington Blvd has an unobstructed top of bank and seven-tenths of a mile, between Washington Blvd and Bandini Blvd, has vertical walls. See **Figure 7-14.**

Due to the highly obstructed character of the top of bank, most of a top of bank alignment would require a combination of (1) long stretches of continuous cantilevered path or channel cut and (2) elevated structures. Beyond acquiring a continuous stretch of additional right of way, these are the only options for a top of bank alignment. **Table 7-1** summarizes the top of bank alignment options along Reach 4.

A channel bottom path is challenging for this Reach.

Between Washington Blvd and Bandini Blvd the channel section becomes rectangular and low-flow water is diverted to the outer walls by concrete curbs. To provide for easier access in and out of the channel, the bike path could be constructed along the edge of the channel's west wall except where the low flow diverges to the outer walls, at which point the bike path could be directed towards the center of the River, with structures built within the channel to carry the path over the water flow. Due to the rectangular shape of the River channel, a channel cut alignment would not be possible within this segment due to the vertical walls, bridge and ramp structures are required within the channel in order to access the surface streets as well. Since it is necessary to construct access structures within the channel flow path, an assumed channel bottom modification is necessary between 1000' north of Washington Boulevard and Bandini Boulevard (4,690 feet) to mitigate hydraulic impacts.

CONFIGURATION	LOCATION
Continuous cantilevered path or channel cut	Cesar Chavez and Olympic Blvd
Top of bank unobstructed	Olympic to 800 feet north of Washington Blvd
Elevated Structures	800 feet north of Washington Blvd to Bandini Blvd

Table 7-1: Top of bank alignment options summary

Even though the channel bottom path within this reach is feasible from an engineering/construction standpoint, it will have to be demonstrated to the Corps that any impacts or changes to the LA River Flood Channel can be mitigated in order to obtain permits for construction and operation. Currently there is no local precedent for bridge or ramp structures being constructed within the flow path of the river channel. Since any structures that are built in the channel bottom would be reducing the flow capacity or obstructing the flow path in this reach, modification to the channel, such as keyway, would likely be required to mitigate any adverse hydraulic impacts caused by the channel bottom path and the access ramps.

It is recommended to consult with the Corps via pre-application meetings to discuss design and engineering concepts. Preliminary plans and engineering calculations should be prepared to aid the dicussion with USACE. During the NEPA process, detailed study of the proposed alignment should be completed to demonstrate to the Corps that the impacts can be mitigated.

Bridge crossings/under crossings

There are thirteen bridges in Reach 4. Channel cuts could be used to traverse eight bridges where the channel walls are sloped. Elevated structures or a bottom channel alignment could be used to traverse five bridges where the River has vertical walls. See **Table 7-2**.

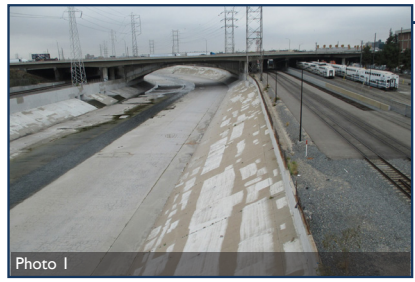
CONFIGURATION	LOCATION
Channel Cuts	El Monte Busway, the US-101 Freeway, 1st St, 4th St, 6th St, 7th St Bridge, Olympic Blvd and the I-10.
Elevated Structures or Channel Bottom	Washington Blvd and the two adjacent railroad bridges (AMTRAK and BNSF), 26th St and Soto St where the River has vertical walls.

Table 7-2: Bridge crossing summary for Reach 4

Complementary projects

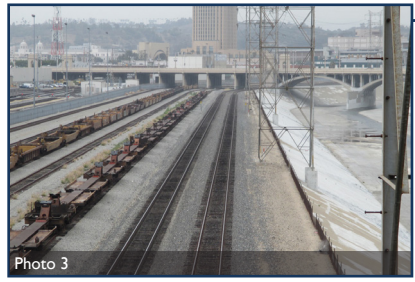
The proposed "Rail to Rail/River" pedestrian and bike path spanning from the future Metro Crenshaw Line to Washington Blvd mostly along or near Slauson Av will provide an important regional mobility route and is likely to connect to the LA River Bike Path in this reach. The project will provide infrastructure for people walking and biking in the communities of South Los Angeles and will provide direct connections to the region via the Metro Crenshaw, Silver, and Blue Lines. Connections to Metro, LADOT DASH, Montebello, and other municipally operated buses exist throughout the reach.

REACH 4 - EXISTING CONDITIONS



Looking South at the US-101 freeway.

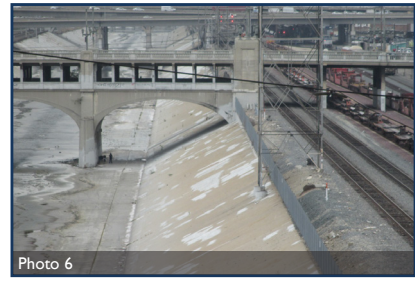
Looking North at the US-101 freeway.



Looking North at the historic 1st Street Bridge.

