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Los Angeles District

Los Angeles River Ecosystem Restoration Feasibility Study

DRAFT – APPENDIX B
ECONOMICS

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LOS ANGELES RIVER ECOSYSTEM RESTORATION FEASIBILITY STUDY
ECONOMIC AFB APPENDIX

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Attachment 1- Recreation Analysis

1. INTRODUCTION

1.1 Purpose

The purpose of this appendix is to document the socioeconomic resources, regional economic development considerations and to present the economic evaluation of the benefits and costs associated with habitat restoration and compatible recreation features along the Los Angeles River (River) within the City of Los Angeles (City) in Los Angeles County, California.

1.2 Guidance and Reference

The principal controlling guidance of the analysis comes from the U.S. Army Corps of Engineers' (USACE) *Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook,* with specific guidance from Appendix D, Economic and Social Considerations. Evaluation of alternatives has been completed in accordance with *IWR Report #95-R-1, Evaluation of Environmental Investments Procedures Manual, Interim: Cost Effectiveness and Incremental Cost Analyses, May 1995*. Benefits and costs are calculated at FY 2013 price levels utilizing the current Federal discount rate of 3.75 percent. The period of analysis is 50 years; the Base Year is 2022.

2. STUDY AREA

2.1 Watershed Description and Location

The confluence of Arroyo Calabasas and Bell Creek forms the start of the Los Angeles River. From the confluence, the River flows through the western San Fernando Valley and through Sepulveda Reservoir and then is joined from the north by Tujunga Wash. Tujunga Wash includes flow from both Hansen Dam and Pacoima Wash. Further downstream, the Burbank-Western channel and smaller creeks draining the western San Gabriel Mountains join the River as it flows easterly through the eastern San Fernando Valley. The River bends south around the Hollywood Hills and is joined from the east by Verdugo Wash, and then flows south though the Glendale Narrows and onto the broad coastal plain. The River is joined by a number of tributaries, including the Arroyo Seco and the Rio Hondo Diversion Channel, which carries runoff from Whittier Narrows Dam. From the Rio Hondo Diversion Channel confluence, the River continues south another 12 miles and discharges into the Pacific Ocean at the San Pedro/Long Beach Harbor.

The watershed has highly varied terrain consisting of precipitous mountains, low-lying foothills, valleys, and coastal plains. The upper portion of the watershed (~360 square miles) is predominantly forest or open space including more than 100 square miles of the Angeles National Forest. The remainder of the watershed (~464 square miles) lies in the coastal plain, which includes the entire City of Los Angeles. It is a highly developed area with commercial, industrial, and residential land uses. North of downtown Los Angeles to the confluence with the Rio Hondo, the river flows through industrial and commercial areas and is bordered by rail yards, freeways, and major commercial and government buildings. From the Rio Hondo Diversion Channel to the Pacific Ocean, the river flows through industrial, residential, and commercial areas, including major refineries and petroleum products storage facilities, major freeways, rail lines, and rail yards serving the Ports of Los Angeles and Long Beach. The river and most of its tributaries in the urbanized portions of the Los Angeles watershed have been highly modified from their original natural courses to protect property and human life from the effects of flooding.

From its headwaters to the Pacific Ocean, the River drops approximately 790 feet in elevation over roughly 51 miles (about 15 feet per mile, yielding an average slope of approximately 0.3 percent). During the rainy season from October to March, heavy flows and occasional floods occur. In times of peak flow the river carries more than 180,000 cubic feet of water per second (cfs) at velocities exceeding 25 feet per second in some areas. That volume of discharge is approximately 14 times the flow of New York's Hudson River moving at a velocity of upwards of 17 miles per hour.

Today, the River no longer resembles the naturally meandering and ephemeral river that periodically caused devastating floods during winter. Even though the River could no longer support the area’s rapidly growing water demands by the late 19th century, extensive development on its natural floodplain have continued into the present. Seasonal flows slowed to a trickle throughout most of the dry season, and the winter storm flood threat increased as development expanded on the River’s natural floodplain. Storms produced massive flows in the

River causing flooding that resulted in the loss of lives and millions of dollars in property damage in the late 19th and early 20th centuries.

Modifying the River to contain these periodic floods has rendered it a flood conveyance channel that does not resemble a natural river system. Improvements for flood risk management have included bank hardening and lining the bed of the channel with concrete for approximately 44 of its 51 miles. An approximately 7 mile stretch of the River near the Verdugo Wash confluence has grouted riprap side slopes and is the only portion of the study area left with a soft bed, albeit this area has also been engineered with a cobblestone bed that has migrated or washed away over the years. During the dry season, base flows in the channel are often less than 100 cfs and are entirely comprised of discharge from municipal and industrial wastewater treatment plants and urban/irrigation runoff. Open space, parks, and greenways are scarce. Instead, impervious surfaces, industrial development, and residential and commercial areas dominate the study area. Additional details and figures of the watershed can be found in sections 1 and 2 of the Integrated Feasibility Report.

2.2 ARBOR Reach

The baseline study area that was initially considered during the planning process includes 32 miles of the River that is within the City of Los Angeles, within a half mile of each bank. It begins at the confluence of Bell Creek and Arroyo Calabasas in the northwest San Fernando Valley at Owensmouth Boulevard, and ends near the City of Vernon in the downtown Los Angeles area. Through initial investigation of constraints in the baseline study area and the identification of where ecosystem restoration might best be accomplished, the planning process resulted in defining the focused study area as the ARBOR (Area with Restoration Benefits and Opportunities for Revitalization) Reach. This area extends from the Headworks downstream to First Avenue (See Figure 2.1). This study area includes the Glendale Narrows, which is the only portion of the River that does not have a hardened bed (bottom of the river channel), and contains several distinctive sites and connections including the Headworks, Pollywog Park, Bette Davis Park, the Burbank-Western Channel and Glendale River Walk, Griffith Park, Ferraro Fields, Verdugo Wash, Atwater Village, Taylor Yard and the Rio de Los Angeles State Park, the "Cornfields" (LA State Historic Park), Arroyo Seco, Elysian Park, "Piggyback Yard" (also known as "Los Angeles Transportation Center" as well as "Mission Yard"), and downtown Los Angeles. These sites, which are identified in later figures, provide key opportunities for restoration and enhanced connectivity.

2.2.1 Reaches

There are eight geomorphically different reaches within the study area (Figure 1-1). They were defined based on the physical characteristics of channel morphology, bank characteristics, soil exposure, existing habitat, and surrounding land uses. Specific geomorphic criteria include: (1) channel bed type (either soft bed with groundwater/surface water exchange, or concrete), (2) side slope type (vertical or trapezoidal), and (3) adjacent land uses or open space.

Reach 1: Pollywog Park/Headworks to Midpoint of Bette Davis Park: Reach 1 is the upstream segment of the study area and is approximately 1.5 river miles in length. It connects the study area to Burbank at Disney Studios and the Headworks Ecosystem Restoration Site. The

channel here has a rectangular concrete-lined configuration with subdrains and no low flow channel. There is a rubber dam within the river bed near the upstream end of this reach that was once used to help divert water to the Headworks spreading grounds operated by Los Angeles Department of Water and Power (LADWP). The channel is approximately 18 feet deep and the bank-to-bank width is approximately 115 feet.

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

Reach 3: Ferraro Fields to Brazil Street: This reach is approximately 1 mile in length. It begins at the upstream edge of the Ferraro Soccer Fields on the right bank where the bed transitions from cobbles to concrete. It makes an approximately 90-degree curve to the south around Griffith Park and transitions back to cobbles at approximately Brazil Street on the left bank. The channel in this area has a rectangular concrete configuration. The bed is approximately 18 to 23 feet deep from the top of bank and approximately 180 feet wide, widening to 380 feet wide downstream of the Verdugo Wash confluence. State Route (SR)-134 (Ventura Freeway) crosses the River at Verdugo Wash.

Reach 4: Brazil Street to Los Feliz Boulevard: This reach is approximately 1.75 miles long and extends from Brazil Street on the left bank downstream to the Los Feliz Boulevard Bridge. The bed transitions from a concrete-lined rectangular channel to a trapezoidal channel with a cobble bed and grouted Derrick stone banks. Banks are toed-down with sheet pile and quarry run stone. The bed was constructed approximately 18 feet deep from the top of slope, and the channel ranges from approximately 130 to 160 feet wide from top of bank to top of bank. Sediment deposited in the channel has formed sand bars/islands, which are stabilized by the root systems of the many trees and other vegetation. This reach ends at the Los Feliz Boulevard Bridge, where localized concrete lining of the bed and banks plus pier noses that extend upstream have been constructed to protect the bridge and lower the water surface underneath the bridge.

Reach 5: Los Feliz Boulevard to Glendale Freeway: This reach is approximately 1.55 miles long and veers east between Hyperion Avenue and SR-2 (Glendale Freeway). The reach extends from the Los Feliz Boulevard Bridge, under the Sunnynook pedestrian bridge and the Hyperion Avenue Bridge, downstream to the Fletcher Drive Bridge and ends at the SR-2 Bridge. The bed transitions from concrete under each of the large bridges (e.g., Los Feliz Boulevard, Hyperion Avenue) to a trapezoidal channel with a cobble bed and grouted Derrick stone banks between the bridges. Banks are toed-down with sheet pile and quarry run stone. The bed is approximately 18 feet deep and the top of the channel is approximately 130 to 160 feet wide. Sediment deposited

in the channel has formed sand bars/islands, which have stabilized as the root systems of the many trees and other vegetation have trapped sediment. This reach ends as the River begins to curve back east as it approaches Taylor Yard.

Reach 6: Glendale Freeway to I-5: This reach is approximately 2.34 miles long and meanders through three river bends. It extends from the SR-2 Bridge to the downstream crossing of Interstate 5 (I-5), where the bed transitions from cobble to concrete-lined. Here, the channel is in a trapezoidal configuration with a cobble bed and grouted Derrick stone banks. The banks are toed-down with sheet pile and quarry run stone. The bed is approximately 30 feet deep from the top of slope and the top of the channel ranges from approximately 190 to 215 feet wide. Sediment deposited in the channel has formed sand bars/islands, which have become stabilized as the root systems of the many trees and other vegetation have trapped sediment. The channel narrows to 170 feet and transitions to a rectangular configuration just upstream of the complicated I-5 and SR-110 interchange.

Reach 7: I-5 to Main Street: This approximately 1-mile-long reach begins at the I-5 Bridge and extends to the Main Street Bridge. The channel in this area transitions out of the rectangular concrete channel at the Arroyo Seco confluence, and becomes a trapezoidal concrete channel that is approximately 30 feet deep, with a top of bank width that ranges from approximately 150 to 190 feet. Three bridges cross the River in this reach, including a railroad bridge, the North Broadway Bridge, and the Spring Street Bridge. The channel has adjacent rail lines on both banks.

Reach 8: Main Street to First Street: This approximately 1-mile-long reach begins at the Main Street Bridge and extends downstream to the First Street Bridge. The trapezoidal concrete channel is approximately 30 feet deep with a top of channel width that ranges from approximately 170 to 200 feet. Rail lines run adjacent to the channel on both banks, and two railroad bridges cross the river. US-101 crosses the river between Cesar Chavez and First Street.

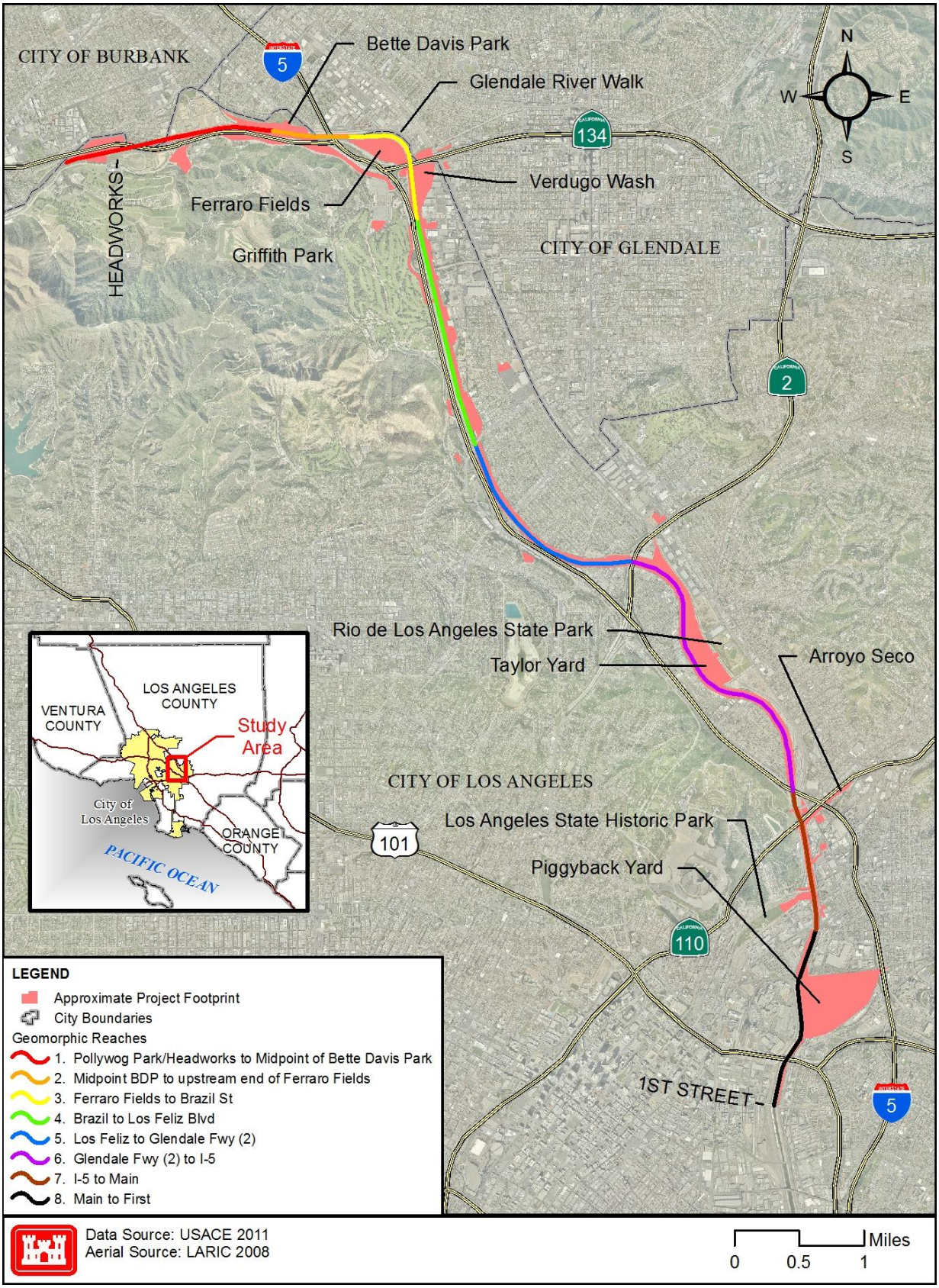

Figure 2.1 ARBOR Reach

2.3 Problems and Opportunities

The Los Angeles River watershed is unique due to the extremely large human population and massive infrastructure development in and adjacent to the river channel and floodplain. While flooding remains a concern in this reach, much had already been accomplished to manage flood risk, including construction and operation of Corps of Engineers and other dams in the watershed and channelization of the LA River and its tributaries.t.. Further reductions in residual flood risk are not the focus of the current investigation. The following problems, which could potentially be addressed by the feasibility study, were agreed upon during planning charettes with key agency and stakeholder representatives and the Corps held in December of 2009 and are listed below.

2.3.1 Problems

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

1. Loss of aquatic habitat for native valley foothills riparian, freshwater marsh, fish, and wildlife species since channelization of the river system and urbanization of the surrounding area during the 20th Century

2. Lack of ecological processes necessary to support ecosystem function in valley foothills riparian, and freshwater marsh habitat

3. Lack of substrate supporting valley foothills riparian, freshwater marsh, and fish habitats

4. Lack of connectivity to floodplains and functioning ecological zones

5. Highly altered hydrologic regime

6. High velocity flows within the study area that prevent establishment of riparian habitat

7. Disruption of natural sedimentation processes

8. Impervious surfaces in the drainage area preventing infiltration and recharge

9. Poor water quality caused by urban runoff and pollution that degrades aquatic habitat

10. Presence of non-native vegetation/exotics and trash accumulation in the river degrading aquatic habitat and prevent establishment of native vegetation

11. Lack of recreation and opportunities to interact with the natural environment

2.3.2 Public Concerns

Following construction of the Los Angeles County Drainage Area (LACDA) Project, walls were built higher downstream to protect the interests of downstream cities. However, in the years since LACDA, extensive growth of vegetation and concentration of sediment has occurred within the soft-bottomed reaches of the river, including within the study area. This condition has

provided habitat but also reduced flood conveyance. Therefore, this condition is an important consideration—and both a problem related to potential flooding and an opportunity related to providing habitat—in formulating the study alternatives.

2.3.3 Opportunities

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

- Restore lost aquatic habitat including valley foothill riparian, freshwater marsh, and native fish habitat (P1).
- Improve diversity and abundance of native valley foothill riparian and freshwater marsh plants to support the diversity and abundance of wildlife species (P1).
- Improve and restore ecological processes in the project area to support ecosystem function in valley foothill riparian communities, freshwater marsh, and native fish habitats (P2).
- Restore substrate in valley foothill riparian, freshwater marsh, and native fish habitats (P3).
- Improve connectivity to floodplains and functioning ecological zones (P4).
- Restore a more natural hydrologic regime (P5).
- Decrease peak discharges and/or increase floodplain area in the mainstem and at tributary confluences to reduce discharges and velocities that prevent establishment of native habitats (P6).
- Improve natural sedimentation processes (P7).
- Improve infiltration and recharge (P8).
- Improve water quality from urban runoff in the river, its tributaries, and other drainages entering the river to prevent degradation of aquatic habitat (P9).
- Remove and manage invasives/exotics and trash to reestablish native vegetation (P10).
- Increase recreation allowing compatible human interaction with restored ecosystems (P11).

3. SOCIOECONOMIC RESOURCES

This analysis focuses on the ARBOR Reach as defined in Section 2 (Figure 2.1). The study area is in a densely populated area of Los Angeles County with centers of substantial commercial and industrial activities. The study area contains a wide range of land uses and economic activities.

3.1 Land Use

Figure 3.1 shows the land use patterns along the three stretches of the river within the study area. In general, the land in the study area is dominated by high-density residential and mixed residential development[1]. The vast majority of land along and around the San Fernando Valley stretch is comprised of high-density single family residential development, a significant portion is also occupied by low-rise apartments, condominiums, and townhouses. Within a two-mile radius of the river the land use is almost exclusively residential with interspersed commercial and retail centers supporting the residential neighborhoods. Significant manufacturing and industrial activity (shown in light blue in Figure 3-1) occurs slightly further away from the river. The Sepulveda Dam and Reservoir are located along this stretch of the river.

The land immediately adjacent to and west of the Glendale Narrows reach is dominated by single-family and mixed residential use, while the land on the east side of the river is less homogeneous and is a combination of mixed residential use (high-density single family, low-rise apartments, condominiums, and townhouses), manufacturing and industrial uses, and some commercial and retail centers. This area includes the Silver Lake Reservoir and the Griffith Park recreational area.

The Downtown Los Angeles area is surrounded by mixed residential, commercial, and manufacturing and industrial uses, and, as can be seen in Figure 3-1, a high percentage of the area is used for manufacturing and industrial activity, as well as wholesaling and warehousing. While the land east of and immediately adjacent to the river is mostly used for manufacturing, industrial, and wholesaling purposes, beyond this narrow strip of land exists a densely-populated area comprised of mixed residential land use.

[1] "Mixed residential" refers here to areas with a variety of residential structure types and densities, such as single family homes, townhomes, condominiums, apartment complexes, etc.

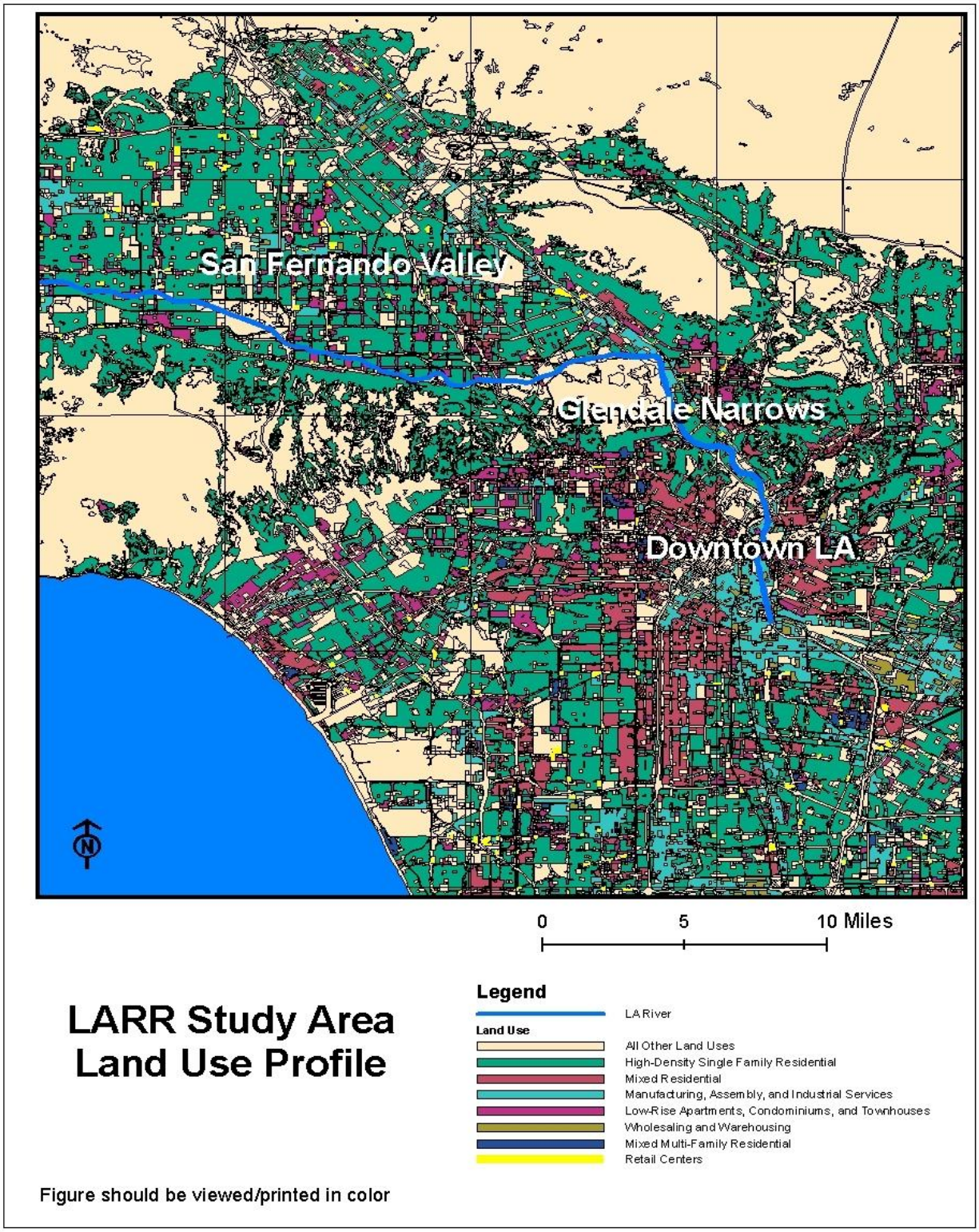

Figure 3.1 LA River Restoration (LARR) Study Area Land Use

3.1.1 Future Land Use

The study area is essentially built out; nearly all new housing development activity will involve recycling of land, as noted in the 2006 – 2014 Housing Element of the General Plan (City of Los Angeles 2009). No large scale changes to land use patterns are anticipated, however there are some trends and small scale changes which are noted below. The City's Planning Department has recently recommended zoning changes to the downtown industrial core that would rezone land from industrial to commercial and mixed-use in order to allow development that is "consistent with existing and surrounding areas".[2] At this point it is not clear to what extent, if any, this would include residential development. The City is also evaluating opportunities adjacent to the river to promote redevelopment – including the creation of recreation areas as well as commercial, residential, and mixed-use areas. The City has made it a priority to promote higher density housing development and mixed-use commercial and residential development through an increasing number of housing initiatives and incentive programs.

3.2 ARBOR Reach Demographics

The ARBOR Reach (Figure 2.1) starts slightly upstream of the Burbank-Western Channel's interception with the Los Angeles River through E 1st Street in downtown Los Angeles. Portions of three cities: Los Angeles, Glendale and Burbank are included in the census tracts located within a half mile of the river. The ½ mile zone is the most likely area to be directly influenced by project features.

Census tract and community level socioeconomic and demographic data is presented in this section. At the community level, data for the cities of Los Angeles, Glendale, and Burbank are presented. The map in Figure 3.2 displays the 28 census tracts, covering approximately 20.9 square miles that are used to compute census tract level statistics. These census tracts were chosen by selecting all census tracts located partially or wholly within a one-half mile buffer on either side of the river. The combined 28 census tracts are referred to as the assessment area in this appendix.

The description of the existing or without project socioeconomic conditions contained in the various sections below is based on the 2005-09 American Community Survey as well as other regional and local data as available (U.S. Census Bureau 2010a).

[2] http://cityplanning.lacity.org/

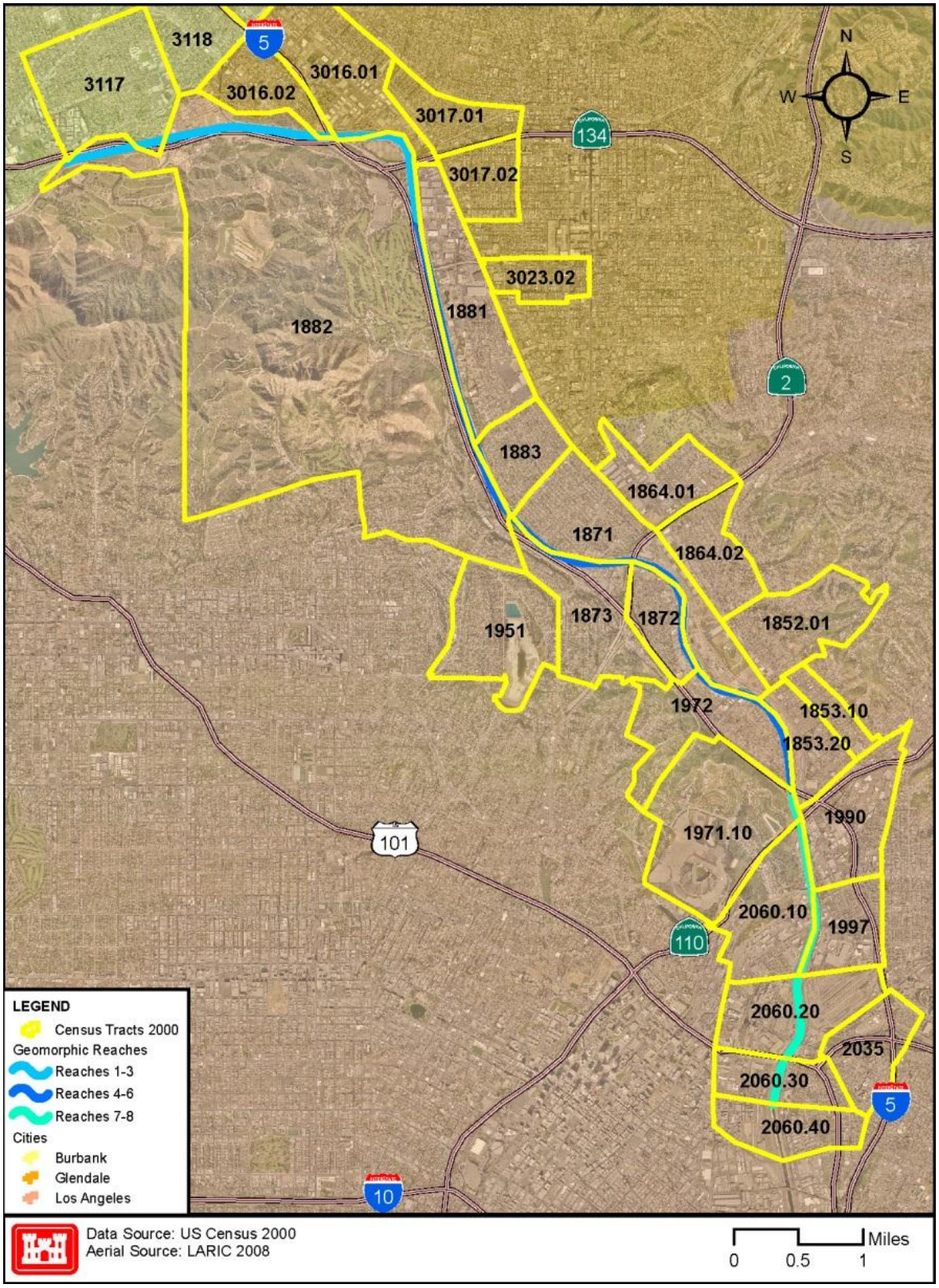

Figure 3.2 Study Area Census Tracts

3.2.1 Population and Housing

Los Angeles County spans over 4,700 square miles and has approximately ten million residents (U.S. Census Bureau 2010b). Within the 28 census tracts in the assessment area, total population is estimated at approximately 129,000 residents, equating to an average density of 6,173 residents per square mile, about three times denser than the county as a whole. The population, density, and racial profile of each census tract are provided in Table 3-1.

Table 3-2 and Figure 3.3 show the recent and projected population for the county and cities in the study area. For both, the rate of annual growth has generally been declining, and the county and City population rate of growth is projected to be around 0.3 percent by 2040 (LAEDC 2012).

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

Housing in the socioeconomic assessment area is summarized in Table 3-3, which includes household, housing and ownership metrics. Among the 28 census tracts, total housing units range from 105 to 3,343, with a total of 43,835 units in the assessment area, and an overall vacancy rate of 6.9 percent. About 36 percent of units are owner occupied and 64 percent are renter occupied in the assessment area. The vacancy rate in the assessment area is 0.4 percent greater than the City of Los Angeles, and 1.2 percent greater than the county. Additionally, the assessment area contains a larger proportion of rental units, with only 35.7 percent owner-occupied units, compared to 39.4 percent in the City of Los Angeles and 48.6 percent in the county.

Table 3-1 Population, Density, and Race[1]

Area	2009 Population[2]	Density (per square mile)	% White	% Black	% Hispanic	% Asian	% Other
City of Burbank	102,364	5,890	60	2	25	10	1
City of Glendale	195,876	6,405	63	2	18	16	1
City of Los Angeles	3,796,840	7,553	29	10	49	11	1
Los Angeles County	9,785,295	2,397	29	9	47	13	1
Assessment Area Tracts							
1852.01	5,630	8,109	15	0	72	12	1
1853.10	3,168	19,434	5	0	91	3	0
1853.20	3,186	9,413	2	0	89	7	2
1864.01	6,460	15,918	8	1	88	5	1
1864.02	5,311	10,657	10	0	76	12	2
1871	6,038	8,183	20	0	55	23	1
1872	3,284	11,056	7	0	83	10	0
1873	3,536	5,196	38	2	37	18	5
1881	4,673	5,694	26	2	60	11	1
1882	5,856	912	59	4	15	16	6
1883	3,398	9,413	44	1	25	29	2
1951	5,290	7,241	59	5	15	19	2
1971.10	699	665	19	0	65	16	0
1972	4,794	7,370	12	6	48	34	0
1990	4,610	7,634	5	0	67	26	2
1997	3,579	9,725	6	0	76	17	1
2035	3,738	9,757	5	1	83	9	1
2060.10	2,788	4,413	1	1	49	43	5
2060.20	8,839	13,517	17	35	42	3	3
2060.30	2,538	7,321	0	0	83	13	4
2060.40	3,014	7,338	6	0	69	24	1
3016.01	7,021	7,890	63	3	30	4	0
3016.02	3,973	10,696	41	3	34	19	3
3017.01	2,725	7,729	59	1	23	15	2
3017.02	6,630	20,820	71	1	13	15	0
3023.02	5,473	22,622	51	2	31	16	0
3117	5,917	6,478	68	2	19	8	3
3118	6,801	12,266	39	6	45	9	1
Totals[1]	128,969	6,173	30	4	50	14	2

[1]The most recent complete data source was the 2005-2009 American Community Survey. Future versions of this document may incorporate data based on the 2010 Census. Race information derived from tables "Hispanic or Latino and Race," where Hispanic includes all those identifying as Hispanic or Latino, and races are one-race statistics (White-Alone, Black-Alone, etc.).

[2] Population is a sum. Race profile totals are weighted averages using population as the weights. Source: U.S. Census Bureau 2010a.

Table 3-2 Historical and Projected Population

Year	Compound Annual Growth Rate[1]	Population (thousands)[2]			
		LA County	City of Los Angeles	City of Burbank	City of Glendale
2000	-	9,540	3,695	100	195
2005	-	9,810	3,731	100	195
2010	-	9,819	3,793	103	192
2015	0.65%	10,140	3,917	107	198
2020	0.70%	10,500	4,056	110	205
2030	0.59%	11,140	4,303	117	217
2040	0.27%	11,450	4,423	120	224

[1] Growth rate from LAEDC 2012 and applied to area cities.
[2] LAEDC 2012 and U.S. Census American Fact Finder

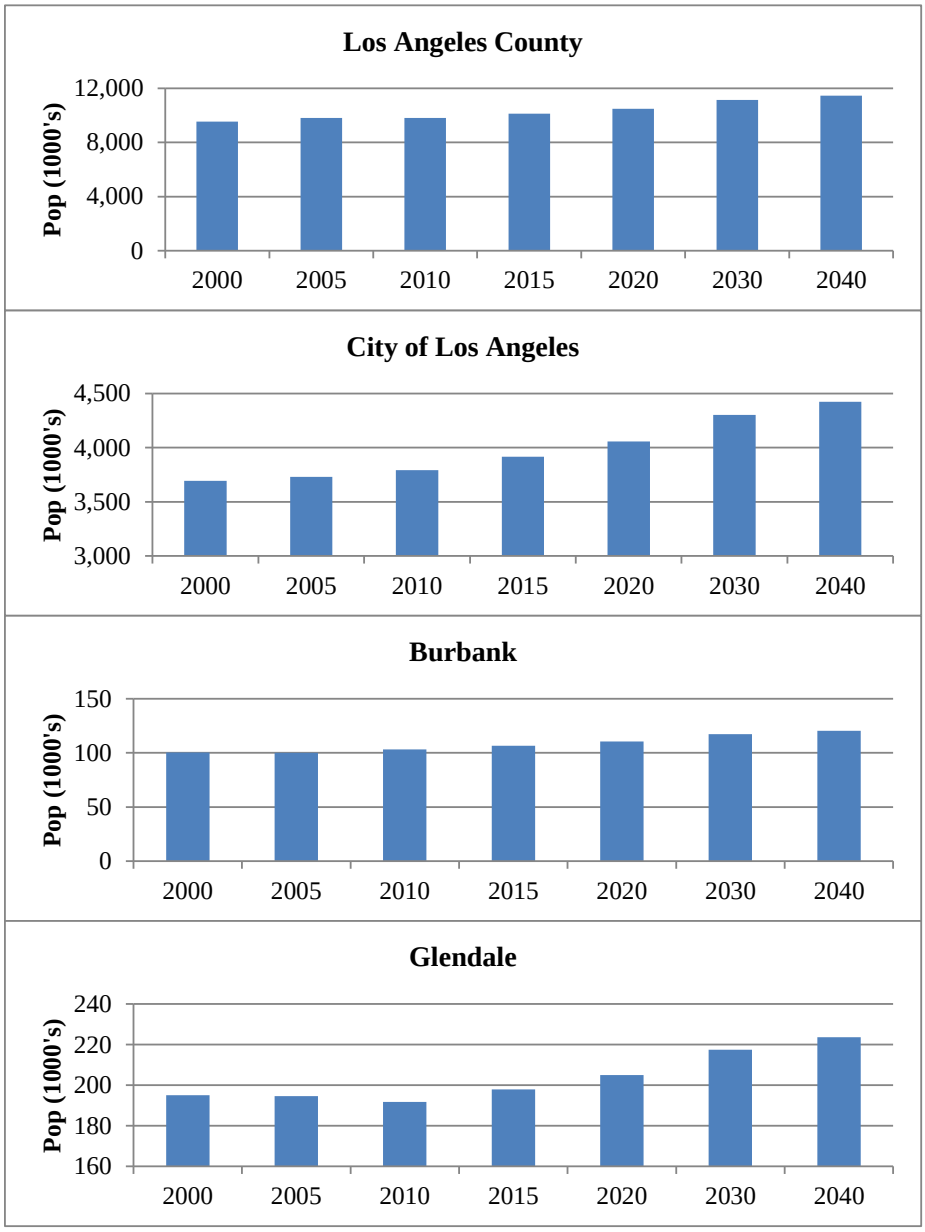

Figure 3.3 Historical and Projected Population

Table 3-3 Housing in the Assessment Area

Area	# Households	# Housing Units	% Vacant	% Owner Occupied
City of Burbank	40,505	42,623	5.0	44.7
City of Glendale	72,149	75,563	4.5	39.0
City of Los Angeles	1,298,350	1,385,394	6.3	39.4
Los Angeles County	3,178,266	3,370,108	5.7	48.6
Assessment Area Tracts				
1852.01	1,517	1,679	9.6	67.9
1853.10	855	899	4.9	31.7
1853.20	900	930	3.2	42.3
1864.01	1,567	1,646	4.8	14.9
1864.02	1,472	1,564	5.9	37.8
1871	2,265	2,519	10.1	46.8
1872	824	884	6.8	38.2
1873	1,513	1,626	6.9	44.9
1881	1,827	1,850	1.2	27.0
1882	3,036	3,343	9.2	37.4
1883	1,383	1,477	6.4	58.0
1951	2,069	2,183	5.2	66.5
1971.10	187	196	4.6	74.9
1972	1,596	1,687	5.4	45.8
1990	1,256	1,341	6.3	27.1
1997	957	977	2.0	33.6
2035	1,125	1,230	8.5	17.4
2060.10	825	906	8.9	4.1
2060.20	86	105	18.1	0.0
2060.30	509	509	0.0	12.4
2060.40	1,040	1,292	19.5	25.3
3016.01	2,349	2,421	3.0	8.0
3016.02	1,642	1,760	6.7	33.1
3017.01	1,129	1,192	5.3	59.4
3017.02	1,965	2,128	7.7	28.2
3023.02	1,827	1,895	3.6	13.1
3117	2,431	2,739	11.2	59.0
3118	2,648	2,857	7.3	17.2
TOTAL	**40,800**	**43,835**	**6.9**	**35.7**
Source: U.S. Census Bureau 2010a.				

3.2.2 Employment and Income

Los Angeles County has a highly diverse economy, with a gross annual product in 2010 of approximately $544 billion (LAEDC 2012), or approximately 29 percent of the gross annual product for all of California. Table 3-4 shows some of the basic economic indicators at the county and state level. Socioeconomic conditions in the assessment area are likely to reflect similar trends as the county and state. Trends over the last decade largely mimic the effects of the Great Recession that began in 2008 and has had national impact. California still has one of the highest unemployment rates in the nation, and this is reflected in parts of the assessment area, though on the whole, the unemployment rate in the assessment area is about 3.7 percent lower than the unemployment rate for Los Angeles County (12.4 percent) and 4.3 percent lower than the City of Los Angeles.

Table 3-4 Comparison of Southern California Economic Indicators

Area	Median Household Income	2010 Unemployment Rate	2010 Poverty Rate	2009 Median Home Value
City of Burbank	$62,255	9.2	8.9	$619,700
City of Glendale	$54,163	12.7	13.1	$641,600
City of Los Angeles	$48,570	13.0	21.6	$565,200
Los Angeles County	$54,828	12.4	17.5	$521,900
All of California	$60,392	12.8	15.8	$479,200
Assessment Area Tracts				
1852.01	$55,604	5.5	15.7	480,800
1853.10	$37,906	3.0	23.3	434,000
1853.20	$31,875	9.9	21.6	436,400
1864.01	$36,215	15.2	21.9	315,900
1864.02	$48,804	7.1	12.4	465,600
1871	$51,309	5.4	3.7	564,200
1872	$46,840	9.1	18.3	375,200
1873	$69,486	8.6	4.1	672,600
1881	$44,359	9.9	4.3	571,800
1882	$67,846	8.4	1.2	1,000,000+
1883	$69,534	12.8	3.3	638,700
1951	$117,768	8.8	2.8	908,600
1971.10	$44,291	6.0	0.0	440,700
1972	$43,529	8.4	14.4	471,800
1990	$26,000	13.6	39.3	365,300
1997	$34,792	11.6	27.3	419,500
2035	$38,709	5.4	20.4	457,800
2060.10	$12,992	12.5	58.9	612,500
2060.20	$100,682	13.3	0.0	n/a
2060.30	$26,743	8.3	37.4	230,900
2060.40	$27,054	11.3	15.0	418,400
3016.01	$45,425	5.7	10.6	453,800
3016.02	$51,626	8.3	9.4	593,300
3017.01	$56,195	5.6	1.2	598,800
3017.02	$46,671	7.9	12.4	430,300
3023.02	$38,363	5.8	18.5	588,900
3117	$69,514	5.5	3.1	654,000
3118	$46,925	8.4	7.9	571,900
TOTAL	**$51,941**	**8.7**	**12.3**	**n/a**
Sources: U.S. Census Bureau 2010a, U.S. Census Bureau 2011, LAEDC 2012.				

According to the Los Angeles County Economic Development Corporation (LAEDC 2012), Los Angeles County's economic base (based on the concept of exports of goods and services), in order of importance, resides in the entertainment, trade (transportation, logistics, distribution), business services, knowledge creation, and fashion industry clusters. Los Angeles County had an estimated non-farm employment of 3.77 million in 2010, reflecting a loss of over 350,000 jobs during the recession which began in 2008, a loss which contributed to the high unemployment

rate. Unemployment rates for LA County are currently estimated at 9.9%[3]. Like the state overall, the LAEDC forecasts a slow but steady recovery for Los Angeles County.

Table 3-5 provides the aggregated employment by industry for the 28 census tracts in the socioeconomic assessment area. This data illustrates that while the largest industries in the county are entertainment and trade, employment in the assessment area is driven by the education, health care, social services, and professional and scientific industries.

Table 3-5 Assessment Area Employment by Industry

Industry	Percent
Educational services, and health care and social assistance	18.4
Professional, scientific, and management, and administrative and waste management services	13.3
Retail trade	10.8
Arts, entertainment, and recreation, and accommodation and food services	10.6
Information	9.3
Manufacturing	8.6
Construction	6.2
Other services, except public administration	5.3
Finance and insurance, and real estate and rental and leasing	4.9
Transportation and warehousing, and utilities	4.7
Public administration	3.7
Wholesale trade	3.7
Agriculture, forestry, fishing and hunting, and mining	0.5
Source: U.S. Census Bureau 2010b	

3.2.3 Environmental Justice

This section provides a discussion of environmental justice in accordance with Executive Order (EO) 12898 and the protection of children from environmental health risks in accordance with EO 13045. The racial and ethnic data from the 2005-2009 American Community Survey (U.S. Census Bureau 2010a) for the census tracts comprising the assessment area, as well as Los Angeles County, are illustrated in Table 3-1 above.

