

Attachment

7

***Stormwater Flood Management Grant Proposal
Santa Barbara County Flood and Water Conservation District
Technical Justification***

Attachment 7 consists of the following items:

- ✓ **Technical Justification.** Attachment 7 provides the technical justification for the proposed project.
- ✓ **Supporting Documentation.** Technical reports, feasibility studies, and other documents justifying the claimed physical benefits are included in this attachment.

Project Overview

The UPRR Bridge Project is proposed by the Santa Barbara County Flood Control and Water Conservation District (District). The Las Vegas and San Pedro Creeks Union Pacific Railroad Bridge Replacement Project (UPRR Bridge Project) will replace two UPRR bridges, one over Las Vegas Creek and one over San Pedro Creek, improving the hydraulic capacity of the creeks to a 25-year storm event from a 10-year storm event. The UPRR Bridge Project is a component of the overall San Pedro and Las Vegas Creeks Capacity Improvement Project.

During storm events, the improved hydraulic capacity will protect residential and commercial property and public safety, ameliorate significant traffic delays through a busy regional transportation corridor, reduce sewer treatment costs that result from stormwater overflows, and reduce damage to natural habitat. In addition to replacing the two bridges, the concrete understructure of each bridge will be replaced and creek banks will be graded back to match the span of the new bridges. The UPRR Bridge Project will open up approximately 584 creek feet of fish habitat for the anadromous and endangered Steelhead by replacing sections of the cement channel with a natural surface and by replacing a concrete grade control structure on San Pedro Creek that blocks fish passage with a fish transition structure.

Project Physical Benefits

The UPRR Bridge Project goals include increasing flood flow conveyance of Las Vegas and San Pedro creeks to reduce flood damage to adjacent communities, improving public safety during storm events by reduction in bank overflow, improving fish passage for federally endangered steelhead trout at San Pedro Creek, and improving water quality. The following bullet list summarizes the physical benefits being claimed by the UPRR Bridge Project. These are described in more detail in the following sections.

- Residential property (structures and contents)
- Commercial property (structures and contents)
- Roads and highways (includes UPRR rail transportation)
- Goleta Sanitary District storm water treatment system (avoided treatment)

- Indirect costs, including emergency response, and disruption to employment, commerce, transportation, and communications
- Habitat restoration

Table 7-1: Summary of Benefits

Physical Benefit	Unit	Technical Justification
Residential Property	Residence flood reduction: <ul style="list-style-type: none"> • 25-year storm = 36 homes, • 50-year storm = 43 homes, • 100-year storm = 39 homes. 	FEMA flood insurance reduction maps and creek profiles were used to calculate the average depths along the creek per storm event. Number and areas of buildings counted and calculated in AutoCAD and GIS. See existing and post-project inundation PDF maps, and PDF document “LVSP Inundation Depths and Areas.”
Commercial Property	Commercial Area reduction: <ul style="list-style-type: none"> • 25-year storm= 315,200 sf, • 50-year storm = 156,000 sf, • 100-year storm = 226,700 sf. 	FEMA flood insurance reduction maps and creek profiles were used to calculate the average depths along the creek per storm event. Number and areas of buildings counted and calculated in AutoCAD and GIS. See existing and post-project inundation PDF maps, and PDF document “LVSP Inundation Depths and Areas.”
Roads and Highways	Transportation miles reduction: <ul style="list-style-type: none"> • 25-year storm = 1.43 miles, • 50-year storm = 0.89 miles, • 100-year storm = 1.30 miles. 	FEMA flood insurance reduction maps and creek profiles were used to calculate the average depths along the creek per storm event. Miles of roadway measured and calculated in AutoCAD and GIS. See existing and post-project inundation PDF maps, and PDF document “LVSP Inundation Depths and Areas.”
Reduce expense by Goleta Sanitary Sewer District to process inflows	\$74,257 (all flood events)	Avoided cost of treated sewer flows.
Riparian habitat	0.59 acres (13,790 sf) and 584 feet of anadromous fish passage	Figure 7, pg. 87, <i>Final Mitigated Negative Declaration Las Vegas-San Pedro Creeks Capacity Improvement Project, September 2011, HDR Engineering, Inc. for SBCFCWC.</i>

Sf: square feet

Description of Expected Physical Benefits

Historical Conditions

The existing conveyance capacities of the Las Vegas Creek under Calle Real, State Route 101 and UPRR are insufficient and result in overtopping of the roadway surface at Calle Real and State Route 101 during heavy rains. In 1995, 1998, and 2000 (see **Figure 7-1**), storm events caused Las Vegas and San Pedro creeks to overflow its banks and flood US 101, the adjacent neighborhoods, UPRR railroad tracks, and the adjacent shopping center. These flooding events caused significant damage to businesses and residences and resulted in closures of both Calle Real and Route 101. The project will increase the capacity to 2000 cubic feet per second [CFS] (an estimated 25-year event) thereby reducing flooding of adjacent properties.