Looking South at the historic 6th Street Bridge.

Location of existing maintenance access tunnel at 6th Street, looking West.



Looking South at the 7th Street Bridge and I-10 overcrossing.

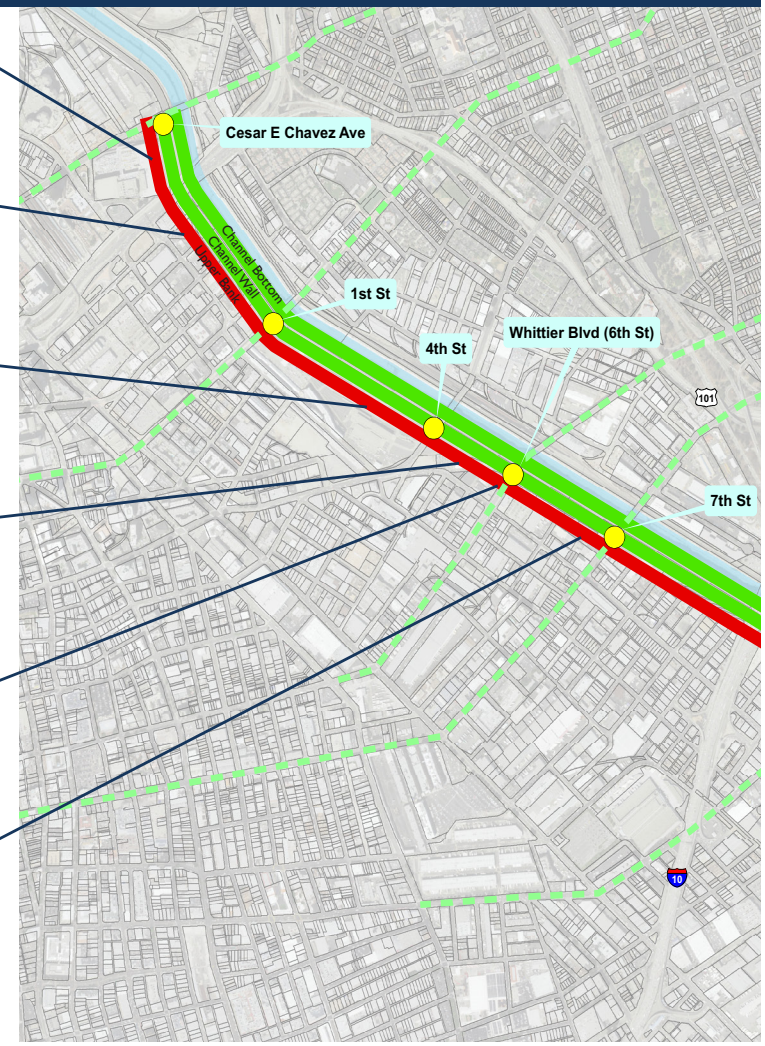
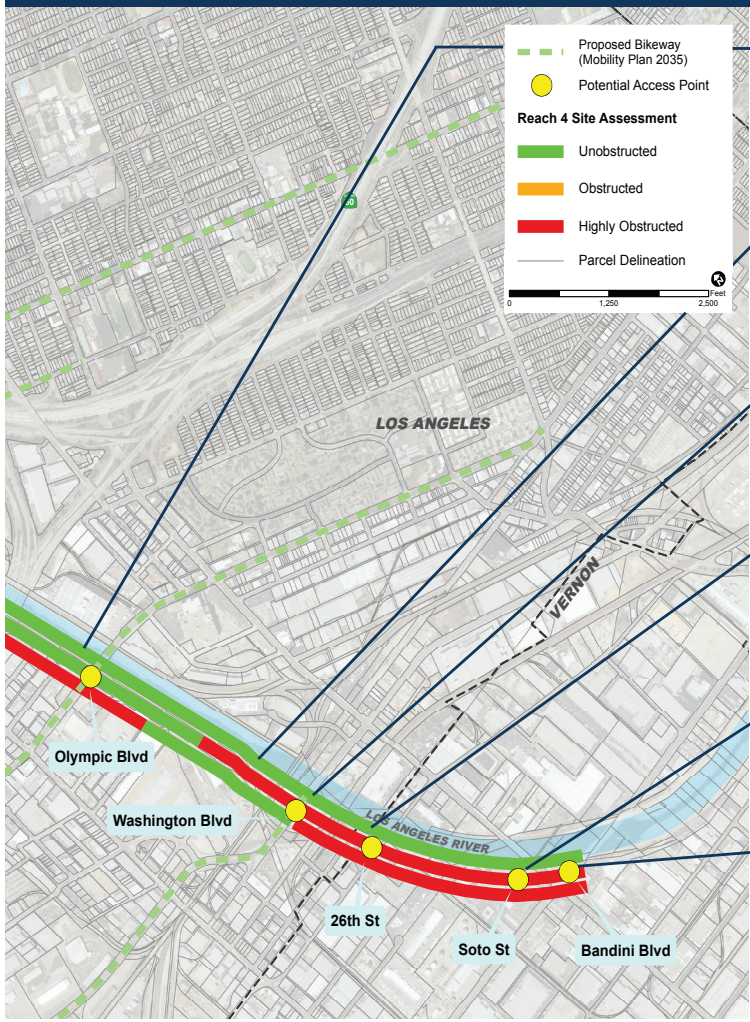