Within the census tracts that encompass the study area, the Hispanic or Latino population was the dominant group with about 50 percent of the population. The White population was second, with about 30 percent of the population. Third was the Asian population, with 14 percent, followed by the African-American population at 4 percent, and other races at 2 percent. Largely similar, the City of Los Angeles reported a 49 percent Hispanic, 29 percent White, 11 percent Asian, 10 percent African-American, and 1 percent other races. In the county, some differences become apparent, where the population is 60 percent White, 25 percent Hispanic, 10 percent Asian, 2 percent African-American, and 3 percent other races.[4]

[3] March 2013, Bureau of Labor Statistics www.data.bls.gov

[4] Data source: 2005-2009 American Community Survey. Race information derived from tables "Hispanic or Latino and Race," where Hispanic includes all those identifying as Hispanic or Latino, and races are one-race statistics

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

As shown in Table 3-6, about two thirds of the population's primary language spoken at home is non-English. About 45 percent of the population in the study area tracts speak Spanish at home, 32 percent speak English, and the remaining 23 percent speak other languages. The substantial Spanish-speaking population is consistent with the demographic information summarized previously.

Table 3-6 Language Spoken at Home

Area	English Only	Other than English	Spanish	Other Indo-European languages	Asian and Pacific Islander languages	Other languages
Study Area Tracts	32.4	67.6	44.7	10.6	11.8	0.5
Los Angeles County	43.9	56.1	39.6	5.3	10.2	1.0
Burbank	55.9	44.1	20.1	16.0	6.3	1.7
Glendale	32.7	67.3	15.2	37.8	12.8	1.5
Los Angeles	40.3	59.7	43.6	6.7	8.1	1.4

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

As shown in Table 3-7 below, poverty in the study area is generally consistent with regional data. Poverty in the study area is about 3 percent lower than the City of Los Angeles, but about 1 percent higher than in the whole County. Burbank and Glendale have much lower overall poverty rates than the areas of those cities in the study area.

Table 3-7 People in Poverty

Area	People in Poverty (percent)			
	All People	Under 18	18 to 64	Over 64
Study Area Tracts	16.2	20.3	14.3	13.1
Los Angeles County, California	15.4	22.1	13.5	10.7
Burbank city, California	8.3	9.7	8.3	5.8
Glendale city, California	12.3	16.4	10.8	13.1
Los Angeles city, California	19.1	27.9	16.7	13

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

Disability information is not available by census tract. Table 3-8 presents the percent of people with disabilities in Los Angeles County, the City of Los Angeles, Burbank, and Glendale. It is

(White-Alone, Black-Alone, etc.). Note that the U.S. Census Bureau considers the race category of White to include Hispanics, while it considers the ethnicity category of Hispanic or Latino as distinct.

assumed that the same general characteristics apply to the specific study area tracts, where approximately eight to ten percent of the population has a disability.

Table 3-8 People with Disabilities

Area	People with Disabilities (percent)			
	All People	Under 18	18 to 64	Over 64
Los Angeles County, California	9.3	2.8	7	38.1
Burbank city, California	8.1	1.7	4.4	34.1
Glendale city, California	10.1	0.9	6.4	44
Los Angeles city, California	9.4	3	6.9	40.1
U.S. Census 2010 and 2010a.				

4. FLOOD RISK CONSIDERATIONS

Flood risk was considered in the plan formulation process to address ecosystem restoration opportunities. The Hydrology and Hydraulic (H&H) Appendix C documents the existing and future with project condition as it relates to flooding and potential for induced flooding related to implementation of ecosystem restoration measures. One of the constraints taken into consideration during the formulation of alternatives was that induced flood damages should be avoided; therefore efforts were made to avoid measures that increase flooding.

As described in the H&H Appendix C, inundation mapping was generated for the 4, 2, 1, and 0.2 percent annual exceedance chance events for both existing and with project conditions. The existing conditions 100-year floodplain has two major breakout areas within the ARBOR Reach, both corresponding to vegetated reaches of the Los Angeles River. The upstream area with extensive overbank flooding is between Barham Boulevard and the confluence with Verdugo Wash, and has an average floodwater depth of 5.2 feet in the overbank areas. The downstream area with extensive overbank flooding is from the Verdugo Wash confluence to the Golden State Freeway, where the in-channel vegetation ends, and has an average floodwater depth of 3.9 feet in the overbank areas. Floodplain mapping can be found within Appendix C.

The final array of alternatives was analyzed and compared to the existing conditions to determine their impacts on the flood conveyance function of the channel. For the most part, the reaches that showed an increase in water surface elevation for the design event were at transition areas, either geometric (trapezoidal to rectangular or from a widened section to a narrow section) or construction material (soft-bottom vs. concrete). Induced flooding can be mitigated in the design and Operation and Maintenance (O&M) phases of the project. See Appendix C, Hydrology and Hydraulics, for a detailed discussion of the effects of the final array on flood conveyance.

5. RECREATION RESOURCES

Section 5 characterizes recreational resources in the baseline study area and considers recreational opportunities within the ARBOR Reach. A draft recreation alternative has been developed and analyzed. The economic analysis of the recreation plan is summarized in Section 7 and detailed in Attachment 1 to this appendix.

5.1 Regional Context and Demand

The City of Los Angeles has approximately 24,000 acres of parks, with approximately 16,000 acres of parkland under the jurisdiction of the Department of Recreation and Parks. Other agencies managing parklands include the Los Angeles Department of Water and Power (LADWP), the Mountains Recreation and Conservation Authority (MRCA), the Santa Monica Mountains Conservancy (SMMC), California State Parks, and the Los Angeles County Department of Parks and Recreation (LACDPR). In all, this equates to a City-wide average of 6.26 acres of park per 1000 residents (Trust for Public Land 2011). The City of Glendale has 39 developed parks comprising 280 acres, or about 1.4 acres per 1000 residents (City of Glendale 2012). The City of Burbank operates 27 park facilities covering 155 acres, as well as 500 acres of open space, equating to approximately 6.34 acres of parkland per 1000 residents (City of Burbank 2010). Including all parks identified in the ARBOR reach presented below, the recreation resource area has an estimated 5,000 acres of park, or 38.77 acres per 1000 residents. This value is high compared to the City-wide average due to the presence of some larger than average parks near the study area, such as Griffith Park (the largest park at 4,210 acres) and Elysian Park (575 acres).

Much of Los Angeles is considered to be “park poor” which refers to any geographic area that provides less than three acres of green space per 1,000 residents, as defined by California law (Green Info Network 2010). In particular, the industrial areas surrounding reaches 7-8 (from the I-5 overpass to Main Street) have the least parkland, with fewer than 3 acres per 1,000 people. Other areas, particularly on the southwest side of Reaches 1-3 (from Pollywog Park to Brazil Street), have greater than 3 acres of parkland per 1,000 residents, which is due to the presence of Griffith Park. In general, access to parks and acres of parkland per 1,000 residents is lowest in areas that have the highest number of families below the poverty line of $47,331 annual income.

According to SCAG, public parks are intended to serve all residents, but not all neighborhoods and people have equal access to these public resources. SCAG calls for a multiagency effort and public transportation to improve access for all to parks throughout Southern California (SCAG 2008). The City Project has been initiated to find resolutions to improving park availability for all neighborhoods, regardless of ethnicity or income level (Garcia et al. 2009).

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

5.1.1 Recreational Opportunities in the Study Area

For this analysis, the recreation resources most likely to be affected by project alternatives are those within a half-mile buffer on either side of the River. The inventory of larger regional parks and other resources that exist outside the study area are beyond the geographic scope of this inventory other than to demonstrate the lack of regional parks and open space available within the greater Los Angeles area.

Approved uses along the River in the study area are limited to pedestrian, cyclist, and equestrian trails along the banks. Although some areas of the River's watershed have recently been permitted for fishing or canoeing/kayaking (Sepulveda Basin), none of these uses are approved in the study area, where it is illegal to walk in the channel below the established bike and pedestrian paths. Still, users are not often cited, and unapproved uses such as fishing do occur in the study area, mostly in the soft-bed areas of the River (LARRC 2011a). Other activities along the River include bird watching, sightseeing, and tours by local interest groups. There are no areas approved for swimming in the study area, and instances of swimming and wading are likely low due to water quality concerns as local agencies and interest groups typically advise users to stay out of the water (LARRC 2011b).

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

The Los Angeles River Bike Path is a Class II Bike Path (off-roadway, paved), and runs along the right bank of the River from Griffith Park through Glendale Narrows to Elysian Park, offering an off-roadway route for pedestrians and cyclists. Another route between Griffith Park and Elysian Park relies on a combination of bike lanes and bike routes (on-roadway) but does not follow the River, making it a Class III Route, less appropriate for recreation and more of a transportation route. Both of these routes are managed by Los Angeles County Metro, and are included in the City of Los Angeles Bicycle Plan (Metro 2012).

Table 5-1 Recreational Resources in Study Area

Name	Type, Location	Amenities
Bette Davis Picnic Area	Public, Los Angeles	Picnicking, walking, jogging, viewing
Chevy Chase Park and Recreation Center	Public, Los Angeles	Playground, basketball, handball, gym, picnicking, auditorium, pool
Crystal Springs Picnic Area	Public, Los Angeles	Picnicking
Ferraro Soccer Fields	Public, Los Angeles	Soccer fields
Griffith Park	Public, Los Angeles	Amphitheatre, bird sanctuary, camping, educational programming, equestrian, golf, hiking, jogging, museum, observatory, picnicking, soccer, swimming, tennis
Harding Golf Course	Public, Los Angeles	18-hole golf course
Lincoln Park	Public, Burbank	Playground, picnicking
Los Angeles Equestrian Center	Private, Los Angeles	Boarding stalls, training rings, indoor/outdoor show arenas, grass fields, riding academy, professional trainers, equestrian trails
Los Angeles Zoo	Public, Los Angeles	Municipal zoo and botanical gardens

Name	Type, Location	Amenities
Los Feliz Golf Course	Public, Los Angeles	9-hole golf course
Milford Mini Park	Public, Glendale	Playground, picnicking
Mountain View Park	Public, Burbank	Playground, restrooms, picnicking, tennis, basketball, horseshoe
North Atwater Park	Public, Los Angeles	Baseball, basketball, playground, volleyball, restrooms
Pelanconi Park	Public, Glendale	Ballfield, basketball, playground, picnicking, special facilities
Roosevelt Municipal Golf Course	Public, Los Angeles	9-hole golf course
Wilson Golf Course	Public, Los Angeles	18-hole golf course
Chavez Ravine Arboretum	Public, Los Angeles	Picnicking, playground, restrooms
Egret Park	Public, Los Angeles	Viewpoint, plantings, interpretive signage
Elysian Park	Public, Los Angeles	Walking, hiking, jogging, restrooms, picnicking, horseshoe, arboretum, baseball, sports field, therapeutic center, lodge, art exhibits, historical monument, community garden, playground
Elysian Valley Gateway Park	Public, Los Angeles	Plantings, benches, River access, picnicking
Elysian Valley Recreation Center	Los Angeles	Community rooms, auditorium, baseball, basketball, playground, handball
Glenhurst Park	Public, Los Angeles	Playground
Oso Park	Public, Los Angeles	Plantings, art, interpretive signage
Marsh Park	Public, Los Angeles	River access, viewing, picnicking, grass field, playground, infiltration area
Rattlesnake Park	Public, Los Angeles	Art exhibit, plantings, benches
Rio De Los Angeles State Park	Public, Los Angeles	Natural wetlands, hiking trails, sports fields, playground, recreation building
River Garden Park	Public, Los Angeles	Fountain, benches, picnicking, lawn area, restrooms
Silver Lake Recreation Center	Public, Los Angeles	Playground, community room, gym, picnicking, sports field, walking, jogging trails, classes, summer camps
Steelhead Park	Public, Los Angeles	Plantings, outdoor amphitheater
Sunnynook Park (under construction)	Public, Los Angeles	Plantings, walking paths, outdoor classroom
William Mulholland Memorial	Public, Los Angeles	Memorial fountain, seating, grass area
Chavez Ridge Disc Golf Course	Public, Los Angeles	18-hole course, restrooms
Confluence Park	Public, Los Angeles	Fountain, benches, plantings,
Dodger Stadium	Private, Los Angeles	Professional baseball stadium
Downey Recreation Center	Public, Los Angeles	Auditorium, baseball, playground, picnicking
Lacey Street Neighborhood Park	Public, Los Angeles	Picnicking, parking lot
Los Angeles Historic State Park	Public, Los Angeles	Walking, jogging, cycling paths, picnicking, natural and urban viewing, multipurpose field, restrooms, telescopes
Pecan Recreation Center	Public, Los Angeles	Baseball, playground, community room, handball, gym, picnicking, restrooms, seasonal pool, volleyball
Radio Hill Gardens	Public, Los Angeles	Trails, plantings, viewing
Solano Canyon Community Garden	Public, Los Angeles	Community gardening, picnicking
Sources: LARRC 2011c. City of Los Angeles 2012c, 2012d, 2012e. CDPR 2012a, 2012b, Linton 2012, PDGA 2012. Sources: SMMC & MRCA 2007. LARRC 2011c. City of Los Angeles 2012c, 2012d, 2012e, CDPR 2012a, 2012b, Linton 2012. Sources: City of Burbank 2012c, City of Glendale 2012, 2012d, City of Los Angeles 2012c, 2012d, and 2012e.		

Figure 5.1 Recreation Resources, Reach 1 - 3

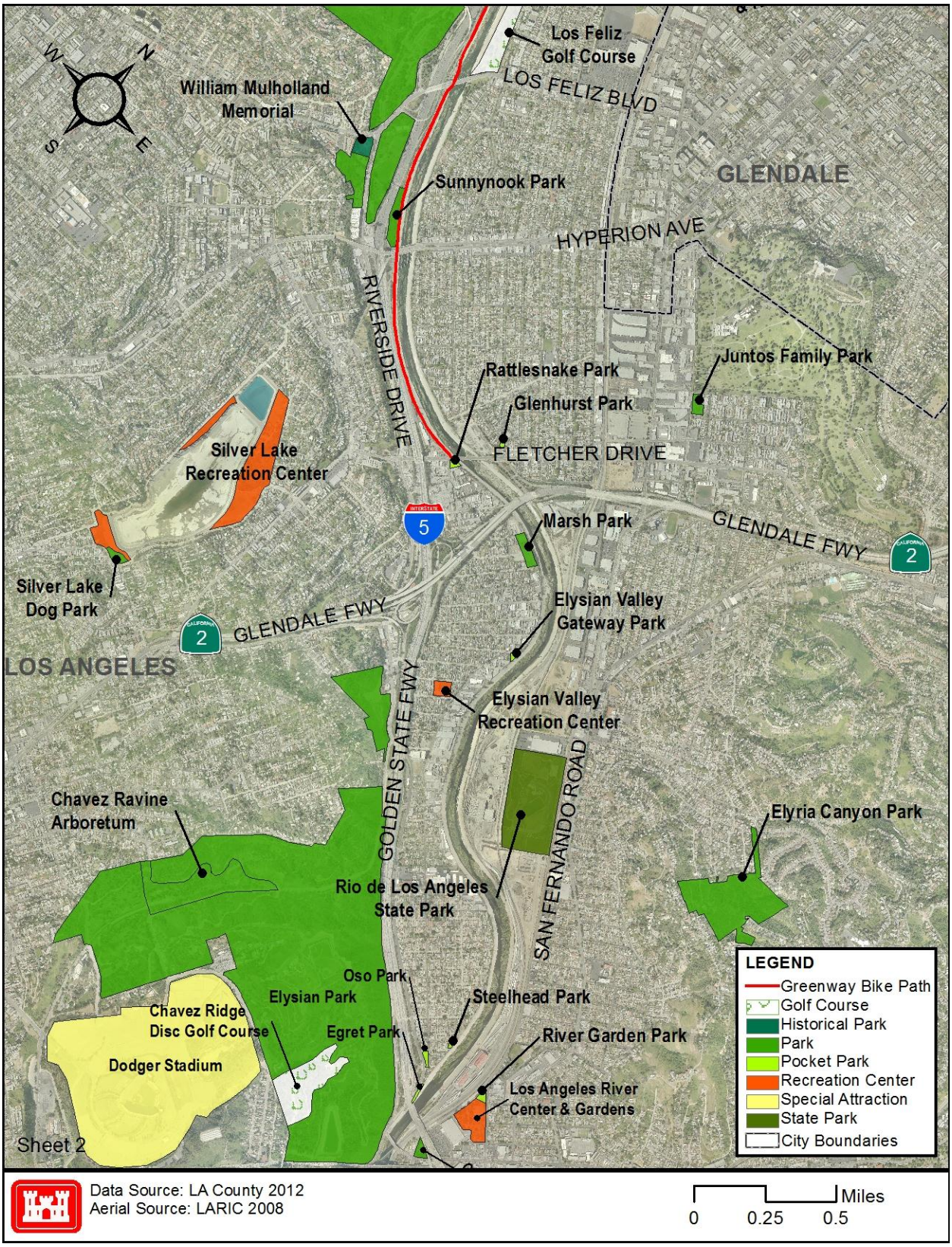

Figure 5.2 Recreation Resources, Reaches 4 - 6

Figure 5.3 Recreation Resources, Reaches 7 - 8

5.1.2 Future Without Project Condition

Because the study area is largely developed, the potential for substantial conversion of land to recreational uses is limited. However, recreational features will continue to be pursued by state or local entities wishing to develop recreational park areas along the River corridor. Local groups, such as the Los Angeles River Revitalization Corporation (LARRC), MRCA, MRCA, North East Trees (NET), Friends of the LA River (FoLAR), and The River Project (TRP) are likely to continue working to enhance the Los Angeles River Greenway through improvements of existing facilities along the River and installation of new park features.

The MTA, LARRC, and City of Los Angeles are actively planning bridges across the river that will provide a safe and convenient bicycle and pedestrian link between the Los Angeles River Bikeway on the west bank, and the Taylor Yard on east bank. The proposed bikeway improvement will consist of a minimum 15-foot wide bridge over the LA River, and a minimum 12-foot wide connection to the Union Pacific's Taylor Yard property (LARRC 2011d). As part of the North Atwater Park Expansion Project, a multimodal bridge is proposed to provide a connection from just downstream of North Atwater Park to the west side of the River. This bridge will provide pedestrian, bicycle, and equestrian access (LARRC 2011d).

Demand for recreation in the area is expected to increase proportionally to growth of population in the study area. Continued implementation of the Los Angeles River Revitalization Master Plan (City of Los Angeles 2007a) could increase recreational opportunities significantly over the long-term in the study area.

6. ECOSYSTEM RESTORATION ALTERNATIVES

The plan formulation process is described in detail in Section 3 of the Integrated Report. That section describes how each of the alternative plans were developed and evaluated at each step in the process, and ultimately included or excluded from the array of plans being considered. This appendix mentions briefly some of the plan formulation processes, evaluation criteria and arrays of plans that were considered. It does not describe these processes or information in detail. For a more detailed description the reader should refer to Sections 3 and 6 of the Integrated Report.

Ecosystem restoration is one of the primary missions of the Corps of Engineers Civil Works program. The Corps objective in ecosystem restoration planning is to contribute to national ecosystem restoration (NER). Contributions to NER are increases in the net quantity and/or quality of desired ecosystem resources. Measurement of NER is based on changes in ecological resource quality and a function of improvement in habitat quality and/or quantity and expressed quantitatively in physical units or indexes (but not monetary units). These net changes are measured in the planning area and in the rest of the nation. Thus, single purpose ecosystem restoration plans shall be formulated and evaluated in terms of their net contributions to increases in ecosystem value (NER outputs) expressed in non-monetary units (habitat units).

For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, shall be selected. The selected plan must be shown to be a cost effective plan for achieving the desired level of output and economically justified (determined to be worth its investment cost). This plan shall be identified as the NER Plan. This formulation, evaluation, and selection process is described below.

6.1 Preliminary Alternatives

Following the charette workshop held December 2-4, 2009, an initial array of alternative plans was identified, which was then subject to additional screening. The screening process that was used applied the evaluation criteria established under the Principles and Guidelines (P&Gs) to assess the feasibility of alternative solutions. Completeness, Effectiveness, Efficiency, and Acceptability were considered as well as the technical feasibility, environmental impacts/benefits, and public acceptability of the alternatives.

A significant effort was undertaken in the development of preliminary restoration features at each site. Restoration features and a set of initial alternatives were developed during the charette workshop. Alternatives were subsequently evaluated and screened and a total of 19 alternatives were formulated, with each alternative containing different combination of measures in the eight reaches. The following 19 preliminary alternative plans, each of which contains different combinations of features in the eight reaches, were evaluated in this study. More detailed description of the formulation of measures and alternatives is found in the main report.

- 1: Comprehensive A. Includes these features throughout entire River study area: development of freshwater marsh, open water ponds, fish refugia, and riparian corridors; exposing storm drain outlets and converting to natural stream confluences; diversion of flow into side channels lined with habitat; development of underground basins and culverts to attenuate flow; bioengineering of channel walls; channel modification to

increase width by terracing; channel widening, and/or modification of channel walls; connections to green streets; modification along tributary confluences to more natural habitat; and development of wildlife crossings.

- 2: Atwater to Cornfields. Includes all of the above within the Atwater to Cornfields part of the reach.

- 3: Banks and Tributaries Only. Leaves the flood control channel bed primarily "as is" and restores floodplain by creating side channels in open areas along the River with freshwater marsh and riparian corridors and restoring tributary confluences. Includes modification of storm drain outlets and bank terracing.

- 4: Comprehensive B. Includes most of the features included in Alternative 1 Comprehensive A with fewer locations, less terracing and side channels, and omits elevating railroads on trestles, bioengineering walls, creating open water areas, and modifying trapezoid channels to vertical channels.

- 5: Los Feliz to Arroyo Seco. Implements all features from Comp A or B within Los Feliz to Arroyo Seco reach.

- 6: Comprehensive C. Includes most of the features included in Alternative 1 Comprehensive A with fewer locations and omits railroad elevation, bioengineering walls, open water area creation, and trapezoid channel modification to vertical. Includes more terracing and storm drain modifications and different locations for wildlife crossings than Alternative C-17 Comprehensive B.

- 7: Channel Reshaping A . Focus is on channel reshaping and attenuation of flow through detention basins, bypass channels, and channel widening. Using culverts and underground basins to attenuate flows, the channel is geomorphically changed to a wider, softer channel, with more naturalized storm drain outlets and some restored riparian corridors.

- 8: Habitat Variation. This alternative focuses on maximizing habitat restoration for species diversity, including fish, through attenuation or reduction in flow, as well as augmentation or creation of freshwater marsh, riparian and aquatic habitat.

- 9: Soft Bed Channel and Associated Banks. This alternative focuses restoration in reaches that already have a soft riverbed. Where open areas are adjacent to the River, the River will be widened rather than terraced. Storm drains are converted to natural stream confluences and restored with riparian vegetation. Habitats include aquatic, freshwater marsh and riparian areas.

- 10: Channel Modifications. This alternative implements features in locations with the least impact to infrastructure and engineering challenges, while still including features in all reaches to attenuate flow, and restore riparian, freshwater marsh habitat and tributary confluences.

- 11: Habitat Connectivity. This alternative focuses on bank to bank and upstream to downstream connections for wildlife and linkages to wildlife areas through channel widening and terracing.

- 12: Hydrologic Connection Improvements. This alternative focuses on lowering elevations of large open areas adjacent to the River to improve connectivity to the floodplain, and features to improve hydrologic connections between the banks, storm drains and River. It also includes features for increasing wildlife movement between the River and adjacent open areas.

- 13: Channel Reshaping B. Using culverts and underground basins to attenuate flows, the channel is geomorphically changed to a wider, softer channel, with naturalized storm drain outlets and restored riparian corridors. Includes bioengineering of channel walls, side channels and has more riparian and freshwater marsh replanting than Channel Reshaping A.

- 14: Channel Widening. This alternative focuses on widening the channel. Attenuation is accomplished with culvert bypasses. Includes planting of freshwater marsh and riparian corridors.

- 15: Bypass with Bank and Tributary Confluence Restoration. Reduces flow using culvert bypass to allow for terracing and channel bank softening. Improves freshwater marsh habitat in soft bed areas and adds riparian habitat to downstream locations on the river overbank. Emphasizes widening and restoration at tributary confluences.

- 16: Side Channels Only. Leaves the flood control channel bed and banks primarily "as is" and restores floodplain by creating side channels in open areas along the river, creating freshwater marsh and riparian corridors and restoring tributary confluences.

- 17: Opportunity Area Restoration With Channel Widening at Tributaries. Restores wetlands on the overbank and major tributaries at the River Glen confluence with Verdugo Wash, Griffith Park, Bowtie/Taylor Yard, Arroyo Seco Confluence, Burbank-Western Channel, Cornfields, and Piggyback Yard. Widens the river at Verdugo, Arroyo Seco and Burbank-Western Channel.

- 18: Comprehensive Pockets. Leaves flood control channel bed and banks "as is" and restores wetlands on the overbank and major tributaries at the River Glen confluence with Verdugo Wash, Bowtie/Taylor Yard, Arroyo Seco Confluence, and Cornfields.

- 19: Taylor Yard. Restores wetlands on the overbank and widens the river at this single key location on the River, and includes the Bowtie parcel.

- T: Tunnel: In addition to the 19 alternatives a tunnel measure was evaluated. Construction of tunnels or large culverts to divert storm season flows around the project reach. This would require excavation and construction of culverts that would need to be sized and designed based on results hydraulic modeling.

6.2 Cost Effectiveness and Incremental Cost Analysis

Although 19 preliminary alternatives were developed in 2009, the features that made-up each alternative were not selected based on cost effectiveness or incremental cost; they were instead based on a common concept or theme. The features are essentially management measures modified for specific locations. The preliminary alternatives represented a combination of these features, one feature per reach.

The study area was broken down into eight reaches, and the output and costs of the 19 preliminary alternatives for the study area were accordingly broken out by these eight reaches to allow recombination of the features in any of the 19 preliminary alternatives on a reach-by-reach basis, as appropriate. As shown later in Figure 6.2, the original 19 preliminary alternatives were then compared to the alternatives which were formulated via the Cost Effectiveness and Incremental Cost Analysis (CE/ICA) software methodology described below.

6.2.1 Methodology

A CE/ICA analysis was conducted using benefit and cost inputs on a reach-by-reach basis using the certified IWR-Planning Suite software version 1.0.11.0 (IWR-PLAN). The various separable element features of the alternative plans were evaluated and compared, and recombined by the software as discussed within this section. The results were then manually inspected to identify apparent break-points in order to identify a final array of alternatives.

CHAP Analysis

For this study, benefits (or outputs) have been quantified using the Combined Habitat Assessment Protocols (CHAP) approach. The CHAP analysis is an accounting and appraisal method that utilizes species-habitat-functions to derive current habitat unit values, which are annualized over the period of analysis to create average annual habitat units (AAHUs). To determine a change in these values over time, projections are needed to alter either the species, habitat, or function parameters. Applying these changes over several time periods requires some conjecture to deduce the amount of influence that might be expected during each time period. Details pertaining to the CHAP analysis are found within Appendix G.

Cost Estimates

Preliminary feasibility level cost estimates for the 19 alternatives were developed using the Civil Works Cost Database as well as input from local regional construction firms and materials suppliers. All costs are presented in FY13 price level. Supporting cost information can be found in Appendix C.

CE/ICA

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

added costs. The CE/ICA is a planning tool to help identify cost-effective plans which provide a certain level out habitat output at the least cost.

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

Cost Effectiveness Analysis

When there is no monetary measure of benefits but project outcomes can be described and quantified in some dimension, cost effectiveness analysis can be used to assist on the decision making process. Cost effectiveness analysis seeks to answer the question: given an adequately described objective, what is the least-costly way of attaining the objective? A plan is considered cost effective if it provides a given level of output for the least cost. Cost effectiveness analysis was used to identify the least cost solution for each level of environmental output being considered.

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

Incremental Cost Analysis

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

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

determined. The intent of the incremental analysis is to identify successively larger plans with the smallest incremental cost per unit of incremental output.

Selection Considerations

For ecosystem restoration, the recommended plan should be the justified alternative and scale having the maximum excess of monetary and non-monetary beneficial effects over monetary and nonmonetary costs. This plan occurs where the incremental beneficial effects just equal the incremental costs, or alternatively stated, where the extra environmental value is just worth the extra costs. A plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, is identified as the National Ecosystem Restoration (NER) Plan. The selected plan should be cost effective and justified in achieving the desired level of output. Thus, the NER plan is selected from the suite of cost effective plans identified in the CE/ICA. While the NER Plan is not required to be a best buy plan, this is often the case. The results of the CE/ICA do not provide a discrete decision, but rather they offer tools to help inform a decision.

Development of Features

For the purposes of the CE/ICA, the aforementioned 19 preliminary alternatives were broken down into the component features for each reach. The breakdown was necessary for the incremental analysis of alternatives and appropriate because the alternatives had been conceptualized as separable elements. In each of the eight reaches, not all 19 alternatives included a feature.

In addition to whether or not each reach contained a feature for a given alternative, some features were dependent on the inclusion of a diversion tunnel to alleviate flows in the channel. The diversion tunnel costs were developed as a separate measure. The features dependent on the diversion tunnel are indicated by pink highlighting in Table 6-1.

Once the alternatives were broken down into the measures presented in Table 6-1 and entered into IWR-PLAN, the software program considered all possible combinations of these measures (taking dependencies into account). The cost-effective and best buy plans were drawn from a list of all possible reach-wise combinations of the preliminary 19 alternatives, as explained in the following section.

Table 6-1 Matrix of Features Comprising the Preliminary Alternatives

Preliminary Alternative	Reach							
	1	2	3	4	5	6	7	8
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								

Pink-highlighted cells indicate features dependent on the diversion tunnel.

6.2.2 CE/ICA Model Implementation

To conform to the software structure, each of the eight reaches was defined as a "measure"[5] (in the language of the software). For each reach, there were a possible 19 different mutually exclusive "scales"[6] that might be implemented (corresponding to the measures with checkmarks in Table 6-1). "Scales," in the CE/ICA software, are mutually exclusive, so the software would choose one measure for each reach to formulate alternatives that combine multiple reaches. Costs and benefits are tabulated by the software for each suite of measures that have been combined into a new alternative plan. Costs and benefits for the diversion tunnel were a separate measure which was called using the dependency relationships in the CE/ICA software. Due to computational limitations, plans requiring the diversion tunnel and those not requiring the diversion tunnel were run separately. As it turned out, Tunnel-Dependent alternatives were screened from further analysis based on prohibitive cost. As such, the Non-Tunnel model became the only model further evaluated. The following sub-sections describe each of the two model runs.

[5] Measures—also called "features" when they are structural measures and "activities" when they are non-structural measures—are typically defined as a type of restoration action (create wetland, remove levee, etc.). In this case, the measures are defined as each of the eight study reaches.

[6] Scales are typically defined as a potential quantity of a measure (create 100, 200, or 300 acres of wetland). In this case, the scales are reach-specific alternatives (derived from the preliminary 19 alternatives) which may be recombined (1 scale per reach) to form new alternatives.

(a) Tunnel-Dependent Model

The Tunnel-Dependent model evaluated those features which were dependent on the diversion tunnel (corresponding to the pink-shaded cells in Table 6-1). The tunnel itself had an average annual cost of $70,943,000. The least cost tunnel-dependent plan was shown to result in only a 0.12 percent increase in habitat output and a of 53 percent increase in cost compared to the largest non-tunnel plan, as illustrated by Figure 6-1 below. Based on these results, the opinion of the study team was that the benefits associated with the diversion tunnel did not exceed the costs. Features requiring the tunnel were screened from further consideration (pink cells in Table 6-1).

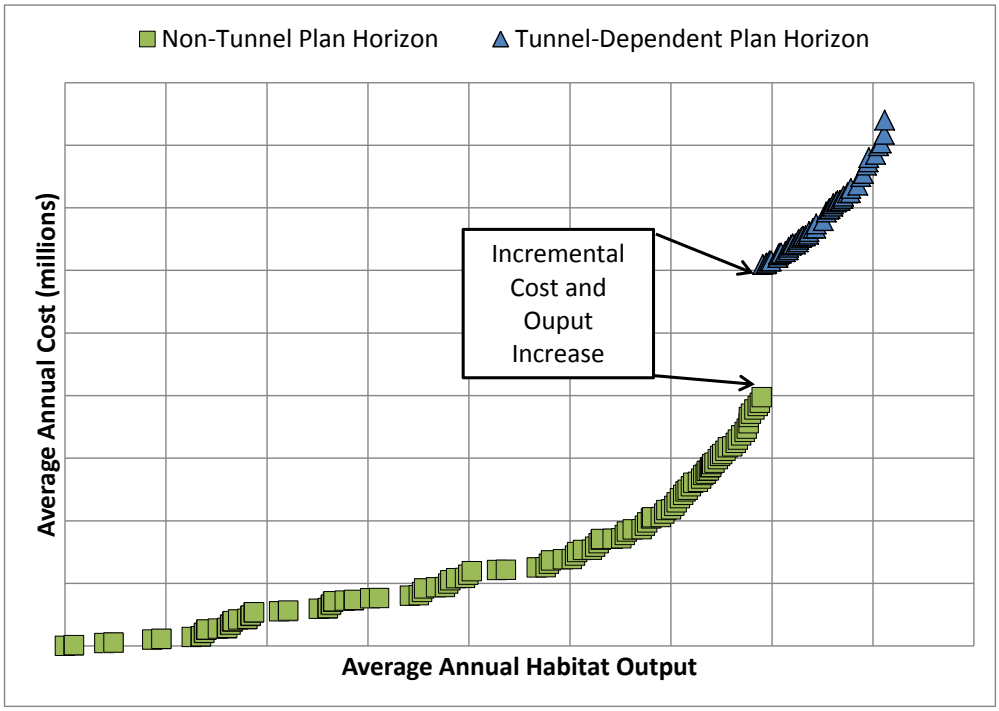

Figure 6-1 Tunnel-Dependent Plan Horizon

(b) Non-Tunnel Model

The Non-Tunnel model included only those features which could be implemented without the diversion tunnel measure. This is equivalent to the blue-shaded cells in Table 6-2 and Table 6-3, which present the annual costs and benefits for each feature, respectively.

As shown in the tables, Reach 1 contains only three features which do not require the diversion tunnel that was originally formulated at part of preliminary alternatives 11, 16, and 18 (compare to shading in Table 6-3, which also contains only three blue cells for reach 1). Thus, only these three features are included in the Non-Tunnel model for Reach 1, and are assigned a code for the reach and the scale in the software. The same methodology is applied to the other seven reaches to generate a complete input sheet for the model run.

Table 6-2 Non-Tunnel Features Annual Cost Matrix

Prelim. Alternative	Reach*							
	1	2	3	4	5	6	7	8
1						$11,996		
2						$12,009		
3						$11,265		$18,003
4						$6,861		$16,170
5					$6,871	$12,009		
6						$10,085		$16,773
7						$6,836		$11,803
8						$8,859		$12,779
9		$1,114		$9,394	$61	$10,085	$177	$105
10						$8,333		$11,561
11	$377	$147				$8,892		$16,253
12			$9,692			$11,222	$1,795	$12,680
13		$1,945				$6,413		$6,822
14		$404	$4,500			$4,557		$14,627
15		$405	$3,833	$150		$7,741		$8,864
16	$2,038	$736	$1,243	$1,775	$61	$3,690	$4,815	$12,727
17			$105	$589		$5,088		$4,539
18	$377		$9,312			$8,922	$3,591	
19						$10,074		

**Costs presented in thousands ($1000)*

Table 6-3 Non-Tunnel Features Annual Output Matrix

Prelim. Alternative	Reach*							
	1	2	3	4	5	6	7	8
1						1,489		
2						1,489		
3						1,476		2,501
4						1,265		2,379
5					352	1,489		
6						1,316		2,340
7						1,334		1,843
8						1,548		2,192
9		425		474	87	1,316	29	20
10						1,465		1,942
11	866	392				1,545		2,282
12			269			1,476	259	2,170
13		447				1,447		734
14		392	201			1,256		1,942
15		392	109	120		1,316		2,159
16	884	395	200	492	87	570	347	2,080
17			40	120		661		701
18	866		330			1,476	251	
19						1,287		

**Output presented in Average Annual Habitat Units (AAHUs)*

6.2.3 Results Summary

The model run resulted in a total of 171 cost effective plans, including the no action plan. Of these cost effective plans, 21 plans were identified as best buy plans. Table 6-4 presents the cost, benefits, and incremental cost for each of the 21 best buy plans. The best buy plans were numbered from 1 to 21. Letters A through H in the plan code stand for reaches 1 through 8, while numbers in the plan code correspond to the preliminary alternative numbers in Table 6-2 and Table 6-3.

For the purposes of comparison, the costs and benefits for the 19 preliminary alternatives were tabulated as well. Table 6-5 presents the costs and benefits of these alternatives. The code 'P-#' denotes that the plan is one of the 19 preliminary alternatives.

Table 6-4 Best Buys Incremental Cost Summary

#	Plan	AACost ($)	AAHU	Inc AACost ($)	Inc AAHU	Inc Cost ($)
1	No Action Plan	$0	0	$0	0	$0
2	B2	$146,743	392	$146,743	392	$374
3	A1B2	$523,358	1,258	$376,615	866	$435
4	A1B2E2	$583,950	1,345	$60,592	87	$696
5	A1B2D2E2	$733,885	1,465	$149,935	120	$1,249
6	A1B2C5D2E2	$839,159	1,505	$105,274	40	$2,632
7	A1B2C5D2E2F14	$5,396,226	2,761	$4,557,067	1,256	$3,628
8	A1B2C5D2E2F14H12	$14,260,310	4,920	$8,864,084	2,159	$4,106
9	A1B2C5D3E2F14H12	$15,884,884	5,292	$1,624,574	372	$4,367
10	A1B2C5D3E2F14G1H12	$16,062,161	5,321	$177,277	29	$6,113
11	A1B2C5D3E2F14G2H12	$17,680,091	5,551	$1,617,930	230	$7,034
12	A1B2C4D3E2F14G2H12	$18,817,690	5,711	$1,137,599	160	$7,110
13	A1B2C4D3E2F13G2H12	$20,673,266	5,902	$1,855,576	191	$9,715
14	A1B2C4D3E2F8G2H12	$23,119,812	6,003	$2,446,546	101	$24,223
15	A1B2C4D3E1F8G2H12	$29,930,469	6,268	$6,810,657	265	$25,701
16	A1B2C4D3E1F8G2H1	$39,069,505	6,610	$9,139,036	342	$26,722
17	A1B1C4D3E1F8G2H1	$40,036,386	6,643	$966,881	33	$29,299
18	A1B1C4D3E1F8G3H1	$43,055,891	6,731	$3,019,505	88	$34,313
19	A1B3C4D3E1F8G3H1	$43,887,027	6,753	$831,136	22	$37,779
20	A1B3C6D3E1F8G3H1	$51,955,779	6,883	$8,068,752	130	$62,067
21	A2B3C6D3E1F8G3H1	$53,616,857	6,901	$1,661,078	18	$92,282

Table 6-5 Preliminary Alternatives Costs and Benefits

Alternative	AA Cost ($)	AAHU
P-1	$11,996,483	1489
P-2	$12,009,286	1489
P-3	$29,267,897	3976
P-4	$23,030,955	3644
P-5	$18,880,535	1841
P-6	$26,858,358	3656
P-7	$18,638,396	3177
P-8	$21,638,317	3740
P-9	$20,936,199	2352
P-10	$19,894,592	3406
P-11	$25,668,150	5084
P-12	$35,389,302	4173
P-13	$15,179,266	2629
P-14	$24,087,662	3790
P-15	$20,992,030	4096
P-16	$27,083,375	5054
P-17	$10,321,082	1522
P-18	$22,201,739	2923
P-19	$10,074,318	1287

In order to summarize the results of the model graphically, three figures are included on the following pages. Data labels in the figures correspond to the left columns in Table 6-4 and Table 6-5.

- Figure 6.2 displays the cost effective plans, the best buy plans, and the 19 preliminary alternatives. The Y-axis measures average annual cost, and the X-axis measures average annual habitat output. The figure also notes which of the best buy plans included features in all eight reaches, and which did not.

- Figure 6.3 displays the incremental cost box plot for all 21 of the best buy plans. The X-axis measures incremental cost per unit incremental output, and the Y-axis measures total average annual habitat units.

- Figure 6.4 is also an incremental cost box plot, but displays only those alternatives which included features in all eight of the study reaches. This corresponds to best buys 10 through 21.

Following the figures, Table 6-6 provides a detailed breakdown of each best buy plan. In the table, each plan is broken down to show which feature is applied in each reach. The naming convention in this table references the name of the preliminary 19 alternatives in order to trace where each feature came from. The first column indicates Best Buys in numerical order. Column two indicates the Reach and which of the preliminary array of alternatives make up the best buy alternatives. The table also shows the average annual cost and output, incremental cost, and Net Present Value (NPV). NPV reflects the current worth of the future stream of annual costs for each alternative, and consistent with the annual costs used in the CE/ICA, includes construction, mobilization, contingency, PED/EDC, S&A, IDC, LERRDs, and O&M.

6.2.3.1 Interpretation of Results

As shown in Figure 6.2, by recombining the reach-specific features from the preliminary 19 alternatives, a new horizon of cost effective and best buy alternatives was created. The figure shows that none of the preliminary 19 alternatives meet the cost effective criteria when compared with the new horizon of plans. Additionally, the new plans offer higher total habitat benefits. As an example, preliminary alternative 11 is close to Best Buy plan 10 on Figure 6.2. Best buy 10 has an annual investment cost of $16 million compared to preliminary alternative 11 which has an annual cost of nearly $26 million. However Best Buy 10 provides 5,321 AAHU versus the 5,084 in preliminary alternative 11.

Among the cost effective plans generated in the CE/ICA analysis, 21 are best buy plans, as indicated by blue triangles and purple diamonds in Figure 6.2. Of particular value are the best buy plans which contain a feature in all eight reaches of the ARBOR stretch of river (purple diamonds in the figure), continuous and complete restoration of the reach was a key consideration in formulation for the study team. Of the best buy plans, Alternatives 10-21 include restoration in all reaches.

As shown in Figure 6.4, best buy plans 10 through 13 show gradual growth incremental cost and output, followed by a large jump in cost to plans 14 through 16, and then sharply rising incremental cost and more slowing rising incremental output for plans 17 through 21.