Figure 7-14: Reach 4 Alignment Assessment – Part 1

REACH 4 - EXISTING CONDITIONS



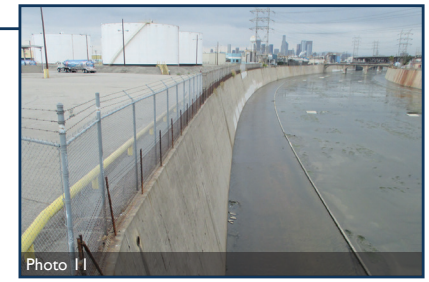
Looking South at Washington Boulevard Bridge and railroad crossings.

Channel bottom area, looking South at the historic Olympic Street Bridge.

Looking South at 26th Street Bridge.

Channel bottom area South of Washington Boulevard, looking South.

Looking South at Bandini Street Bridge.



Looking North at 26th Street Bridge.

Figure 7-15: Reach 4 Alignment Assessment – Part 2

7.6 Reach 5: Between Bandini Blvd and Atlantic Blvd

Reach 5, which is entirely within the city of Vernon, is 2.4 miles long and trapezoidal in shape along its length. It has limited space along the top of bank right of way and is obstructed by electrical towers, bridge abutments at Downey Rd and Atlantic Blvd, a railroad crossing, and adjacent rail lines.

Access Points

There are three access points along Reach 5: Bandini Blvd, Downey Blvd, and Atlantic Av. The area adjacent to Reach 5 is in the City of Vernon, which is characterized by heavy industrial land uses. The City has over 1,800 businesses and 50,000 employees but fewer than 200 residents.

All three of the access points provide direct access to major employment centers. The large Farmer John plant, one of the largest employers in the City of Vernon, is directly adjacent to the Bandini Blvd Bridge crossing and a major FedEx distribution center is less than ¼ mile from the crossing. Access to Downey Rd would provide path users with connections to the large BNSF Hobart rail yard and neighborhoods in Maywood and Huntington Park to the south.

Atlantic Av provides access to a number of employment centers including the FedEx distribution center which is immediately adjacent to the Atlantic Av River crossing, as well as the Naval operations support center. Several homeless services providers are located within ½ mile of the Atlantic Av Bridge including the Shelter Partnership, The Salvation Army Center, and The Recuperative Center for medical services.

There are no existing or proposed bike path infrastructure improvements for Downey Rd.

There is a proposed Project that would widen and rehabilitate the Atlantic Blvd Bridge which could provide for future bicycle infrastructure improvements although none are currently planned.

In 2017 the City of Vernon will create a Bicycle Master Plan that will address the need for connections to the existing LA River Bike Path south of Vernon as well as this Project.

Alignment

The top of bank right of way in Reach 5 is obstructed by adjacent rail lines. The channel walls are trapezoidal for the entire length of this reach making channel cuts feasible. See **Figure 7-15**.

A top of bank alignment would require a continuous cantilevered structure or channel cut due to the adjacent rail lines. Channel cuts can be used to traverse under the two roadway bridges in the Reach. Access to Downey Rd and Atlantic Blvd is feasible with minor grading and pavement reconstruction.

A channel bottom path is feasible in this Reach. Similar to Reach 4, at locations where water is being diverted, an elevated structure is needed within the channel to carry the center-located bike path over the water obstruction back to the edge of the channel walls. It is assumed that channel bottom modifications for approximately 1,000 feet south of Bandini Boulevard would be required to mitigate hydraulic impacts.

After the point where the low flow water is diverted back to the center of the channel, the channel bottom path along the edge of channel walls would be entirely unobstructed; this option would require the construction of ramps approximately 600 feet long within the trapezoidal walls to access Downey Blvd and Atlantic Blvd.

South of the Atlantic Blvd Bridge, the path can climb up and join with the existing LA River Bike Path on top of bank, which continues along the River to Long Beach.

REACH 5 - EXISTING CONDITIONS

Channel wall area South of Bandini Boulevard, looking South.

Location of the existing maintenance access road
North of Downey Road, looking South.

Channel wall area North of Atlantic Boulevard, looking North.

Channel wall area North of Atlantic Boulevard, looking South.

Terminus of existing path at Atlantic Boulevard, looking North.