Alternative 10 total costs are $360 million, adds the additional reach (7) connecting the entire study area and provides 5,321 habitat units. The group of alternatives 10-13 range in total costs from $347 million to $444 million dollars for Alternative 13. Habitat benefits increase from 5,321 units to 5,902 for Alternative 13. Within this grouping there are significant changes within Alternatives 10 to 13. Reach 3, 6, and 7 are changed. Alternative 13 accomplishes all that Alternative 10 does, and adds freshwater marsh habitat to better meet objectives. Connectivity is increased with additional contiguous riparian corridors and restoration of the confluence at Arroyo Seco, the most significant tributary in the ARBOR reach with potential to connect to future restoration planning on that tributary.

The next incrementally grouped alternatives are 14-16. These alternatives range in benefits from 6,003 to 6,610 with a total cost range from $518 million to $876 million. These all meet targets for performance on Objective 1 with Alternative 16 showing an incremental jump in restoration of freshwater marsh, riffle-pool complexes, and conditions for native fish survival, greater hydrologic/hydraulic connections and other related conditions.

The remaining alternatives 17-21 incrementally increase the habitat value from 6,643 to 6,901 and have significantly increased total costs ranging from $898 million to $1.2 billion. In addition to the benefits and measures included in the other alternatives, these alternatives include widening and increased habitat in the river bed in reach 2, and connection to the Los Angeles River State Historic Park (Cornfields) in Alternatives 18-21. Alternative 20 shows the greatest single increase in habitat value in this group with the addition of restoration at the confluence of a major tributary (Verdugo Wash), increasing natural hydraulic conditions and regional connectivity.

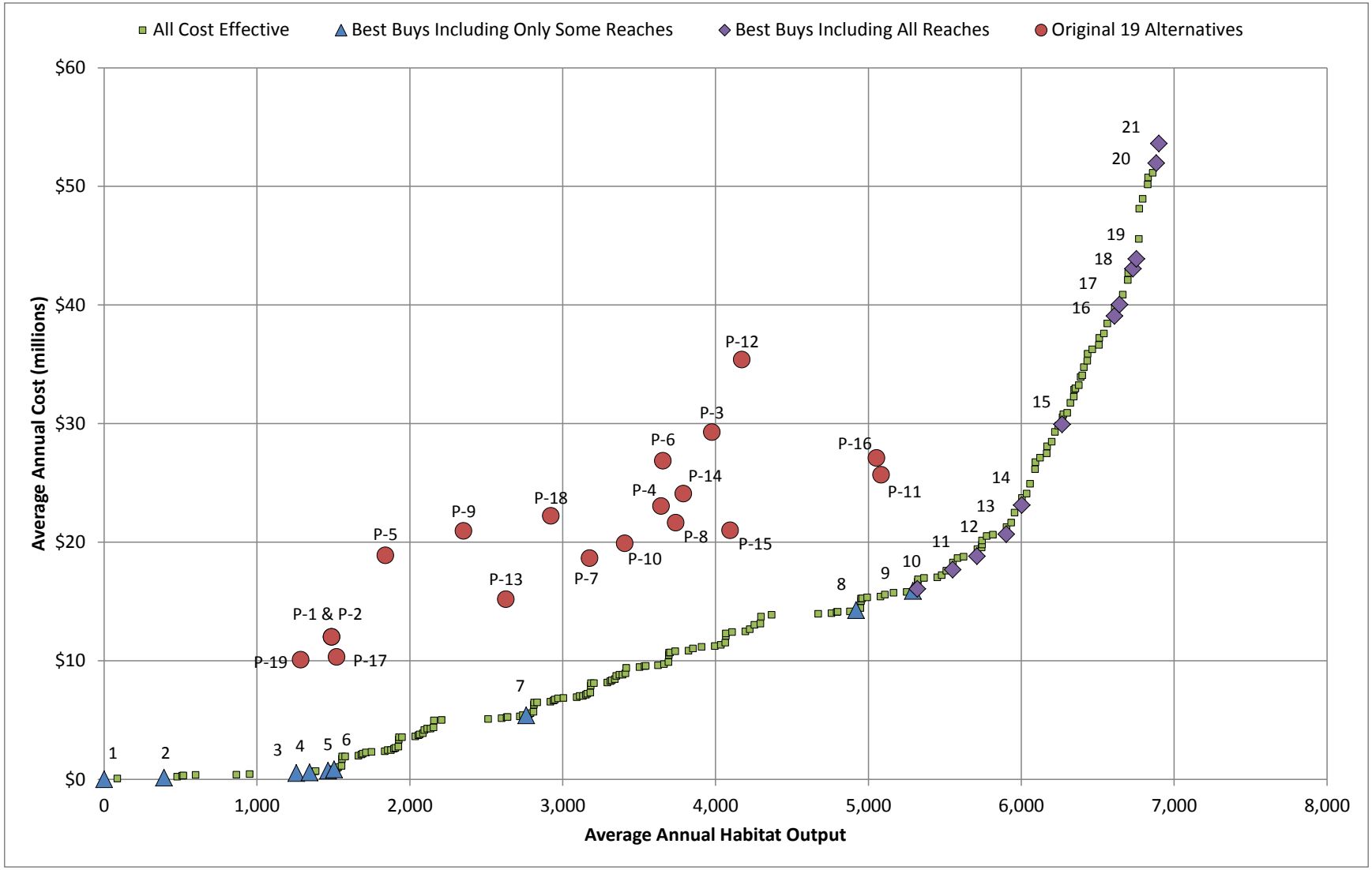

Figure 6.2 Model Output Summary

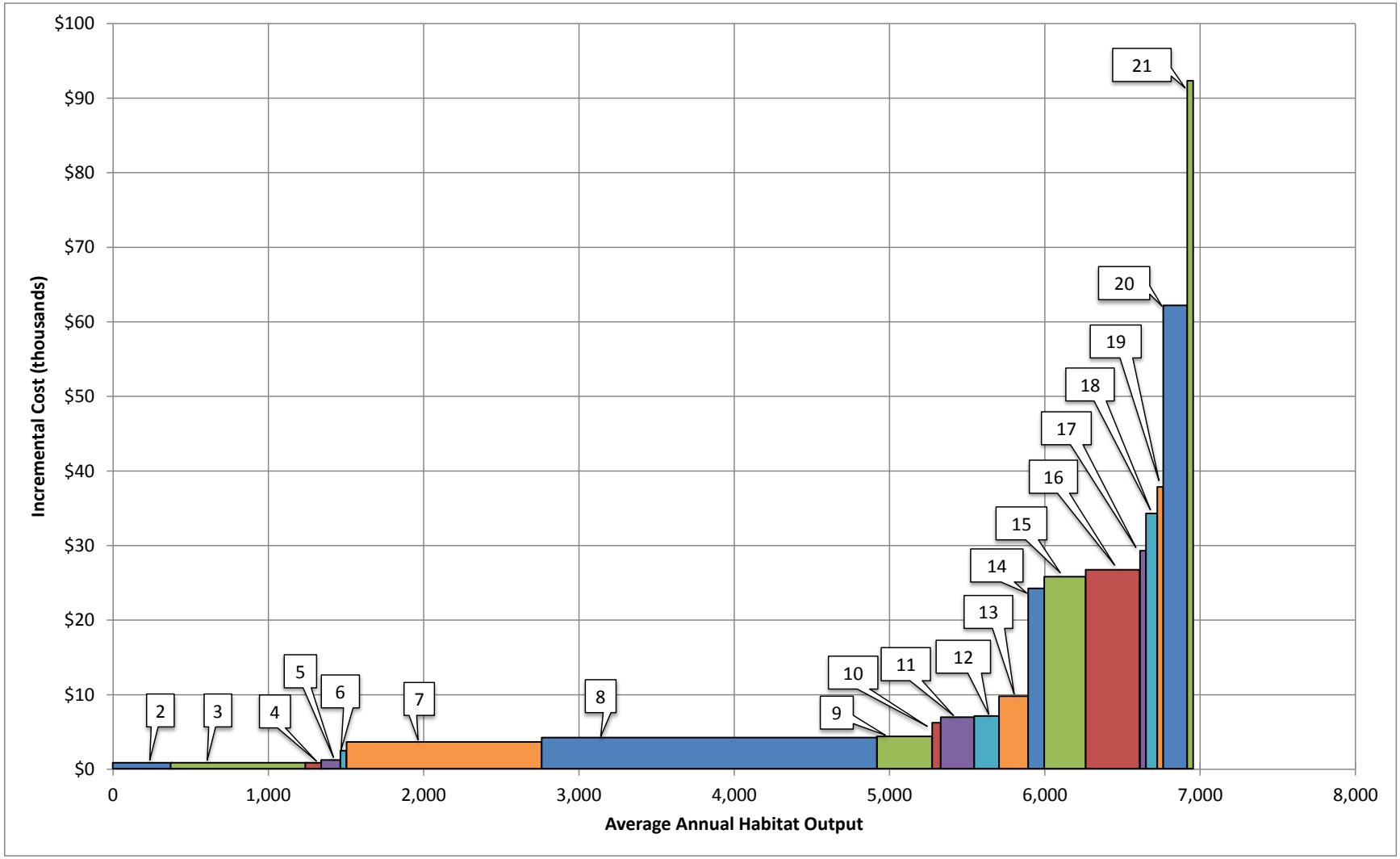

Figure 6.3 All Best Buy s Incremental Cost Box Plot

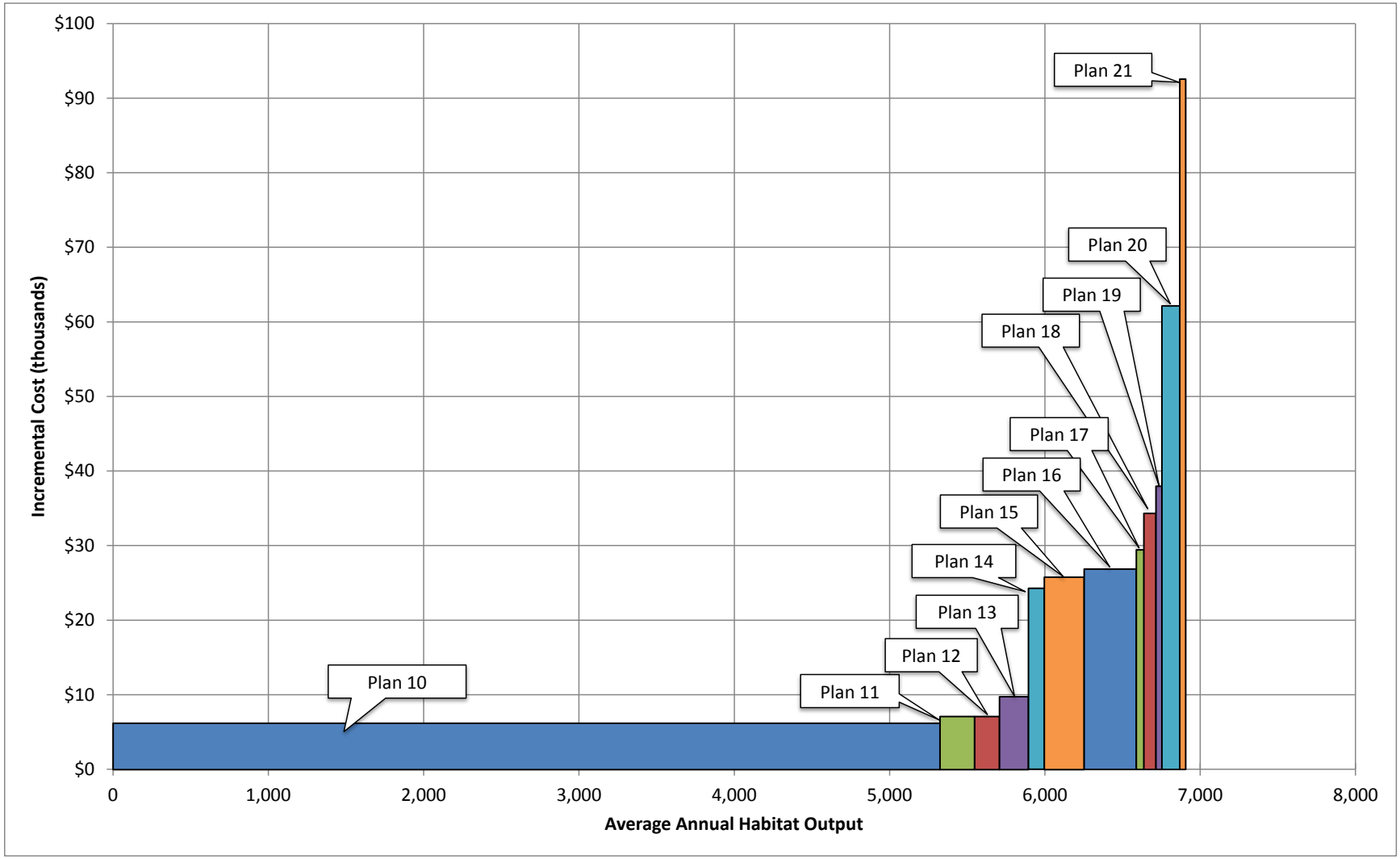

Figure 6.4 Best Buy Plans 10-21 Incremental Cost Box Plot

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Table 6-6 Combined Model – Best Buy Plans Descriptions and Cost Data

Best Buy #	Plan Components (Meas./Scale)	Plan Components (Reach - Alt./Feat.)	Plan Components (Name)	Average Annual Cost ($)	Average Annual Habitat Units	Incremental Cost ($)	Net Present Value ($)
1	No Action	No Action	No Action	$0	0	$0	$0
2	B2	R2 - A11	Reach 2 - Charette Team 4	$146,743	392	$374	$3,292,105
3	**A1**	**R1 - A11**	**Reach 1 - Charette Team 4**	$523,358	1,258	$435	$11,741,271
	B2	R2 - A11	Reach 2 - Charette Team 4				
4	A1	R1 - A11	Reach 1 - Charette Team 4	$583,950	1,345	$696	$13,100,622
	B2	R2 - A11	Reach 2 - Charette Team 4				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
5	A1	R1 - A11	Reach 1 - Charette Team 4	$733,885	1,465	$1,249	$16,464,338
	B2	R2 - A11	Reach 2 - Charette Team 4				
	D2	**R4 - A15**	**Reach 4 - Charette Team 2**				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
6	A1	R1 - A11	Reach 1 - Charette Team 4	$839,159	1,505	$2,632	$18,826,107
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C5	**R3 - A17**	**Reach 3 - Charette Team 7**				
	D2	R4 - A15	Reach 4 - Charette Team 2				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
7	A1	R1 - A11	Reach 1 - Charette Team 4	$5,396,226	2,761	$3,628	$121,061,595
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C5	R3 - A17	Reach 3 - Charette Team 7				
	D2	R4 - A15	Reach 4 - Charette Team 2				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F14	**R6 - A14**	**Reach 6 - Charette Team 5**				
8	A1	R1 - A11	Reach 1 - Charette Team 4	$14,260,310	4,920	$4,106	$319,922,827
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C5	R3 - A17	Reach 3 - Charette Team 7				
	D2	R4 - A15	Reach 4 - Charette Team 2				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F14	R6 - A14	Reach 6 - Charette Team 5				
	H12	**R8 - A15**	**Reach 8 - Charette Team 2**				
9	A1	R1 - A11	Reach 1 - Charette Team 4	$15,884,884	5,292	$4,367	$356,369,322
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C5	R3 - A17	Reach 3 - Charette Team 7				
	D3	**R4 - A16**	**Reach 4 - Side Channels Only**				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F14	R6 - A14	Reach 6 - Charette Team 5				
	H12	R8 - A15	Reach 8 - Charette Team 2				
10	A1	R1 - A11	Reach 1 - Charette Team 4	$16,062,161	5,321	$6,113	$360,346,441
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C5	R3 - A17	Reach 3 - Charette Team 7				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F14	R6 - A14	Reach 6 - Charette Team 5				
	G1	**R7 - A9**	**Reach 7 - Soft Bot. Ch. & Assoc. Banks**				
	H12	R8 - A15	Reach 8 - Charette Team 2				
11	A1	R1 - A11	Reach 1 - Charette Team 4	$17,680,091	5,551	$7,034	$396,643,881
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C5	R3 - A17	Reach 3 - Charette Team 7				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F14	R6 - A14	Reach 6 - Charette Team 5				
	G2	**R7 - A12**	**Reach 7 - Charette Team 3**				
	H12	R8 - A15	Reach 8 - Charette Team 2				
12	A1	R1 - A11	Reach 1 - Charette Team 4	$18,817,690	5,711	$7,110	$422,165,338
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C4	**R3 - A16**	**Reach 3 - Side Channels Only**				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F14	R6 - A14	Reach 6 - Charette Team 5				
	G2	R7 - A12	Reach 7 - Charette Team 3				
	H12	R8 - A15	Reach 8 - Charette Team 2				
13	A1	R1 - A11	Reach 1 - Charette Team 4	$20,673,266	5,902	$9,715	$463,794,245
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F13	**R6 - A13**	**Reach 6 - Charette Team 6**				
	G2	R7 - A12	Reach 7 - Charette Team 3				
	H12	R8 - A15	Reach 8 - Charette Team 2				

Best Buy #	Plan Components (Meas./Scale)	Plan Components (Reach - Alt./Feat.)	Plan Components (Name)	Average Annual Cost ($)	Average Annual Habitat Units	Incremental Cost ($)	Net Present Value ($)
14	A1	R1 - A11	Reach 1 - Charette Team 4	$23,119,812	6,003	$24,223	$518,681,264
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E2	R5 - A9 OR R5 - A16	Reach 5 - (Soft Bot. Ch. & Assoc. Banks) OR (Side Channels Only)				
	F8	**R6 - A8**	**Reach 6 - Charette Team 1**				
	G2	R7 - A12	Reach 7 - Charette Team 3				
	H12	R8 - A15	Reach 8 - Charette Team 2				
15	A1	R1 - A11	Reach 1 - Charette Team 4	$29,930,469	6,268	$25,701	$671,474,902
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	**R5 - A5**	**Reach 5 - City: Los Feliz to Arroyo Seco**				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G2	R7 - A12	Reach 7 - Charette Team 3				
	H12	R8 - A15	Reach 8 - Charette Team 2				
16	A1	R1 - A11	Reach 1 - Charette Team 4	$39,069,505	6,610	$26,722	$876,504,543
	B2	R2 - A11	Reach 2 - Charette Team 4				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	R5 - A5	Reach 5 - City: Los Feliz to Arroyo Seco				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G2	R7 - A12	Reach 7 - Charette Team 3				
	H1	**R8 - A3**	**Reach 8 - Banks & Tribs Only**				
17	A1	R1 - A11	Reach 1 - Charette Team 4	$40,036,386	6,643	$29,299	$898,196,028
	B1	**R2 - A9**	**Reach 2 - Soft Bot. Ch. & Assoc. Banks**				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	R5 - A5	Reach 5 - City: Los Feliz to Arroyo Seco				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G2	R7 - A12	Reach 7 - Charette Team 3				
	H1	R8 - A3	Reach 8 - Banks & Tribs Only				
18	A1	R1 - A11	Reach 1 - Charette Team 4	$43,055,891	6,731	$34,313	$965,937,093
	B1	R2 - A9	Reach 2 - Soft Bot. Ch. & Assoc. Banks				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	R5 - A5	Reach 5 - City: Los Feliz to Arroyo Seco				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G3	**R7 - A16**	**Reach 7 - Side Channels Only**				
	H1	R8 - A3	Reach 8 - Banks & Tribs Only				
19	A1	R1 - A11	Reach 1 - Charette Team 4	$43,887,027	6,753	$37,779	$984,583,208
	B3	**R2 - A13**	**Reach 2 - Charette Team 6**				
	C4	R3 - A16	Reach 3 - Side Channels Only				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	R5 - A5	Reach 5 - City: Los Feliz to Arroyo Seco				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G3	R7 - A16	Reach 7 - Side Channels Only				
	H1	R8 - A3	Reach 8 - Banks & Tribs Only				
20	A1	R1 - A11	Reach 1 - Charette Team 4	$51,955,779	6,883	$62,067	$1,165,601,569
	B3	R2 - A13	Reach 2 - Charette Team 6				
	C6	**R3 - A18**	**Reach 3 - Comprehensive Pockets**				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	R5 - A5	Reach 5 - City: Los Feliz to Arroyo Seco				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G3	R7 - A16	Reach 7 - Side Channels Only				
	H1	R8 - A3	Reach 8 - Banks & Tribs Only				
21	**A2**	**R1 - A16**	**Reach 1 - Side Channels Only**	$53,616,857	6,901	$92,282	$1,202,867,012
	B3	R2 - A13	Reach 2 - Charette Team 6				
	C6	R3 - A18	Reach 3 - Comprehensive Pockets				
	D3	R4 - A16	Reach 4 - Side Channels Only				
	E1	R5 - A5	Reach 5 - City: Los Feliz to Arroyo Seco				
	F8	R6 - A8	Reach 6 - Charette Team 1				
	G3	R7 - A16	Reach 7 - Side Channels Only				
	H1	R8 - A3	Reach 8 - Banks & Tribs Only				

6.3 Final Array of Alternatives

Four alternatives were identified from the list of best buys as the final array for analysis and given a new name to identify the recombination of restoration features. Those four alternatives include: 10-ARBOR Riparian Transitions, 13-ARBOR Corridor Extension, 16-ARBOR Narrows to Downtown, and 20-ARBOR Riparian Integration via Varied Ecological Reintroduction (numbers correspond to the best buy plan numbers in the previous section's tables and figures). These four alternatives were identified as the best representation of the range of restoration approaches that resulted from the CE/ICA. General description and rationale for selection is provided below.

Substitution

The study team reviewed and considered the sub reach plans identified in the best buys. In Reach 6 a recommended modification was made that the team considers a more effective plan. Best buy Alternative 13 includes preliminary Alternative 13 in Reach 6. However, Best Buy 16 and 20 included Preliminary Alternative 8 instead. Preliminary Alternative 13 in Reach 6 includes freshwater marsh and widens the riverbed more than the reach sub-plan from Preliminary Alternative 8. Preliminary Alternative 13 also represents a cost savings of $51 million dollars versus Preliminary Alternative 8. Therefore, reach sub-plan Reach 6 Alternative 13 will be carried forward in place of Reach 6 Alternative 8 in the Final Array Alternatives 16 and 20. To distinguish these alternatives they will be designated Alternatives 16A and 20A with the understanding that this change has been made. Table 6-7 includes a summary of the measures included in each alternative and total acres restored.

Alternative 10, ARBOR Riparian Transitions (ART) - Focuses on areas upstream and downstream of existing soft-bottomed Glendale Narrows; includes all reaches but limited restoration in reaches 3, 4 and 5.

- Alternative 10 is the first best buy plan which included restoration in all eight ARBOR reaches. Creating a corridor of continuous restoration was an important formulation consideration for the study team.
- Alternative 10 provides 5,321 AAHU.
- Relative to the No Action alternative, Alternative 10 has an incremental cost per unit output of $3,000.

Alternative 13, ARBOR Corridor Extension (ACE) - Includes all 8 river reaches, with side-channels in key locations and treatments into Downtown LA, but not at the Cornfields/LA State Historic Park.

- Alternative 13 provides an 11 percent increase in habitat output versus Alternative 10 for a 29% increase in project cost.
- As shown in Figure 6.4, Alternative 13 is located just before a large increase in incremental cost associated with Alternative 14, making it a logical break point on the incremental cost box plot.

- Relative to Alternative 10, Alternative 13 has an incremental cost per unit output of $7,900.

Alternative 16A, ARBOR Narrows to Downtown (AND) - Includes all river reaches and reaches 1-4 are similar to the smaller two alternatives. Reach 5 includes channel widening and terracing, includes restoration of Arroyo Seco and Piggyback Yard.

- Alternative 16 provides a 12 percent increase in habitat output versus Alternative 13 for an 89 percent increase in project cost.

- As shown in Figure 6.4, this alternative is located at the next logical major breakpoint on the incremental cost box plot. It provides a relatively substantial increase in habitat benefit at a low incremental cost relative to Alternative 15. Moving to Alternative 17 would provide little increased habitat benefit at relatively high incremental cost.

- Relative to Alternative 13, Alternative 16 has an incremental cost per unit output of $26,000.

Alternative 20A, ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER) - Most extensive, includes measures in all eight reaches with channel widening at Verdugo Wash, Arroyo Seco, Cornfields/LA State Historic Park, and Piggyback Yard.

- Alternative 20 provides a 4 percent increase in habitat output versus Alternative 16 for a 33 percent increase in project cost.

- Alternative 20 is the second to last best buy plan. Figure 6.4 shows that among all the plans larger than Alternative 16, Alternative 20 provides the largest marginal increase in habitat benefits.

- Relative to Alternative 16, Alternative 20 has an incremental cost per unit output of $47,200.

Table 6-7 Final Alternative Measure Matrix

Reach	Submeasure	Alternative			
		10	13	16	20
1. Pollywog Park area of Griffith Park	Riparian habitat corridors	x	x	x	x
2. Bette Davis Park area of Griffith Park	Restructure top of bank to support vines				x
	Riparian habitat corridors	x	x	x	x
	Modify trap channel to vertical banks				x
3. Ferraro Fields area of Griffith Park	Create pool & riffle system and plant for freshwater marsh		x	x	x
	Daylight streams plant with riparian fringe and freshwater marsh	x	x	x	
	Divert flow into side channels with riparian fringe and return to the river		x	x	x
	Riparian habitat corridors		x	x	x
	Open water habitat	x			

Reach	Submeasure	Alternative			
		10	13	16	20
	Widen mainstem				x
	Widen tributaries				x
4. Griffith Park	Create pool & riffle system and plant for freshwater marsh	x	x	x	x
	Daylight streams plant with riparian fringe and freshwater marsh	x	x	x	x
	Divert flow into side channels with riparian fringe and return to the river	x	x	x	x
	Riparian habitat corridors	x	x	x	x
5. Riverside Drive	Create pool & riffle system and plant for freshwater marsh			x	x
	Daylight streams plant with riparian fringe and freshwater marsh	x	x	x	x
	Wildlife access from river to bank (in daylighted streams)			x	x
	Restructure channel walls to support vines			x	x
	Riparian habitat corridors	x	x	x	x
	Terrace banks			x	x
	Modify trap channel to vertical banks			x	x
6. Taylor Yard	Create pool & riffle system and plant for freshwater marsh		x	x	X
	Restructure channel walls to support vegetation		x	x	x
	Riparian habitat corridors	x	x	x	x
	Restructure to of bank to support vines and other vegetation		x	x	x
	Widen channel mainstem	x	x	x	x
	Widen channel sloping or terracing back to overbank levels	x	x	x	x
7. Arroyo Seco/ Los Angeles State Historic Park	Create pool & riffle system and plant for freshwater marsh				x
	Daylight streams plant with riparian fringe and freshwater marsh	x			x
	Divert flow into side channels with riparian fringe and return to the river				x
	Riparian habitat corridors		x	x	x
	Restructure channel walls to support vegetation, plantings.		x	x	
	Widen channel (Arroyo Seco) sloping or terracing back to overbank levels		x	x	x
8. Piggyback Yard	Create pool & riffle system and plant for freshwater marsh			x	x
	Restore historic wash with riparian habitat	x	x	x	x
	Divert flow into side channels with riparian fringe and return to the river			x	x
	Wildlife access from river to bank	x	x	x	x
	Riparian habitat corridors	x	x	x	x
	Widen channel			x	x
	Terrace banks			x	x

Costs and benefits of each of the final array are summarized in Table 6-8 below. This includes first costs and annualized costs. Average Annual Habitat Units per alternative are also displayed. Note that the costs in this table have been further refined after those displayed in Table 6-6 so do not match precisely.

Table 6-8 Final Array of Alternatives Cost and Benefits Summary

	Alt 10	**Alt 13**	**Alt 16A**	**Alt 20A**
Construction	34,419,492	79,547,000	263,866,460	362,473,621
Mobilization (7.5%)	2,581,462	5,966,025	19,789,984	27,185,522
Contingency (25%)	9,250,238	21,378,256	70,914,111	97,414,786
PED/EDC (11%)	4,070,105	9,406,433	31,202,209	42,862,506
S&A (6.5%)	2,405,062	5,558,347	18,437,669	25,327,844
LERRD	293,455,604	319,708,444	352,897,118	481,212,935
Total First Cost	**346,181,963**	**441,564,505**	**757,107,551**	**1,036,477,214**
Interest During Construction	1,171,742	2,656,875	17,598,150	27,557,494
Total Investment Cost	347,353,704	444,221,379	774,705,701	1,064,034,706
Annualized Investment Cost	16,062,161	20,673,266	36,606,299	49,761,088
Annualized O&M	579,141	872,445	2,074,398	2,332,573
AAHU	5,321	5,902	6,509	6,782

Finally, the following cost summary table (Table 6-9) presents the final array costs including both the risk based contingencies developed as part of the Abbreviated Risk Analysis and refined LERRDs estimates. See Appendix C– Cost Appendix, for further description. The refinements to the costs for the Final Array alternatives resulted in minor changes in total first cost and average annual cost (less than 10% for all alternatives). Economic evaluation confirmed that these impacts would not have had a material impact on the CE/ICA analysis, best buy plans, or Final Array plan selection.

Table 6-9 Final Array Cost and Benefits Summary with Risk Based Contingencies

	Alt 10	Alt 13	Alt 16A	Alt 20A
Construction	$37,160,342	$82,287,850	$265,844,810	$365,214,471
Mobilization (7.5%)	$2,787,026	$6,171,589	$19,938,361	$27,391,085
Construction First Cost	$39,947,368	$88,459,438	$261,753,170	$363,575,556
Construction Contingency	38.83%	36.01%	37.89%	39.38%
Total Construction Cost	**$55,456,944**	**$120,312,641**	**$360,927,221**	**$506,743,287**
PED/EDC (11%)	$4,394,210	$9,730,538	$31,436,149	$43,186,611
PED/EDC Contingency	24.40%	24.40%	24.40%	24.40%
Total PED/EDC	**$5,466,398**	**$12,104,790**	**$39,106,569**	**$53,724,144**
S&A (6.5%)	$2,596,579	$5,749,864	$18,575,906	$25,519,361
S&A Contingency	26.25%	26.25%	26.25%	26.25%
Total S&A	**$3,278,181**	**$7,259,203**	**$23,452,081**	**$32,218,193**
Lands & Damages	$247,425,237	$250,048,826	$278,031,210	$352,858,303
Lands & Damages Contingency	20.00%	20.00%	20.00%	20.00%
Relocations	$11,392,360	$11,392,360	$35,422,360	$49,072,002
Relocations Contingency	20.00%	20.00%	32.14%	31.46%
Total LERRDs	**$310,581,116**	**$313,729,423**	**$380,442,863**	**$487,941,715**
TOT FIRST COST	**$374,782,639**	**$453,406,057**	**$803,928,734**	**$1,080,627,339**
Interest During Construction	$1,323,438	$2,808,572	$19,580,381	$23,889,483
Tot Investment Cost	$376,106,077	$456,214,629	$823,509,115	$1,104,516,822
Annualized Investment Cost	$16,764,634	$20,335,411	$36,707,275	$49,232,974
Annualized O&M	$579,141	$872,445	$2,257,215	$2,515,390
Total Annual Cost	$17,343,775	$21,207,856	$38,964,490	$51,748,364
AAHU	5,321	5,902	6,509	6,782

7. Recreation Plan

This section provides a summary of the recreation analysis conducted for the Los Angeles River Ecosystem Restoration Feasibility Study Integrated Feasibility Report (IFR). Attachment 1 to this appendix contains detailed documentation of the analysis. For this analysis, the recreation resource area is the ARBOR reach. The focus is on those recreation resources connected to or otherwise affected by the River.

The objective of the recreation plan is to maintain and improve the quality and quantity of recreation amenities that complement the ecosystem restoration in the ARBOR reach, especially in regard to promoting access and connectivity between both banks of the river and throughout the length of the ARBOR reach. The recreation features will be designed to avoid any negative impacts to the restoration areas. The recreation plan was formulated cooperatively by USACE and the non-Federal sponsor. The features of the recreation plan are designed to capitalize on the areas where substantial ecosystem restoration is proposed.

The recreation plan includes the modification, upgrade, or creation of multi-use trails and related basic amenities (access points, wildlife viewpoints, parking lots, restrooms, signage). The plan also includes non-motorized multi-use bridges across the LA River and smaller pedestrian bridges across tributaries or within large restored areas. The plan would result in 7% of existing trails being upgraded, and a 45% increase in total accessible trails and multi-use paths along the river (when including multi-use paths created by the ecosystem restoration plan).

The proposed recreation features would provide both direct and indirect benefits to recreation participants as well as the communities surrounding the ARBOR reach. Direct benefits of the recreation plan would include:

- Improved quality and quantity of trails for multiple user groups along the river
- Increased connectivity of each side of the river's recreation resources
- Increased public safety through better signage and trail development along the river
- Improved viewing and lines of sight along the river, especially in areas of substantial restoration via the ecosystem restoration plan
- Opportunity for interpretive signage and environmental education\
- Improved public health by providing opportunities for exercise and psychological respite

In addition to these direct benefits, communities along the ARBOR reach will receive benefits in the form of increased quantity and quality of neighborhood parks. As discussed in the main report, parks provide OSE benefits to communities they serve. The addition of trails and amenities in the restored Piggyback Yard will benefit the surrounding historically-underserved communities along the downstream end of the ARBOR reach, providing substantial open space in highly-developed neighborhoods which are currently considered park-deficient. The recreation plan will also help support the projected RED benefits related to redevelopment in the study area.

The benefits and costs of the proposed recreation features were estimated based on the guidelines in Appendix E, ER 1105-2-100 Planning Guidance Notebook, dated 22 April 2000. The Unit

Day Value (UDV) method was selected as the appropriate valuation method. Based on the results of the recreation analysis, recreation benefits would be approximately $2,389,644 amortized annual dollars over the 50-year period of analysis. In this analysis, benefits exceed the cost, which is anticipated to be an amortized annual cost of $318,152. The benefit cost ratio (BCR) is therefore estimated to be 7.51. The benefits exceed the costs for the proposed recreation features, and therefore the recreation features are economically justified.

For detailed documentation of the recreation analysis, see Attachment 1 to this appendix.

8. REGIONAL ECONOMIC DEVELOPMENT

The US Water Resources Council's Principles and Guidelines for Water Resources and Related Land Implementation Studies (P&G), which replace the 1972 "Principles and Standards," direct the studies of major water projects by Federal water resources development agencies. A stated purpose of the P&G is to ensure that the formulation and evaluation of water resource studies are done properly and consistently by federal agencies. The federal objective in project planning is to contribute to national economic development (NED) while protecting the environment. NED contributions are increases in the net values of national goods and services outputs, both marketed and non-marketed. A plan, consistent with federal objectives and which maximizes NED benefits, is the "NED plan."

In addition to NED, the P&G include three other accounts: regional economic development (RED), environmental quality (EQ), and other social effects (OSE). Collectively, the four accounts are required to include all significant effects of a plan on the human environment. The RED account includes the regional incidence of NED effects, income transfers, and employment effects. The EQ account shows the non-quantifiable effects of a plan on ecological, cultural, and aesthetic attributes of significant natural and cultural resources. The OSE account displays the effects of a plan on urban and community settings and on life, health, and safety.

The P&G require only that the NED account be developed for the selection of a plan. However, information on the other three accounts, which may bear significantly on selection of a plan, should be included in the alternative assessment.

The RED account shows the effects of plan alternatives on the distribution of regional economic activity in the area where the plan will have significant income and employment effects. All or most of the NED benefits for a plan will typically accrue to the region, and this is also the case for the current project. Effects outside the study region are categorized as "rest of the United States" impacts. The effects on regional income are the sum of 1) the NED income benefits accrued within the region, and 2) transfers from outside the region. Income transfers comprise income from implementation outlays, transfers of economic activities, and indirect and induced effects. Indirect effects are those that result from the changed outputs of goods and services in industries which help meet changes in final products and export demands. Induced effects result from changes in consumer expenditures stimulated by changes in personal income. The effects of a plan on regional employment parallel those on regional income. Typically, employment impacts of a plan are developed for individual industries at some level of aggregation in order to discern the distributional impacts on business sectors.

8.1 Relation of the RED Account to Other Accounts

RED impacts include, principally, changes in income and employment. However, the nuances of each of those categories may easily overlap with other accounts defined within the P&Gs. As indicated above, NED impacts are also RED impacts if they occur within the region of interest. However, the NED account is to reflect all effects on the national economy and excludes indirect and induced effects because they represent inter-regional transfers of regional economic activity. Conversely, indirect and induced impacts are shown in the RED account, and differences

between it and the NED accounts are therefore accounted for as transfers from or to the rest of the nation.

The RED account may also overlap with the OSE account. The OSE account includes urban and community impacts, in particular those on income, population and employment distribution, fiscal conditions, and displacement of people and businesses and farms. A flood event may have social impacts through reduced property values, contaminated drinking water, and greater exposure to biological toxins. All may have regional impacts as typically defined by the RED account, but many may not be quantifiable and thus be included in the OSE account. Others which are measurable may fit into the OSE account and concurrently be an RED impact. For example, people in flooded areas may be unable to live in their homes or commute to work. The inability to live in their homes is an OSE impact, while the inability to commute to work is also an OSE impact, but with RED implications. In the latter case, the outputs of industries will decline if employees are unable to reach their places of employment.

8.2 Study Area RED Analysis

The study area for the RED analysis is the Los Angeles metropolitan area. The metropolitan area is defined by the Office of Management and Budget as the Los Angeles-Long Beach-Santa Ana metropolitan statistical area (MSA), consisting of Los Angeles and Orange counties. Its land area is 4,850 sq. mi (12,562 km²). At its core, the MSA has the most densely populated urbanized area (the cities of Los Angeles-Long Beach-Santa Ana) in the United States with a population of 12,828,837 as of the 2010 Census. The Census Bureau, based on commuting patterns, defines the Combined Statistical Area (the MSA plus the counties of Ventura, Riverside, and San Bernardino) as home to 18.2 million people, making it the most populous metropolitan area in the western United States and the largest in area in the United States. If the Greater Los Angeles Combined Statistical Area were counted as a country it would have the 15th largest economy in the world in terms of nominal GDP (Gross Domestic Product), placing it just below Australia and above the Netherlands, Turkey, Sweden, Belgium, and Indonesia.[7]

8.3 Regional Economic Modeling

Many of the RED effects considered in this report are quantified using regional economic models that are based on the principles of input-output (I-O) analysis. I-O analysis represents a means of measuring the flow of commodities and services among industries, institutions, and final consumers within an economy (or study area). I-O models capture all monetary market transactions in an economy, accounting for inter-industry linkages and availability of regionally-produced goods and services. The resulting mathematical formulae allow I-O models to simulate or predict the economic impacts of a change in one or several economic activities on an entire economy.

I-O analyses use three main metrics to measure economic impacts – industry output, value added, and employment. Industry output refers to the value of goods and services produced in a

[7] CIA World Factbook. 2009. GDP (Official Exchange Rate), October, 2009.

region. Value added consists of four components – employee compensation, proprietor income, other property income, and indirect business tax. Labor income represents the sum of employee compensation and proprietor income. Lastly, employment is measured by the number of full- and part time jobs. For the purposes of this study, the focus is on value added, which represents regional income, and employment, which is consistent with the guidance on RED analysis presented in the P&Gs.

The primary input variable for I-O analysis is the dollar change in purchases of products or services for final use, the "final demand." Final demand changes drive I-O models. Industries respond to meet demands directly or indirectly by supplying goods and services to meet final demand changes. The primary output variables are predicted changes in direct, indirect, and induced economic output, employment, and income for the affected industries within a study area. Direct economic effects refer to the response of a given industry (i.e., changes in output, income, and employment) based on final demand for that industry. Indirect effects refer to changes in output, income, and employment resulting from the iterations of industries purchasing from other industries caused by the direct economic effects. As an example, ecosystem restoration will purchase plants and trees – a direct effect. But to supply these plants and trees the seller would have purchased seeds, soil, fertilizers, containers and other items from other businesses to produce them – these "backward linkages" effects are indirect. Induced economic effects refer to changes in output, income, and employment caused by the expenditures associated with new household income generated by direct and indirect economic effects. The incomes earned by the workers in the industries supplying the goods and services for the direct and indirect products are then spent in other sectors of the economy – for example, retail stores, restaurants, doctor offices, and entertainment. Figure 8.1shows additional examples of these linkages.

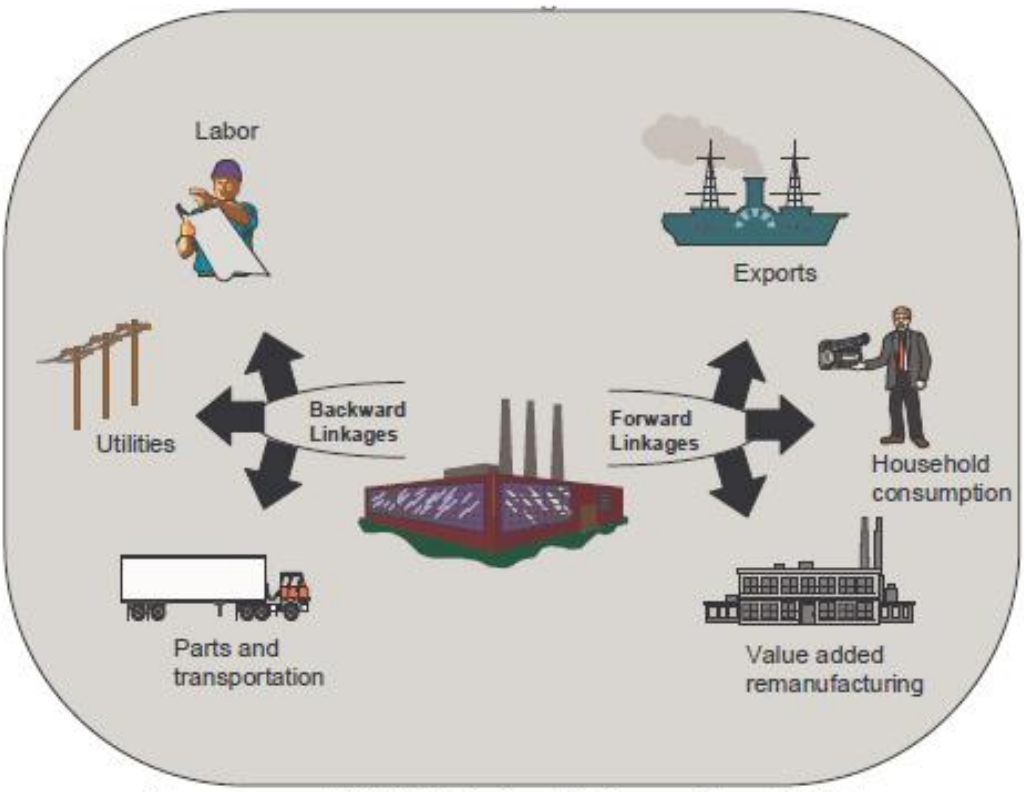


Figure source: IMPLAN Professional, Reference Manual, MIG, Inc.

Figure 8.1 Input-Output Model Linkage Examples

The measurement of direct, indirect, and induced linkages within a regional economy is based on the concept of a multiplier. A multiplier is a single number that quantifies the total economic effect resulting from direct effects. For example, an output multiplier of 1.7 for the planting and forestry sector indicates that every $100,000 of plant sales (the direct output of this industry) supports a total of $170,000 in business sales (like fertilizer, soil, and seeds) throughout the economy (total output of all industries), including the initial $100,000 in plant sales. Several types of multipliers are produced by an I-O model, including output, employment, and income multipliers.

For this study, two I-O models are employed. The first is the Corps RECONS model that is utilized to analyze the economic impacts of project construction expenditures. The Civil Works Regional Economic System (RECONS) Program is a regional economic impact modeling tool that was developed to provide accurate and defendable estimates of regional economic impacts associated with USACE spending. RECONS is the only USACE certified RED model for agency-wide use. This modeling tool automates calculations and generates estimates of jobs and other economic measures such as income and sales associated with USACE's annual Civil Work program spending, as well as that stemming from effects of additional economic activities associated with USACE's core programs (such as water transportation, tourism spending, etc.). RECONS incorporates impact area data, as well as multipliers, direct ratios (jobs to sales, income to sales, etc.), and geographic capture rates that were extracted from the IMPLAN models performed for different USACE projects.

The second model is IMPLAN. IMPLAN (IMpact Analysis for PLANning) is used to estimate regional economic effects of the redevelopment improvements anticipated to occur along the restoration corridor of the project. IMPLAN is a computer-driven system of software and data commonly used to perform economic impact analysis. It was originally developed by the USDA Forest Service (USFS) to assist in land and resource management planning and has been in use since 1979. It is a widely used for economic analyses in Federal, state and local governments, universities, and the private sector. The system is now maintained and marketed by the Minnesota IMPLAN Group, Inc. (MIG), which updates the data annually using information collected at the national, state, county, and local level. The incorporation of IMPLAN to the study is due to RECONS structure being primarily focused on Corps construction projects and isn't as well-suited to measure redevelopment as IMPLAN.

IMPLAN and RECONS are "non-survey" or secondary I-O system, as they do not require primary, survey-based data, which is often difficult and expensive to obtain. National technical relationships among industries form the basis for the model, but are adjustable to account for unique regional conditions. Information on regional economic activity is also incorporated into the models. Changes can be made to data elements to account for regional conditions when better information, such as from primary surveys, is available.

The 2011 IMPLAN dataset was used in the analysis, and no adjustments were made to the regional data or economic model. All input values into IMPLAN were aligned to 2013 dollars employing the 2011 I/O modeling database. The RED analyses are based on the Los Angeles-Long Beach-Santa Ana MSA where impacts are anticipated to occur.

8.4 RED Study Analyses

The RED analysis of the Los Angeles River Ecosystem Restoration Project is divided into three separate levels. The first level is the RED impacts of the construction of the project's alternatives. As noted earlier, this will be accomplished using the Corps' RECONS model. The second level will be redevelopment construction induced by the Corps' ecosystem restoration project. This level of RED benefits will be analyzed using IMPLAN and statistical relationships. The third level will be the analysis of housing and employment generated by the second level's construction. Again, this level will be analyzed using IMPLAN and statistical relationships.

Modeling of the RED impacts of ecosystem restoration expenditures consisted of placement of costs in the standardized account of "*Environment – Construction Activities for Ecosystem*" within the IMPLAN sectors of the RECONS model. The industry sectors considered most appropriate within this account are the following: "*construction of other new nonresidential structures*" and "*support activities for agriculture and forestry*." These contain several related sub-industries within them. Standard default settings for this account were applied for all ecosystem restoration alternatives, which results in a 75/25 percent split between the construction and agriculture/forestry (covering the planting industry) categories, respectively.

8.5 Ecosystem Restoration Alternatives

Brief descriptions of the alternatives under consideration are as follows.

- Alternative 10 – ARBOR Riparian Transitions (ART): The smallest restoration plan focusing on areas upstream and downstream of existing soft-bottomed Glendale Narrows.
- Alternative 13 – ARBOR Corridor Extension (ACE): The plan includes all eight ARBOR reaches, with side channels in key locations and treatments into Downtown LA.
- Alternative 16A – ARBOR Narrows to Downtown (AND): Similar to Alternative 13 the plan includes measures in all eight reaches with channel widening at Verdugo Wash, Arroyo Seco, Cornfield/LA State Historic Park, and Piggyback Yard.
- Alternative 20A – ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER): The most extensive plan including measures of Alternative 16 with the addition of marsh creations in the River Glen and Cornfield/LA State Historic Park areas.

The relative contributory acreage provided by these alternatives are indicated in Table 8-1.

Table 8-1 Acreage of Habitat Restoration, by Alternative

Alternative			
10	**13**	**16A**	**20A**
528	588	659	719

Table 7–2 presents the same costs as shown previously in Table 6–9, but adjusted to only show first cost without LERRDs. As noted in the table, Alts 16A and 20A contain LERRDs costs for construction of railroad trestles. These are included here because even though they are not cost shared costs, they are an actual construction cost.

Table 8-2 Cost Basis for RED Construction Impacts

	Alt 10	**Alt 13**	**Alt 16A**	**Alt 20A**
Construction	$37,160,342	$82,287,850	$265,844,810	$365,214,471
Mobilization (7.5%)	$2,787,026	$6,171,589	$19,938,361	$27,391,085
Construction First Cost	$39,947,368	$88,459,438	$261,753,170	$363,575,556
Construction Contingency	38.83%	36.01%	37.89%	39.38%
Total Construction Cost	**$55,456,944**	**$120,312,641**	**$360,927,221**	**$506,743,287**
PED/EDC (11%)	$4,394,210	$9,730,538	$31,436,149	$43,186,611
PED/EDC Contingency	24.40%	24.40%	24.40%	24.40%
Total PED/EDC	**$5,466,398**	**$12,104,790**	**$39,106,569**	**$53,724,144**
S&A (6.5%)	$2,596,579	$5,749,864	$18,575,906	$25,519,361
S&A Contingency	26.25%	26.25%	26.25%	26.25%
Total S&A	**$3,278,181**	**$7,259,203**	**$23,452,081**	**$32,218,193**
Total LERRDs*			**$33,134,579**	**$40,461,349**
TOT FIRST COST	**$64,202,000**	**$139,677,000**	**$456,620,000**	**$633,147,000**

**For Alts 16 and 20, LERRDs costs for railroad trestle construction are included. They are included in LERRDs because the cost will not be cost shared, but they do represent a construction cost that should be included in the input to the RED analysis.*

8.5.1 Alternative 10: ARBOR Riparian Transitions (ART)

8.5.1.1 Ecosystem Restoration Project RED Construction Impacts – RECONS

ART's project's construction consists of ecosystem restoration and recreation facilities. Ecosystem restoration construction (excluding LERRDs) is estimated at $64,202,000. Ecosystem restoration construction is estimated to occur over 7.5 months, an estimate that assumes optimal funding and schedule.

(a) Ecosystem Restoration Construction – RED Impacts

Ecosystem restoration construction is estimated to support overall regional employment of 913 during its development with 529 being directly related to the construction. With the construction period, average annual total employment for ecosystem restoration construction is 1,329. The expenditure to total employment ratio for the project is approximately $48,300 per job or about $121,400 per direct regional employment. Direct regional labor income is estimated at $28,976,000 with total regional labor income at $52,560,000.[8] The results of the RECONS model for ecosystem restoration are displayed in the following tables.

Table 8-3 Project Information

Project Name:	Alternative 10 - ARBOR Riparian Transitions (ART) Construction
Project ID:	3001711
Division:	South Pacific
District:	Los Angeles
Type of Analysis:	Civil Works Budget Analysis
Business Line:	Environmental Stewardship
Work Activity:	Construction Activities for Ecosystem and Habitat Restoration or Improvements

Table 8-4 Economic Impact Regions

Regional Impact Area:	Los Angeles Long Beach Santa Ana CA MSA
Regional Impact Area ID:	24
Counties included	Los Angeles/Orange
State Impact Area:	California
National Impact:	Yes

[8] As discussed above in Section 8.3, *direct* employment/labor income is the first expenditure of money—in the current case that associated with construction and vegetation. These businesses then buy supplies from others, which is *indirect* employment/labor income. Finally, the workers and new employees within both the direct and indirect categories have income changes which they spend, causing induced employment/labor income. The sum of direct, indirect, and induced amounts is the *total* employment/labor income. A higher expenditure to employment ratio (cost per job) is typically the result of only considering the direct category. Both are offered herein.

Table 8-5 Input Assumptions (Spending and LPCs) – Alternative 10: ARBOR Riparian Transitions (ART) Construction

Category	Spending (%)	Spending Amount	Local Purchase Coefficient[9] (LPC) (%)	State LPC (%)	National LPC (%)
Planting and Forestry Activities	25%	$16,050,500	72%	97%	98%
Heavy Construction Activities	75%	$48,151,500	100%	100%	100%
Total[10]	100%	$64,202,000	93%	99%	99%

USACE is planning on expending $64,202,000 on the project. Of this total project expenditure $59,635,000 will be captured within the regional impact area. The rest will be leaked out to the state or the nation. The expenditures made by USACE for various services and products are expected to generate additional economic activity that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 8-6 shows the overall economic impacts for this analysis.

Table 8-6 Overall Summary Economic Impacts – Alternative 10: ARBOR Riparian Transitions (ART) Construction

Impact	Impacts Areas	Regional	State	National
Total Spending		$64,202,000	$64,202,000	$64,202,000
Direct Impact				
	Output	$59,635,000	$63,712,000	$63,945,000
	Job	529	625	631
	Labor Income	$28,976,000	$32,199,000	$32,383,000
	GRP	$33,809,000	$36,967,000	$37,148,000
Total Impact				
	Output	$125,936,000	$140,846,000	$184,456,000
	Job	913	1,071	1,329
	Labor Income	$52,560,000	$58,664,000	$71,207,000
	GRP	$73,445,000	$82,032,000	$103,215,000

Table 8-7 reports the total effects over the lifespan of construction. On an average annual basis during construction, these effects are estimated to be the same as shown in since construction is approximately one year in length.

[9] Purchase coefficients determine the mix of goods and services purchased with each dollar in their respective sectors at the indicated (local, state, national) level.

[10] Figures represent a weighted average, by industry.

Table 8-7 Overall Economic Impact at Regional Level – Alternative 10: ARBOR Riparian Transitions (ART) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$11,484,000	257	$9,078,000	$8,896,000
36	Construction of other new nonresidential structures	$48,152,000	272	$19,898,000	$24,913,000
	Total Direct Effects	$59,635,000	529	$28,976,000	$33,809,000
	Secondary Effects	$66,301,000	384	$23,584,000	$39,636,000
	Total Effects	$125,936,000	913	$52,560,000	$73,445,000

Table 8-8 Average Annual Economic Impact at Regional Level – Alternative 10: ARBOR Riparian Transitions (ART) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$11,484,000	257	$9,078,000	$8,896,000
36	Construction of other new nonresidential structures	$48,152,000	272	$19,898,000	$24,913,000
	Total Direct Effects	$59,635,000	529	$28,976,000	$33,809,000
	Secondary Effects	$66,301,000	384	$23,584,000	$39,636,000
	Total Effects	$125,936,000	913	$52,560,000	$73,445,000

Table 8-9 shows the top ten industries that typically benefit from the types of expenditures made for this project. This analysis was conducted at the national level and thus it cannot be guaranteed that these industries would be present in the regional impact area as analyzed.

Table 8-9 Top Ten Industries Affected by Work Activity– Alternative 10: ARBOR Riparian Transitions (ART) Construction

Rank	Industry	IMPLAN No.	% of Total Employment
1	Construction of other new nonresidential structures	36	34 %
2	Food services and drinking places	413	4 %
3	Architectural, engineering, and related services	369	4 %
4	Real estate establishments	360	2 %
5	Wholesale trade businesses	319	2 %
6	Employment services	382	2 %
7	Offices of physicians, dentists, and other health practitioners	394	1 %
8	Private hospitals	397	1 %
9	Retail Stores - General merchandise	329	1 %
10	Retail Stores - Food and beverage	324	1 %
			53 %

8.5.2 Alternative 13: ARBOR Corridor Extension (ACE)

8.5.2.1 Ecosystem Restoration Project RED Construction Impacts – RECONS

Analysis of Alternative 13 and all others follow the procedures employed for the analysis of Alternative 10. ACE's construction consists of ecosystem restoration and recreation facilities. Ecosystem restoration construction is estimated at $139,677,000 (excluding LERRD). Construction is assumed to take 13 months for completion.

(a) Ecosystem Restoration Construction – RED Impacts

Ecosystem restoration construction is estimated to support overall regional employment of 1,986 with 1,150 directly related its construction. Again, with a one year construction schedule, average annual regional employment is the same. Overall total employment is estimated at 2,892 with 1,373 being direct employment. The expenditure to total employment ratio for the project is approximately $48,300 per job. At a direct regional employment level this ratio is $121,500-to-1. Direct regional labor income is estimated at $63,040,000 with total regional labor income at $114,350,000. The results of the RECONS model for ecosystem restoration are displayed in the following tables.

Table 8-10 Input Assumptions (Spending and LPCs) – Alternative 13: ARBOR Corridor Extension (ACE) Construction

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Planting and Forestry Activities	25%	$34,919,000	72%	97%	98%
Heavy Construction Activities	75%	$104,758,000	100%	100%	100%
Total [11]	100%	$139,677,000	93%	99%	99%

USACE is planning on expending $139,677,000 on the project. Of this total project expenditure $129,741,000 will be captured within the regional impact area. The rest will be leaked out to the state or the nation. The expenditures made by USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 8-11 is the overall economic impacts for this analysis.

[11] Figures represent a weighted average, by industry.

Table 8-11 Overall Summary Economic Impacts – Alternative 13: ARBOR Corridor Extension (ACE) Construction

Impact	Impacts Areas	Regional	State	National
Total Spending		$139,677,000	$139,677,000	$139,677,000
Direct Impact				
	Output	$129,741,000	$138,610,000	$139,118,000
	Job	1,150	1,359	1,373
	Labor Income	$63,040,000	$70,051,000	$70,452,000
	GRP	$73,554,000	$80,425,000	$80,818,000
Total Impact				
	Output	$273,986,000	$306,423,000	$401,299,000
	Job	1,986	2,330	2,892
	Labor Income	$114,350,000	$127,629,000	$154,916,000
	GRP	$159,785,000	$178,469,000	$224,553,000

Table 8-12 reports the total effects over the lifespan of construction. On an average annual basis during construction, these effects are estimated in

Table 8-13. The two tables are the same since construction is approximately one year in length.

Table 8-12 Overall Economic Impact at Regional Level – Alternative 13: ARBOR Corridor Extension (ACE) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$24,983,000	559	$19,750,000	$19,354,000
36	Construction of other new nonresidential structures	$104,758,000	591	$43,290,000	$54,200,000
	Total Direct Effects	$129,741,000	1,150	$63,040,000	$73,554,000
	Secondary Effects	$144,244,000	836	$51,310,000	$86,231,000
	Total Effects	$273,986,000	1,986	$114,350,000	$159,785,000

Table 8-13 Average Annual Economic Impact at Regional Level – Alternative 13: ARBOR Corridor Extension (ACE) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$24,983,000	559	$19,750,000	$19,354,000
36	Construction of other new nonresidential structures	$104,758,000	591	$43,290,000	$54,200,000
	Total Direct Effects	$129,741,000	1,150	$63,040,000	$73,554,000
	Secondary Effects	$144,244,000	836	$51,310,000	$86,231,000
	Total Effects	$273,986,000	1,986	$114,350,000	$159,785,000

8.5.3 Alternative 16A: ARBOR Narrows to Downtown (AND)

8.5.3.1 Ecosystem Restoration Project RED Construction Impacts – RECONS

Alternative 16's construction consists of ecosystem restoration and recreation facilities. Ecosystem restoration construction is estimated at $456,620,000. This construction is assumed to take 29 months for completion.

(a) Ecosystem Restoration Construction – RED Impacts

Ecosystem restoration construction is estimated to support overall regional employment of 6,491 during its development. Direct regional construction employment is estimated at 3,759. Overall total employment is estimated at 9,455 with 4,487 being direct. The expenditure to total employment ratio for the project is approximately $48,300 per job and $121,500 at a direct regional job level. A more accurate picture of employment is average annual employment, as a given job may last over several years and is counted each year. Average annual overall regional employment for ecosystem restoration is 2,160 with 1,250 being direct construction employment. Total regional labor income during construction is estimated at $373,823,000 or $124,608,000 per year. The results of the RECONS model for ecosystem restoration are displayed in the following tables.

Table 8-14 Input Assumptions (Spending and LPCs) – Alternative 16A: ARBOR Narrows to Downtown (AND) Construction

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Planting and Forestry Activities	25%	$114,155,000	72%	97%	98%
Heavy Construction Activities	75%	$342,465,000	100%	100%	100%
Total[12]	100%	$456,620,000	93%	99%	99%

USACE is planning on expending $456,620,000 on the project. Of this total project expenditure $424,139,000 will be captured within the regional impact area. The rest will be leaked out to the state or the nation. The expenditures made by USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 8-15 shows the overall economic impacts for this analysis.

[12] Figures represent a weighted average, by industry.

Table 8-15 Overall Summary Economic Impacts – Alternative 16A: ARBOR Narrows to Downtown (AND) Construction

Impact	Impacts Areas	Regional	State	National
Total Spending		$456,620,000	$456,620,000	$456,620,000
Direct Impact				
	Output	$424,139,000	$453,132,000	$454,793,000
	Job	3,759	4,442	4,487
	Labor Income	$206,085,000	$229,004,000	$230,317,000
	GRP	$240,457,000	$262,918,000	$264,204,000
Total Impact				
	Output	$895,690,000	$1,001,733,000	$1,311,892,000
	Job	6,491	7,616	9,455
	Labor Income	$373,823,000	$417,233,000	$506,438,000
	GRP	$522,357,000	$583,434,000	$734,089,000

Table 8-16 reports the total effects over the lifespan of construction, while Table 8-17 reports the effects on an average annual basis during construction.

Table 8-16 Overall Economic Impact at Regional Level – Alternative 16A: ARBOR Narrows to Downtown (AND) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$81,674,000	1,829	$64,564,000	$63,271,000
36	Construction of other new nonresidential structures	$342,465,000	1,931	$141,521,000	$177,186,000
	Total Direct Effects	$424,139,000	3,759	$206,085,000	$240,457,000
	Secondary Effects	$471,551,000	2,732	$167,738,000	$281,899,000
	Total Effects	$895,690,000	6,491	$373,823,000	$522,357,000

Table 8-17 Average Annual Economic Impact at Regional Level – Alternative 16A: ARBOR Narrows to Downtown (AND) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$27,225,000	610	$21,521,000	$21,090,000
36	Construction of other new nonresidential structures	$114,155,000	640	$47,174,000	$59,062,000
	Total Direct Effects	$141,380,000	1,250	$68,695,000	$80,152,000
	Secondary Effects	$157,184,000	910	$55,913,000	$93,966,000
	Total Effects	$298,563,000	2,160	$124,608,000	$174,119,000

8.5.4 Alternative 20A: ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER)

8.5.4.1 Ecosystem Restoration Project RED Construction Impacts – RECONS

The RIVER's construction consists of ecosystem restoration and recreation facilities. Ecosystem restoration construction is estimated at $633,147,000. Construction is assumed to take nearly 34 months to complete.

(a) Ecosystem Restoration Construction – RED Impacts

Ecosystem restoration construction is estimated to support overall regional employment of 9,001 during its development. Direct regional employment is estimated at 5,213. The cost per total job ratio is approximately $48,300-to-1 or $121,500-to-1 at the direct regional job level. A more accurate picture of employment is average annual employment, as a given job may last over several years and is counted each year. Average annual total regional employment for ecosystem restoration is 3,000. Total regional labor income during the construction period is estimated at $518,341,000 or $172,780,000 per year. The results of the RECONS model for ecosystem restoration are displayed in the following tables.

Table 8-18 Input Assumptions (Spending and LPCs) – Alternative 20A: ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER) Construction

Category	Spending (%)	Spending Amount	Local LPC (%)	State LPC (%)	National LPC (%)
Planting and Forestry Activities	25%	$158,287,000	72%	97%	98%
Heavy Construction Activities	75%	$474,860,000	100%	100%	100%
Total [13]	100%	$633,147,000	93%	99%	99%

USACE is planning on expending $633,147,000 on the project. Of this total project expenditure $588,108,716 will be captured within the regional impact area. The rest will be leaked out to the state or the nation. The expenditures made by USACE for various services and products are expected to generate additional economic activity in that can be measured in jobs, income, sales and gross regional product as summarized in the following table and includes impacts to the region, the State impact area, and the Nation. Table 8-19 is the overall economic impacts for this analysis.

[13] Figures represent a weighted average, by industry.

Table 8-19 Overall Summary Economic Impacts – Alternative 20A: ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER) Construction

Impact	Impacts Areas	Regional	State	National
Total Spending		$633,147,000	$633,147,000	$633,147,000
Direct Impact				
	Output	$588,109,000	$628,311,000	$630,613,000
	Job	5,213	6,159	6,222
	Labor Income	$285,756,000	$317,536,000	$319,356,000
	GRP	$333,417,000	$364,561,000	$366,344,000
Total Impact				
	Output	$1,241,959,000	$1,388,997,000	$1,819,063,000
	Job	9,001	10,560	13,110
	Labor Income	$518,341,000	$578,534,000	$702,224,000
	GRP	$724,297,000	$808,987,000	$1,017,884,000

Table 8-20 reports the total effects over the lifespan of construction, while Table 8-21 shows the total effects on an average annual basis during construction.

Table 8-20 Overall Economic Impact at Regional Level – Alternative 20A: ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$113,248,000	2,535	$89,524,000	$87,731,000
36	Construction of other new nonresidential structures	$474,860,000	2,677	$196,232,000	$245,685,000
	Total Direct Effects	$588,109,000	5,213	$285,756,000	$333,417,000
	Secondary Effects	$653,850,000	3,788	$232,585,000	$390,880,000
	Total Effects	$1,241,959,000	9,001	$518,341,000	$724,297,000

Table 8-21 Average Annual Economic Impact at Regional Level – Alternative 20A: ARBOR Riparian Integration via Varied Ecological Reintroduction (RIVER) Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
19	Support activities for agriculture and forestry	$37,749,000	850	$29,841,000	$29,244,000
36	Construction of other new nonresidential structures	$158,287,000	890	$65,411,000	$81,895,000
	Total Direct Effects	$196,036,000	1,740	$95,252,000	$111,139,000
	Secondary Effects	$217,950,000	1,260	$77,528,000	$130,293,000
	Total Effects	$413,986,000	3,000	$172,780,000	$241,432,000

8.6 Alternatives Summary – RED Benefits of Ecosystem Restoration Construction

Each of the proposed alternatives will produce significant impacts to employment, income and gross regional product (GRP) during their construction periods. Employment gains are estimated to range from 913 to over 9,000 depending upon alternative over their construction lifespans. Incomes derived from construction and its related employment effects would add between $52 million to over $518 million to the regional economy. The regional economy as a whole is anticipated to show growth from $73 million to over $720 million in gross regional product depending upon the alternative. Note that the effects shown are proportional to the size and/or expenditure of the respective alternatives because they share the same RECONS model type and default settings.

Table 8-22 Total Regional Effects of Alternative Construction

	Alt 10: ART	Alt 13: ACE	Alt 16A: AND	Alt 20A: RIVER
Sales	$125,936,000	$273,986,000	$895,690,000	$1,241,959,000
Jobs	913	1,986	6,491	9,001
Labor Income	$52,560,000	$114,350,000	$373,823,000	$518,341,000
GRP	$73,445,000	$159,785,000	$522,357,000	$724,297,000

8.7 Recreation Development

A recreation project has been proposed for the alternatives (see Section 5). The plan complements ecosystem restoration features covering the same geographic extent in all four final alternatives, and as such, the RED impacts of recreation construction do not differ by alternative. The plan is estimated to cost $6,134,000 and will take less than one year to construct. To analyze the regional economic impacts of the plan the Corps' RECONS model was employed. Under RECONS' New Construction in Recreation Areas sector the model estimates 100% of the construction cost will be captured in the local impact area. The overall impacts of recreation construction are as follows.

Table 8-23 Overall Summary Impacts – Recreation Construction

Impact	Impacts Areas	Regional	State	National
Total Spending		$6,134,000	$6,134,000	$6,134,000
Direct Impact				
	Output	$6,134,000	$6,134,000	$6,134,000
	Job	35	35	35
	Labor Income	$2,535,000	$2,535,000	$2,535,000
	GRP	$3,174,000	$3,174,000	$3,174,000
Total Impact				
	Output	$12,958,000	$13,610,000	$17,796,000
	Job	74	78	102
	Labor Income	$4,998,000	$5,139,000	$6,350,000
	GRP	$7,264,000	$7,546,000	$9,592,000

With construction being less than one year, overall regional impacts and annual average regional impacts are the same. The model's estimate of overall regional impacts is as follows.

Table 8-24 Regional/Average Annual Impacts of Recreation Construction

IMPLAN No.	Industry Sector	Sales	Jobs	Labor Income	GRP
	Direct Effects				
36	Construction of other new nonresidential structures	$6,134,000	35	$2,535,000	$3,174,000
	Total Direct Effects	$6,134,000	35	$2,535,000	$3,174,000
	Secondary Effects	$6,824,000	39	$2,463,000	$4,091,000
	Total Effects	$12,958,000	74	$4,998,000	$7,265,000

8.8 RED Benefits From Induced Development

In the preceding sections the analysis focused on what is commonly referred to as backward linkages in I/O modeling terms. A backward linkage is between an industry and its suppliers, or a household and the producers of household goods and services. So for the ecosystem restoration alternatives of the previous sections the analysis focused on their construction demands on their supplying industries and labor market demands. I/O models are well suited to examine these backward linked industry multipliers. However, I/O models are not well-suited to examine what is referred to as forward linkages. A forward linkage is between an industry producing a good or service and the consumers of that good or service. The consumers may be another industry who will add further value to the purchased good in the production of their product. Potential forward linkages to the proposed ecosystem restoration plans are the redevelopment possibilities and economic activity (employment and housing) spurred by the ecosystem restoration in surrounding areas. An important underlying assumption in the analysis is that any existing businesses that are displaced by the redevelopment do so as a result of a free exchange in an open market; that is, conversion of the property would be voluntary due to beneficial economic terms to the existing owner. Thus, the forward linkage in the analysis is for jobs created to supply the projected redevelopment's employment requirements for the workspace created as well as the workforce induced by residential development. This represents new demand that would be generated rather than transferred from another location in the MSA.

To assess how the ecosystem restoration plan could spur economic redevelopment, a qualitative approach utilizing interviews with developers, business groups, and City officials was undertaken. A consistent theme among those interviewed is that the project could alter the development and redevelopment path for the project area. While there is some concern that the project could entice development away from other parts of the city, all agree that the overall net gains would be positive.

The qualitative assessment that the project would be a key environmental and recreational amenity that would positively impact development and property values is also supported and informed by numerous examples and studies of property values and development projects nationwide. One such example is the Rio Salado Ecosystem Restoration Project, the first authorized ecosystem restoration project studied and subsequently constructed by USACE, the City of Phoenix, and the City of Tempe. The project has experienced $500 million dollars in seven square miles of new development since implementation of the restoration project. Another example is the Trinity River Vision Authority's master plan being implemented in Fort

Worth to preserve and enhance the river corridor in a multi-purpose context with greenways for open space, wildlife habitat, trails, neighborhood focal points, and special recreation areas. The Authority reports that developers actively embrace the setting by planning river-centric communities within areas dedicated to flood risk management, ecosystem restoration, and urban revitalization. A significant project partner in the Trinity River Vision is USACE. Further, in a study carried out by Indiana University's Eppley Institute as reported by the Trust for Public Land, 66 percent of property owners living near a former railroad line that was converted into a park for bicycling, skating, and walking felt that it increased the resale value of their property, while only 5 percent felt the opposite….and 64 percent felt the trail made their property easier to sell while 10 percent felt the opposite.

The primary challenge for the project is to maintain a consistent vision for development standards while taking into account changes in the real estate market and the political environment. Cooperation among developers, public officials, business, and community groups will be required which has already been demonstrated considering the representatives currently involved in the project. Officials with the City believe the project itself, along with the associated infrastructure, should provide sufficient incentive to attract the expected commercial, residential, and mixed-use development. Further, redevelopment is assumed to occur in a free market setting. Current owners will freely exchange property rights with developers if the economics of the offers make business sense. Existing vacancy rates in retail, office and industrial locations suggest current businesses, if they desired, could relocate to new locations making business redevelopment and its employment a total RED gain to the economy.

8.8.1 Redevelopment Projections

Redevelopment projections for this study were developed through discussions with the City of Los Angeles staff and the Los Angeles Economic Development Corporation with consideration to the Los Angeles River Revitalization Master Plan (City of Los Angeles 2007a). The Revitalization Master Plan provides both a long-term vision and implementation guidance for revitalizing the River, and as such is referenced in the Water Resources Development Act of 2007 as a source of information with which to help accomplish the current study.[14] Although the Revitalization Master Plan is more extensive than the current study's alternatives, each of the alternatives is consistent with the river changes evaluated in the Revitalization Master Plan. This consistency allows the detailed work of the Master Plan—developed through redevelopment experts, City personnel, and the public—to be a basis of extrapolation for the alternatives.

8.8.1.1 Revitalization Master Plan: Context

The Los Angeles River Revitalization Master Plan identified 20 Opportunity Areas having revitalization potential, as seen in Figure 8.2. Five areas (highlighted in red in the figure) were identified for their considerable potential in demonstrating revitalization and redevelopment. The

[14] Section 4018 of the Water Resources Development Act of 2007, PL 110-114 includes the following language: "prepare a feasibility study…that is consistent with the goals of the Los Angeles River Revitalization Master Plan published by the [C]ity of Los Angeles," and "[i]n preparing the study… use, to the maximum extent practicable…information obtained from the Los Angeles River Revitalization Master Plan."

Canoga Park and Downtown Industrial areas are outside the current study area and are not addressed in this report.

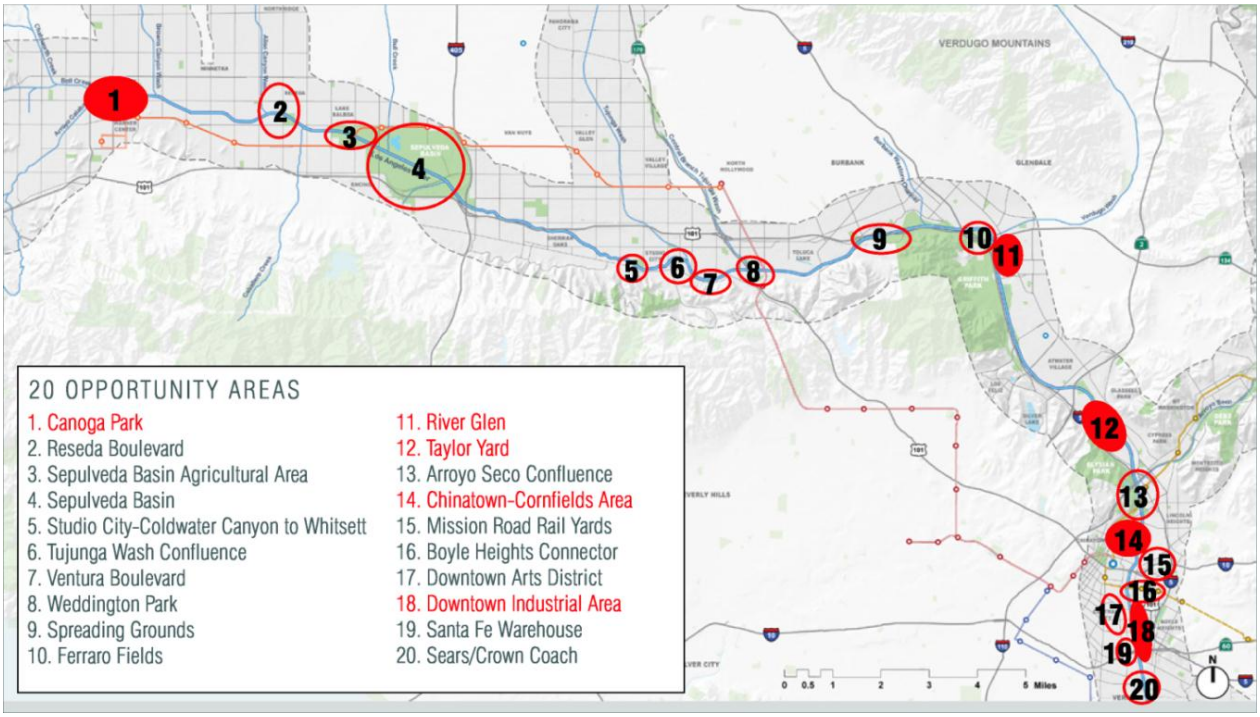


Figure 8.2 Los Angeles River Opportunity Areas

Two areas of the Master Plan, River Glen (area at the confluence with Verdugo Wash) and Chinatown-Cornfields, are of redevelopment interest to this study. Each of these areas consists of older commercial and light industrial buildings, with some public housing within the Chinatown-Cornfields area. The older building stock along with the sites' locations—especially the Chinatown-Cornfields' proximity to downtown and adjacent transportation facilities—are identified by the City as prime redevelopment opportunities for the City's long-term development. Within the Chinatown-Cornfields Opportunity Area, the Revitalization Master Plan projects redevelopment of nearly 5,000 residential units with 1 million square feet of retail & manufacturing and 1.6 million square feet of office space. The projection for the River Glen Opportunity Area is for 600,000 square feet of office/industrial space.

The City's desire and commitment to this redevelopment program is reflected by the creation of the Cornfield Arroyo Seco Specific Plan (CASP)[15] currently under consideration. The CASP was a direct outgrowth of the Revitalization Master Plan and focuses on river and community changes in its place-making recommendations. The Specific Plan calls for rezoning of industrial property for mixed-uses, and the establishment of additional design guidelines to ensure that economic and community development strategies are mutually complementary. The CASP

[15] Cornfield Arroyo Seco Specific Plan, Draft, 2012. City of Los Angeles, Planning Department, August 6, 2012.

boundary includes the Los Angeles River from the confluence with the Arroyo Seco downstream to the Cornfields.

Further, the projected increases in residential development are well-below the expected demand: The maximum residential redevelopment projection within the ARBOR study area represents approximately 900 housing units. The California Department of Finance estimates the population of Los Angeles County to increase by 1.8 million from 2010 to 2060. With a per-household occupancy rate of nearly 3, this population growth would require over 600,000 housing units. The potential for displacement of other development, given the small number of redevelopment in comparison to the overall county requirement, is minimal. Similarly, redevelopment's non-residential estimate is also minimal to the future demand of the county. In comparison to the projected demands of the Revitalization Master Plan the estimated demands are between 20 to 30 percent at the maximum level. Note that these percentages were developed by the study team as reasonable factors, based upon available information, for developing a general estimate of potential redevelopment RED benefits associated with project alternatives.

8.8.1.2 Revitalization Master Plan: Methodology

The economic analysis used in the Revitalization Master Plan was based on projected urban development within each of the Opportunity Areas that would occur as a consequence of river revitalization. This included estimates of new housing units, businesses, and manufacturing areas as an outgrowth of changes in the River. The methodology used included:

Under the without-project condition, the redevelopment areas are expected to exist without much improvement, as they have for decades. Past improvements have mostly been limited to replacement of physically obsolete or damaged structures. Therefore, in the without-project condition, it is expected that over the next several decades a limited number of random structures would be redeveloped in the absence of the project, but that this redevelopment would not significantly alter the evaluation below. It is the proposed project in conjunction with the City's Revitalization Master Plan that provides the backbone for any significant redevelopment efforts in these areas.

The analysis was conducted by several urban development professionals on the Revitalization Master Plan team which included City staff from the Bureau of Engineering and the Planning Department, with input from the Los Angeles Economic Development Corporation. The analysis considered the types of uses, densities, and mix of building types that the market would support. Improvements that were considered as stimuli to economic development included the proposed restoration of the River, associated parks and connections, green streets, and transit improvements. Urban design considerations suggested that neighborhoods would have more mixed uses, be better connected, and be more active and walkable than current conditions. It is important to note that the projected development within the Opportunity Areas is hypothetical and intended to demonstrate only that if economic development is pursued, then new jobs, housing production, new businesses, and tax revenues might result. Any actual agenda for economic development in these Areas is expected to come from a combination of community planning and private initiatives in response to River restoration.

Taking the Chinatown-Cornfields Opportunity Area as an example: The development program was based on a new recreational riverfront anchored by the changes in the River as both an inducement and component to redevelopment. The riverfront village concept was that Main Street would once again become an important mixed-use walking street, with arterials in the area becoming entertainment and shopping destinations with a substantial mix of office and residential uses in dense buildings and towers at key locations, especially along the new riverfront and the habitat and park facilities in the Los Angeles State Historic Park. A destination riverfront with retail and restaurants, cafes, hotels, and opportunities for the arts could emerge. This new destination would likely cause substantial redevelopment connecting the area continuously from the River to Chinatown.

Projections of potential new or redeveloped areas include specific land use quantities for residential units, retail areas, office space, and manufacturing. From this number, the team worked with the Los Angeles Economic Development Corporation and used its own experience on similar projects to develop formulas for estimating the number of jobs, wage-levels, and tax revenues that could result from the specific densities and uses prescribed for each alternative in the Revitalization Master Plan. Table 8-25 displays the results from the Revitalization Master Plan for the two Opportunity Areas, with each Opportunity Area having a higher and lower level estimate of potential development.

Table 8-25 Potential Development Program as Evaluated in the Revitalization Master Plan

Opportunity Area	Residential (units)	Retail (ft^2)	Office (ft^2)	Manufacturing (ft^2)
Chinatown/Cornfields “higher range”	4,665	871,402	1,477,144	241,648
Chinatown/Cornfields “lower range”	3,041	589,584	1,616,073	147,270
River Glen “higher range”	1,085	--	150,742	450,830
River Glen “lower range”	--	--	--	349,207

In examining restoration as an attribute for the current study, the alternatives were examined with respect to the Revitalization Master Plan to compare their potential development to that programmed within the Revitalization Master Plan. None of the restoration alternatives within the current feasibility study are as extensive nor have as widespread channel changes as the River Glen or Chinatown areas depicted in the Revitalization Master Plan. Therefore, discussions with members of the Project Delivery Team took place to reflect a more conservative approach compared to the economic analysis programmed in the Revitalization Master Plan. Factors considered were as follows:

- The channel restoration herein is less extensive than the Revitalization Master Plan, which envisioned a wider channel less constrained by rights-of-way. More rights-of-way allowed additional features such as gateways, promenades, paseos, and other revitalization components to be programmed in the Master Plan. However, these features would not provide incremental habitat benefits and are therefore not part of a Federal project. Even though the City is anticipating these features in the future following the restoration of the River, a more conservative approach is taken when programming future redevelopment in the current RED analysis.

- The River Glen area would likely remain with industrial land uses mixed with commercial land uses, such as found within an industrial park. The effect of a restored river would therefore have a smaller impact on RED benefits compared to the Chinatown-Cornfields area, the latter of which is anticipated to have a larger shopping/entertainment presence. Still, the value of open space is already demonstrated in the River Glen area by some of the businesses that have created "aesthetic space" for their employees. Since the area is expected to continue to evolve into higher density/higher tech uses consolidated closer to San Fernando Road, the amenities of adjacent habitat, open space, and trails are expected to attract higher-skilled employees seeking higher wages, thereby providing higher value associated with the alternatives.

- Ecosystem restoration within the Los Angeles River is only one component of neighborhood revitalization albeit a critical anchor feature around which redevelopment is expected to occur. As shown by other river restoration projects referenced herein, restoration would make a meaningful difference to the region and help leverage overall revitalization within the ARBOR. However, to reflect a conservative approach and the uncertainty of a cause-effect relationship, the development programmed within the Revitalization Master Plan was scaled downward for the RED analysis.

The resulting estimate as described below is that restoration in the River Glen area is projected to influence 10 to 15 percent of the development projected within the Revitalization Master Plan, and 20 to 30 percent of the development projected in the Revitalization Master Plan for the Chinatown-Cornfields area.

8.8.2 River Glen Opportunity Area – Redevelopment Construction

River Glen (Figure 8.3) is characterized by industrial, biomedical, and film/studio-related land uses. Once an area occupied by low-rent businesses, it now is poised to become the premier eco-industrial park in the City.

The River Glen area is approximately 150 acres. It includes three distinct sub-areas that can be defined, based on the quality of building stock and stability of current land use. The most stable of the areas is between Colorado Street and one half-block south of Brazil Street, and is occupied by large employers, such as Baxter, Huntsman Advanced Materials Americas Inc., Quixote Studios, and Kaiser Permanente, which are viewed as long-term and stable job creators for the area.

The second area, between Brazil Street and one-half block south of Doran Street, contains land uses comprising light-industrial and warehouse-type facilities including a vacated Levitz Furniture building, a used car dealership, and the Priority Pak Shipping Facility. Within this area, the dominant pattern is consolidation of multiple parcels into single ownership, resulting in large-format warehouse buildings that wall off the River on its eastern edge.
The third and most susceptible area of potential change is the area's northern boundary, which includes an assortment of metal and paper recycling facilities, and a California Department of Transportation maintenance facility located directly below Interstate 134.