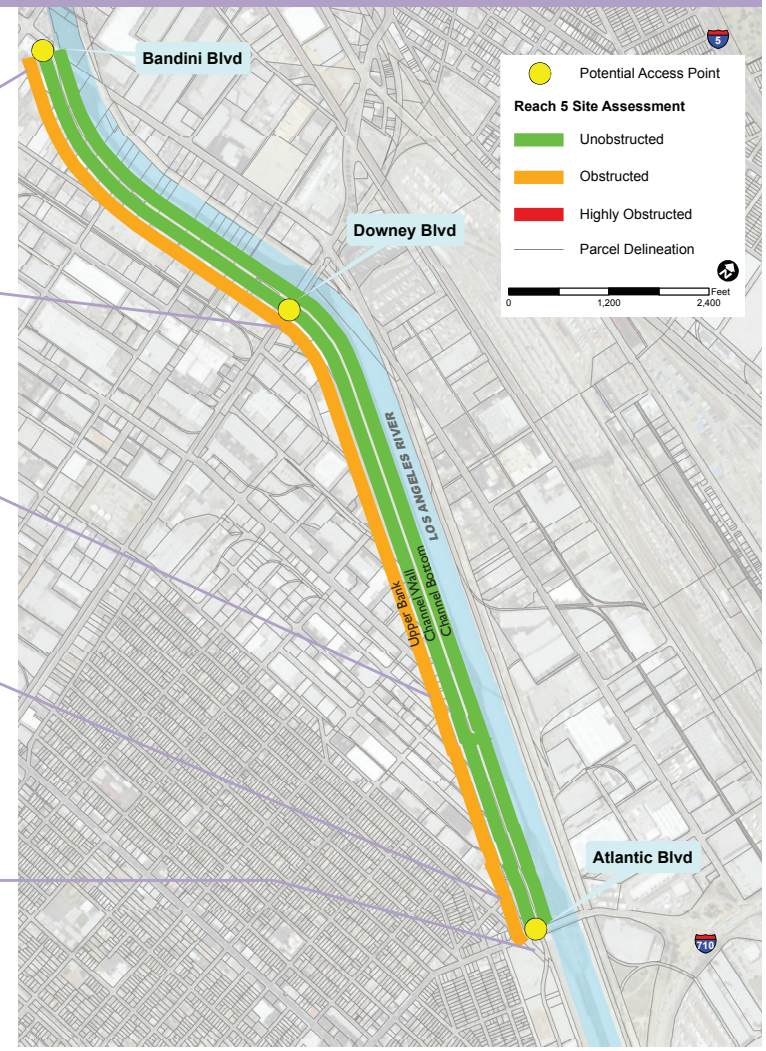


Figure 7-16: Reach 5 Alignment Assessment

8. HYDRAULIC CONSIDERATIONS

8.1 Summary

This Study included preliminary hydraulic analysis to gauge the effect of the LA River Bike Path on the overall flood carrying capacity of the channel. As summarized below and discussed in detail in Technical Appendix E, the analysis indicates that the path would have minimal effect on the flood carrying capacity of the channel. Specifically, in the design case examined, the water surface elevation (WSE) of the design flow increased on average by less than 0.2 inches when the bike path was added to the channel bottom. These results are based on a one-dimensional model built to assess the entire 8-mile length of channel. No impact to the flood carrying capacity would be expected for top of bank or channel wall alignments.

For final Project approval the Corps will require a physical or multi-dimensional model to assess the effects of each of the access ramps into and out of the channel.

8.2 Model Representation

This analysis used the Corps one-dimensional HEC-RAS model for the River to assess the effect of the channel bottom/in-channel alignment. This alignment was chosen for analysis as it represents the largest hydraulic impact on the River (i.e., it is the alignment with the maximum potential length of in-channel bike path). The LA River Bike Path was represented in the model as a 12-foot wide, 6-inch raised concrete path with a swept concrete finish. Access ramps at either end of the in-channel portion (i.e., upstream end under Main St Bridge and downstream of Atlantic Blvd), which demonstrate one potential access ramp configuration, were included into this model. However, since the Corps recommends using two or three-dimensional models to fully assess effects of access ramps, all of the considered access ramps (nominally every 0.5 miles) were not included into the present one-dimensional model.

8.3 Results

The model shows that the LA River Bike Path in the channel bottom would have minimal effects on the channel hydraulics. Specifically, the WSE of the design flow increased on average by less than 0.2 inches when the path was added. This change in WSE is considerably less than changes that may be caused by slight variations in channel roughness (i.e., Manning's "n"), as demonstrated by sensitivity analyses (see Appendix E). That is, the change caused by the addition of the bike path is less than the anticipated accuracy of the hydraulic model its self.

8.4 Additional Studies

Under the design flow most of the 8 miles of the Study area is in a 'supercritical' (i.e., fast-flow) condition. To obtain a 408 permit the Corps recommends that multi-dimensional (i.e., two or three-dimensional) modeling, and/or physical (i.e., in large-scale hydraulic laboratories) modeling to be used to assess the effect of individual access ramps on supercritical flow. Therefore additional studies would be required to accurately assess the effects of channel bottom access ramps on the formation of oblique hydraulic jumps, water run-up (e.g., on ramps facing upstream), and standing/rolling wave heights relative to the channel banks.

However, the one-dimensional modeling demonstrates the overall flood carrying capacity over the 8-mile reach is not substantially altered by the addition of a bike path on the channel bottom. The one-dimensional model will also serve as input to any future multi-dimensional modeling studies of individual ramps.

9. COST ESTIMATES

The Study developed preliminary costs based on 2016 dollars for design, outreach, permitting, right-of-way, construction and construction oversight for each Project alignment. Costs are based on construction industry cost data and consider both the path as well as the cost for providing access for each reach. Details for the cost analysis are presented in Appendix C.

Lower costs are associated with reaches where there are few or no obstructions along the top of bank or channel bottom. Higher costs are associated with top of bank areas where elevated or cantilevered structures, or channel cuts are needed to traverse obstructions.

To assess total costs for each alignment, costs were developed for the following five section types:

A. Aerial Structure (Elevated Structure or Centilevered)
B. Top of Bank
C. Channel Bottom
D. Channel Cut
E. Channel Bottom with Keyway

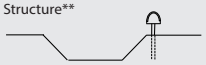
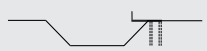
Costs for each section type include the major elements involved in construction. These include but are not limited to removal of existing materials, adding retaining walls, building cantilevered structures, and paving. A 35% contingency, which is appropriate for this level and stage of planning, was added to the construction costs. The contingency accounts for the uncertainty in costs as well as other items associated with the Project such as landscaping and bike path striping. As the Project progresses and the costs become more certain, the contingency percentage will decrease. Over and above the 35% contingency, 51% of the construction cost is added for "soft costs" including planning, engineering, permitting, environmental clearance, and outreach. The 51% cost factor includes 15% preliminary engineering and environmental clearance, 10% for final engineering, 15% for right-of-way (private land easements, utility and railroad coordination), and 11% for construction and engineering management. These figures are consistent with other Metro projects of similar scope.

Table 9-1 shows an overview of the elements that were included in each of these configurations and the resulting cost per linear foot. Detailed cost figures are shown for each section type in Appendix C.

To calculate the total cost for both top of bank and channel bottom alignment alternatives in each reach, the following procedure was used:

1. The total number of feet for each of the five section types was calculated and then multiplied by the cost per foot for that section type. For example, to keep the bike path mostly on top of bank in Reach 1, approximately 950 feet of the alignment would be aerial structure, which is required to bridge over the Union Pacific tracks and 1,159 feet would be at-grade pavement for a top of bank path. At $13,100 per linear foot (see **Table 9-1** and Appendix C), the cost for areial structure in this reach is approximately $12.5 million and at $420 per linear foot for at-grade pavement, the cost of the paved top of bank path is about $0.5 million. The total cost of top of bank alignment in Reach 1 adds up to $13.0 million.
2. Costs for providing access are calculated using the same procedure. For Reach 1, one access ramp would be constructed at Riverside Dr for the top of bank path at the cost of $0.2 million.
3. Summing these costs together gives a total cost of construction for each alignment alternative for each reach. For the top of bank alternative in Reach 1, the total cost is estimated at $13.2 million.

Metro LA River Bike Path Feasibility Study
Items in Cost Estimate Per Section Type

	SECTION DESCRIPTION	ITEMS INCLUDED	
A1	Bikeway on Elevated Structure** 	12'x8" Concrete Structure Pavement Bridge Deck Bridge Column Chain Link Cover at Bridge Overhead * Estimated Project Cost per linear foot:	$13,070
A2	Bikeway with Cantilever** 	12'x8" Concrete Structure Pavement Bridge Deck 6' High Chain Link Fence 8 Piles per Cantilever - 4 Cantilevers Per Station * Estimated Project Cost per linear foot:	$13,120
B	Bikeway at Top of Bank 	12'x4" Asphalt Concrete Pavement 6' High Chain Link Fence * Estimated Project Cost per linear foot:	$420
C	Bikeway at Channel Bottom 	12'x6" PCC Concrete Pavement Subgrade Prep. & Channel Removal * Estimated Project cost per linear foot:	$460
D	Bikeway at Channel Cut 	12'x6" PCC Concrete Pavement Subgrade Prep. & Channel Removal Structural Retaining Wall with Drainage * Estimated Project Cost per linear foot:	$3,720
E	Bikeway at Channel Bottom (with keyway)*** 	12'x6" PCC Concrete Pavement Subgrade Prep. & Channel Removal Modified Channel Keyway (36 SF estimated additional section) * Estimated Project cost per linear foot:	$2,730

*** Project costs include 35% contingency and 51% for soft costs including 15% Preliminary Engineering and Environmental Clearance, 10% Final Design, 15% Right-of-Way, and 11% Construction Engineering.**
**** An average unit cost of $13,100 for aerial structure (elevated structure and cantilever) was used while generate the rough order of magnitude (ROM) cost estimate. This was due to the similar unit cost of the structures and to make design options flexible during future phases of the project.**
***** Modified area is assumed to mitigate hydraulic impact due to structures constructed within the channel.**

Table 9-1: Cost breakdown per linear foot for each section type including path, access points, contingency and soft costs.

Total Project costs range from $243 million (sum of lowest cost alignments at each reach) to $348 million (sum of highest cost alignments). The costs for each alignment are shown by reach in **Table 9-2** with more detail in **Table 9-3.** A detailed breakdown of the costs per reach is included in Appendix C.