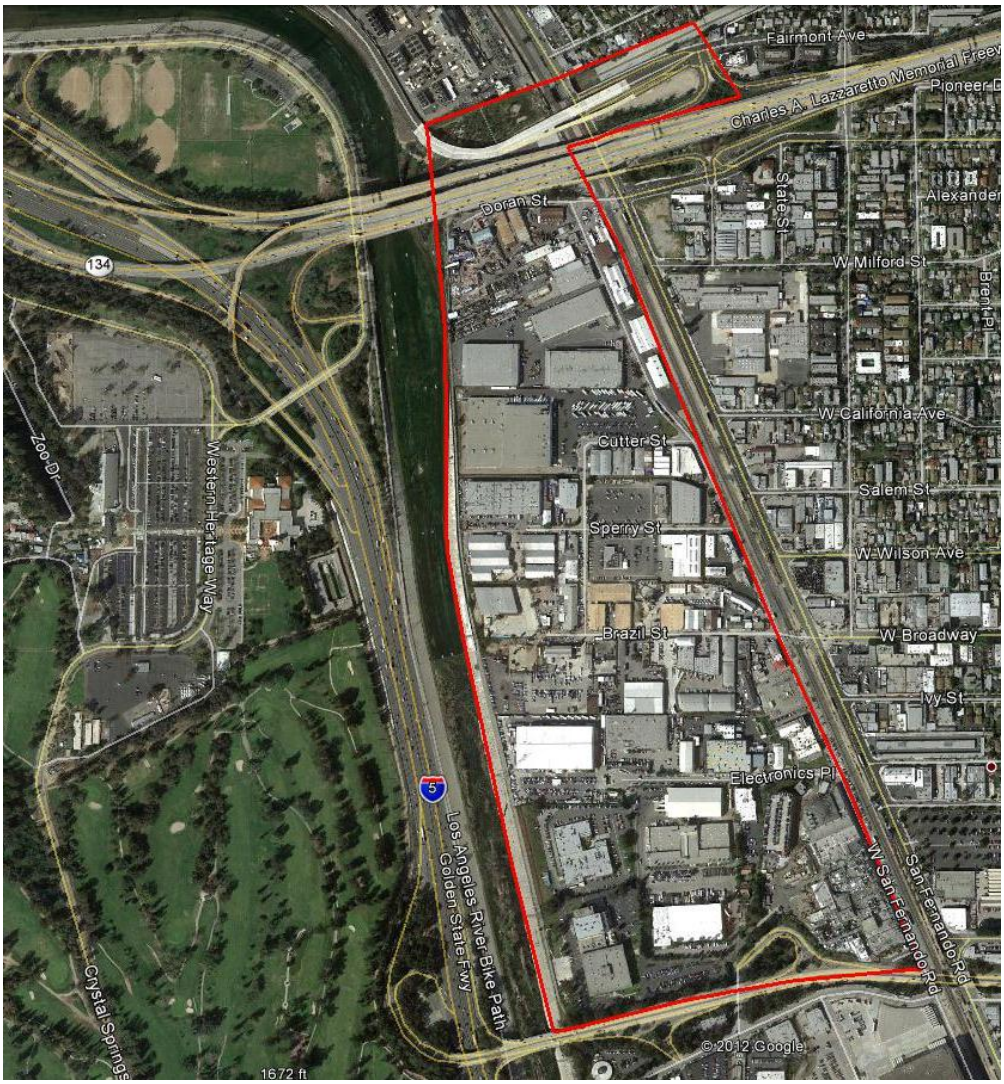


Figure 8.3 River Glen Opportunity Area

Seventy percent of the River Glen area is considered as having redevelopment potential. This area is currently zoned for industrial uses, which could either be modified or maintained with higher density/smaller footprint uses, as mentioned above. Either way, the City recognizes that the area is isolated by aging infrastructure and access, and has underutilized potential for green space and habitat. This provides the impetus for riverly redevelopment at the confluence anchored by a proposed project.

Under Alternative 10 (ART) minor restoration activities take place in the area and as such no change is anticipated to the area's existing development process. The restoration plans of Alternatives 13 (ACE) and 16 (AND) are the same for the River Glen area, with both proposing modest restoration changes to the channel bank. The plan for Alternative 20 (RIVER) proposes the acquisition of recycling yards at the north end of the area to allow for dramatic expansion and greening of the confluence of Verdugo Wash with the River along with the channel bank improvements. This alternative would promote redevelopment of industrial uses within River Glen to a much larger extent.

It is estimated that up to 300,000 square feet of light manufacturing redevelopment in response to restoration may occur during the period of analysis, depending upon alternative–about 5 percent of the total 6.5 million square feet available. In comparison to the LA River Revitalization Plan, the maximum redevelopment is less than 15 percent of the Plan's. This potential redevelopment has a value of $24 million based on a Marshall & Swift construction value of $80 per square foot. The potential for redevelopment by alternative is estimated in Table 8-26.

Table 8-26 River Glen Redevelopment Construction

Alternative	Manufacturing Square Feet	Value
Alt 10: ART	0	$0
Alt 13: ACE	50,000	$4,000,000
Alt 16A: AND	50,000	$4,000,000
Alt 20A: RIVER	300,000	$24,000,000

RED impacts for River Glen redevelopment by alternative as estimated by IMPLAN for the Los Angeles-Orange Counties area are presented below. Total cumulative employment impacts, direct, indirect and induced, over the 50-year redevelopment period are estimated in Table 8-27.

For these alternatives, the investment to total job ratio is approximately $73,000-to-1 and $120,000-to-1 at a direct job ratio. Assuming equal development for each year, annual employment impacts are shown in Table 8-28.

Overall industry and summary cumulative impacts for River Glen redevelopment are shown in Table 8-29. Impacts on an annual basis, assuming a constant annual expenditure during the redevelopment period, are shown in Table 8-30.

Table 8-27 River Glen Redevelopment Construction Employment Impacts by Alternative

Alternative 13: ACE				
Industry	**Direct**	**Indirect**	**Induced**	**Total**
Total	33.2	5.5	15.7	54.5
Agriculture	0.0	0.0	0.0	0.0
Mining	0.0	0.0	0.0	0.0
Construction	33.2	0.1	0.1	33.4
Manufacturing	0.0	0.8	0.3	1.1
TIPU	0.0	0.2	0.5	0.7
Trade	0.0	0.5	3.3	3.8
Service	0.0	3.9	11.4	15.3
Government	0.0	0.0	0.1	0.2

Alternative 16A: AND				
Industry	**Direct**	**Indirect**	**Induced**	**Total**
Total	33.2	5.5	15.7	54.5
Agriculture	0.0	0.0	0.0	0.0
Mining	0.0	0.0	0.0	0.0
Construction	33.2	0.1	0.1	33.4
Manufacturing	0.0	0.8	0.3	1.1
TIPU	0.0	0.2	0.5	0.7
Trade	0.0	0.5	3.3	3.8
Service	0.0	3.9	11.4	15.3
Government	0.0	0.0	0.1	0.2

Alternative 20A: RIVER				
Industry	**Direct**	**Indirect**	**Induced**	**Total**
Total	199.4	33.1	94.2	326.7
Agriculture	0.0	0.0	0.1	0.1
Mining	0.0	0.1	0.1	0.2
Construction	199.4	0.4	0.8	200.6
Manufacturing	0.0	4.6	1.7	6.3
TIPU	0.0	1.4	2.8	4.2
Trade	0.0	2.7	19.9	22.6
Service	0.0	23.5	68.2	91.7
Government	0.0	0.2	0.9	1.1

Table 8-28 River Glen Redevelopment Construction Average Annual Employment Impacts

Alternative	**Direct**	**Indirect**	**Induced**	**Total**
Alt 13: ACE	0.7	0.1	0.3	1.1
Alt 16A: AND	0.7	0.1	0.3	1.1
Alt20A: RIVER	4.0	0.7	1.9	6.5

Table 8-29 River Glen Redevelopment Construction Overall Impacts by Alternative

Alternative 13: ACE				
Impact Type	**Employment**	**Labor Income**	**Value Added[16]**	**Output[17]**
Direct Effect	33.2	$2,464,000	$2,610,000	$4,000,000
Indirect Effect	5.5	$396,000	$597,000	$1,056,000
Induced Effect	15.7	$824,000	$1,452,000	$2,317,000
Total Effect	54.5	$3,684,000	$4,659,000	$7,373,000
Alternative 16A: AND				
Direct Effect	33.2	$2,464,000	$2,610,000	$4,000,000
Indirect Effect	5.5	$396,000	$597,000	$1,056,000
Induced Effect	15.7	$824,000	$1,452,000	$2,317,000
Total Effect	54.5	$3,684,000	$4,659,000	$7,373,000
Alternative 20A: RIVER				
Direct Effect	199.4	$14,785,000	$15,662,000	$24,000,000
Indirect Effect	33.1	$2,375,000	$3,580,000	$6,336,000
Induced Effect	94.2	$4,943,000	$8,709,000	$13,903,000
Total Effect	326.7	$22,103,000	$27,952,000	$44,240,000

RED impacts on an annual basis assuming a constant annual expenditure during the redevelopment period are:

Table 8-30 River Glen Redevelopment Construction Average Annual Impacts Summary by Alternative

Alternative 13: ACE				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	0.7	$49,283	$52,208	$80,000
Indirect Effect	0.1	$7,916	$11,934	$21,122
Induced Effect	0.3	$16,477	$29,031	$46,344
Total Effect	1.1	$73,677	$93,173	$147,466
Alternative 16A: AND				
Direct Effect	0.7	$49,283	$52,208	$80,000
Indirect Effect	0.1	$7,916	$11,934	$21,122
Induced Effect	0.3	$16,477	$29,031	$46,344
Total Effect	1.1	$73,677	$93,173	$147,466
Alternative 20A: RIVER				
Direct Effect	4.0	$295,700	$313,246	$480,000
Indirect Effect	0.7	$47,498	$71,604	$126,730
Induced Effect	1.9	$98,862	$174,187	$278,067
Total Effect	6.5	$442,060	$559,038	$884,797

[16] IMPLAN's Value Added is equivalent to RECON's Gross Regional Product (GRP)

[17] IMPLAN's Output is equivalent to RECON's Sales

8.8.2.1 River Glen Redevelopment State and Local Tax Impacts

The previous section discussed the employment, income, and sales gains projected with redevelopment. In addition to these gains, redevelopment construction will generate new state and local taxes since taxes would be paid on these income and sale gains. Over the entire redevelopment period, these taxes are shown in Table 8-31 and Table 8-32 for the three alternatives, according to the IMPLAN model.

Table 8-31 River Glen Redevelopment Construction State & Local Taxes Impacts Alternatives 13-ACE and 16A-AND

Description	Employee Compensation	Proprietor Income	Indirect Business Tax	Households	Corporations
Dividends					
Social Ins Tax- Employee Contribution	$4,000				
Social Ins Tax- Employer Contribution	$6,000				
Indirect Bus Tax: Sales Tax			$74,000		
Indirect Bus Tax: Property Tax			$79,000		
Indirect Bus Tax: Motor Vehicle Lic			$2,000		
Indirect Bus Tax: Severance Tax					
Indirect Bus Tax: Other Taxes			$13,000		
Indirect Bus Tax: S/L NonTaxes			$6,000		
Corporate Profits Tax					$12,000
Personal Tax: Income Tax				$101,000	
Personal Tax: NonTaxes (Fines-Fees				$24,000	
Personal Tax: Motor Vehicle License				$4,000	
Personal Tax: Property Taxes				$2,000	
Personal Tax: Other Tax (Fish/Hunt)				$1,000	
Total State and Local Tax	$10,000		$174,000	$132,000	$12,000

Table 8-32 River Glen Redevelopment Construction State & Local Taxes Impacts Alternative 20A-RIVER

Description	Employee Compensation	Proprietor Income	Indirect Business Tax	Households	Corporations
Dividends					$3,000
Social Ins Tax- Employee Contribution	$22,000				
Social Ins Tax- Employer Contribution	$39,000				
Indirect Bus Tax: Sales Tax			$446,000		
Indirect Bus Tax: Property Tax			$471,000		
Indirect Bus Tax: Motor Vehicle Lic			$10,000		
Indirect Bus Tax: Severance Tax					
Indirect Bus Tax: Other Taxes			$80,000		
Indirect Bus Tax: S/L NonTaxes			$39,000		
Corporate Profits Tax					$72,000
Personal Tax: Income Tax				$604,000	
Personal Tax: NonTaxes (Fines-Fees				$147,000	
Personal Tax: Motor Vehicle License				$27,000	
Personal Tax: Property Taxes				$11,000	
Personal Tax: Other Tax (Fish/Hunt)				$6,000	
Total State and Local Tax	$61,000		$1,046,000	$794,000	$75,000

8.8.3 River Glen Opportunity Area – Long-Term Redevelopment Impacts

The preceding section examined the construction activities of potential redevelopment, but construction is only the initial impact of redevelopment. It follows that the building of retail, office, or industrial facilities is in anticipation of employment within these facilities. Employment in these facilities will produce long-term impacts in the area through the wages employees receive. The following sections will analyze the potential long-term impacts on jobs, wages, and taxes that redevelopment may create.

8.8.3.1 Long-Term Employment, Wages, and Taxes – River Glen Opportunity Area

Each of the alternatives is anticipated to create manufacturing floor space. In a study for the Southern California Association of Governments it is estimated that the average square feet per employee in this sector ranges from 829 to 1,796.[18] For this employment analysis it is assumed that light manufacturing requires 1,000 sq. ft. per employee and that a 5 percent vacancy rate exists in manufacturing.[19] Like the ground space development, employment growth follows a similar straight-line approach over the 50-year analysis period. The Bureau of Labor Statistics

[18] The Natelson Company, Inc. 2001. Employment Density Study – Summary Report. Prepared for the Southern California Association of Governments.

[19] Colliers International. 2012. Central Los Angeles Market Report: Industrial. 2nd Quarter.

(BLS) reports the average weekly wage rate for manufacturing in Los Angeles County at $1,067 or $55,484 per year.[20] Employment and wage results are shown in the following table.

Table 8-33 River Glen Long-Term Employment & Wages

Alternative	Total Employment	Average Annual Employment	Total of all Wages	Average Annual Wages	NPV of all Wages
Alternative 13: ACE	47.5	24.2	$67,205,000	$1,344,000	$21,562,000
Alternative 16: AND	47.5	24.2	$67,205,000	$1,344,000	$21,562,000
Alternative 20: RIVER	285.0	145.4	$403,230,000	$8,065,000	$129,375,000

The sales tax rate for Los Angeles County and the City of Los Angeles is 9 percent. Of this tax rate, 6.5 percent goes to the State and the remaining 2.5 percent is returned to the county and city. Sales taxes generated from employment, assuming 24 percent of wages are taxable expenditures, are:[21]

Table 8-34 River Glen Long-Term Sales Tax Revenues

	Cumulative			
Alternative	Sales Tax: State	Sales Tax: Local	Average Annual: Local	NPV: Local
Alternative 13: ACE	$1,048,000	$403,000	$8,000	$129,000
Alternative 16A: AND	$1,048,000	$403,000	$8,000	$129,000
Alternative 20A: RIVER	$6,290,000	$2,419,000	$48,000	$776,000

8.8.4 Taylor Yard Opportunity Area

The Taylor Yard opportunity area (Figure 8.4) is within the Elysian Valley and bordered on the northeast by San Fernando Road and southwest by the River and extends from near Arroyo Seco to Fletcher Drive. The area includes the Rio del Los Angeles State Park but along the east side of the river there are many industrial parcels and both freight and Metrolink Railroad tracks and large industrial parcels. The Elysian Valley residential community on the west side is connected to the River with most east/west streets terminating at the River.

An RED analysis was not conducted for this Opportunity Area. The Los Angeles River Revitalization Master Plan states:

The Taylor Yard Opportunity Area demonstrates a significant opportunity for ecosystem restoration on a large scale. Because stakeholders and many community members expressed that this area is inappropriate for more intensive development, and active open space is being incorporated into the Rio de Los Angeles State Park to the east, this Opportunity Area was selected to illustrate the potential for restoration of the River's hydro-ecological functions, and as a showcase for removing the concrete channel walls.

[20] Bureau of Labor Statistics. 2013. County Employment and Wages – Second Quarter 2012. January 8, 2013. USDL-13-0013.

[21] City of Los Angeles, Department of Public Works. 2007. *Los Angeles River Revitalization Master Plan.* 284 pp.

Figure 8.4 Taylor Yard Opportunity Area

The community's desire to keep this area from development is one of the reasons that an analysis was not conducted to evaluate the value of future development. Another reason is that the area of proposed restoration is approximately 1,000 feet away from the main thoroughfare where redevelopment potential exists, with an existing, newly created natural area, park, and school in between that area and the proposed habitat area. Any redevelopment related to the proposed habitat restoration—in light of the just-stated, existing facilities at Taylor Yard—would have an indeterminate cause/effect because the surrounding land uses are already benefiting from some of the adjacent open space and aesthetic amenities. However, even though the evaluation was not conducted, it should still be recognized that the proposed restoration is expected to provide positive benefits. These include increased real estate values, the improved desirability of the neighborhood, and greater redevelopment potential due to the enhanced environment and proximity to additional green space and recreation.

8.8.5 Chinatown–Cornfields Opportunity Area

The Chinatown-Cornfields Opportunity Area (Figure 8.5) boasts grand views of Downtown and the River from its historic bridges. The area is completely cut off from the River because of existing heavy rail lines. The Department of Water and Power facility and the William Mead housing development combine to make up about 40 percent of the entire Opportunity Area of approximately 210 acres. The remaining 60 percent is composed of a series of light industrial

and manufacturing facilities, commercial food warehousing and distribution facilities, and large-vehicle parking lots. Existing building character generally varies from block to block, with small pockets of historically significant and aesthetically beautiful structures interspersed throughout the area. At the area's western edge is the Los Angeles State Historic Park (LASHP); which will provide a catalyst for transforming development along its edge.

Any of the proposed restoration plans in combination with LASHP, Metro Link's Gold Line and its 1.5 mile proximity to the heart of downtown Los Angeles will bring a catalyst of change to this often overlooked area. Redevelopment within this area will certainly occur with the proposed restoration and recreation features of the plan.

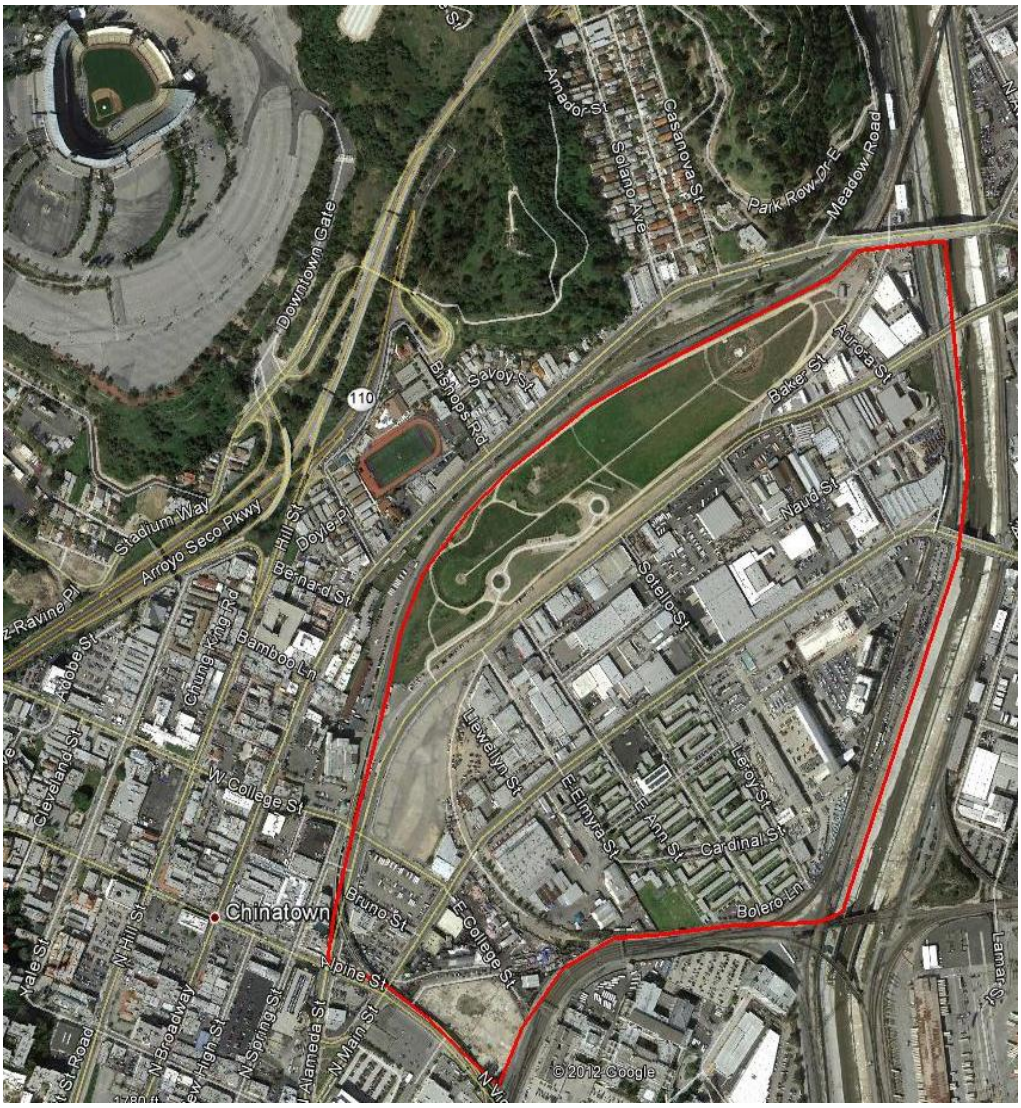


Figure 8.5 Chinatown – Cornfields Opportunity Area

Redevelopment in the Chinatown-Cornfields area will require substantial rezoning of industrial property for mixed-uses, and the establishment of additional design guidelines through the River Improvement Overlay or a Specific Plan to fully garner the benefits of the restoration and recreation plan. The potential range in redevelopment by alternative is shown in Table 8-35. Ecosystem system restoration plans for 10-ART, 13-ACE, and 16-AND are essentially the same – modest restoration along the river's bank. Thus, redevelopment is estimated at the same level for these plans. For the 20-RIVER plan, restoration increases occur not only along the river's edge but also include the development of a marsh area in the northern area of the site. Redevelopment for the RIVER is estimated to be more extensive than the others for these reasons.

Table 8-35 Chinatown-Cornfields Redevelopment Construction Potential

Chinatown-Cornfields Potential Redevelopment Alternative 10: ART	
Redevelopment Use	**Square Feet (in thousands)**
Residential	281,250
Retail	44,250
Office	111,000
Manufacturing	44,100
Chinatown-Cornfields Potential Redevelopment Alternative 13: ACE	
Residential	281,250
Retail	44,250
Office	111,000
Manufacturing	44,100
Chinatown-Cornfields Potential Redevelopment Alternative 16A: AND	
Residential	281,250
Retail	44,250
Office	111,000
Manufacturing	44,100
Chinatown-Cornfields Potential Redevelopment Alternative 20A: RIVER	
Residential	1,125,000
Retail	177,000
Office	444,000
Manufacturing	44,100

Square footage Marshall & Swift construction estimates are $165/retail, $230/residential, $235/office, and $80/manufacturing. Potential redevelopment values by alternative are indicated in Table 8-36.

Table 8-36 Chinatown-Cornfields Redevelopment Construction Values

Chinatown-Cornfields Redevelopment Valuation Alternative 10: ART	
Redevelopment Use	**Value**
Residential	$64,688,000
Retail	$7,301,000
Office	$26,085,000
Manufacturing	$3,528,000
Total	$101,602,000
Chinatown-Cornfields Redevelopment Valuation Alternative 13: ACE	
Residential	$64,688,000
Retail	$7,301,000
Office	$26,085,000
Manufacturing	$3,528,000
Total	$101,602,000
Chinatown-Cornfields Redevelopment Valuation Alternative 16A: AND	
Residential	$64,688,000
Retail	$7,301,000
Office	$26,085,000
Manufacturing	$3,528,000
Total	$101,602,000
Chinatown-Cornfields Redevelopment Valuation Alternative 20A: RIVER	
Residential	$258,750,000
Retail	$29,205,000
Office	$104,340,000
Manufacturing	$3,528,000
Total	$395,823,000

RED impacts for Chinatown-Cornfields redevelopment by alternative as estimated by IMPLAN for the Los Angeles-Orange Counties area are presented in Table 8-37, which shows total cumulative employment impacts, direct, indirect and induced, over the 50-year redevelopment period.

Table 8-37 Chinatown-Cornfields Redevelopment Construction Cumulative Employment Impacts

Alternatives 10, 13, & 16A				
Industry	**Direct**	**Indirect**	**Induced**	**Total**
Total	675.7	205.4	345.0	1,226.1
Agriculture	0.0	0.1	0.2	0.3
Mining	0.0	1.2	0.2	1.5
Construction	675.7	2.1	2.7	680.5
Manufacturing	0.0	23.1	6.1	29.2
TIPU	0.0	12.7	10.1	22.8
Trade	0.0	63.3	72.8	136.1
Service	0.0	101.7	249.5	351.3
Government	0.0	1.2	3.3	4.4

Alternative 20A				
Industry	**Direct**	**Indirect**	**Induced**	**Total**
Total	2,615.0	807.0	1,338.5	4,760.4
Agriculture	0.0	0.5	0.8	1.3
Mining	0.0	4.8	0.9	5.7
Construction	2,615.0	8.0	10.7	2,633.7
Manufacturing	0.0	90.5	23.6	114.0
TIPU	0.0	50.2	39.3	89.5
Trade	0.0	252.0	282.4	534.4
Service	0.0	396.5	968.1	1,364.6
Government	0.0	4.5	12.7	17.2

The investment to total job ratio for ART, ACE, and AND is approximately $83,000-to-1 and $150,000-to-1 on a direct employment basis. The ratios for the RIVER plan are approximately the same. Annual employment impacts are shown in Table 8-38, which assumes equal development during each year.

Table 8-38 Chinatown-Cornfields Redevelopment Construction Average Annual Employment Impacts

Alternative	Direct	Indirect	Induced	Total
Alternatives 10, 13, & 16	13.5	4.1	6.9	24.5
Alternative 20	52.3	16.1	26.8	95.2

The overall industry and summary cumulative impacts for the Chinatown-Cornfields area, as estimated by IMPLAN are presented in Table 8-39.

Table 8-39 Chinatown-Cornfields Redevelopment Construction Cumulative Economic Impacts by Alternative

Overall Impact Summary – Alternatives 10, 13, & 16A				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	675.7	$50,265,000	$60,207,000	$101,602,000
Indirect Effect	205.4	$12,622,000	$19,046,000	$33,136,000
Induced Effect	345.0	$18,094,000	$31,879,000	$50,891,000
Total Effect	1,226.1	$80,981,000	$111,132,000	$185,629,000
Overall Impact Summary – Alternative 20A				
Direct Effect	2,615.0	$194,539,000	$233,920,000	$395,823,000
Indirect Effect	807.0	$49,439,000	$74,607,000	$129,749,000
Induced Effect	1,338.5	$70,197,000	$123,674,000	$197,434,000
Total Effect	4,760.4	$314,175,000	$432,201,000	$723,007,000

The impacts on an average annual basis are shown in Table 8-40.

Table 8-40 Chinatown-Cornfields Redevelopment Construction Average Annual Impacts by Alternative

Average Annual Impact Summary – Alternatives 10, 13, & 16A				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	13.5	$1,005,000	$1,204,000	$2,032,000
Indirect Effect	4.1	$252,000	$381,000	$663,000
Induced Effect	6.9	$362,000	$638,000	$1,018,000
Total Effect	24.5	$1,620,000	$2,223,000	$3,713,000
Average Annual Impact Summary – Alternative 20A				
Direct Effect	52.3	$3,891,000	$4,678,000	$7,916,000
Indirect Effect	16.1	$989,000	$1,492,000	$2,595,000
Induced Effect	26.8	$1,404,000	$2,473,000	$3,949,000
Total Effect	95.2	$6,284,000	$8,644,000	$14,460,000

8.8.5.1 Chinatown-Cornfields Redevelopment State and Local Tax Impacts

Redevelopment construction will generate state and local taxes. Over the entire redevelopment period, these taxes will amount to the following, according to the IMPLAN model, as shown in Table 8-41 and Table 8-42.

Table 8-41 Chinatown-Cornfields Redevelopment Construction Cumulative State & Local Taxes Impacts – Alternatives 10, 13, and 16A

Description	Employee Compensation	Proprietor Income	Indirect Business Tax	Households	Corporations
Dividends					$16,000
Social Ins Tax- Employee Contribution	$75,000				
Social Ins Tax- Employer Contribution	$133,000				
Indirect Bus Tax: Sales Tax			$2,334,000		
Indirect Bus Tax: Property Tax			$2,469,000		
Indirect Bus Tax: Motor Vehicle Lic			$53,000		
Indirect Bus Tax: Severance Tax			$1,000		
Indirect Bus Tax: Other Taxes			$417,000		
Indirect Bus Tax: S/L NonTaxes			$203,000		
Corporate Profits Tax					$368,000
Personal Tax: Income Tax				$2,223,000	
Personal Tax: Non Taxes (Fines- Fees				$540,000	
Personal Tax: Motor Vehicle License				$99,000	
Personal Tax: Property Taxes				$41,000	
Personal Tax: Other Tax (Fish/Hunt)				$22,000	
Total State and Local Tax	$209,000		$5,476,000	$2,925,000	$383,000

Table 8-42 Chinatown-Cornfields Redevelopment Construction Cumulative State & Local Taxes Impacts - Alternative 20A

Description	Employee Compensation	Proprietor Income	Indirect Business Tax	Households	Corporations
Dividends					$61,000
Social Ins Tax- Employee Contribution	$291,000				
Social Ins Tax- Employer Contribution	$516,000				
Indirect Bus Tax: Sales Tax			$9,139,000		
Indirect Bus Tax: Property Tax			$9,666,000		
Indirect Bus Tax: Motor Vehicle Lic			$209,000		
Indirect Bus Tax: Severance Tax			$5,000		
Indirect Bus Tax: Other Taxes			$1,633,000		
Indirect Bus Tax: S/L NonTaxes			$794,000		
Corporate Profits Tax					$1,440,000
Personal Tax: Income Tax				$8,625,000	
Personal Tax: NonTaxes (Fines- Fees				$2,096,000	
Personal Tax: Motor Vehicle License				$384,000	
Personal Tax: Property Taxes				$158,000	
Personal Tax: Other Tax (Fish/Hunt)				$87,000	
Total State and Local Tax	$807,000		$21,445,000	$11,349,000	$1,501,000

8.8.6 Chinatown–Cornfields Opportunity Area – Long-Term Redevelopment Impacts

8.8.6.1 Long-Term Employment, Wages, and Taxes – Chinatown-Cornfields Opportunity Area

Each of the alternatives is anticipated to create a mixture of floor space. Light manufacturing is assumed to require 1,000 sq. ft. per employee with a yearly wage of $55,484, as previous stated. The U.S. Energy Information Agency (EIA) reports an average of 766 square feet per worker for commercial businesses.[22] BLS reports the average weekly wage rate for retail in Los Angeles County at $826 or $42,952 per year.[23] The vacancy rate among retail establishments is assumed

[22] U.S. Energy Information Agency, Department of Energy. 2001. http://www.eia.gov/emeu/consumptionbriefs/cbecs/pbawebsite/retailserv/retserv_howmanyempl.htm

[23] Bureau of Labor Statistics. 2013. County Employment and Wages – Second Quarter 2012. January 8, 2013. USDL-13-0013.

to be 5 percent.[24] EIA reports office workers have an average of 387 square feet of space. The average weekly wage for office workers is $1,222 ($63,544 annually) according to BLS. Vacancy is estimated at 15 percent within the office sector.[25, 26] The overall average weekly wage rate in Los Angeles County is $1,006 or $52,312 annually as reported by BLS. The jobs-to-housing ratio in the City of Los Angeles is 1.33.[27] Jobs-to-housing ratio is used as an indicator of how jobs-rich or jobs-poor a community is. Generally, a ratio of less than 1-to-1 indicates a jobs-poor area, and a ratio of more than 1-to-1 indicates a jobs-rich area. It is assumed that the residential redevelopment in the Chinatown-Cornfields opportunity area will maintain this jobs-to-housing ratio. The Los Angeles Housing Department reports a vacancy rate of approximately 4 percent for multi-family individually metered housing units based on data from the Los Angeles Department of Water and Power.[28]

Employment and wage results are shown in the following four tables.

Table 8-43 Chinatown-Cornfields Cumulative Long-Term Employment by Sector

Alternative	Residential	Retail	Office	Manufacturing	Total
Alternatives 10, 13, & 16	287.3	54.9	243.8	41.9	627.9
Alternative 20	1149.1	219.5	975.2	41.9	2385.7

Table 8-44 Chinatown-Cornfields Average Annual Long-Term Employment by Sector

Alternative	Residential	Retail	Office	Manufacturing	Total
Alternatives 10, 13, & 16	146.5	28.0	124.3	21.4	320.2
Alternative 20	586.1	112.0	497.3	21.4	1216.7

Table 8-45 Chinatown-Cornfields Cumulative Long-Term Wages by Sector

Alternative	Residential	Retail	Office	Manufacturing	Total
Alternatives 10, 13, & 16	$383,219,000	$60,108,000	$395,044,000	$59,275,000	$897,646,000
Alternative 20	$1,532,876,000	$240,432,000	$1,580,177,000	$59,275,000	$3,412,759,000

Table 8-46 Chinatown-Cornfields Average Annual Wages by Sector

Alternative	Residential	Retail	Office	Manufacturing	Total
Alternatives 10, 13, & 16	$7,664,000	$1,202,000	$7,901,000	$1,185,000	$17,953,000
Alternative 20	$30,658,000	$4,809,000	$31,604,000	$1,185,000	$68,255,000

[24] Colliers International. 2012. Central Los Angeles Market Report: Retail. 3rd Quarter

[25] Daum Commercial Real Estate Services. 2012. Office Los Angeles County. www.daumcommercial.com. Q3.

[26] Los Angeles Business Journal. 2012. *Special Report Real Estate Quarterly*. April 16, 2012.

[27] City of Los Angeles, City Planning Department. 2011." Jordan Downs Specific Plan Draft EIR." September 2011.

[28] City of Los Angeles, Los Angeles Housing Department. 2012. "City of Los Angeles Vacancy Rates Estimate. "June 11 2012

The net present values of the wage streams over the 50-year redevelopment period are shown in Table 8-47.

Table 8-47 Chinatown-Cornfields NPV of Long-Term Wages by Sector

Alternative	Residential	Retail	Office	Manufacturing	Total
Alternatives 10, 13, & 16	$122,954,000	$19,285,000	$126,748,000	$19,018,000	$288,006,000
Alternative 20	$491,817,000	$77,142,000	$506,994,000	$19,018,000	$1,094,971,000

The sales tax rate for Los Angeles County and the City of Los Angeles is 9 percent. Of this tax rate, 6.5 percent goes to the State and the remaining 2.5 percent is returned to the county and city. Sales taxes generated from employment, assuming 24 percent of wages are taxable expenditures, are shown in Table 8-48.

Table 8-48 Chinatown-Cornfields Long-Term Sales Tax Revenues

	Cumulative			
Alternative	Sales Tax: State	Sales Tax: Local	Average Annual: Local	NPV: Local
Alternatives 10, 13, & 16	$14,003,000	$5,386,000	$108,000	$1,728,000
Alternative 20	$53,239,000	$20,477,000	$410,000	$6,570,000

8.9 Regional Economic Development and Economic Impacts Summary

Table 8-49 presents the cumulative regional economic impacts from construction through the study's period of analysis for the alternatives. These results were developed by the study team as reasonable factors, based upon available information, for developing a general estimate of potential redevelopment RED benefits associated with project alternatives.

Table 8-49 Cumulative RED & Economic Impacts of Ecosystem Restoration

Ecosystem Construction Cumulative Impacts				
	10 ART	13 ACE	16A AND	20A RIVER
Jobs	913	1,986	6,491	9,001
Labor Income	$52,560,000	$114,350,000	$373,823,000	$518,341,000
Sales	$125,936,000	$273,986,000	$895,690,000	$1,241,959,000
GRP	$73,445,000	$159,785,000	$522,357,000	$724,297,000
Recreation Construction Cumulative Impacts				
Jobs	74	74	74	74
Labor Income	$4,998,000	$4,998,000	$4,998,000	$4,998,000
Value	$12,958,000	$12,958,000	$12,958,000	$12,958,000
Output	$7,265,000	$7,265,000	$7,265,000	$7,265,000
Redevelopment Construction Cumulative Impacts				
Jobs	1,226	1,281	1,281	5,087
Labor Income	$80,981,000	$84,665,000	$84,665,000	$336,278,000
Value	$111,132,000	$115,791,000	$115,791,000	$460,153,000
Output	$185,630,000	$193,002,000	$193,002,000	$767,247,000
Redevelopment Long-term Economic Activity Cumulative Impacts				
Jobs	628	675	675	2,671
Labor Income	$897,646,000	$964,851,000	$964,851,000	$3,815,989,000
Taxes - Local	$5,386,000	$5,789,000	$5,789,000	$22,896,000

The alternatives are estimated to create 2,200 to 14,100 construction related jobs over the period of analysis. Employment is anticipated to generate labor income ranging from $138 million to $860 million. Regional economic activity from construction is expected to increase by $260 million to nearly $1.5 billion with ecosystem restoration, recreation and redevelopment construction.

The long-term economic impacts of redevelopment are estimated to eventually create permanent employment of 620 to 2,700 jobs. This employment will have a greater impact to the region as these employment opportunities exist throughout the period of analysis. Total labor income from these employment opportunities is estimated to range from nearly $900 million to just under $4 billion depending upon alternative.

The cumulative effects of the construction/redevelopment components over the period of analysis will create between 2,800 to 16,800 jobs with incomes from over $1 billion to nearly $5 billion as shown in Table 8-50.

Table 8-50 Employment and Income Cumulative Impacts

	10 ART	13 ACE	16A AND	20A RIVER
Jobs	2,841	4,016	8,521	16,833
Labor Income	$1,036,185,000	$1,168,864,000	$1,428,337,000	$4,675,606,000

A useful interpretation of the economic impacts is average annual impacts, as construction and redevelopment occur over time. In addition to average annual, net present value is also a method to view impacts that occur over time in current dollars. Ecosystem restoration construction takes place in a short period of time (1 to 3 years) whereas the redevelopment components span the 50 years of the analysis. With these time dimensions being so different, combining average annual figures for ecosystem restoration construction with the redevelopment categories would be misleading. For this reason, the following two tables present average annual impacts separately for ecosystem restoration construction and redevelopment activities.

Table 8-51 Ecosystem Restoration Construction Impacts – Average Annual

Ecosystem Construction Average Annual Impacts				
	10 ART	13 ACE	16A AND	20A RIVER
Sales	$125,936,000	$273,986,000	$298,563,000	$413,986,000
Jobs	913	1,986	2,160	3,000
Labor Income	$52,560,000	$114,350,000	$124,608,000	$172,780,000
GRP	$73,445,000	$159,785,000	$174,119,000	$241,432,000
Construction Duration	1 year	1 year	2.5 years	3 years

Table 8-52 Recreation Construction Impacts – Average Annual

Recreation Construction Average Annual Impacts				
	10 ART	13 ACE	16A AND	20A RIVER
Sales	$12,958,000	$12,958,000	$12,958,000	$12,958,000
Jobs	74	74	74	74
Labor Income	$4,998,000	$4,998,000	$4,998,000	$4,998,000
GRP	$7,265,000	$7,265,000	$7,265,000	$7,265,000
Construction Duration	1 year	1 year	1 year	1 year

Table 8-53 Redevelopment Economic Impacts - Average Annual

Redevelopment Construction - Average Annual Impacts				
	10 ART	**13 ACE**	**16A AND**	**20A RIVER**
Jobs	25	26	26	102
Labor Income	$1,620,000	1,693,000	$1,693,000	$6,726,000
Sales	$2,223,000	2,316,000	$2,316,000	$9,203,000
GRP	$3,713,000	3,860,000	$3,860,000	$15,345,000
NPV Income	$36,335,000	$37,988,000	$37,988,000	$150,885,000
Redevelopment Long-term Economic Activity - Average Annual Impacts				
Jobs	320	344	344	1,362
Labor Income	$17,953,000	$19,297,000	$19,297,000	$76,320,000
Taxes	$108,000	$116,000	$116,000	$458,000
NPV Income	$288,006,000	$309,568,000	$309,568,000	$1,224,346,000
Combined Redevelopment Average Annual Impacts				
Jobs	345	370	370	1,464
Labor Income	$19,573,000	$20,990,000	$20,990,000	$83,046,000
NPV Income	$324,341,000	$347,556,000	$347,556,000	$1,375,231,000

9. OTHER SOCIAL EFFECTS

Since the adoption of the P&G by the Water Resources Council in 1983 and their subsequent incorporation into the USACE water resources policies, there has been a tendency to focus attention on NED and NER benefit/cost procedures. In the last decade, more focus has also been given to the roles and importance of OSE factors in water resources planning. Newer guidance—principally, EC 1105-2-409, "Planning in a Collaborative Environment" from 2005—places much greater emphasis on the importance of including a broad range of considerations in planning that are to be used to develop appropriate water resources solutions. These include social factors addressed in the OSE account, and addressed herein.

The OSE account describes the potential effects of project alternatives in areas that are not dealt with explicitly in the NER and RED accounts. ER 1105-2-409 states, "[a]ny alternative plan may be selected and recommended for implementation if it has, on balance, net beneficial effects after considering all plan effects, beneficial and adverse, in the four Principles and Guidelines evaluation accounts," of which the OSE is one. The Principles and Guidelines state that the OSE, when included in U.S. Army Corps of Engineers documents, should "display plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation and others."

Social effects in a general sense refer to a concern for how the constituents of life that influence personal and group definitions of satisfaction, well-being, and happiness are affected by some condition or proposed intervention. Well-being is an ensemble concept composed of multiple dimensions. While economic factors are very important in characterizing well-being there are many more factors which come into play. In particular the distribution of resources; the character and richness of personal and community associations; the social vulnerability and resilience of individuals, groups, and communities; and the ability to participate in systems of governance are all elements that help define well-being.

This OSE analysis describes the potential social effects of the alternatives under consideration. The OSE account explores the following categories of effects from the implementation of the alternatives considered. In most cases it is not possible to significantly differentiate between the social effects of the restoration alternatives because the scale of the categories on an overall community level exceeds the scale of differences among the alternatives.

- Displacement/Impacts to Population
- Public Health and Safety
- Displacement/Impacts to Minorities and Special Interest Groups
- Displacement/Impacts to Businesses
- Displacement/Impacts to Agriculture
- Displacement/Impacts to Recreational Areas
- Community Growth
- Project Impacts and Connectivity of the Community
- Community Well-being

There is significant interest and activity along the LA River in the form of numerous small efforts to create pocket parks, improve habitat, increase recreation trails, and filter stormwater runoff. Green spaces facilitate hydrological processes in areas where urban development interferes with the movement, distribution, and quality of water. They also provide social, health, environmental, and economic benefits, some of which include the promotion of physical activity, filtration of water pollution, increased control of stormwater runoff and flooding, reduced loading on stormwater systems, improved groundwater recharge, provision of wildlife habitat, and reduced need for pollution prevention measures.[29] Similarly, construction of the ecosystem restoration project under consideration has strong potential to deliver significant and meaningful environmental, economic, and social benefits to the region. The feasibility study includes alternative plans that incorporate a suite of habitat types along and within the Los Angeles River, such as wetlands, riparian areas, pool/riffle complexes, and riparian buffers, as well as appropriate recreation features (e.g., trails, signage).

Indeed, a significant social effect documented herein is the health effect of nearby habitat areas and the associated recreational features of ecosystem restoration projects. And while the primary purpose of an ecosystem restoration project along the Los Angeles River is the creation of habitat value, USACE promotes multipurpose project values in that "collaboration is critically important for achieving the missions of the Corps in the 21st century. Solutions to today's problems require reaching out to those with different authorities, perspectives, and resources to solve the various dimensions of these problems."[30] This is true even though funding of USACE

[29] Heather E. Wright Wendel, Joni A. Downs, and James R. Mihelcic. 2011. "Assessing equitable access to urban green space: the role of engineered water infrastructure". *Environ. Sci. Technol.* 45:6728.