REACH	TOP OF BANK	CHANNEL BOTTOM
1 (0.4 mile)	$13.2 Million $33.0 Million/Mile	$5.4 Million $13.5 Million/Mile
2 (0.6 mile)	$39.4 Million $65.6 Million/Mile	$43.8 Million $73.0 Million/Mile
3 (1.0 mile)	$27.9 Million $27.9 Million/Mile	$29.2 Million $29.2 Million/Mile
4 (3.4 miles)	$213.8 Million $62.8 Million/Mile	$152.0 Million $44.7 Million/Mile
5 (2.4 miles)	$47.9 Million $20.0 Million/Mile	$18.4 Million $7.61 Million/Mile
TOTAL	$342.2 Million	$249.0 Million

Table 9-2: Total project cost and cost per mile per reach and alignment option

On a per mile basis, costs range from a low of approximately $7 million per mile to a high of $70 million per mile. The lowest costs are where the reach is unobstructed and where costs for access ramps are relatively low. The highest costs are in areas where the top of bank is highly obstructed and require long access ramps/aerial structures.

Table 9-3 breaks down the costs by alignment as well access points. The overall costs for the top of bank alignment are higher than the channel bottom alignment because the top of bank option requires a substantial amount of channel cuts and long stretches of aerial structures. But the channel bottom option would have more stringent permitting, safety, operations and maintenance requirements and concerns.

Details for these costs are shown in **Table 9-3** and Appendix C.

	REACH		ALIGNMENT OPTION		CASE #	ACCESS POINT		COST
1	Elysian Valley: Terminus of paths to Burbank through area constrained by overpasses and vertical walls. Includes historic Riverside Dr bridge abutment.	0.4 mi	Top of Bank	$12,994,880		5 Fwy		$13,154,880
					1	Riverside Dr	$210,000	
						110 Fwy		
			Channel Bottom	$3,202,600		5 Fwy		$5,434,600
					2	Riverside Dr	$2,232,000	
						110 Fwy		
2	Chinatown North: Transitions to trapezoidal cross section after the Arroyo Seco confluence. Includes inflatable dam for water wheel and Los Angeles State Historic Park.	0.6 mi	Top of Bank	$8,691,660		R/R Crossing		$39,355,660
					3	Broadway	$15,332,000	
					3	Spring St	$15,332,000	
			Channel Bottom	$8,726,900		R/R Crossing		$43,854,900
					4	Broadway	$17,564,000	
					4	Spring St	$17,564,000	
3	Piggyback Yard: Adjacent industrial and rail land uses. Includes potential for connection to Union Station.	1 mi	Top of Bank	$11,828,880	5	Main St	$805,200	$27,966,080
						R/R Crossing		
					3	Cesar Chavez	$15,332,000	
			Channel Bottom	$8,691,040	6	Main St	$3,037,200	$29,292,240
						R/R Crossing		
					4	Cesar Chavez	$17,564,000	
4	Arts District to Vernon: Heavily industrial activity with both passenger and freight rail as well as trucking in adjacent land uses. Includes Boyle Heights to the east of the river.	3.4 mi	Top of Bank	$104,183,240		101 Fwy		$213,803,240
					3	1st	$15,332,000	
					3	4th	$15,332,000	
					7	Whittier Blvd	$2,232,000	
					3	7th	$15,332,000	
						10 Fwy		
					3	Olympic Blvd	$15,332,000	
						R/R Crossing		
					9	Washington Blvd	$6,760,000	
					11	26th St	$13,100,000	
					11	Soto St	$13,100,000	
					11	Bandini Blvd	$13,100,000	
			Channel Bottom	$26,925,540		101 Fwy		$152,023,540
					4	1st St	$17,564,000	
					4	4th St	$17,564,000	
					8	Whittier Blvd		
					4	7th St	$17,564,000	
						10 Fwy		
					4	Olympic Blvd	$17,564,000	
						R/R Crossing		
					10	Washington Blvd	$15,542,000	
					12	26th St	$13,100,000	
					12	Soto St	$13,100,000	
					12	Bandini Blvd	$13,100,000	
5	Vernon: Heavily industrial activity leading to residential neighborhood. New Path meets existing terminus of path to Long Beach.	2.4 mi	Top of Bank	$47,500,680	1	Downey Rd	$210,000	$47,920,680
						R/R Crossing		
					1	Atlantic Blvd	$210,000	
			Channel Bottom	$13,949,340	2	Downey Rd	$2,232,000	$18,413,340
						R/R Crossing		
					2	Atlantic Blvd	$2,232,000	
	Project Totals	7.8 mi	Top of Bank	$185,149,340			$157,051,200	$342,200,540
			Channel Bottom	$61,495,420			$187,523,200	$249,018,620

Table 9-3: Costs by reach for the Top of Bank and Channel Bottom configurations and the associated access points.

10. SAFETY, OPERATIONS AND MAINTENANCE

10.1 Overview

An effective and well used bike path depends on users feeling personally safe as well as the facility being well maintained.

Several elements of path safety, operations and maintenance plans should be incorporated into the design and long-term operation plan of the facility. Some of them occur up-front during the planning and design process while others are long-term and ongoing.