[30] The State of Collaboration in the Corps: A Field Perspective. 2011. From "The Collaborative Capacity Assessment Initiative." Conflict Resolution & Public Participation Center, USACE. 2011-CPC-R-04, May 2011. http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/2011-CPC-R-04.pdf

projects along typical missions such as ecosystem restoration "makes it harder to work with small communities that typically value recreation."[31] Further, parks and recreation are critical to any multipurpose project even from an economic perspective, as declared by the Mayor of Indianapolis: "Parks…have a tremendous impact on our cities, from increased tourism to enhanced retail to higher property values to environmental mitigation."[32]

In a recent Environmental Science and Technology article the authors report that there is evidence that urban residents living in greener environments may be significantly healthier than those living in environments with less green space, and the presence of water may create even greater health improvements.[33] Most notably for low-income and minority residents, inequitable urban development and the privatization of natural amenities has contributed to environmental injustices in the distribution of green space and water features. Collectively, this can cause disparities in health-related behaviors and obesity.[34] Given the health benefits related to the contact with or use of green space, disadvantaged populations with green space access may obtain some protection from the effects of poverty-related stress, possibly decreasing their mortality rates relative to similar populations that lack access.[35] For example, people exercising in all types of natural environments experienced enhanced self-esteem and mood, with the presence of water creating the greatest improvements.[36]

This OSE assessment covers not only the standard categories previously mentioned, but it also covers less common areas of social effects as highlighted in the previous paragraph. The primary region of influence (ROI) for the analysis of social effects is the previously defined study area– the approximately 1-mile wide corridor along the River. This ROI area definition extends beyond the potential construction impact area and was chosen based on the assumption that direct social effects associated with the project would be mainly confined to this area.

9.1 Displacement/Impacts to Population

The project location is adjacent to residential, commercial, and industrial land uses that are found along the Los Angeles River channel. The direct effects of construction of the proposed Alternatives 10,13,16, and 20 are not likely to result in any displacement or impacts to population beyond the health and safety concerns outlined below. It is generally assumed that the workers needed for construction will come from the local labor pool. However, labor demands

[31] Ibid.

[32] Bart Peterson, Mayor of Indianapolis. 2003. In the introduction to "The Excellent City Park System," written by Peter Harnik and published by The Trust for Public Land.

[33] Heather E. Wright Wendel, Joni A. Downs, and James R. Mihelcic. 2011. "Assessing equitable access to urban green space: the role of engineered water infrastructure." *Environ. Sci. Technol.* 45:6728.

[34] Powell, L. M.; Slater, S.; Chaloupka, F. J. 2004. "The relationship between community physical activity settings and race, ethnicity and socioeconomic status." *Evidence-Based Prev. Med*. 1(2), 135–144.

[35] Mitchell, R.; Popham, F. "Effect of exposure to natural environment on health inequalities: an observational population study." *Lancet*. 2008, 372 (9650), 1655–1660.

[36] Barton, J.; Pretty, J. 2010. "What is the best dose of nature and green exercise for improving mental health? A multi-study analysis." *Environ. Sci. Technol*. 44 (10), 3947–3955.

are not anticipated to affect the labor pool as their demands are relatively minor in relation to the labor pool. Thus, construction-related employment is not likely to increase the population to any significant degree within the ROI.

9.2 Public Health and Safety

This section presents a great deal of research literature as evidence of the health costs of obesity and the benefits of exercise at the national, state, and local level. The abundance of information herein is a fraction of the literature that supports the high economic and social health costs of a sedentary lifestyle, and *serves to underline the importance of this facet of OSE benefits related to the project*. Indeed, the challenge of promoting a healthy lifestyle founded on outdoor recreation and the value of natural resources is partly why the America's Great Outdoors (AGO) initiative was begun under President Obama's administration in 2010.[37] A report introducing the AGO initiative states that "[t]he outdoors has increasingly lost its relevance in the lives of our children"…and that "[s]tudies show that access to the outdoors can help reverse the obesity epidemic that has tripled among our children in the last generation. They show that time spent in nature can reduce stress and anxiety, promote learning and personal growth, and foster mental and physical health."[38]

At the current level of analysis, it is impractical to be quantitative about the differences in beneficial effects among the final array primarily because the effects would not greatly vary among the alternatives.

9.2.1 Health Costs

Excessive weight and obesity and their associated health problems have a significant economic impact on the U.S. health care system. Medical costs associated with excessive weight and obesity involve both direct and indirect costs. Direct medical costs may include preventive, diagnostic, and treatment services related to obesity. Indirect costs relate to morbidity and mortality costs. Morbidity costs are defined as the value of income lost from decreased productivity, restricted activity, absenteeism, and bed days. Mortality costs are the value of future income lost by premature death. The medical care costs of obesity in the United States are staggering. In 2008 dollars, these costs totaled about $147 billion.[39] Researchers from the Mayo Clinic, published in the *Journal of Occupational and Environmental Medicine*,[40] found that people who are obese have an extra $1,850 in health costs a year, on average, compared with

[37] US Dept. of the Interior, 2011. "America's Great Outdoors: A Promise to Future Generations." A report in collaboration with the USEPA, USDA, and the CEQ. February 2011.

[38] Ibid.

[39] Finkelstein, E., Trogdon, J., Cohen, J. & Dietz, W. 2009. "Annual medical spending attributable to obesity: payer- and service-specific estimates." *Health Affairs* 28(5).

[40] Moriarty, J., Branda M., Olsen, K., Shah, N., Borah, B., Wagie, A., Egginton, J. & Naessens, J. 2012. "The effects of incremental costs of smoking and obesity on health care costs among adults: A 7-year longitudinal study." *Journal of Occupational and Environmental Medicine* Mar; 54(3).

normal weight people, and for people who are morbidly obese, the costs are even higher: up to $5,500 a year.

The consequences of the country's obesity epidemic expand beyond just personal health. Overweight or obese full-time workers with other chronic health conditions miss 450 million more days of work each year than would healthy workers, costing businesses $153 billion annually in lost productivity, according to a 2011 Gallup poll.[41]

The California Center for Public Health Advocacy (CCPHA) found the total annual estimated cost to California for overweight, obesity and physical inactivity was $41.2 billion – $21.0 billion for overweight and obesity, and $20.2 billion for physical inactivity. Health care costs totaled $20.7 billion and lost productivity costs reached $20.4 billion. Health care costs associated with overweight and obesity were $12.8 billion while health care costs associated with physical inactivity totaled $7.9 billion. Finally, lost productivity costs associated with overweight and obesity were $8.2 billion, and lost productivity costs associated with physical inactivity were $12.3 billion.[42]

9.2.2 Physical Activity and Obesity

Physical activity, essential to overall health, can help control weight, reduce the risk of heart disease and some cancers, strengthen bones and muscles, and improve mental health.[43] The American Planning Association reports that proximity to public parks and tree-lined streets appears to have the greatest impact on the length of the lives of study participants, even when taking into account factors known to affect longevity, such as gender, marital status, income and age.[44] The Centers for Disease Control and Prevention's goal of increasing physical activity among all Americans is supported by key strategies such as creating or enhancing access to places for physical activity, enhancing physical education and activity in schools and physical activity in child care settings, and supporting urban design, land use, and transportation policies.[45,46] The proposed alternatives' features fit well within the context of these strategies since all alternatives provide trails, access points, bridges, parking facilities, and restrooms located at strategic locations. All of these serve to provide easier access to recreation along the

[41] Witters, D. & Agrawal, S. 2011. "Unhealthy U.S. workers' absenteeism costs $153 billion." Internet website: http://www.gallup.com/poll/150026/Unhealthy-Workers-Absenteeism-Costs-153-Billion.aspx.

[42] California Center for Public Health Advocacy. 2006. *"The Economic Costs of Overweight, Obesity and Physical Inactivity Among California Adults – 2006."* Internet website: http://www.publichealthadvocacy.org/costofobesity.html

[43] U.S. Department of Health and Human Services. 2008. "Physical activity guidelines for Americans." Hyattsville, MD. U.S. Department of Health and Human Services.

[44] American Planning Association, 2003. "How cities use parks to improve public health, help children learn, create safer neighborhoods." *City Parks Forum Briefing Papers.*

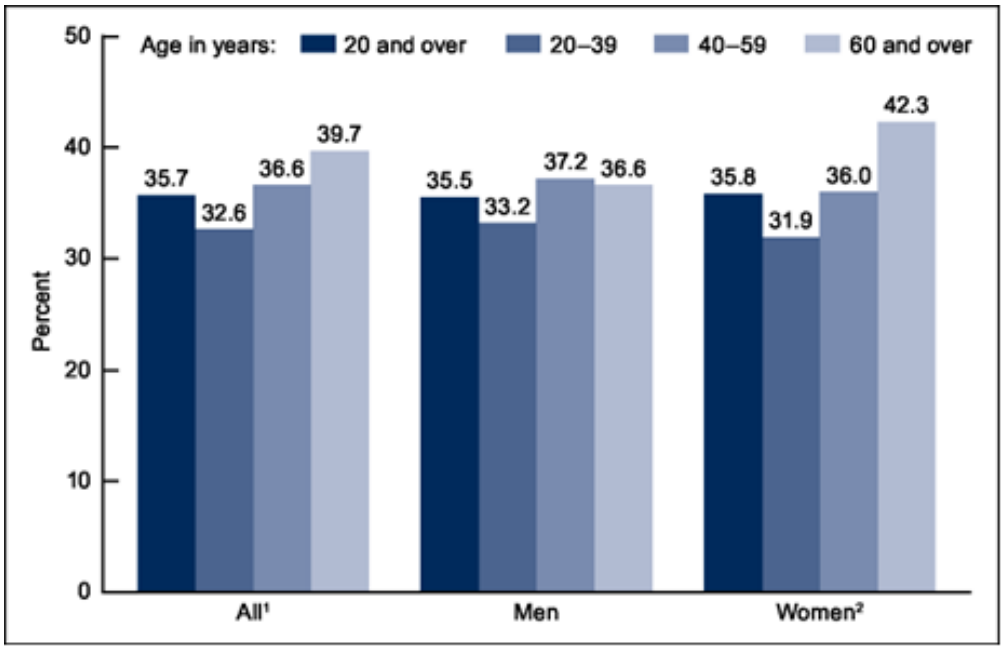
[45] Resources for State and Community Programs. 2010. "CDC's guide to strategies for increasing physical activity in the community." (CD-ROM). Centers for Disease Control and Prevention.

[46] Kahn, E., Ramsey, L., Brownson, R., et al. 2002. "The effectiveness of interventions to increase physical activity: A systematic review." *Am J Prev Med*. 22, (4 suppl).

River as well as to existing, adjacent parks and facilities, thereby encouraging recreation and exercise.

9.2.2.1 National Statistics

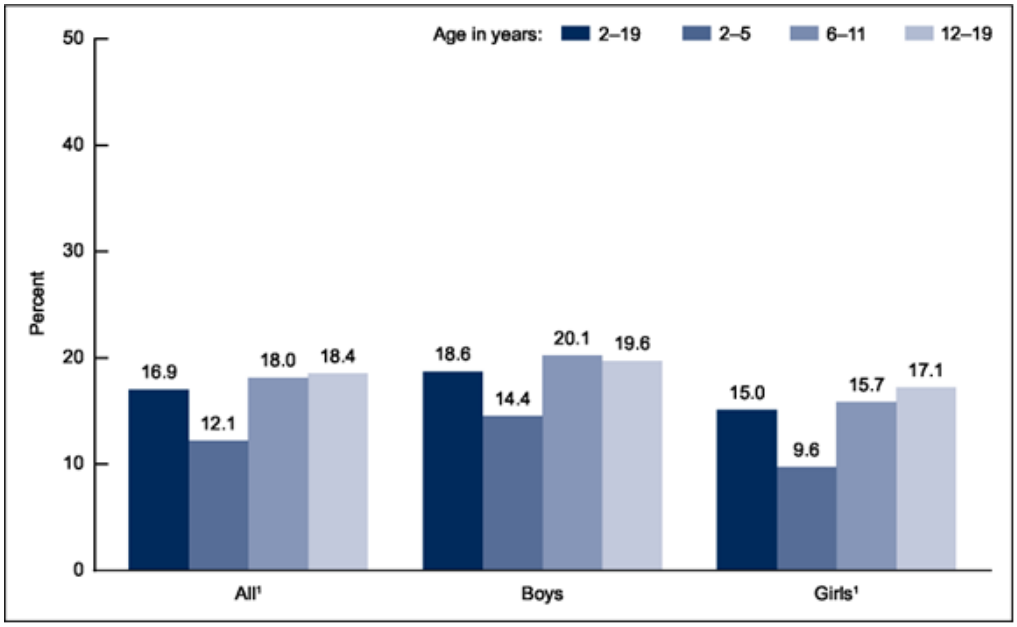
Nationwide, more than 35 percent of U.S. men and women were obese in 2009–2010. There was no significant difference in prevalence between men and women at any age. Overall, adults aged 60 and over were more likely to be obese than younger adults. Among men there was no significant difference in obesity prevalence by age. Among women, however, 42.3 percent of those aged 60 and over were obese compared with 31.9 percent of women aged 20–39 (Figure 9.1).[47] The prevalence of obesity was higher among adolescents than among preschool-aged children (Figure 9.2). The prevalence of obesity was higher among boys than girls (18.6 percent of boys and 15.0 percent of girls were obese).



[1] Significant increasing linear trend by age ($p < 0.01$).
[2] Significant increasing linear trend by age ($p < 0.001$).
NOTE: Estimates were age adjusted by the direct method to the 2000 U.S. Census population using the age groups 20–39, 40–59, and 60 and over.
Source: CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2010

Figure 9.1 Prevalence of Obesity among Adults Aged 20 and Over, by Sex and Age: United States, 2009–2010

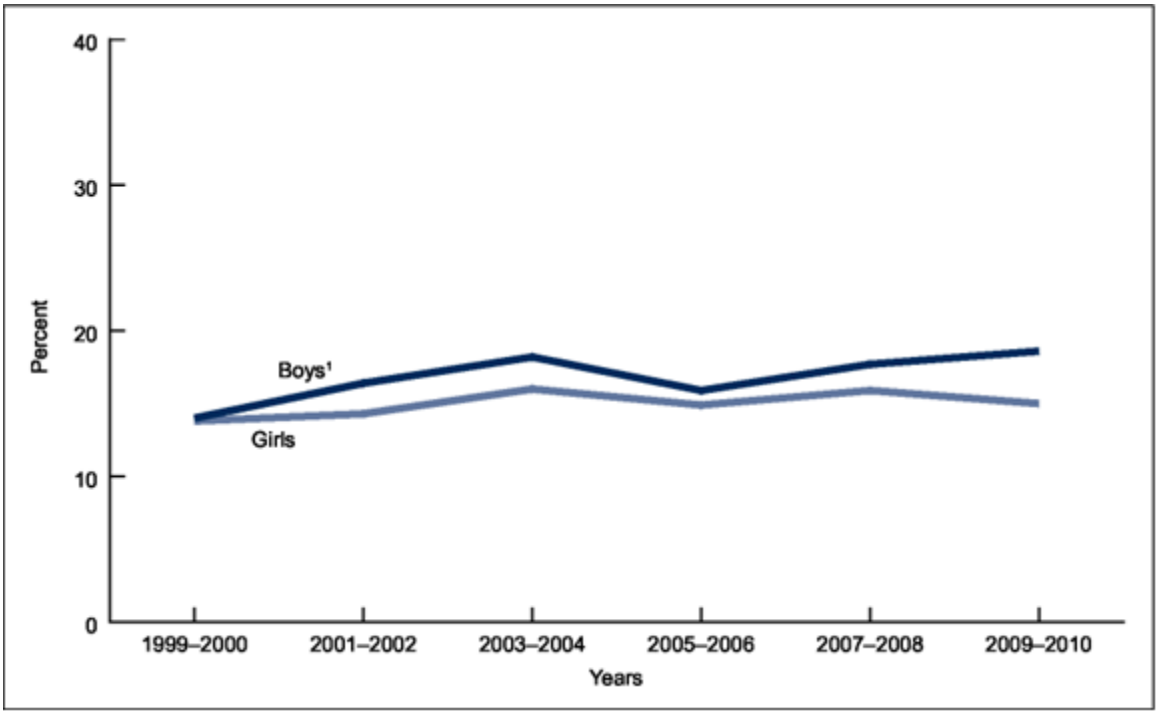
[47] U.S. Department of Health and Human Services. 2012. "Prevalence of obesity in the United States, 2009-2010." NCHS, Data Brief No. 82. January, 2012.



[1] Significant increasing linear trend by age ($p < 0.005$).
Source: CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2010.

Figure 9.2 Prevalence of Obesity among Children and Adolescents Aged 2–19, by Sex and Age: United States, 2009–2010

Obesity has been on the rise: In 1999–2000, 27.5 percent of men were obese, and by 2009–2010 the prevalence had increased to 35.5 percent. Among women, 33.4 percent were obese in 1999–2000 with a small change in 2009–2010 (35.8 percent). The prevalence of obesity among boys increased from 14.0 percent in 1999–2000 to 18.6 percent in 2009–2010. There was a small change among girls: the prevalence was 13.8 percent in 1999–2000 and 15.0 percent in 2009–2010 (Figure 9.3).



[1] Significant increasing linear trend 1999–2000 to 2009–2010 ($p < 0.05$).
Source: CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2010.

Figure 9.3 Trends in the Prevalence of Obesity among Children and Adolescents Aged 2–19, by Sex: United States, 1999–2010

The prevalence of these and similar statistics exhibit the growing problem of obesity, nationwide, for which the proposed project features offer beneficial effects regardless of their specific contributory magnitude.

9.2.2.2 California Statistics

In California, despite these now-well-known benefits of physical activity, only 50 percent of California adults engage in the recommended levels of physical activity, and 23.2 percent engage in no leisure-time physical activity, as shown in Table 9-1, according to the Centers for Disease Control and Prevention.

Table 9-1 California: Summary of Physical Activity

	Recommended	Insufficient	Inactive	No-Leisure Time Physical Activity
California	50.0%	37.6%	12.5%	23.2%

Physical activity rates for adults in California by age and gender are shown in Table 9-2.

Table 9-2 California: Recommended Physical Activity - 2007

	18–24	25–34	35–44	45–64	65+
Recommended	64.4%	52.1%	48.7%	47.1%	43.5%
Insufficient	29.8%	37.5%	40.6%	39.5%	36.0%

Inactive	N/A	10.4%	10.7%	13.4%	20.5%
No Leisure-Time Physical Activity*	17.6%	25.2%	25.4%	22.4%	23.9%

	Female	Male
Recommended	48.9%	51.1%
Insufficient	38.6%	36.4%
Inactive	12.5%	12.5%
No Leisure-Time Physical Activity*	24.6%	21.7%

* "Recommended," "Insufficient," and "Inactive" data comprise one measure, and responses should sum to ~100%. "No Leisure-Time Physical Activity" is a separate question, and should not be included with calculations for the recommended, insufficient, or inactive.

Recommended physical activity (meeting the "Healthy People 2010 Objectives") is defined as reported moderate-intensity activities in a usual week (i.e., brisk walking, bicycling, vacuuming, gardening, or anything else that causes small increases in breathing or heart rate) for at least 30 minutes per day, at least 5 days per week; or vigorous-intensity activities in a usual week (i.e., running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate) for at least 20 minutes per day, at least 3 days per week or both. This can be accomplished through lifestyle activities (i.e., household, transportation, or leisure-time activities).

Insufficient physical activity is defined as doing more than 10 minutes total per week of moderate or vigorous-intensity lifestyle activities (i.e., household, transportation, or leisure-time activity), but less than the recommended level of activity.

Inactivity is defined as less than 10 minutes total per week of moderate or vigorous-intensity lifestyle activities (i.e., household, transportation, or leisure-time activity).

No leisure-time physical activity is defined as no reported leisure-time physical activities (i.e., any physical activities or exercises such as running, calisthenics, golf, gardening, or walking) the previous month.

Source: As found in California State Parks. 2005. "The Health and Social Benefits of Recreation." California State Parks. Planning Division. Values updated from the CDC's Behavioral Risk Factor Surveillance System data site: http://www.cdc.gov/brfss/ as accessed in May 2012.

Obesity continues to increase in the state, with a slight dip between 2009 and 2010, as shown in Figure 9.4. Although overall obesity is "down" to roughly 25 percent in 2010 for all Californians, the CDC reports an obesity rate of 30.5 percent for youths between the ages of 10 - 17 in 2007—a rate 7 percent higher than for all Californians.

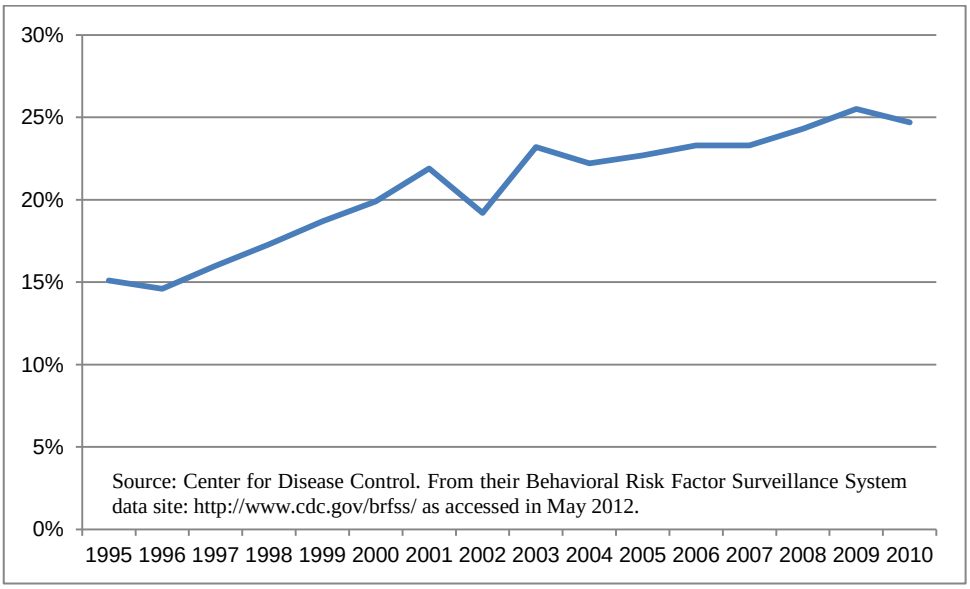


Figure 9.4 California's Overweight and Obesity Annual Rates

More troubling is a recent 2011 report by the UCLA Center for Health Policy Research and California Center for Public Health Advocacy–"*A Patchwork of Progress: Changes in Overweight and Obesity Among California 5th-, 7th-, and 9-th Graders, 2005-2010"*–which indicates 38 percent of 5th, 7th, and 9th graders are overweight or obese. From this report, childhood obesity by ethnicity/race is shown in Figure **9**.5.

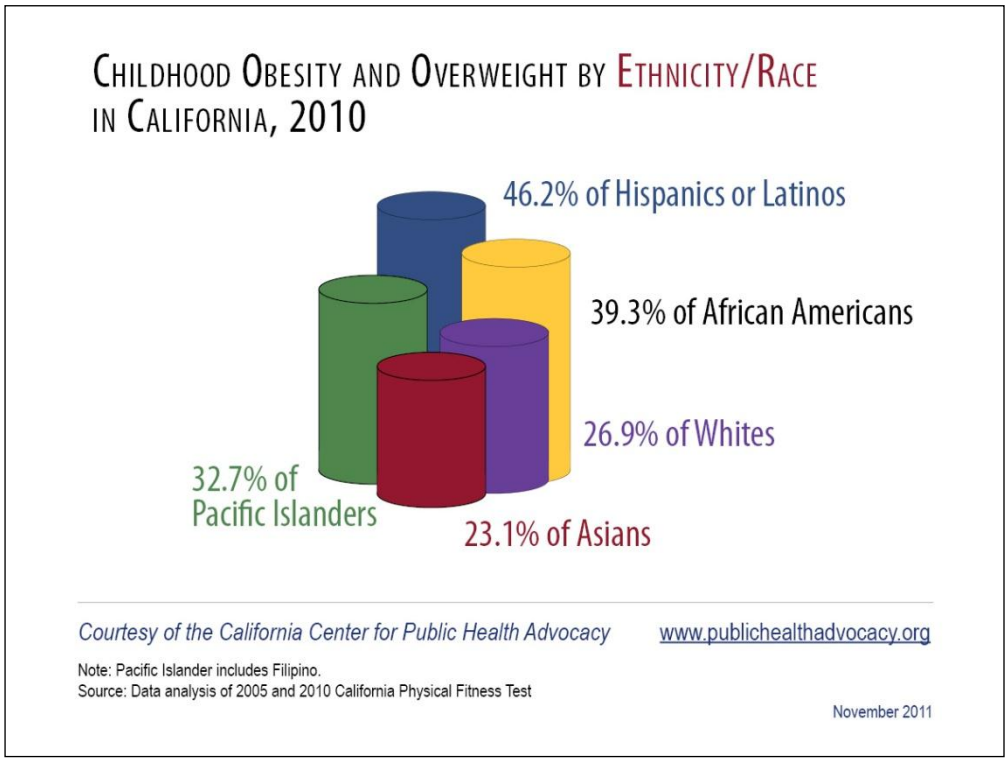


Figure 9.5 **Childhood Obesity**

The reasons for the correlation between ethnicity and obesity may of course be discussed in the context of culture, income, diet, employment, and a host of environmental justice factors. Among those factors are ample statistics correlating conditions of park-poor neighborhoods within communities that are predominantly Hispanic and African-American. Facilities that provide a greater opportunity and access to recreation opportunities across all of the proposed alternatives, therefore, would serve to help reduce the obesity levels within the ROI.

9.2.2.3 Los Angeles Statistics

The 2005, the CDC's physical activity prevalence statistics for the Los Angeles - Long Beach – Glendale Metropolitan Statistical Area (MSA) indicated that only 45.4 percent of the adult population meets the recommended level of physical activity.

Table 9-3 Physical Activity Prevalence Statistics by Metropolitan Area — SMART BRFSS 2005

	Recommended	Insufficient	Inactive
Los Angeles-Long Beach-Glendale	45.4%	32.4%	13.3%

In a follow-on study in 2008, the CDC reports the level of no leisure-time physical activity for this area's adult population at 25.9 percent.

In 2007 the Department of Public Health and the American Diabetes Association of Los Angeles found that 22 percent of residents suffer from obesity — up from 14.3 percent in 1997.

The issues with overweight/obesity in children are even more severe. After some hope that the obesity/overweight rate with children was stabilizing as evaluated in the Los Angeles County Department of Public Health 2008 report "Los Angeles Health Trends," a subsequent 2010 study conducted by the UCLA Center for Health Policy Research and the California Center for Public Health Advocacy revealed contrary data on the levels of overweight/obesity. The study indicates that while 38 percent of the state's children are overweight or obese, Los Angeles County has both the highest and lowest city rates. City ranges begin as low as 11.3 percent (Manhattan Beach) and climb five-fold to 53 percent for the state's poorest performing city (Huntington Park) with the City of Los Angeles at 45.2 percent and an overall rate for the County at 41.6 percent.

9.2.3 Health Benefits of Exercise Facilities

A landmark report by the U.S. surgeon general found that people who engage in regular physical activity benefit from reduced risk of premature death; reduced risk of coronary heart disease, hypertension, colon cancer, and non-insulin-dependent diabetes; improved maintenance of muscle strength, joint structure, and joint function; reduced body weight and favorable redistribution of body fat; improved physical functioning if they suffer from poor health; and healthier cardiovascular, respiratory, and endocrine systems.[48, 49]

> "Americans can substantially improve their health and quality of life by including moderate amounts of physical activity in their daily lives," the report found. It also found that "health benefits appear to be proportional to the amount of activity; thus, every increase in activity adds some benefit." [50]

The Surgeon General additionally found that physical activity also produces important psychological benefit. It relieves symptoms of depression and anxiety, improves mood, and enhances psychological well-being.[51] Exercise leads to enhanced tranquility and more relief of anxiety and depression when it occurs in natural settings like parks rather than along urban streets.[52]

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[48] Sherer, Paul M. 2006. "The Benefits of Parks: Why America Needs More City Parks and Open Space." The Trust for Public Land. Reprint of "Parks for People" white paper, published in 2003.

[49] U.S. Department of Health and Human Services. 1996. "Physical activity and health: A report of the Surgeon General." U.S. Department of Health and Human Services. http://www.cdc.gov/nccdphp/sgr/pdf/sgrfull.pdf.

[50] Ibid.

[51] Ibid.

[52] American Planning Association, 2003. "How Cities Use Parks to Improve Public Health, Help Children Learn, Create Safer Neighborhoods." *City Parks Forum Briefing Papers.*

Exercise significantly reduces the chance for heart problems, according to 43 separate studies conducted by the Centers for Disease Control. Those who do not exercise are twice as likely to have coronary heart disease.[53] A study publishes in the Archives of Internal Medicine indicates the risk of Type II diabetes decreased progressively with increasing levels of physical activity.[54] Women, who exercised regularly in their 20's and had a healthy intake of calcium, decreased by 30 percent their risk of developing osteoporosis in their 70's.[55]

Despite these now well-known benefits of physical activity however only 49 percent of American adults engage in the recommended levels of physical activity, and 24 percent engage in no leisure-time physical activity, according to the Centers for Disease Control and Prevention.[56] The numbers for children and adolescents are similar: only 50 percent of students in grades 9 through 12 engage in moderate to intensive physical activity.[57]

Fortunately, strong evidence shows that people are more likely to exercise when they have access to parks and recreation facilities, thereby reducing obesity and its associated health problems and societal costs. A group of studies reviewed in the American Journal of Preventive Medicine showed that "creation of or enhanced access to places for physical activity combined with informational outreach" produced a 48.4 percent increase in the frequency of physical activity.[58] The same studies showed that easy access to a place to exercise results in a 5.1 percent median increase in aerobic capacity, along with weight loss, a reduction in body fat, improvements in flexibility, and an increase in perceived energy.[59] Further, a study by the RAND Corporation found that Los Angeles residents who live near parks visit them and exercise more often than people who live greater distances from green spaces.[60] While it may be argued that people with a propensity to exercise will seek to live near parks rather than the proximity to parks *causing* exercise, the fact remains that—either way—more trails, greenways, and parks along the River will result in more exercise among the population.

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[53] American Hiking Society (AHS). (n.d.). "A Step in the right direction: The health benefits of hiking and trails." Retrieved from http://atfiles.org/files/pdf/AHShealthben.pdf.

[54] Wannamethee, S.G., Shaper, A.G., & Alberta, K.G.M.M. 2000. "Physical activity, metabolic factors, and the incidence of coronary heart disease and type 2 diabetes." *Archives of Internal Medicine, 160*(14), 2108-2116.

[55] Gorman, Christine. 2002. "Walk, Don't Run: It's Simple, it's cheap, and studies show that walking may be the best exercise for reducing the risk of heart disease, stroke and diabetes." *Time, 159*(3), 82. June, 2012. http://www.time.com/time/covers/1101020121/walking.html

[56] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. 2012. http://apps.nccd.cdc.gov/PASurveillance/StateSumResult.

[57] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. 2012. http://apps.nccd.cdc.gov/youthonline/App/Results.

[58] Kahn, E., *et al.* 2002. "The effectiveness of interventions to increase physical activity." *American Journal of Preventive Medicine* 22, no. 4S.

[59] Ibid.

[60] Yañez, E. & Muzzy, W. 2005. "Healthy parks and healthy communities: Addressing health disparities and park inequities through public financing of parks, playgrounds, and other physical activity settings." *The Trust for Public Land*.

Unfortunately, residents of many American communities do not have easy access to a park or recreation facility. This is especially true in cities and urban areas, where 80 percent of Americans lived in 2000. Study after study shows that when people cannot reach parks, they often go without exercise. There is a notable scarcity of parks in poor communities. More generally, there is a correlation among poverty, minority status, obesity, ill health, and neighborhood factors that discourage exercise, including the absence of parks and recreation facilities. Indeed, a 2005 University of Southern California study of park access in Los Angeles found that people who live in areas of low income or concentrated poverty and in Latino, African American, and Asian American/Pacific Islander neighborhoods are less likely to have nearby access to parks, playgrounds, and other exercise facilities than people living in largely white neighborhoods.[61,62]

9.2.4 Proposed Alternatives and Public Health

The alternatives' proposed recreational and open space facilities would occur in LA's Council Districts 1, 4, 13 and 14. These districts have some of the lowest parkland to population ratios in the City (Figure 9.6). Note that Council District 4 is third in the ranking due to the inclusion of Griffith Park; however, the current evaluation discounts the recreational use of Griffith Park "on a regular/daily basis" due to its distance from the River and separation by Interstate 5.

Within the principal service territory of the proposed parks, over 11,000 senior citizens (aged 65 and older) and 74,000 adults (aged 18 to 65) reside. The Trust for Public Land in a 2009 study, *"Measuring the Economic Value of a City Park System,*" has developed a system ("Parks Health Benefits Calculator") to measure the health value of park usage for exercise by adults.

In their study, after identifying the common types of medical problems that are inversely related to physical activity such as heart disease and diabetes, they created the calculator based on studies in seven different states that show an annual $250 cost difference between those who exercise regularly and those who do not. For people over the age of 65, the value is $500 because seniors typically incur two or more times the medical care costs of younger adults.

The key data input is the number of park users who indulge in a sufficient amount of physical activity (at least 30 minutes of moderate to vigorous activity at least three days per week) to make a difference. If it is assumed that the proposed facilities would impact only 10 percent of the adults in the service territory (1,000 seniors and 7,400 adults) the annual health benefit would be $2,400,000, according to the benefit calculator.

[61] Wolch, J., Wilson, J. & Fehrenback, J. 2005. "Parks and park funding in Los Angeles: An equity-mapping analysis," *Urban Geography* 26, no. 1.

[62] Pincetl, S., *et al.* 2003. "Toward a sustainable Los Angeles: A 'nature's services' approach." University of Southern California, Center for Sustainable Cities. March, 2003.

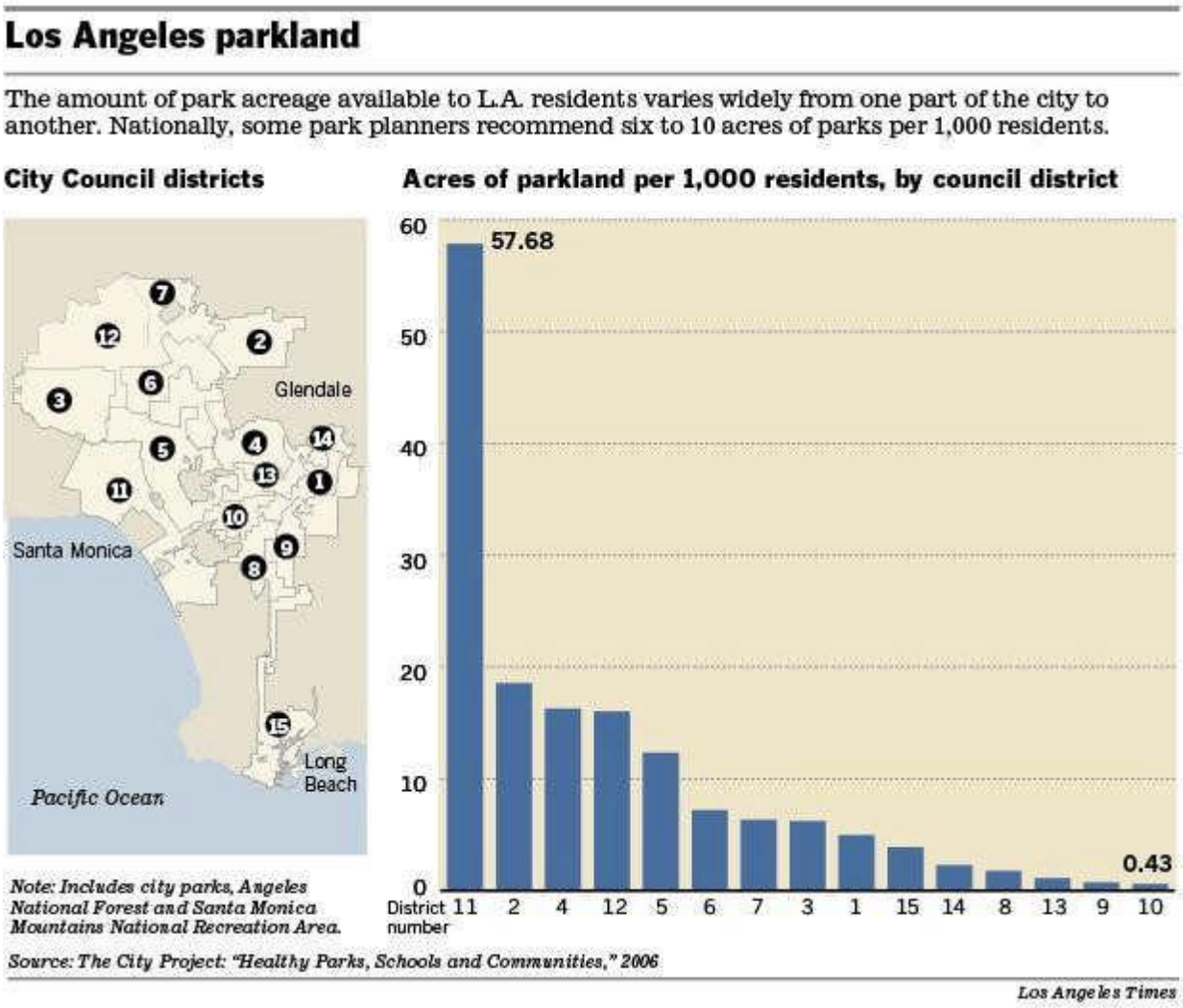

Figure 9.6 Los Angeles Parkland to Population Ratios

As seen in the supporting evidence presented within this section (Section 9.2), inactivity, obesity, and loss of productivity in the workplace contribute to major annual health care cost in California and the Nation, and people who live closer to parks are more likely to participate in physical activity and healthier living. As mentioned above, much of the Los Angeles area is considered to be "park poor" which is defined by California law as any geographic area that provides less than three acres of park per 1,000 residents.[63] Based on this classification, project reaches 7-8 would be considered "park poor" having the lowest amount of parkland per resident in the project area (less than three acres per 1,000 people).

[63] GreenInfo Network. 2010. "Park Poor, Income Poor, and People of Color." Figure presented by the City Project, Los Angeles, CA. Accessed September 2012 at http://www.mapsportal.org/thecityproject/socalmap/LosAngelesCounty.html#.

Restoration measures under Alternatives 10, 13, 16A, and 20A would increase accessibility for recreational opportunities in a safe, user-friendly, and accessible setting resulting in a higher frequency of recreation and physical activity use by community members. The recreational facilities common to all alternatives include: trails along the River; bridges that offer accessibility and connectivity to existing, adjacent parks; parking; and access point for trails as well as for kayaking. This is expected to result in a 45% increase in recreation visitation with project, as described in Section 5 and Attachment 1.

Further—beyond the habitat units offered by the restoration measures—the habitat proposed within the alternatives also provide an amenity that would serve to increase the aesthetic enjoyment of recreation along the River by providing an environment conducive to recreation. Linking restoration acreage to public health in this manner results in comparing the acreages of each proposed alternative: Alternative 10 proposes the smallest area of proposed restoration, followed by 13, 16, and 20 with the largest area of proposed restoration. Actual differences in the alternatives based on acreage of restoration may be seen in Table 9-4, indicating increases from one alternative to the next of 13%, 10%, and 4%, respectively.

Table 9-4 Acreage of Habitat Restoration, by Alternative

Alternative			
10	**13**	**16A**	**20a**
528	588	659	719

Restoration measures and associated recreational effects would not only provide obese and at-risk community members with increased opportunities for physical activity and exercise, but would also provide opportunities for healthy and active members of the community who regularly exercise to sustain their health. This would improve the health of the community as a whole by reducing health care costs, increasing productivity, and promoting well-being.

9.3 Displacement/Impacts to Minorities and Special Interest Groups

Displacements or relocations related to the construction efforts surrounding the project are unlikely due to the construction footprint being on vacant public lands and the limited workforce required for construction.

9.3.1 Proposed Alternatives and Displacement/Impacts to Minorities and Special Interest Groups

Benefits to minorities and special interest groups would be seen in all reaches of the project area post construction. The proposed restoration measures under Alternative 10, 13, 16A, and 20A would provide added trails and linkages to neighboring parks providing recreational activities for hikers, bicycle riders, and equestrian use.

Housing prices would likely appreciate under Alternatives 10, 13, 16A, and 20A, due to the potential of restoration measures to act as a catalyst for the renewal and redevelopment/beautification of adjacent commercial, industrial, business, and residential properties, as discussed above in Section 8.8. Minority and special interest group homeowners would benefit as property values would likely appreciate, while minority renters would be

negatively impacted due to rent increases, which could potentially displace minority and special interest group residents.

Alternatives 10, 13, 16A, and 20A vary in the respective implementation acreage of restoration measures; however, each alternative proposes measures in all project reaches (1-8). Therefore, impacts would be similar under each alternative with the slight differences as shown in Table 6-7 and Table 9-4.

9.4 Displacement/Impacts to Businesses

From an economic perspective, it is assumed that redevelopment would occur in the normal business of free market enterprise. Developers and business owners would agree upon the terms in a free exchange. Existing owners would only transfer ownership if the economic proposition was beneficial. Vacant properties exist throughout the City making relocations possible for the current owner to relocate or build if so desired. The impact areas do not involve residential properties. Thus, the impacts are strictly “business” related.

For Alternative 20, restoration measures and construction staging areas would extend into lands designated as industrial in the Verdugo Wash area of the Northeast Los Angeles Community Plan. Although the construction staging areas represent temporary land uses with less-than significant land use impacts, measures in some alternatives would result in the permanent conversion of industrial uses to a non-industrial use. This would conflict with the designated Industrial Use definition for this site. In addition, active industrial uses are currently in operation within the proposed conversion area. These uses would likely not be able to continue to exist at the site with the restoration measures included in some alternatives, and might require relocation. Further, indirect impacts could occur from the reduction in viable industrial operations adjacent to and in the vicinity of the site. This could result in potentially significant adverse impacts to existing land uses. Still, in the past two decades, the City has supported the conversion of key river-adjacent parcels that have had industrial, public facility, commercial, and other zoning classifications into publicly-accessible open spaces with ecosystem value. Commitment to this process may be seen by the City Council's adoption of the Los Angeles River Revitalization Master Plan in 2007, which calls for acquisition of key industrially-zoned parcels at the Verdugo Wash confluence, Taylor Yard, the Cornfields, and Arroyo Seco.

The Piggyback Yard site, located within the Boyle Heights Community Plan Area, would convert industrial container rail yard lands to riparian habitat under Alternatives 10, 13, 16A, and 20A with more extensive restoration measures under Alternative 16A and 20A. These include the creation of freshwater marsh, re-grading of channel banks and revegetation, and the relocation of railroad tracks to trestles to provide hydrologic connections to the river. Proposed restoration features would conflict with the Industrial land use designation, and potentially significant impacts to land use could occur as the current container storage/loading facility would be replaced by habitat areas and trails. New industrial uses may not desire to locate to an area if it has decreased availability and viability for industrial operations. In addition, indirect impacts could result from the decreasing availability of industrial land in the Los Angeles area; this could decrease the viability of industrial and manufacturing businesses from remaining in the area if their operations are limited to increasingly small and potentially isolated parcels of land surrounded by restored riparian and wetland habitat and recreational areas.

Conversion of industrial land within the Boyle Heights Community Plan Area to non-industrial uses would conflict with the industrial land use objectives and policies in the Plan; the objectives include preserving industrial lands for industrial uses, and conserving industry to preserve the tax base for the City and to provide jobs. In addition, policies in the Plan state that the industrial uses north of the San Bernardino freeway and west of the Golden State freeway should be preserved since they are near existing transportation facilities. Therefore, implementation of Alternatives 10, 13, 16A, and 20A would result in potentially significant adverse impacts unless community and political desires help develop mutually-agreeable changes in land use designations that include phasing plans. To this end, as mentioned above in this subsection, past actions by the City indicates a willingness and intent to undertake additional rezoning actions to accommodate the River's ecosystem restoration.

9.4.1 Proposed Alternatives and Displacement/Impacts to Businesses

Benefits to businesses due to the implementation of restoration measures post construction may be seen in areas adjacent to the project footprint due to the previously discussed potential increase in economic benefits derived from increased property values and attractive multi-use development. Though the project area is primarily built out and highly urbanized, restoration measures could stimulate redevelopment and urban renewal. Benefits associated with Alternatives 10, 13, 16A, and 20A would be similar in scope since each Alternative covers all eight reaches. However, direct adverse impacts to businesses within the project footprint—primarily in the Piggyback Yard areas for all alternatives and in the Verdugo Wash area for Alternative 20—would take place in the proposed habitat areas that would displace those businesses.

9.5 Displacement/Impacts to Agriculture

There are no agricultural activities in the area and no impacts are anticipated.

9.6 Displacement/Impacts to Recreational Areas

Generally, construction will take place on vacant public or industrial lands that are not currently used for recreational purposes. Construction traffic may produce a slight impact on existing travel to existing recreational areas outside of the ROI, but these are considered insignificant.

9.6.1 Proposed Alternatives and Displacement/Impacts to Recreational Areas

Post-construction benefits would include the expansion of project area recreation and improved river corridor trail connectivity between these areas, providing the community increased access and recreational opportunities. From the perspective of actual recreational facilities, the alternatives are the same since there is a single recreation plan for the trails, bridges, access points, parking, and other proposed facilities. But in terms of the additional habitat that offers passive respite and aesthetic amenities during recreational activities, the alternatives would differ based on their respective habitat acreage, as shown in Table 9-4, above, which shows that Alternative 20A proposes the largest restoration acreage, followed by16A, 13, and 10 in decreasing order. Specific improvements and associated increases in recreational use are discussed in Chapter 5.

9.7 Community Growth

Generally, a project is expected to promote growth if it contributes substantially to the population or economics of the ROI area. The project is not expected to significantly contribute economically to the ROI during the construction phase in a direct and indirect manner. Employment benefits are expected to occur in the ROI during construction; however, their impacts in relation to the overall employment within the ROI are small.

The plan is not expected to contribute to any rise in area population, directly or indirectly, during the construction. The ROI is essentially a fully developed urban area. Finally, each municipality or county controls growth in their respective areas through land use and growth policies. Other, more powerful economic considerations also directly influence area growth. Thus, plan construction is not expected to affect community growth, either directly or indirectly, during its construction.

9.7.1 Proposed Alternatives and Community Growth

Although an ecosystem restoration construction project is not expected to contribute to community growth during construction, its existence after construction would create a stimulus for redevelopment as discussed above in Section 8.8. Ecosystem restoration measures proposed under Alternatives 10, 13, 16A, and 20A, in increasing magnitude, respectively, are projected to revitalize commercial, industrial, and residential development in several areas along the Los Angeles River as previously detailed in the RED section of this appendix.

9.8 Project Impacts and Connectivity of the Community

Connectivity is generally defined as the degree to which residents feel a sense of belonging to their neighborhood or municipality. Other important measurements include the level of commitment residents feel to the community and the level of attachment residents have to certain neighbors, groups, or institutions. Generally, these levels are higher as a result of continued association over time. Major impacts to community cohesion are generally caused by displacements to important community businesses, centers of community interactions (churches, community centers, recreation areas) or large tracts of residences. Impacts can also occur through a project separating or dividing individual communities. Finally, visual impacts can affect the quality of adjacent communities, which can sometimes affect community connectivity depending on the severity of the impact.

Any institution that promotes this kind of community cohesion adds value to a neighborhood and, by extension, to the whole city. This human web, which Jane Jacobs termed "social capital,"[64] is strengthened in some cities by parks. From playgrounds to sports fields to park benches to flower gardens, parks offer opportunities for people of all ages to interact, communicate, compete, learn, and grow. Perhaps more significantly, the acts of creating, improving, renewing, or even saving a park can build extraordinary levels of social capital. This

[64] Jacobs, J. 1961. *The Death and Life of Great American Cities*. New York: Random House. February 1993 [1961].

is particularly true in a neighborhood suffering from alienation partially due to the lack of public spaces.

Parks satisfy needs for interaction by enticing residents into public spaces with trees, greenery, natural settings, and recreational facilities. In a study conducted at a large public housing development in Chicago, vegetated areas were found to be used by significantly more people and those individuals were more likely to be engaged in social activities than similar areas without vegetation.[65] Social interaction and neighborhood spaces have been identified as key facets of healthy communities supporting social networks, social support, and social integration that have been linked to improvements in both physical and mental health.[66] Sociability may alleviate some forms of mental illness and contribute to a sense of belonging and community. A park brings neighbors together, encourages safer, cleaner neighborhoods and creates a livelier community atmosphere. Parks also help improve a community's image, socioeconomic status and enhance the area's desirability. Perhaps most importantly, parks become a source of community pride and inspiration for further community improvements and revitalization.

9.8.1 Proposed Alternatives and Connectivity of the Community

Alternatives 10, 13, 16A, and 20A would include the restoration of riparian, in-channel, and overbank wetland habitat, and the greening of impervious surfaces throughout all eight reaches of the project area. Moreover, additional trails, access points, parking areas, and bridges are included in the alternatives. These would provide linkage and connectivity to the restoration areas as well as to existing parks, thereby improving community cohesion. Similar benefits would be seen under all alternatives and would provide a common place for residents of various socio-economic backgrounds to recreate and interact. As shown in the literature cited above, this would help create a sense of community and belonging. In turn, these beneficial social effects would potentially influence the enhancement of surrounding areas to conduct similar activities.

9.9 Community Well-Being

Among the many benefits of nature there are two major mental health benefits that arise from contact with nature. The first is the immediate mental health benefits which help with stress recovery, and the second is the longer-term psychological benefits which help with ongoing health restoration. In terms of immediate mental health benefits, literature shows that stressed individuals often turn to the natural world for relief. Research also shows that trees and woodlands, and contact with nature in general can have a calming effect, helping to reduce stress.[67] Coleman and Iso-Ahola suggest participation in leisure activities provides resources that

[65] Sullivan, W., *et al*. 2004. "The fruit of urban nature: Vital neighborhood spaces." *Environment and Behavior*, 39.

[66] Berkmana, L., *et al*. 2000. "From social integration to health: Durkheim in the new millennium."*Social Science and Medicine*, 51.

[67] Palace Road Nature Garden. 2011. "The relationship between nature and human health and well-being in urban areas." Notes on the Royal Commission on Environmental Pollution Study on Urban Environments, Well-being and Health, as found in https://www.facebook.com/notes/palace-road-nature-garden/the-relationship-between-nature-and-human-health-and-well-being-in-urban-areas/158334140891119, March 16, 2011.

assist people either to resist the onset of stress reactions or cope with stress before stress has an impact on health.[68] Visual appreciation of natural scenes provides a means to stress recovery. The healing value of hospital gardens or of nature views from hospital windows is a theme present in much literature. Window views of nature have been shown to increase positive feelings, lower stress levels and improve the physical condition of both hospital patients and office employees.[69]

In terms of longer term mental health, nature acts as a restorative environment, providing restoration from mental fatigue. Contact with nature may also help to reduce anger and aggression over the long term. Alternative studies provide a more in depth understanding of how urban nature impacts on psychological well-being. Rhode and Kendle (1994) suggest that urban nature brings emotional benefits (by lowering stress and increasing happiness), cognitive benefits (by reducing mental fatigue) and behavioral benefits (by encouraging adventurous behavior).[70] Contact with urban nature is beneficial to people as it provides an escape from the city, a peaceful retreat to repair emotions and it allows for intellectual learning.

Contact with nature is important for well-being. The benefits that nature brings to human well-being are applicable to both rural and urban settings. The implications of less contact with nature in urban areas are however more significant. A major study, in English Nature, found that people living in built up areas with access to gardens or green open spaces had a lower prevalence of mental disorder than people in built up areas with no such access.[71]

Many studies refer to the social benefits of urban green space. Urban green space contributes significantly to social inclusion because it is free and access is available to all, it provides a neutral ground for all sectors of society, and it can provide many opportunities for social interaction. Urban nature can be a meeting place for people of all classes and backgrounds and can therefore contribute to the health of society. Research suggests that there is value to be found in social participation in shared green spaces. Nature settings allow for different types of social interactions through activities like recreation and picnicking - activities that strengthen social bonding. Evidence therefore clearly suggests that contact with nature is important for well-being.[72]

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[68] Coleman, D. & Iso-Ahola, S. 2001. "Leisure and health: The role of social support and self-determination." *Journal of Leisure Research,* Volume 25, No. 2.

[69] Tarrant, M. 1996. "Attending to past outdoor recreation experiences: Symptom reporting and changes in affect." *Journal of Leisure Research*, *28*(1).

[70] Rohde, C. & Kendle, A. 1994. "Report to English nature-human wellbeing, natural landscapes and wildlife in urban areas: A Review." Department of Horticulture and Landscape and the Research Institute for the Care of the Elderly, Bath: University of Reading, UK.

[71] Palace Road Nature Garden. 2011. "The relationship between nature and human health and well-being in urban areas." Notes on the Royal Commission on Environmental Pollution Study on Urban Environments, Well-being and Health, as found in https://www.facebook.com/notes/palace-road-nature-garden/the-relationship-between-nature-and-human-health-and-well-being-in-urban-areas/158334140891119, March 16, 2011.

[72] Tabbush, P. & O'Brien, E. 2003. "Health and well-being: Trees, woodlands and natural spaces." Forestry Commission, Edinburgh.

Studies have shown that the more webs of human relationships a neighborhood has, the stronger, safer, and more successful it is. Institutions that promote this kind of community cohesion add value to a neighborhood. This social capital is strengthened by parks by offering opportunities for people of all ages to interact, communicate, compete, learn, and grow. [73] The acts of improving, renewing, or even saving a park can build extraordinary levels of social capital. This is particularly true in a neighborhood suffering from alienation partially due to the lack of safe public spaces.

City parks make inner-city neighborhoods more livable. They offer opportunities for recreation and exercise to at-risk and low-income children, youth, and families who might not be able to afford them elsewhere. They also provide places in low-income neighborhoods where people can experience a sense of community. Research shows that residents of neighborhoods with greenery in common spaces are more likely to enjoy stronger social ties than those who live surrounded by barren concrete.[74]

Park and recreation opportunities are essential for strengthening and maintaining a healthy community. Positive impacts are evident throughout the community. Recreation brings neighbors together, encourages safer, cleaner neighborhoods and creates a livelier community atmosphere. Parks and recreational facilities also help improve a community's image, socioeconomic status and enhance the area's desirability. When people move they seek a desirable community. When they retire they also look for a community that will accommodate their special needs. Residents recognize the numerous benefits that well maintained open spaces and recreation facilities can have for a community.[75]

9.9.1 Crime Reduction

Access to public parks and recreational facilities has been strongly linked to reductions in crime and in particular to reduced juvenile delinquency. Recreational facilities keep at-risk youth off the streets, give them a safe environment to interact with their peers, and fill up time within which they could otherwise get into trouble.

Research supports the widely held belief that community involvement in neighborhood parks is correlated with lower levels of crime. The Project on Human Development in Chicago Neighborhoods studied the impact of "collective efficacy," which it defined as "cohesion among neighborhood residents combined with shared expectations for informal social control of public space." The study found that "in neighborhoods where collective efficacy was strong, rates of violence were low, regardless of socio-demographic composition and the amount of disorder

[73] Harnik, P. & Welle, B. 2009. "Measuring the economic value of a city park system." The Trust for Public Land.

[74] Gies, E. 2006. "The health benefits of parks - how parks help keep Americans and their Communities fit and healthy." The Trust for Public Land.

[75] California State Parks. 2005. "The Health and Social Benefits of Recreation." California State Parks. Planning Division.

observed. Collective efficacy also appears to deter disorder: Where it was strong, observed levels of physical and social disorder were low."[76]

These benefits may be abstract, but they lead to concrete community improvements such as fewer homicides and other violent crime; fewer property crimes, including graffiti; reduced juvenile delinquency; higher educational achievement; lower rates of asthma and teen pregnancy; and better response to the community's needs by central governments because they see a united front.[77]

Residents who live near outdoor greenery are more familiar with their nearby neighbors, socialize more with them, and expressed greater feelings of community and safety than did residents lacking nearby green spaces.[78]

Well-maintained parks and recreation facilities help reduce crime in a community. The presence of park users in and around the facilities is an excellent deterrent. Low crime rates increase property values and help residents feel secure.

9.9.2 Support of Youths and Seniors

Play is the foundation for children's healthy development. The benefits of outdoor play are maximized when developmentally appropriate equipment and materials provided.[79] Preschool students exposed to a structured intervention program of a physical education demonstrated significantly higher improvement in fundamental locomotion and object control skills than preschool students who were only allowed to have unstructured physical play with limited equipment.[80] Participation in sports and physical activities is positively associated with psychological maturity and identity development for young women.[81] Environments that are nurturing where youth can have a sense of achievement and recognition as well as opportunities for creative expression, physical activity, and social interaction provides the best settings for them to achieve the five development competencies needed to be successful as adults.[82]

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[76] Gies, E. 2006. "The health benefits of parks - how parks help keep Americans and their Communities fit and healthy." The Trust for Public Land.

[77] Sherer, Paul. 2004. "Park power land & people." The Trust for Public Land. http://www.tpl.org.

[78] American Planning Association. 2003. "How cities use parks to improve public health, help children learn, create safer neighborhoods." City Parks Forum Briefing Papers.

[79] Sawyers, Janet K. 1994. "The Preschool Playground." *The Journal of Physical Education, Recreation & Dance*. *65*(6). p.32-33. August, 1994.

[80] Ishee, Jimmy H. 2003. "The Influence of Motor Skill Interventions on Disadvantaged Children." *The Journal of Physical Education, Recreation & Dance*. *74*(8), p.14. October, 2003.

[81] Shaw, Susan; Klieber, Douglas A.; Caldwell, Linda L. 2001. "Leisure and Identity Formation in Male and Female Adolescents: A Preliminary Examination." *Journal of Leisure Research*, *27*(3), 245- 263,

[82] Hudson, Susan D. 1997 "Helping Youth Grow." *The Journal of Physical Education, Recreation & Dance*, *68*(9). pp.16-17. Nov/Dec, 1997.

For seniors, recreation can enhance active living, helping limit the onset of disease and impairment normally associated with the aging process. Physical activity help the aging population lead independent and satisfied lives helping them remain mobile, flexible and maintaining their cognitive abilities.[83] Recreation activities provide socialization opportunities and help keep seniors active in the community.

Seniors who live alone are often cut off from the community mainstream, losing their purpose for being and retreating into their homes, thus increasing their health risks. It is generally accepted that the risk of depression increases with age.[84] Seniors involved in recreation programs have reduced feelings of alienation and loneliness and increased intergenerational understanding.[85]

9.9.3 Environmental Health

As referenced by Paul Sherer,[86] the U.S. Forest Service calculated that over a 50-year lifetime, one tree generates $31,250 worth of oxygen, provides $62,000 worth of air pollution control, recycles $37,500 worth of water, and controls $31,250 worth of soil erosion. Further, the research scientists of the Pacific Southwest Research Station of the U.S. Department of Agriculture using the i-Tree Streets program estimate a large tree will provide $3,270 in environmental and other benefits over its lifetime.[87] These researchers also report that 100 large trees will each year remove 7 tons of carbon dioxide, 328 pounds of other air pollutants, and catch 212,000 gallons of rainwater.[88] In addition, they suggest that tree-filled neighborhoods report lower levels of domestic violence, are safer and more sociable, reduce stress of body and mind, and decrease the need for medication, and speed recovery times.[89]

The U.S. Forest Service also completed a relevant study of Los Angeles' existing tree canopy cover for the Million Trees LA Initiative.[90] That study identified locations for additional tree planting and quantified benefits for additional trees. The study found average annual benefits monetized at $38 and $56 per tree planted, depending on tree mortality assumptions. Eighty-one percent of total benefits were aesthetic/other, eight percent were stormwater runoff reduction, six

[83] State of California Resources Agency. 2005. "The Health and Social Benefits of Recreation-An Element of the California Outdoor Recreation Planning Program." California State Parks Planning Division.

[84] Chodzko-Zajko, W.J. 1998. "Physical activity and aging: Implications for health and quality of life in older persons." *President's Council on Physical Fitness and Sport Research Digest, 3*(4).

[85] State of California Resources Agency. 2005. "The Health and Social Benefits of Recreation-An Element of the California Outdoor Recreation Planning Program." California State Parks Planning Division.

[86] Sherer, Paul M. 2006. "The Benefits of Parks: Why America Needs More City Parks and Open Space." The Trust for Public Land. Reprint of "Parks for People" white paper, published in 2003.

[87] U.S. Department of Agriculture. 2011. "Trees pay us back–in the Southern California Coast Region." May, 2011.

[88] Ibid.

[89] Ibid.

[90] McPherson, E. Gregory; Simpson, James R.; Xiao, Qingfu; Wu, Chunxia.2008. "Los Angeles 1-Million Tree Canopy Cover Assessment." Gen. Tech. Rep. PSW-GTR-207. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 52 p.

percent energy savings, four percent air quality improvement, and less than one percent atmospheric carbon reduction.

For comparison purposes herein, the assumptions and values from the "Los Angeles 1-Million Tree Canopy Cover Assessment"[91] were applied to the number of potential trees to be planted per alternative. Areas of higher residential densities, commercial, and industrial areas generally have fewer trees and a higher value per tree planted. Therefore, the benefit of $56/tree is used. Table 9-5 includes the annual benefits of trees per alternative.

Table 9-5 Estimated Annual Benefits of Trees per Alternative

	Alt 10-ART	Alt 13-ACE	Alt 16A-AND	Alt 20A-RIVER
Valley Foothills Riparian (acres)	251	273	270	288
Trees/Acre	300	300	300	300
Annual Benefit per Tree	$56	$56	$56	$56
Total Annual Benefit	$4,216,800	$4,586,400	$4,536,000	$4,838,400

9.9.4 Parks and Housing Values

The real estate market consistently demonstrates that many people are willing to pay a larger amount for property located close to parks and open space areas than for a home that does not offer this amenity. The higher value of these residences means that their owners pay higher property taxes. In effect, this represents a "capitalization" of park land into increased property values of proximate land owners.[92] Indeed, parks, greenery, and vegetation in general are typically found associated with higher property values. The researchers from the previous U.S. Forest Study [93] indicate that each large front yard tree adds one percent to the sales price of a house, and large specimen trees can add 10 percent to a property's value. Findings of this type help support the economic development benefits of property located near parkland and trees, and the value placed by society on vegetation, as discussed in the RED section of this appendix.

Repeated studies over the years have confirmed that people prefer to buy homes close to parks, open space, and greenery. One key study looked at the effect of proximity to greenbelts in Boulder, Colorado. The study showed that, other things being equal, there was a $4.20 decrease in the price of residential property for every foot one moved away from the greenbelt, and that the average value of homes next to the greenbelt was 32 percent higher than those 3,200 feet away. A University of Southern California study found that the positive relationship between park proximity and property value holds true in neighborhoods where the residents are mostly immigrants and poor. In a dense urban neighborhood, the value effect of nearby green space can be stronger than lot size itself. The study found that an 11 percent increase in the amount of

[91] Ibid.

[92] Crompton, J. 2004. "The proximate principle: The impact of parks, open space and water features on residential property values and the property tax base." National Recreation and Park Association

[93] McPherson, E. Gregory; Simpson, James R.; Xiao, Qingfu; Wu, Chunxia.2008. "Los Angeles 1-Million Tree Canopy Cover Assessment." Gen. Tech. Rep. PSW-GTR-207. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 52 p.

green space within a radius of 200 to 500 feet from a house leads to an approximate increase of 1.5 percent in the expected sales price of the house, or an additional $3,440 in the median price.[94]

In a 2001 survey conducted for the National Association of Realtors by Public Opinion Strategies, 50 percent of respondents said they would be willing to pay 10 percent more for a house located near a park or other protected open space. In the same survey, 57 percent of respondents said that if they were in the market to buy a new home, they would be more likely to select one neighborhood over another if it was close to parks and open space.[95]

Most people are willing to pay more for a home close to a nice park. Economists call this phenomenon "hedonic value." Hedonic value is affected primarily by two factors: distance from the park and the quality of the park itself. While proximate value can be measured up to 2,000 feet from a large park, most of the value is within the first 500 feet. Moreover, people's desire to live near a park depends on characteristics of the park. Beautiful natural resource parks with great trees, trails, meadows, and gardens are markedly valuable. Other parks with excellent recreational facilities are also desirable. Less attractive or poorly maintained parks are only marginally valuable. Parks with frightening or dangerous aspects can reduce nearby property values.[96] The preponderance of studies has revealed that excellent parks may add 15 percent to the value of a proximate dwelling; on the other hand, problematic parks may subtract 5 percent of home value.[97]

9.9.5 Proposed Alternatives and Community Well-being

The discussion in Section 9.9 suggests that the restoration measures and associated recreational facilities as proposed under Alternatives 10, 13, 16, and 20 would have beneficial impacts to community well-being in the following manner:

- Reduction in short term stress and promotion of long term well-being and restorative psychological effects
- Improvements in community social interactions and community health
- Reduction in crime correlated with increased opportunities for youth to participate in recreation activities and increased community involvement and strength
- Support of youth development and senior citizen health
- Increases in housing values

[94] Sherer, Paul M. 2006. "The Benefits of Parks: Why America Needs More City Parks and Open Space." The Trust for Public Land. Reprint of "Parks for People" white paper, published in 2003.

[95] *National Association of Realtors*. 2001, (Press release). "NAR survey shows public support for open space depends on use and cost" April, 2001.

[96] Harnik, P. & Welle, B. 2009. "Measuring the economic value of a city park system." The Trust for Public Land.

[97] Ibid.

Restoration measures would include the restoration of riparian, in-channel, and overbank wetland habitat, the greening of impervious surfaces throughout all eight reaches of the project area, and associated recreational trails and paths. Recreation measures would provide open space, trails, linkage to neighborhood parks, parking, and access to the River. Because Alternatives 10, 13, 16, and 20 vary in implementation area and proposed features, as shown in Table 6-7 and Table 9-4, alternatives would have similar but scaled qualitative benefits, respectively, in increasing community well-being throughout the project area.

10. REFERENCES

City of Burbank. 2010. City of Burbank: Keep Pace With Technology. Fact Sheet. Accessed August 2012 at http://www.ci.burbank.ca.us/Modules/ShowDocument.aspx?documentid=9636

City of Glendale. 2012. Glendale Quality of Life Indicators: 9.2 Developed Parkland. Accessed August 2012 at http://www.ci.glendale.ca.us/planning/qol/indicators09/9_parks_open_space/developed_parkland.asp

City of Los Angeles. 2007a. Los Angeles River Revitalization Master Plan. Prepared by the City of Los Angeles, Department of Public Works, Bureau of Engineering, River Project Office. May, 2007.

———. 2007b. Programmatic Environmental Impact Report/Environmental Impact Statement for the Los Angeles River Revitalization Master Plan. Prepared by The City of Los Angeles, Department of Public Works, Bureau of Engineering and the U.S. Army Corps of Engineers, Los Angeles District, Planning Division, with technical assistance from Tetra Tech, Inc.

———. 2009. Housing Element of the General Plan, 2006 – 2014. Los Angeles Department of City Planning. Council File No. 08-1933 and No. 08-1933-S1. Internet website: http://cityplanning.lacity.org/HousingInitiatives/HousingElement/Final/HE_Final.pdf

García, R., A. Rawson, M. Yellott, and C. Zaldaña. 2009 Healthy Parks, Schools and Communities for All: Park Development and Community Revitalization. Policy Report for The City Project. Accessed September 2012 at http://www.cityprojectca.org/publications/documents/PolicyReportHealthyParksSchoolsCommunitiesforAllAB31.pdf

GreenInfo Network. 2010. Park Poor, Income Poor, and People of Color. Figure presented by the City Project, Los Angeles, CA. Accessed September 2012 at http://www.mapsportal.org/thecityproject/socalmap/LosAngelesCounty.html#

Los Angeles County Economic Development Corporation (LAEDC). 2012. LAEDC 2012-2013 Economic Forecast and Industry Outlook. February 2012. Accessed December 2012 at http://laedc.org/economic-research-analysis/laedc-reports/

Los Angeles County Metropolitan Transit Authority (Metro). 2012. Bike Metro: Cyclists' Guide: Metro Bike Map. Accessed August 2012 at http://www.metro.net/riding_metro/bikes/images/la_bike_map.pdf

Los Angeles River Revitalization Corporation (LARRC). 2011a. Los Angeles River Guide: Fishing. Accessed August 2012 at http://thelariver.com/guide/

———. 2011b. LA River Guide: Walking: Access and Cautions. Accessed August 2012 at http://thelariver.com/guide/walks/access-and-cautions/

———. 2011c. Los Angeles River Guide: Walks. Accessed August 2012 at http://thelariver.com/guide/walks/

———. 2011d. In the Works: A description of projects that are funded and under active development. Accessed September 2012 at http://larivercorp.org/

Public Policy Institute of California. 2000. PPIC Statewide Survey: Special Survey on Californians and the Environment. PPIC in collaboration with The David and Lucile Packard Foundation. June 2000. Accessed July 2012 at http://www.ppic.org/main/allpubs.asp

Santa Monica Mountains Conservancy (SMMC) and) Mountains Recreation Conservation Authority (MRCA). 2007. Your Parks. Accessed August 2012 at http://www.lamountains.com/parks.asp?parkid=20

Southern California Association of Governments (SCAG). 2008. Regional Comprehensive Plan.

Trust for Public Land. 2011. 2011 City Park Facts: Report #1 – Acres of Parkland by City and Agency. Published by the Center for City Park Excellence, The Trust for Public Land. Accessed August 2012 at http://cloud.tpl.org/pubs/ccpe-city-park-facts-2011.pdf

U.S. Census Bureau. 2010. Profile of General Population and Housing Characteristics: 2010. Accessed December 2012 at http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk

———. 2010a. 2005 – 2009 American Community Survey. Census Tract Data. Accessed July 2012 at http://www.factfinder2.census.gov

———. 2010b. 2010 American Community Survey. 1-Yr Estimates. Accessed July 2012 at http://www.factfinder2.census.gov

———. 2011. 2010 Census Data by County, Form SF1. Accessed July 2012 at http://www.factfinder2.census.gov

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Los Angeles River Ecosystem Restoration
Integrated Feasibility Study
Los Angeles County, California

Recreation Analysis

August 2013

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Attachments

1. USACE Unit Day Value Guidance (EGM 13-03)

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1 INTRODUCTION

1.1 RECREATION STUDY AREA

This is the Recreation Analysis report for the Los Angeles River Ecosystem Restoration Feasibility Study Integrated Feasibility Report (IFR). For this analysis, the recreation resource area is the same as the IFR area—defined as being approximately one-half mile buffer on either side of the Los Angeles River (approximately 11 square miles), also known as the ARBOR or Area with Restoration Benefits and Opportunities for Revitalization. The focus is on those recreation resources connected to or otherwise affected by the River. The inventory of larger regional parks and other resources that exist outside this area are beyond the geographic scope of the recreation plan benefit analysis, but are presented below to provide an overview of the regional recreation context along the ARBOR reach.

1.1.1 CURRENT RECREATION USES

Plates 1 through 3 provide an overview of the recreation context along the ARBOR reach. Approved recreation uses of the River in the study area are limited to pedestrian, cyclist, and equestrian trails along the banks. Some areas of the River's watershed have recently been permitted for seasonal fishing or canoeing/kayaking (Sepulveda Basin and a portion of the ARBOR reach—from Fletcher Drive to Barclay Street in Elysian Valley), these uses are not approved in the rest of the study area, where it is illegal to walk in the channel below the established bike and pedestrian paths. Even in those places users are not often admonished or given citations by the authorities, and unapproved uses do occur, mostly in the soft-bed areas of the River (Los Angeles 2011a). Other activities along the River include bird watching, sightseeing, impromptu performances, small-scale art exhibitions, and tours by local interest groups. There are no areas approved for swimming in the study area, and instances of swimming and wading are likely low due to water quality concerns; local agencies and interest groups typically advise users to stay out of the water (Los Angeles River Revitalization Corporation [LARRC] 2011b). The Los Angeles River Pilot Recreation Zone was opened from Memorial Day in May to Labor Day in September 2013 in the 2.5-mile portion of the River in Elysian Valley, described above. The recreation zone included the river channel and five feet of adjacent riverbank. The public was allowed to walk, fish, and kayak in this zone during the period.

Small parks along the River's pathways provide an improved pedestrian recreational experience with facilities, such as benches, native habitat, open space areas, interpretive signage, art installations, and some play areas. These parks have been implemented by the city and a combination of other organizations, including local non-profit groups and the State of California—seeking to develop a greenway along the River (Santa Monica Mountains Conservancy and Mountains Recreation Conservation Authority 2007). The Los Angeles River Greenway is a priority of the County of Los Angeles as expressed in its 1996 Los Angeles River Master Plan, the City of Los Angeles via its 2007 Los Angeles River Revitalization Master Plan, the 2012 and 2010 Bicycle Plans of both agencies, respectively, and the Los Angeles River Revitalization Corporation via its "Greenway 2020" campaign initiated in 2013.

The Los Angeles River Bike Path is a Class I Bike Path (off-roadway, paved), and runs along the right bank (facing downstream) of the River from Griffith Park through the Glendale Narrows to Elysian Park (begins in Reach 2 and ends in Reach 7), offering an off-roadway route for pedestrians and cyclists. That portion of the Los Angeles River Bike Path was included in the National Recreational Trail System by the U.S. Department of the Interior in 2012. The existing and future trails on both sides of the River

throughout the study area also coincide with the National Park Service's Juan Bautista de Anza National Historic Trail. Another route between Griffith Park and Elysian Park relies on a combination of bike lanes and bike routes (on-roadway) but does not follow the River, making it a Class III Route, less appropriate for recreation and more of a transportation route. Both of these routes are managed by the Los Angeles County Metropolitan Transportation Authority (Metro), and are included in the City of Los Angeles Bicycle Plan (Metro 2012d).

1.1.2 Existing Trails, Pathways, and Access Roads

The study area contains a mixture of trails, pathways, and access roads which may see some degree of recreation use in the existing condition. Existing trails along the river or those affected by the recreation plan were quantified and categorized via analysis of aerial photographs and available data in geographic information systems (GIS). Plates 4 through 10 summarize the existing features while noting how they will be affected by the proposed recreation plan.

1.1.3 Recreation Supply and Demand

The City of Los Angeles has approximately 24,000 acres of parks, with approximately 16,000 acres of parkland under the jurisdiction of the Department of Recreation and Parks (RAP). Other agencies managing parklands include the Los Angeles Department of Water and Power (LADWP), the Mountains Recreation and Conservation Authority (MRCA), the Santa Monica Mountains Conservancy (SMMC), California State Parks, the Los Angeles County Department of Parks and Recreation (LACDPR) and the Los Angeles County Flood Control District (LACFCD). In all, this equates to a Citywide average of 6.26 acres of park per 1,000 residents (Trust for Public Land 2011). The City of Glendale has 39 developed parks comprising 280 acres, or about 1.4 acres per 1,000 residents (City of Glendale 2012). The City of Burbank operates 27 park facilities covering 155 acres, as well as 500 acres of open space, equating to approximately 6.34 acres of parkland per 1,000 residents (City of Burbank 2010). Including all parks identified in the ARBOR reach presented below, the recreation resource area has an estimated 5,000 acres of parkland, or 38.77 acres per 1,000 residents. This value is high compared to the Citywide average due to the presence of some larger-than-average parks near the study area, such as Griffith Park (the largest park at 4,210 acres) and Elysian Park (575 acres). However, access to these large open space areas has been historically-restricted due to many factors, including infrastructural barriers, such as freeways, streets, rail lines, and prohibited public circulation in/around the River.

Even given the presence of large open spaces like Griffith Park, much of Los Angeles is considered to be park deficient because of distribution and access; this condition is defined as any geographic area that provides less than three acres of green space per 1,000 residents, as prescribed by California law (Green Info Network 2010). In particular, the industrial areas surrounding reaches 7-8 (from the I-5 overpass to Main Street) have the least parkland, with fewer than 3 acres per 1,000 people. Other areas, particularly on the southwest side of Reaches 1-3 (from Pollywog Park to Brazil Street), have greater than 3 acres of parkland per 1,000 residents, which is due to the presence of Griffith Park. In general, access to parks and acres of parkland per 1,000 residents is lowest in areas that have the highest number of families below the poverty line of $47,331 annual income.

According to the Southern California Association of Governments (SCAG), public parks are intended to serve all residents, but not all neighborhoods and people have equal access to these public resources. SCAG calls for a multiagency effort and public transportation to improve access for all to parks throughout Southern California (SCAG 2008). The City Project has been working toward finding

resolutions to improve park availability for all neighborhoods, regardless of ethnicity or income level (Garcia et al. 2009).

Residents of Los Angeles place a high priority on the quality of natural and environmental resources. In a study from 2000, 75 percent of those surveyed said that preserving wetlands, rivers, and environmentally sensitive areas would be either “somewhat effective” or “very effective” at improving their quality of life. There is also strong support for protecting cultural resources and for environmental education (Public Policy Institute of California 2000). A notable move forward for public recreation was the California Legislature’s passage of Senate Bill 1201 (authored by Senator Kevin De León and signed by Governor Jerry Brown) in 2012, which calls for expanded public access to the River for recreational purposes.

1.2 Recreation Plan Context within Restoration Plan

The recreation plan was formulated cooperatively by USACE and the non-Federal sponsor. The USACE generated GIS shapefiles outlining the basic features of the recreation plan and provided those files for use in development of the recreation plan cost estimate (discussed further in Section 4.1).

The recreation plan features are integrated into the ecosystem restoration plan; however, these features are evaluated as separable components of the plan. The features of the recreation plan are designed to capitalize on the areas where substantial ecosystem restoration is proposed. As such, it is assumed that the ecosystem restoration will have taken place when considering the effects of the recreation plan features. For example, the proposed wildlife viewpoints in the recreation plan are dependent upon the ecosystem restoration plan providing the restored area. In this way, the success of the recreation plan is linked to, and affected by, the selected ecosystem restoration plan. For the purposes of this analysis, it was assumed that ecosystem restoration Alternative 13 will be the recommended plan. Alternative 13 was deemed appropriate as it encompasses largely the same geographic area as all of the final alternatives and allows for a full range of recreation resources to be developed that would remain compatible and representative of the recreation plan goals if another ecosystem restoration alternative were selected.

Additionally, all ecosystem restoration plans which call for modification of the channel banks implicitly require that existing top-of-levee access and maintenance roads be replaced to some degree. Per discussion with the study team, it is assumed that the ecosystem restoration plan will include in its design the designation of these top-of-levee or equivalent access roads as multiple-use pathways that may be used for various general recreation activities by the public. It is beyond the scope of this recreation plan analysis to quantify the recreation benefits that these multi-use access roads would provide, as their exact location, length, and type will be determined in future phases of the ecosystem restoration plan design, but their inclusion would be key to providing full connectivity of recreation trails, on both sides of the river, throughout the ARBOR reach. No costs or direct benefits for these access roads associated with the ecosystem restoration plan are included in the recreation cost estimate or recreation benefit calculation.

1.3 Proposed Recreation Features

The objective of the recreation plan is to maintain and improve the quality and quantity of recreation amenities that complement the ecosystem restoration in the ARBOR reach, especially in regard to

promoting access and connectivity between both banks of the river and throughout the length of the ARBOR reach. The recreation features will be designed to avoid any negative impacts to the restoration areas.

The recreation plan includes the modification, upgrade, or creation of multi-use trails and related basic amenities (access points, wildlife viewpoints, parking lots, restrooms, signage). The plan also includes non-motorized multi-use bridges across tributaries or within large restored areas. Specifically, the plan calls for:

- 4.04 miles of new unpaved non-motorized multi-use trail *(to include decomposed granite surface and trail signage)*
- 1 smaller bridge/crossing within Taylor Yard *(approximately 150 feet long)*
- 1 medium bridge spanning Arroyo Seco *(approximately 250 feet long)*
- 1 medium bridge spanning the restoration area in Piggyback Yard *(approximately 250 feet long)*
- 2 paved parking lots, one at Taylor Yard and one at Piggyback Yard *(each about 15,000 square feet)*
- 3 restrooms, one at Bette Davis Park, one at Taylor Yard, and one at Piggyback Yard
- 1 pedestrian tunnel beneath the railroad track on the east side of Taylor Yard
- 19 trail access points throughout the study area *(access points would include grading and planting, signage, stairs, benches, gating, and trash receptacles to provide quality trail access)*
- 5 wildlife viewing points throughout the study area *(viewpoints would include an elevated wood deck with railing, benches, interpretive signage, and trash receptacles to allow users to enjoy high quality viewsheds within the restored ARBOR reach)*

Plates 4 through 10 display these features. Table 1, below, summarizes the three proposed bridges. Table 2, below, summarizes the proposed changes in trails. As shown in the table, the plan would result in 7% of existing trails being upgraded, and a 36% increase in total accessible trails and multi-use paths along the river (when including multi-use paths created by the ecosystem restoration plan).

Table 1. Proposed Bridges

ID	Length (ft)	Location	Description
1	150	R6; in Taylor Yard	elevated crossing of railroad tracks to provide access to/from Taylor Yard for pedestrians at the southwest corner of the Fed Ex property
2	250	R7; Arroyo Seco	spans Arroyo Seco just before confluence with LA River to connect the downstream side of the Arroyo Seco confluence to an existing bridge across the LA River and the trails being added just upstream on the opposite bank
3	250	R8; Piggyback Yard	medium pedestrian bridge over restoration area within Piggyback Yard
Note: See Appendix C – Cost Appendix for detailed backup of the Recreation Plan costs summarized in Section 4.1.			

As shown in Table 2 below, 20.61 miles of existing trail would not be modified by the recreation plan. However, there would be 1.95 miles of existing length that would be upgraded to a fully-developed multi-use trail. There would also be 4.04 miles of new trail added in the study area, and 5.23 miles of newly accessible multi-use pathway created by the ecosystem restoration plan. At the current level of design, trails are assumed to be multiple-use, twelve feet wide, using a decomposed granite surface.

Table 2. Proposed Trail Changes

Trail Type	***Miles***	***% of Total With Project Miles***
Existing Trail	20.61	69%
Upgraded road/Trail by Recreation Plan *	1.95	7%

New Trail	4.04	14%
Multi-Use Pathway created by Restoration Plan	5.23	25%
TOTAL	**29.88**	100%
** Upgraded trail does not contribute to the sum of total miles or % of total miles*		

1.3.1 BENEFITS OF THE RECREATION PLAN

The proposed recreation features would provide both direct and indirect benefits to recreation participants as well as the communities surrounding the ARBOR reach. Direct benefits of the recreation plan would include:

- Improved quality and quantity of trails for multiple user groups along the river
- Increased connectivity of each side of the river's recreation resources
- Increased public safety through better signage and trail development along the river
- Improved viewing and lines of sight along the river, especially in areas of substantial restoration via the ecosystem restoration plan
- Opportunity for interpretive signage and environmental education
- Improved public health by providing opportunities for exercise and psychological respite

In addition to these direct benefits, communities along the ARBOR reach will receive benefits in the form of increased quantity and quality of neighborhood parks. As discussed in the main report, parks provide OSE benefits to communities they serve. The addition of trails and amenities in the restored Piggyback Yard will benefit the surrounding historically-underserved communities along the downstream end of the ARBOR reach, providing substantial open space in highly-developed neighborhoods which are currently considered park-deficient. The recreation plan will also help support the projected RED benefits related to redevelopment in the study area.

This recreation analysis will evaluate the net benefits of the proposed recreation features relative to the No Action alternative to assess whether the recreation features are economically justified.

2 UNIT DAY VALUE ANALYSIS

The benefits of recreation features are measured through approximation of visitors' willingness to pay for the recreation resource. Willingness-to-pay is assumed to represent the economic value, in dollars, that a visitor places on a recreation resource. Measuring the economic value of the recreation resource without a project and comparing it to the value of the project in place, allows the calculation of net recreation benefits resulting from construction of the recreation alternative.

The appropriate valuation methodology was selected based on the guidelines in Appendix E, ER 1105-2-100 Planning Guidance Notebook, dated 22 April 2000. For this study, recreation is incidental to the primary ecosystem restoration purpose; there is no regional model available; the project is not creating specialized recreation activities as defined in the ER; projected increase in visitation is well below the 750,000 threshold requiring more rigorous approaches; and the increase in Federal costs for adding recreation purpose is well below the 10% limit. As such, the Unit Day Value (UDV) method was selected as the appropriate valuation method.

When applying the Unit Day Value methodology, two categories of outdoor recreation visits, general and specialized, may be differentiated for evaluation purposes. "General" refers to a recreation visit involving primarily those activities that are attractive to the majority of outdoor users and that generally require the development and maintenance of convenient access and adequate facilities. "Specialized"

refers to a recreation visit involving those activities for which opportunities in general are limited, intensity of use is low, and a high degree of skill, knowledge, and appreciation of the activity by the user may often be involved (USACE, Economic Guidance Memorandum 13-03, Unit Day Values for Recreation, Fiscal Year 2013). All of the activities at the project site, with and without project, were assumed to fall into the general recreation category.

The unit day value (UDV) method for estimating recreation benefits relies on expert or informed opinion and judgment to approximate the average willingness to pay of users of Federal or Federally assisted recreation resources. By applying a unit day value per visitor, an approximation of project recreation benefits is obtained.