Up-front design elements include:

> Safe access and egress
> Personal safety
> On-path location information (mile markers)
> Emergency responder access
> Maintenance access
> Closure for high water conditions

On-going elements include:

> Safety education
> Interagency coordination
> Maintenance including post high-water
> High water notification and closure

10.2 Facility Design

The LA River Bike Path must afford users a safe bicycling and walking experience. For safety, access points from the local road network should be spaced at intervals of no more than one mile and as frequently as every one quarter mile. This distance and the corresponding response time is a critical factor for emergency situations. If this is not possible when emergencies arise, users and/or first responders may have to travel significant distances to enter or exit the bike path.

Mile markers should be installed at quarter mile intervals along the path. These mile markers allow users to quickly identify their locations and to communicate that information to first responders in the event of an emergency. This is currently the policy for existing segments of the LA River Bike Path within the City of Los Angeles. A stencil has been approved for use and should continue to be used for all new segments of the path.

Most people call 911 in case of an emergency. However, the LA River Bike Path is not included on 911 Operator locator maps in the County of Los Angeles. By providing location identification information on the bike path between access points, users will be able to inform emergency response operators of their location, which reduces delays for first responders in finding the location of people in need of assistance.

Wayfinding signage should be installed directing users to and from the path, as well as along the path. The signage should include directions to important destinations such as parks, commercial zones, government facilities and bike routes. Maps should be placed at the entry points to the bike path to provide a location perspective to users.

Access points should provide bicyclists and pedestrians space to easily enter and exit the path while avoiding motor vehicles, other bicyclists and pedestrians. The top of the ramp should include a clear space to provide people on bicycles an opportunity to see and react to oncoming traffic. This includes a good view of the roadway and vehicle travel lanes and also allows motorists to see people on bicycles as they come up the ramp from the bike path. This point, known as the sight triangle, should be designed so people on bicycles and motorists have time to see each other, slow or stop and avoid a crash.

The measured sight distance at each location should be a function of the speed limit and width of the roadway. It is also desirable to have room for curb ramps for access between the ramp and the street.

Signage at the top of the ramps should clearly indicate the actions the bicyclist should take such as stop or which way to turn. They should also provide information on nearby destinations.

Lighting at the access points should help provide a safe environment at night. Lighting should make the location of the ramp more visible to people on bicycles, enhance navigation of the ramp/roadway intersection, and make people on bicycles more visible to motorists as they approach the ramp.

Isolation will be an issue on the path within the channel and along some sections of the top of bank. Installing pedestrian scale lighting, emergency phones and surveillance cameras will make the path safer and more comfortable for all users.

Fencing and gates need to be installed at all access points so the path can be quickly closed for high-water events. Signage should indicate the danger of using the path during high water.

For a channel bottom alignment the design of the path should include stairs and refuge areas at the top of the bank, in the event users are unable to reach an access/egress point during a high-water event. Stairways and refuge areas should be lit.

Roadways and bike facilities leading to the path need to be designed to safely accommodate users coming to and from the path. For example, railroad tracks near path access points should be designed for the safety of people on bicycles and people walking. Crossings may need to be upgraded to allow for people on bicycles to safely cross. Nearby intersections and sidewalks should be clear of obstructions that may be hazardous to people walking or biking who use these for access to the path.

10.3 High Water Closure and Emergency Response

The LA River Bike Path in the Project area will be closed when local storms are forecast or in the event of a regional storm where heavy water flows or runoff might affect the safety of people walking and biking on the path.

Alert systems in the form of electronic messaging via changeable message signs at entrances to the bike path and along the route should be implemented. These systems can rely on strategically placed in-river monitoring equipment as well as signs controlled remotely by responsible agencies. Warnings can also be transmitted in the form of text messages, e-mails, and other open communications platforms such as Nixle. Public address systems and/or sirens can be considered as supplemental warning systems. Similar information can also be displayed on Metro's website as traveler alerts.

10.4 Safety Education and Encouragement

Metro and community organizations can partner to provide safety education and encouragement for people to use this segment of the LA River Bike Path. Programs may include bicycle education that promote bicycle safety for new and experienced riders as well as activities such as the LA River Ride, hosted by the Los Angeles County Bike Coalition. Although there are a number of river channel bike paths in Los Angeles County this bike path will be unusual in that it may include channel bottom segments. As such, education programs on how to use the bike path and its safety features and what to do when warning messages are displayed will be an important part of the safety program.

10.5 Operations and Maintenance

From an operations and maintenance perspective the LA River Bike Path in the Project area may be relatively unique in the Los Angeles area with parts of it potentially located along the channel bottom. During and after storms the channel-bottom path would be covered with water. After the water returns to its normal level, there would be river borne debris including

leaves, branches dirt/mud and trash that maintenance crews would need to remove before the bike path could be safely reopened. The ability to keep the path debris-free would be critical to maintaining the reliability and safety of the path.

Operations and maintenance agreements that take into account the unique character of this section of the path will need to be created with a responsible agency. Currently the existing bike paths along the River are maintained by the LACDWP.