The UDV process includes scoring of the project site using five guidance-defined criteria to yield a point score for the groups of recreation activities at the site. The point score is converted to dollars per visit using tables provided in the UDV guidance (updated annually). The final dollars-per-visit value is the UDV. The UDV is then multiplied by the number of annual visitors to generate an estimate of the annual recreation value at the site. This annual value is then projected over the 50 year period of analysis based on visitation projections for the study area.

This method of annual recreation value estimate is completed twice. First, a valuation is completed for the without project condition. Second, a valuation is completed for the with project alternative. The difference between the two estimates is the net recreation benefit attributable to the proposed recreation features. This net benefit is then compared to the cost of the recreation features to generate a benefit to cost ratio. The following sections describe the development of visitation estimates and UDV scores.

2.1 Visitation Estimate via Trails

Trail visitation was only counted for recreation tied to or in close proximity to the River. For example, use of trails in off-river areas of Griffith Park are not likely to be directly relevant to the proposed recreation plan.

Visitation estimates were developed for the without- and with-project conditions. No official, comparable visitor count data were readily available by activity. Inquiries were made with contacts at the Audubon Society, the LA River Equestrian Center, and the Los Angeles Department of Recreation and Parks. The contacts indicated that, while the assumed types of recreation were consistent with their knowledge of the study area, no specific trail counts or total user counts were available for the study area, and that those counts would require a separate data collection effort, determined to be beyond project budget and schedule constraints. The study team identified that following methodology for estimating baseline project visitation.

General trail use was estimated based on published design standards for urban trails in the “Recreation Park and Open Space Standards and Guidelines,” by the National Recreation and Parks Association (NRPA 1983). It cites a standard for urban trail use at 90 users per day per mile of trail. This base value was adjusted for weekday/weekend and seasonality, and then applied to a GIS-based estimate of the length of trails in the existing and with-project conditions. Existing trails include trail segments provided by the Local Sponsor in GIS as well as additional areas of trail identified via aerial photographs in GIS. Seasonality weekday/weekend adjustments were based on professional judgment and familiarity with the ARBOR reach. Because inclement weather, which would prevent trail use, is rare in the study area, weekday/weekend use was estimated to have a stronger effect than the season.

As shown in Plates 4 through 10, in order to limit the visitation estimate to those users affected by the River, only trails adjacent to the River or affected directly by proposed recreation plan features were included in the evaluation.

It was qualitatively estimated that the with project condition would experience a higher volume of visitation because of the added amenities of the recreation plan, including the increased access points, parking, restrooms, and connectivity of existing trails in the ARBOR reach. In order to estimate this increase consistent with the methodology in the without project condition, the increase in with project condition was estimated as a function of the additional miles of trail that would be added via the recreation plan and the ecosystem restoration plan. As such, the visitation estimates for the without and with project conditions are summarized in Tables 3 and 4, below. It was noted that some portion of the with project visitation may be a transfer from other regional recreation areas, but due to lack of area-specific visitation data, there was no basis for quantifying transfers. Qualitatively, the team expects that transfer will not be substantial. For example, new visitors may be residents of the communities around the ARBOR reach which are currently underserved by community parks.

As shown in the tables below, annual visitation for the with project condition was estimated to be 45% higher than in the without project condition, equivalent to the expected increase in accessible trails with the recreation plan and ecosystem restoration features. No estimate of visitation growth from general population growth was included, as this was judged to be a relatively minor effect compared to the increase already described. Based on this methodology, annual visitation is held constant throughout the period of analysis in the with and without project conditions.

Table 3. Without Project Visitation

Season	*Miles*	*User/Mile*	*Users/Day*	*Days*	*Subtotal Users*
Summer Weekend	20.61	80	1,649.02	26	42,875
Summer Weekday	20.61	65	1,339.83	65	87,089
Fall Weekend	20.61	70	1,442.90	26	37,515
Fall Weekday	20.61	55	1,133.70	65	73,691
Winter Weekend	20.61	70	1,442.90	26	37,515
Winter Weekday	20.61	55	1,133.70	65	73,691
Spring Weekend	20.61	70	1,442.90	26	37,515
Spring Weekday	20.61	55	1,133.70	65	73,691
TOTAL ESTIMATED ANNUAL USE					463,582
Average Users/Day					1,274

Table 4. With Project Visitation

Season	*Miles*	*User/Mile*	*Users/Day*	*Days*	*Subtotal Users*
Summer Weekend	29.88	80	2,390.40	26	62,150
Summer Weekday	29.88	65	1,942.20	65	126,243
Fall Weekend	29.88	70	2,091.60	26	54,382
Fall Weekday	29.88	55	1,643.40	65	106,821
Winter Weekend	29.88	70	2,091.60	26	54,382
Winter Weekday	29.88	55	1,643.40	65	106,821
Spring Weekend	29.88	70	2,091.60	26	54,382

Spring Weekday	29.88	55	1,643.40	65	106,821
TOTAL ESTIMATED ANNUAL USE					672,002
Average Users/Day					1,846

2.2 UDV Scoring/Point Assignment

Per USACE guidance, two scores were created, one for the without project condition, and one for the with project condition. The five UDV criteria from the guidance, for which points are assigned, include the following items:

- Recreation Experience: score increases in proportion to the number of available activities at the site
- Availability of Opportunity: score is based on availability of substitute sites; the fewer the sites in the region that offer comparable recreation experience, the higher the score
- Carrying Capacity: score rates level of facilities at the site to support the activities
- Accessibility: score rates ease of access to the site
- Environmental: rates the aesthetic/environmental quality of the recreation site/activities

Scoring was based on the consideration of general recreation activities that would be affected on those trails along the river in the ARBOR reach. This includes some specific activities, such as equestrian, bird watching, and biking, but also includes more general park-related activities, such as walking/jogging, viewing, picnicking, or general use of outdoor park areas along the River.

The table below summarizes the scores assigned. In the sections following the table, the rationale is provided for the point assignments according to the five UDV criteria. Attachment 1 provides a copy of the USACE guidance which contains the scoring rubric.

Table 5. UDV Score Summary

UDV Criteria	General Recreation	
	Without Project	**With Project**
Recreation Experience	13	16
Availability of Opportunity	5	5
Carrying Capacity	5	7
Accessibility	9	12
Environmental	2	8
Total Score	34	48

2.2.1 Recreation Experience

Without Project. In the without project condition, this criteria received a score of 13 out of 30 possible points. The project site currently supports the identified general activities, and in the existing condition is a high quality bird watching location, uniquely situated in an urban environment. Per USACE guidance, a high quality activity is defined as an activity which is not common to the region or Nation, and that are usually of high quality. The ARBOR reach is located upstream of a seven-mile stretch of the LA River designated as an Important Bird Area by the National Audubon Society due to high level of use by migrating shorebirds for feeding from July to October.

With Project. In the with project condition, this criterion received a score of 16 out of 30 possible points. The number and type of activities remain largely the same as in the without project condition. All

activities related to wildlife viewing along the trail will improve substantially in quality by provided designated viewpoints to take advantage of newly restored areas.

Improvement of ecosystem conditions in the ARBOR reach is likely to improve opportunities for bird watching in the ARBOR reach, as well as provide indirect benefits to downstream reaches of the river already included in the Important Bird Area.

Additionally, the restoration of the ARBOR reach may induce participation in additional recreation activities which do not currently exist, or which see very low participation levels. These might include activities such as wildlife viewing, new areas for bird watching, non-motorized boating, environmental education, stewardship training, or even visits to the ARBOR reach specifically to view the ecosystem restoration features.

2.2.2 Availability of Opportunity

The study team noted that the availability of other substitute recreation resources would likely remain the same between the without and with project conditions. Because the same general types of activities would be available to the same user groups, it was determined that, from a regional perspective, the construction of the recreation plan features would not alter the relative availability of substitute sites. Thus, in both the without and with projects, a score of 5 out of 18 possible points was given. This score reflects that there are several substitute locations which would provide similar recreation activities within one hour, including areas of Griffith Park or Elysian Park not adjacent to the river. However, these areas would not be perfect substitutes. For example, residents living adjacent to the ARBOR reach are likely to view the River as a community park, rather than a regional one. Additionally, in the with project condition, the newly restored ARBOR reach may become a destination for tourists, environmental educators, artists, and others looking to take advantage of the River's recreation opportunities that were not previously accessible.

2.2.3 Carrying Capacity

Without Project. This criteria received a score of 5 out of 14 possible points. Because the study area already has recreation features, basic facilities already exist to conduct the identified general recreation activities at the site. There is currently very little connectivity, so it may discourage users from exploring.

With Project. This criteria received a score of 7 out of 14 possible points. This reflects a change from the "basic" to "adequate" category on the rubric. The proposed features would make substantial improvements toward connecting the left and right bank of the river for recreation purposes, add new trails, viewing points, interpretive signage, and provide additional parking and restroom facilities.

2.2.4 Accessibility

Without Project. This criteria received a score of 9 out of 18 possible points. Because the study area is situated in a highly-urbanized area, the existing road network provides fair access to the site, and there are established road networks within park areas as well. However, trail connectivity and access can be improved, as there are few opportunities for users to cross the River, and many trail lengths are not connected.

With Project. This criterion received a score of 12 out of 18 possible points. The additional trails and access points in the proposed recreation plan would substantially increase the connectivity of trail

segments along the River, including connecting the left and right bank for trail users. This would constitute a jump from the “fair” to “good” access rating.

2.2.5 ENVIRONMENTAL

Without Project. This criterion received a score of 2 out of 20 possible points. In its present condition, the ARBOR reach is surrounded by a highly-urbanized areas, with commercial and industrial uses, infrastructure barriers, blight, and likely contamination, which lower the quality of the sites.

With Project. This criterion received a score of 8 out of 20 possible points. The addition of recreation plan features would bump the score into the “above average” range by improving the amenities within the site, as well as through the addition of wildlife viewpoints and bridges which would highlight restored areas rather than adjacent commercial and industrial areas. The presence of the new ecosystem restoration features would also greatly improve the aesthetic quality of the site. While there would remain commercial and industrial activity in close proximity to the recreation resource, the effects of these factors would be relatively minor due to improvements within the site that capitalize on the restoration plan features.

2.3 UNIT DAY VALUE CONVERSION

For the with and without project conditions, the points were converted to a dollar value based on the FY2013 UDV conversion table in EGM 13-03 (USACE 2013). The scores were interpolated linearly as necessary. The table below shows the point conversion table from the guidance and the dollar values generated for general recreation activities.

Table 6. FY2013 UDV Conversion Table

General Recreation			General Recreation Value per Visit ($)	
Point Values	**Values ($)**		**Without Project**	**With Project**
0	3.80		$6.27	$7.88
10	4.51			
20	4.98			
30	5.70			
40	7.12			
50	8.07			
60	8.78			
70	9.26			
80	10.21			
90	10.92			
100	11.39			
USACE CECW-CP EGM 13-03 for FY2013				

3 EXPECTED RECREATION BENEFITS

Using the UDV dollar values per visit and visitation estimates generated in the previous sections, recreation values for the without and with project conditions were calculated. Taking the difference between the with project and the without project, net recreation benefits were estimated. The following table summarizes expected recreation benefits in terms of net present value (NPV) and an amortized annual value. Amortization over the period of analysis uses the FY2013 Federal discount rate

of 3.75% over a 50-year period of analysis. The analysis estimates amortized annual net benefits of $2,389,644.

Table 7. Summary of Recreation Value Calculation

	Without Project	With Project
Average Annual Visitation	463,582	672,002
Value per Visit	$6.27	$7.88
Average Annual Recreation Value	$2,905,732	$5,295,376
Average Annual Net Benefits	**$2,389,644**	
Net Present Value of Benefits	**$53,610,447**	

4 BENEFIT COST ANALYSIS

4.1 CONSTRUCTION COST

Construction costs were developed for the proposed recreation features. Costs are presented in FY2013 price level. As summarized in the table below, the present value total estimated investment cost for the proposed recreation features is $6,190,701, or $275,946 in amortized annual dollars. Operations and maintenance of the recreation plan features adds an additional amortized annual cost of $42,206 or $946,870 in present value dollars. Total present value project cost is estimated at $7,137,571. This cost does not include LERRDs, as there are no LERRDs costs over and above those required for the ecosystem restoration features. As a percentage of the ecosystem restoration plan cost, the recreation plan is approximately 1.6% of the cost. The Cost Appendix (Appendix C) provides more detail on the recreation plan cost estimate, including individual costs and backup components of the recreation plan. The table below shows the derivation of the annual cost, followed by another table showing a summary of the construction cost estimates detailed in Appendix C.

Table 8. Derivation of Costs

Construction First Cost	$6,133,701
IDC (3.75%, 6-months)	$57,000
Investment Cost PV	$6,190,701
Annual Investment Cost	$275,946
Annual O&M	$42,206
Total Annual Cost	**$318,152**
Total NPV	**$7,137,571**

Table 9. Recreation Plan Cost Summary

LOS ANGELES RIVER FEASIBILITY
RECREATION COMPONENTS

Page: 1 of 1
Date: 23-Jul-13

CONSTRUCTION COST SUMMARY PAGE

ITEM #	ITEM DESCRIPTION	UOM	QUANTITY	UNIT COST	CONTINGENCY	TOTAL CONSTRUCTION COST
REC	Recreation Construction Costs					
MOB	Mobilization / Demobilization	LS	1	$ 316,987.12	35.00%	$ 427,933
1	Existing Acces Road to Un-Paved Multi Use Trail	LF	4,317	$ 91.62	35.00%	$ 533,974
2	Trail Improvement	LF	5,955	$ 57.47	35.00%	$ 462,049
3	New Unpaved Trail	LF	31,626	$ 27.25	35.00%	$ 1,163,568
4	Parking Lot 1	SF	13,800	$ 7.06	35.00%	$ 131,490
5	Parking Lot 2	SF	15,625	$ 7.06	35.00%	$ 148,888
6	Restrooms	EA	3	$ 70,000.00	35.00%	$ 283,500
7	Trail Access Point	EA	19	$ 5,000.00	35.00%	$ 128,250
8	Pedestrian Tunnel	LF	50	$ 2,142.22	35.00%	$ 144,600
9	Wildlife Viewpoint	EA	5	$ 11,400.00	35.00%	$ 76,950
10	Bridges	EA	3	$ 650,000.00	35.00%	$ 2,632,500
					Total Construction Cost:	$ 6,133,701

O&M COST SUMMARY PAGE

ITEM #	ITEM DESCRIPTION	UOM	QUANTITY	UNIT COST	CONTINGENCY	ANNUAL O&M COSTS
REC	Recreation Construction Costs					
MOB	Mobilization / Demobilization	YR	1	$ -	35.00%	$ -
1	Existing Acces Road to Un-Paved Multi Use Trail	YR	1	$ 1,077.36	35.00%	$ 1,454
2	Trail Improvement	YR	1	$ 3,191.00	35.00%	$ 4,308
3	New Unpaved Trail	YR	1	$ 8,903.65	35.00%	$ 12,020
4	Parking Lot 1	YR	1	$ 1,043.00	35.00%	$ 1,408
5	Parking Lot 2	YR	1	$ 1,181.00	35.00%	$ 1,594
6	Restrooms	YR	1	$ 3,150.00	35.00%	$ 4,253
7	Trail Access Point	YR	1	$ 674.50	35.00%	$ 911
8	Pedestrian Tunnel	YR	1	$ 1,226.67	35.00%	$ 1,656
9	Wildlife Viewpoint	YR	1	$ 1,066.25	35.00%	$ 1,439
10	Bridges	YR	1	$ 9,750.00	35.00%	$ 13,163
					ANNUAL O&M:	$ 42,206

4.2 Expected Benefit to Cost Ratio

Based on the results of the recreation analysis, recreation benefits would be approximately $2,389,644 amortized annual dollars over the 50-year period of analysis. In this analysis, benefits exceed the cost, which is anticipated to be an amortized annual cost of $318,152. The benefit cost ratio (BCR) is therefore estimated to be 7.51. The benefits exceed the costs for the proposed recreation features, and therefore the recreation features are economically justified.

Table 10. Benefit-to-Cost Ratio by Alternative

Alternative	Annual Benefits ($)	Annual Costs ($)	BCR
No Action	$0	$0	0.00
Proposed Recreation Plan	$2,389,644	$318,152	**7.51**

4.3 Sensitivity Analysis

Visitation

Visitation estimates are typically a source of uncertainty in recreation analyses. Visitation estimates directly affect the benefits of each alternative and the BCR. As discussed in Section 2.1, a key assumption in this analysis was the growth of visitation from the without project to the with project based on additional miles of trails associated with the recreation plan.

The sensitivity analysis calculated the level of reduction in visitation that would be required before the BCR fell to 1:1. In order for the recreation features to have a BCR of 1:1, total visitation over the period of analysis would need to be reduced by 39.1% (results in BCR of 1.00). A 39.1% drop in annual visitation would equate to a new visitation level of 409,249 annual visits. This value is less than the annual visitation for the without project condition (463,582), indicating that even without any growth in recreation visitation with the proposed features in place along a newly restored ARBOR reach, the recreation plan would be economically justified.

Furthermore, visitation is judged to be likely to increase in the with project condition, both in response to the ecosystem restoration and recreation improvements drawing more visitors; therefore, the risk of the BCR falling below 1.0 because of visitation uncertainty is judged to be very low.

UDV Score

Another source of uncertainty in the UDV methodology is the UDV scoring itself. The differential between the without project and the with project UDV scores drives the estimate of net recreation benefits from the proposed features. In this analysis, the without project was scored 34 total points, or $6.27 of recreation value per visit. The with project was scored 48 total points, or $7.88 per visit.

Using the same visitation levels as in the analysis (higher visitation in the with project condition), a drop in UDV score alone would not be sufficient to drop the BCR below 1.0, because the additional visitation in the with project would add benefits above the cost of the recreation plan. At $6.27 per visit (no change in UDV from without to with project), the recreation plan would still result in a BCR of 4.11.

Under a worst-case scenario where visitation was held constant at without project levels (463,582 visits per year without and with the project), the BCR would be 2.35 at $7.88 per visit (48 points). If the with project UDV score were dropped to 38 points, the BCR would drop to 0.83, resulting in a BCR below 1.0. However, it is unlikely that visitation would not increase at all. At a minimum, some increase would be expected from general population growth.

Conclusion

Combining the visitation uncertainty and the UDV score uncertainty, a more reasonable scenario might be one where with project visitation does not increase as significantly as estimated in the analysis, which estimated an 45% increase in annual visitation with the recreation plan. If this increase were instead limited to 5%, the BCR would fall from 7.51 to 2.92 at $7.88 per visit (48 points). The BCR would fall below 1.0, to 0.89, when the UDV value had dropped to $6.55 per visit (36 points). Because the without project condition was scored at 34 points, and because the study team judges that the proposed recreation features would have a more substantial impacts on the ARBOR reach's recreation value than is captured by only a 2 point differential, there is low risk that the recreation plan would not be economically justified. Therefore, the study team concludes that there is federal interest in construction of the recreation plan and recommends its inclusion in the project.

5 REFERENCES

Los Angeles River Master Plan. 1996. County of Los Angeles.

Los Angeles River Recreation Zone. 2013. City of Los Angeles Department of Recreation and Parks and the Mountains Recreation and Conservation Authority. http://www.lariverrecreation.org/LA_River_Recreation/home.html

Los Angeles River Revitalization Corporation (LARRC). 2011b. LA River Guide: Walking: Access and Cautions. Accessed August 2012 at http://thelariver.com/guide/walks/access-and-cautions/.

Los Angeles River Revitalization Master Plan. 2007. City of Los Angeles. www.lariver.org

Metropolitan Transit Authority (Metro). 2012d. Bike Metro: Cyclists' Guide: Metro Bike Map. Web. Accessed August 2012. http://www.metro.net/riding_metro/bikes/images/la_bike_map.pdf. Los Angeles County.

National Recreation and Park Association. Published 1983. Recreation Park and Open Space Standards and Guidelines. Edited by Roger A. Lancaster, Director of Research. http://www.prm.nau.edu/prm423/recreation_standards.htm

Santa Monica Mountains Conservancy and Mountains Recreation Conservation Authority. 2007. Your Parks. Accessed August 2012 at http://www.lamountains.com/parks.asp?parkid=20.

Senate Bill 1201, Los Angeles River. 2012. http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB1201

(USACE) U.S. Army Corps of Engineers. 13 February 2013. EGM 13-03 Unit Day Values for Recreation for Fiscal Year 2013. CECW-CP Memorandum for Planning Community of Practice. Retrieved online via http://planning.usace.army.mil/toolbox/library/EGMs/EGM13-03.pdf .

6 PLATES

Plate 1. Current Recreation Areas, Reaches 1-3

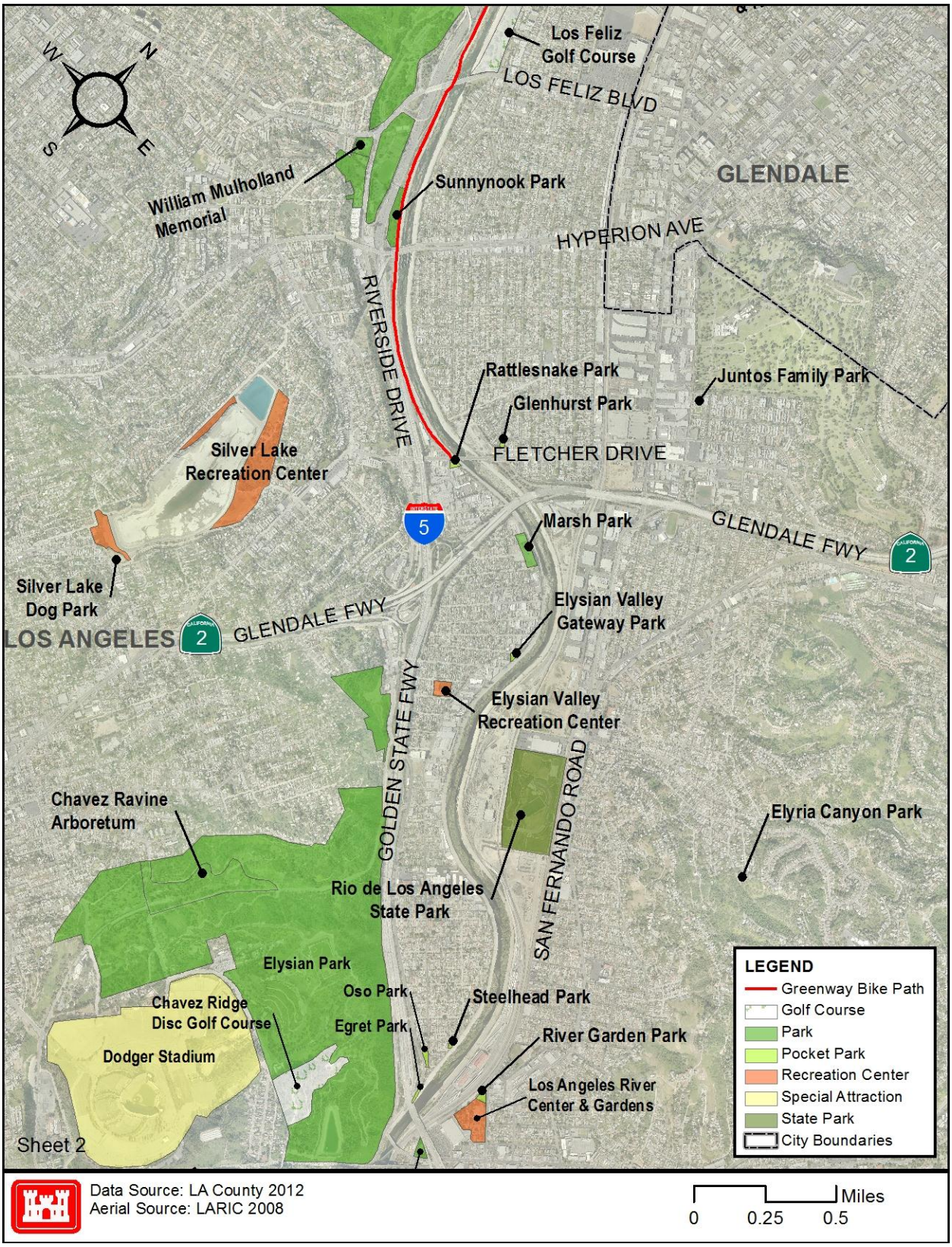

Plate 2. Current Recreation Areas, Reaches 4-6

Plate 3. Current Recreation Areas, Reaches 7-8

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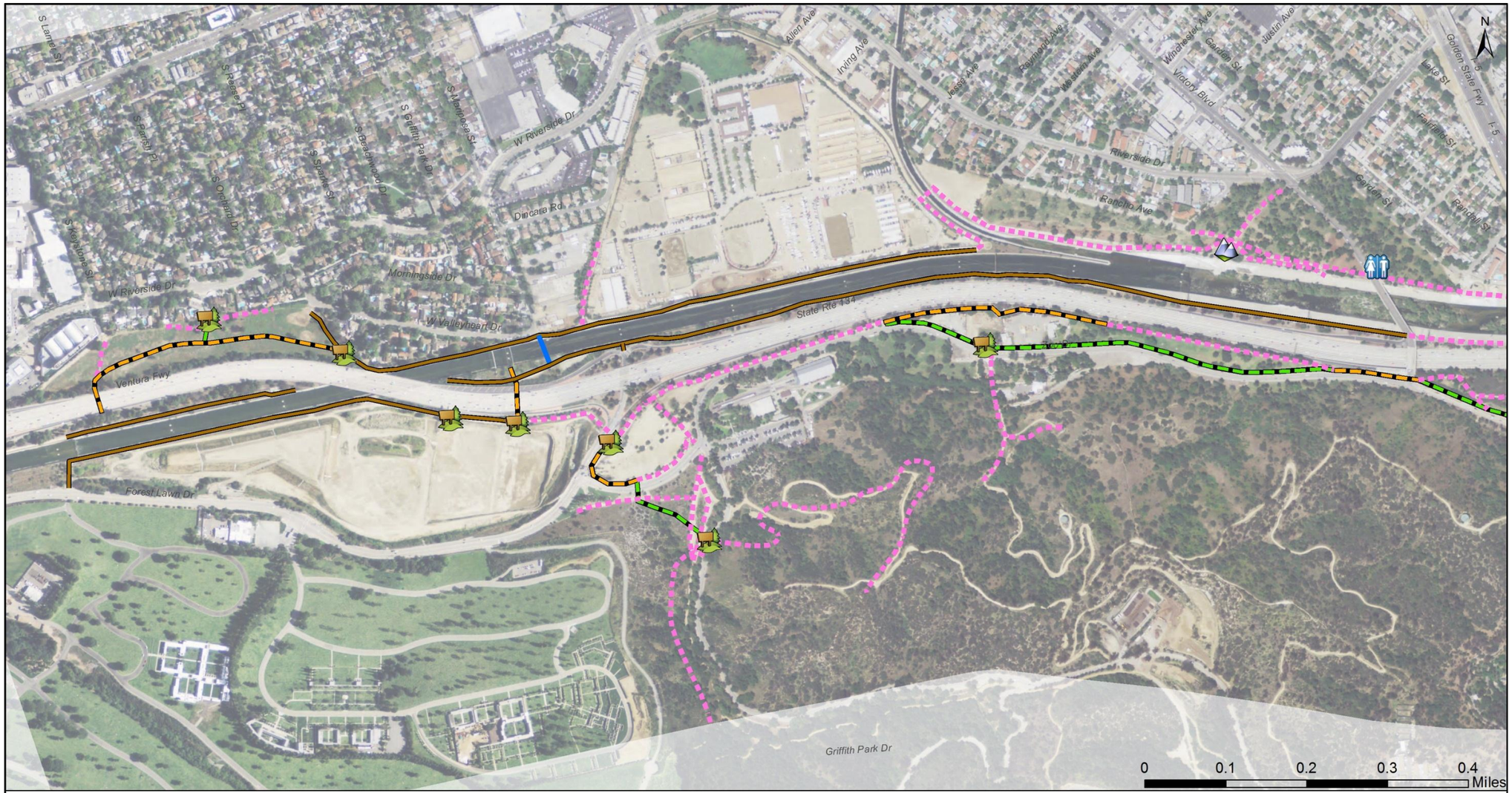


Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Proposed Features of Recreation Plan

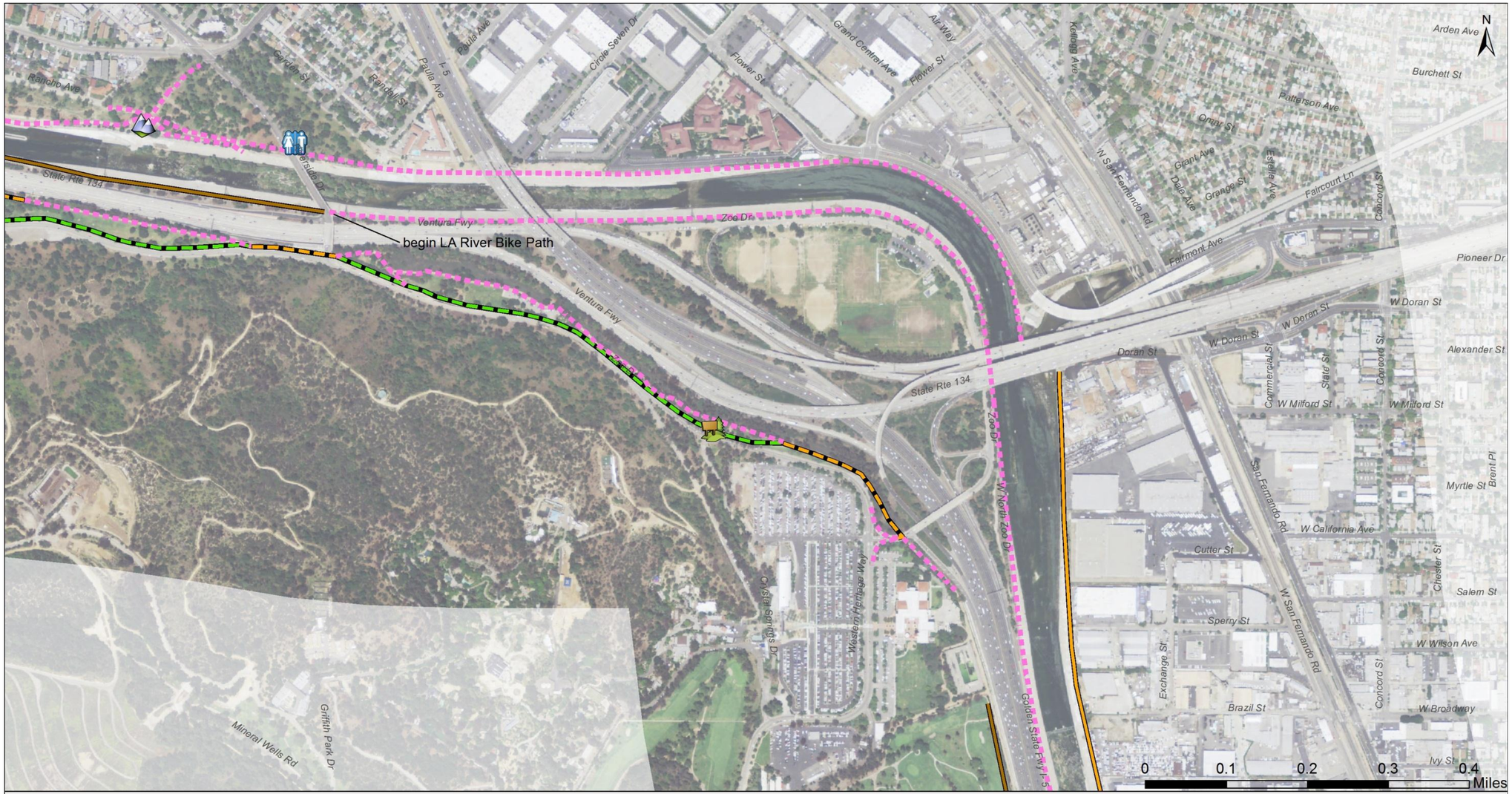
- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Other Relevant Projects

- See map for annotation

Reach 1

Plate 4. Recreation Plan Reach 1



Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Proposed Features of Recreation Plan

- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Other Relevant Projects

- See map for annotation

Reaches 2 and 3

Plate 5. Recreation Plan Reaches 2 and 3

Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Other Relevant Projects

- See map for annotation

Proposed Features of Recreation Plan

- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Reach 4

Plate 6. Recreation Plan Reach 4

Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Other Relevant Projects

- See map for annotation

Proposed Features of Recreation Plan

- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Reach 5

Plate 7. Recreation Plan Reach 5

Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Other Relevant Projects

- See map for annotation

Proposed Features of Recreation Plan

- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Reach 6

Plate 8. Recreation Plan Reach 6

Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Other Relevant Projects

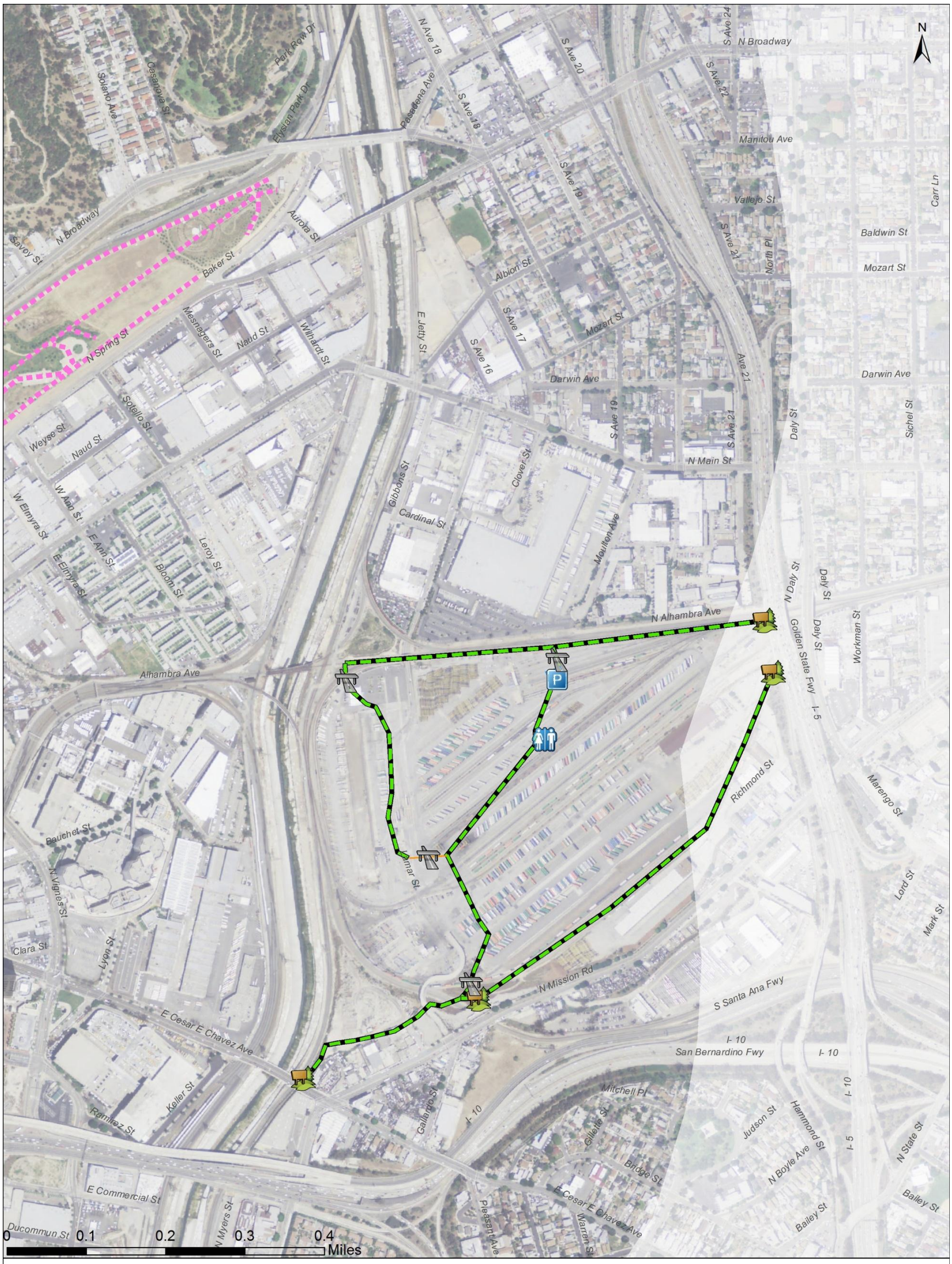
- See map for annotation

Proposed Features of Recreation Plan

- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Reach 7

Plate 9. Recreation Plan Reach 7



Existing Trails, Pathways, and Access Roads

- Access road; will be replaced in-kind via Eco. Rest. Plan with unpaved DG pathway; multi-use
- Access road; will be converted to new unpaved multi-use trail via Recreation Plan
- Access road; will be removed as part of Eco. Rest. Plan
- Trail; no proposed modifications; will receive accessibility and interconnection benefits from Recreation Plan
- Trail; to be improved as part of Recreation Plan
- Vehicle bridge with sidewalks
- Non-Motorized multi-use pedestrian bridge

Other Relevant Projects

- See map for annotation

Proposed Features of Recreation Plan

- New unpaved trail
- Bridge
- Parking Lot
- Restroom
- Trail Access Point
- Tunnel
- Wildlife Viewpoint

Reach 8

Plate 10. Recreation Plan Reach 8

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Attachment 1 – USACE Unit Day Value Guidance (EGM 13-03) Excerpts

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Unit Day Values for Recreation, Fiscal Year 2013

The national economic development (NED) benefit evaluation procedures contained in ER 1105-2-100 (22 Apr 2000), Appendix E, Section VII, include three methods of evaluating the beneficial and adverse NED effects of project recreation: travel cost method (TCM), contingent valuation method (CVM), and unit day value (UDV) method.

The criteria for selecting the appropriate method are described in paragraph E-50b(4) and Figure E-10 of ER 1105-2-100 and in the attached document. If the UDV approach is used, the range of unit day value for FY 2013 studies is:

General Recreation	$ 3.80	$ 11.39
Specialized Recreation	$ 15.43	$ 45.09

If, when using the UDV method, evidence indicates a value outside the published range, use either TCM or CVM to evaluate recreation benefits.

The attached document provides a detailed description of the application of the UDV method. The tables provided in the attachment are constructed as guidance for planners in the selection of unit day values for particular recreation activities. Tables 1 and 2 illustrate a method of assigning a point rating to a particular activity. Point values are assigned based on measurement standards described for the five criteria of activities, facilities, relative scarcity, ease of access, and aesthetic factors.

Table 1 covers general recreation, involving relatively intensive development of access and facilities. The specialized recreation category, covered in Table 2, includes such unique experiences as big game hunting, wilderness pack trips, white water canoeing, and other activities generally categorized by more extensive, low density use.

Values provided for FY 2013 may be used to convert points to a UDV dollar amount if the point assignment method is used. The table was adjusted from Table K-3-1, Federal Register Vol. 44, No. 242, p.72962, December 14, 1979, and the subsequent Table VIII-3-1 "Conversion of Points to Dollar Values", Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, March 10, 1983, using the Consumer Price Index (CPI) factors published by the Bureau of Labor Statistics. The CPI basis of Table VIII-3-1 from Principles and Guidelines is July 1, 1982 (CPI value = 97.5). The FY 2013 CPI basis is September, 2012 (CPI value = 231.407).

As a special note of warning, it is important to recognize that all specialized recreation activities claimed will require a regional model or a site-specific study, the results of which would probably not agree with the specialized values in the attached table. The only exception would be in those specific cases for which the unreliability or

infeasibleness of TCM or CVM can be stated convincingly.

Conversion of Points to Dollar Values

Point Values	General Recreation Values (1)	General Fishing and Hunting Values (1)	Specialized Fishing and Hunting Values (2)	Specialized Recreation Values other than Fishing and Hunting (2)
0	$ 3.80	$ 5.46	$ 26.58	$ 15.43
10	$ 4.51	$ 6.17	$ 27.29	$ 16.38
20	$ 4.98	$ 6.65	$ 27.77	$ 17.56
30	$ 5.70	$ 7.36	$ 28.48	$ 18.99
40	$ 7.12	$ 8.07	$ 29.19	$ 20.17
50	$ 8.07	$ 8.78	$ 32.04	$ 22.78
60	$ 8.78	$ 9.73	$ 34.89	$ 25.16
70	$ 9.26	$ 10.21	$ 37.03	$ 30.38
80	$ 10.21	$ 10.92	$ 39.87	$ 35.36
90	$ 10.92	$ 11.16	$ 42.72	$ 40.35
100	$ 11.39	$ 11.39	$ 45.09	$ 45.09

(1) Points from Table 1 in attachment.
(2) Points from Table 2 in attachment.

Table 1: Guidelines for Assigning Points for **General Recreation**

Criteria	Judgment factors				
Recreation experience[1] Total Points: 30 Point Value:	Two general activities[2] 0-4	Several general activities 5-10	Several general activities: one high quality value activity[3] 11-16	Several general activities; more than one high quality high activity 17-23	Numerous high quality value activities; some general activities 24-30
Availability of opportunity[4] Total Points: 18 Point Value:	Several within 1 hr. travel time; a few within 30 min. travel time 0-3	Several within 1 hr. travel time; none within 30 min. travel time 4-6	One or two within 1 hr. travel time; none within 45 min. travel time 7-10	None within 1 hr. travel time 11-14	None within 2 hr. travel time 15-18
Carrying capacity[5] Total Points: 14 Point Value:	Minimum facility for development for public health and safety 0-2	Basic facility to conduct activity(ies) 3-5	Adequate facilities to conduct without deterioration of the resource or activity experience 6-8	Optimum facilities to conduct activity at site potential 9-11	Ultimate facilities to achieve intent of selected alternative 12-14

Attachment 5

Table 1: Guidelines for Assigning Points for **General Recreation** (Continued)

Accessibility Total Points: 18 Point Value:	Limited access by any means to site or within site 0-3	Fair access, poor quality roads to site; limited access within site 4-6	Fair access, fair road to site; fair access, good roads within site 7-10	Good access, good roads to site; fair access, good roads within site 11-14	Good access, high standard road to site; good access within site 15-18
Environmental Total Points: 20 Point Value:	Low esthetic factors[6] that significantly lower quality[7] 0-2	Average esthetic quality; factors exist that lower quality to minor degree 3-6	Above average esthetic quality; any limiting factors can be reasonably rectified 7-10	High esthetic quality; no factors exist that lower quality 11-15	Outstanding esthetic quality; no factors exist that lower quality 16-20

[1]Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.
[2]General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.
[3]High quality value activities include those that are not common to the region and/or Nation, and that are usually of high quality.
[4]Likelihood of success at fishing and hunting.
[5]Value should be adjusted for overuse.
[6]Major esthetic qualities to be considered include geology and topography, water, and vegetation.
[7]Factors to be considered to lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

Attachment 6