A source of revenue for the maintenance and operation of the path may be through local business improvement districts (BID), whereby businesses would pay a tax or levy to support the project near their location of operation. Conversations with organizations such as the Art's District BID, which has been a driving force behind creating this path, would be an important first step in attempting to secure this funding.

Based on research into existing bike paths and consideration of conditions unique to the Project, the following are recommendations for maintenance of the 8 miles of path along the River from Riverside Dr to Atlantic Blvd.

Ongoing Maintenance

Ongoing maintenance of the path and access roads:

> Machine sweeping the path and access roads to the path once per week.
> After the path is closed due to weather conditions machine sweeping the path prior to reopening.
> Review of surface conditions at least monthly and anomalies corrected as soon as possible.
> Review of fences and gates reviewed monthly and anomalies corrected as soon as possible.

Ongoing Inspection

> Monthly and immediately after storm events.
> Assess condition of pavement, including potholes, cracks, persistent water, mud and/or algae growth that create slippery conditions.
> Assess issues relevant to personal safety including missing lights, signage, vandalism, graffiti, drain covers and debris.

For all channel bottom portions of the path:

> Check drainage conduits passing under the path for blockages. These drainage conduits are important for dry-weather flows (e.g., from storm drains) entering the river low-flow channel without overtopping and wetting the bike path. Remove any blockages.
> Check areas that are subject to regular inundation (e.g., by dry weather flows) and associated biological growth (e.g., algae) that could pose a slip hazard to bicyclists.
> In addition to the routine monthly inspection, should be made after any rain event where the path has been inundated by river flows to assess the presence of debris or sediment.

Gates at Entrance Points

All gates leading to segments of the LA River Bike Path must be well-engineered, properly maintained, and accessible to all emergency responders.

All portions of the path are subject to closure during rain events per the Corps. The threat of inclement weather will require the managing agency to close all public access points to the LA River Bike Path. Once a closure is in place, all gates at entrance points must be checked to ensure they are properly closed. Following a rain event, gates must be checked to ensure they are properly open.

11. CLOSING SUMMARY

The Los Angeles River Bike Path Gap Closure Feasibility Study evaluates the feasibility of various alignments and alternatives for implementing a path along an 8-mile stretch of the Los Angeles River between Riverside Dr in Elysian Valley and Atlantic Blvd in the City of Vernon. When complete, the Project will meet a number of goals and objectives of Metro's Long Range Transportation Plan, the Los Angeles Bike Master Plan and the Los Angeles River Master Plan.

Closing the LA River Bike Path gap will provide a safe environment for people biking and walking. It will provide a regional link between beach communities, Downtown Los Angeles, and the San Fernando Valley. It will provide new and expanded linkages to bus and transit services and to destinations along the Los Angeles River including schools, parks, employment centers as well as retail and entertainment venues. It will also provide a much needed low-cost transportation option for area residents.

The Study found that a path along the Los Angeles River in the Project area is feasible through a number of engineering solutions.

The Study divided the 8-mile stretch of the River into five reaches based on the top of bank character within the reach. Potential alignments for the five reaches depend on the channel shape (trapezoidal versus rectangular) and top of bank character.

Through most reaches, a channel bottom alignment is feasible but requires additional considerations in permitting, safety, operations, and maintenance. Bank top configurations are also feasible along most reaches but require additional engineering solutions to traverse obstructions by rail and electricity facilities. A channel cut alignment is feasible in many reaches including at most bridge under crossings.

The Study identified total costs ranging from approximately $243 million to $348 million dollars to close the gap in the path, depending on alignment and design considerations.

Further study will be needed to fully determine permitting requirements as well as further develop alignment alternatives in the next phase: Project Approval/Environmental Documentation.

Funding Sources

The Project is allocated $365 million in funding through Measure M, which was a half cent sales tax ballot measure approved by voters in November 2016. The Project is expected to break ground in Fiscal Year (FY) 2023 and open for public use in FY2025. If additional funding is needed for the Project, potential sources to go after include federal, state, and local assistance, private development, and philanthropy. The following is a brief summary of some of the funding opportunities that could be considered for this Project.

Metro Call for Projects - A competitive process that distributes discretionary capital transportation funds to regionally significant projects in eight modal categories. Funds are administered by Metro.

California Active Transportation Program (ATP) - The ATP was created by Senate Bill 99 (Chapter 359, Statutes of 2013) and Assembly Bill 101 (Chapter 354, Statutes of 2013) to encourage increased use of active modes of transportation, such as biking and walking.

Highway Safety Improvement Program (HSIP) - Under the newly authorized Fixing America's Surface Transportation Act (FAST Act), the Highway Safety Improvement Program (HSIP) continues to be a core federal aid program to states for the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads.

Transportation Investment Generating Economic Recovery (TIGER) - TIGER discretionary grants fund capital investments in surface transportation infrastructure, and are awarded on a competitive basis to projects that generate economic development and improve access to reliable, safe and affordable transportation for disconnected urban and rural communities.

LA RIVER BIKE PATH GAP CLOSURE FEASIBILITY STUDY PHOTO CREDITS

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