Figure 7-1: Flooding Photo (Jan 1995 storm, Las Vegas Creek culvert upstream of US 101)



Without-Project Conditions

Las Vegas Creek has the capacity to convey approximately 1,400 CFS (an estimated 10-year event) and there are no other proposed projects that would increase this existing capacity. San Pedro Creek has the capacity to convey approximately 1,100 CFS (an estimated 10-year event) and there are no other proposed projects that would increase this existing capacity.

Relationship of Project to Other Projects Included in the Proposal

Improvements are proposed for both Las Vegas and San Pedro Creeks starting at Calle Real within the City of Goleta, Route 101 within Caltrans right-of-way (ROW), the UPRR within the UPRR ROW, and the City of Santa Barbara Airport properties downstream of the UPRR. The project has been separated into three components to facilitate implementation by the District and Caltrans. The three components are identified as:

- Project A: Replacement of the Calle Real and State Highway 101 culverts on San Pedro and Las Vegas creeks, lowering the channel bed level, and constructing a fish transition structure within San Pedro Creek upstream of Calle Real. Caltrans is responsible for this

work. Caltrans funding is secured through the 2012 State Highway Operation and Protection Program Budget (in accordance with Government Code Section 14526.5), committed, programmed (see Exhibit 3-A or Caltrans 2012 SHOPP Project List http://www.dot.ca.gov/hq/transprog/SHOPP/2012_SHOPP_as_approved_by_the_CTC.pdf, p. 134), and approved by the California Transportation Commission.

The Project is underway, as project planning has been initiated including administration and finalizing of contract documents and advertising for construction. Caltrans and the District have been cooperating throughout the process (Exhibit 8-1 - CaltransLtr to PWFApril 2012). Environmental compliance documentation and permitting is complete, including: 1) Section 401 Permit (RWQC); 2) Section 1600 Streambed Alternation Agreement (DFG); 3) Nationwide Permits 6 and 43 (ACOE); 4) CEQA Final Negative Declaration; and 5) NEPA Determination, Categorical Exemption. The Caltrans work will proceed with or without Prop 1E funding for the UPRR Bridge Project (known as Project B from previous planning documents).

- Project B: (Project B is the subject of this application and is referred to as the UPRR Bridge Project) Replacement of the UPRR bridges on San Pedro and Las Vegas creeks, including channel grading downstream of the bridge structures.
- Project C: Construction of the San Pedro Creek floodwall. This will be constructed by the District, commensurate with Projects A and B. Project C does not provide new flood benefits.

With the construction of Projects A and B, flood flows between 10 cfs (for a 25-year event) up to 190 cfs (for a 100-year event) will remain in San Pedro Creek (instead of overflowing to Las Vegas Creek) and could damage a commercial area east of the creek below Highway 101 and the UPRR San Pedro Bridge. Project C will construct a floodwall to protect this property from the potential additional flow associated with restoring the capacity of San Pedro Creek.

Methods Used to Estimate Benefits

The methods that were used to estimate physical benefits come from several sources.

Hydrology and hydraulics were studied by HDR Engineering, Inc., and the results published in the reports entitled,

- San Pedro and Las Vegas Creeks Capacity Improvement Project, UPRR Bridge Replacement Hydrology and Hydraulic Analysis Report, Draft Technical Report, HDR Engineering, Inc., January 2013
- San Pedro and Las Vegas Creeks Capacity Improvement Project, Final Hydrology and Hydraulic Analysis Report” in 2008.

Residential and Commercial Property

Residential and commercial property benefits were determined using F-RAM’s depth-damage curves and unit replacement cost assumptions for structural and contents damages. Damages include damages to structures and contents, external landscapes and outbuildings, and cleanup

costs. Residential external damages and cleanup costs are set by F-RAM at \$5,000 and \$4,000 per property, respectively. Commercial external damages and cleanup costs are set by F-RAM at 30% of direct structural damages.

Roads and Highways

Benefits from reducing damage to roads, highways, and rail service utilized FEMA flood insurance maps and creek profiles to inventory miles of impacted roadways for the without- and the with-project conditions using AutoCAD and GIS. Separate estimates were developed for the three road types, arterial, major, and minor roads, per F-RAM input requirements.

F-RAM does not include a category for rail transportation; therefore, F-RAM's damage cost per mile for arterial roads was used to estimate damage to the UPRR line.

The impact of closure and traffic delays for State Route 101 was determined using Caltrans Level of Service F to estimate the average vehicle-to-capacity ratio. , average traffic volume estimates from Caltrans (Caltrans, 2010, Draft Project Report, 05-SB-101, PM 22.3/23.2, 06-258, EA 05-0G070K, October 6, 2010, Tables 1 and 2), and then F-RAM calculations for disruption to transportation services (for a more detailed description of how benefits were estimated see Attachment 8, p 8-9).

Goleta Sanitary District Stormwater Treatment System

To calculate the benefit of avoided treatment, "HEC-HMS Analysis Results_Attenuated Volumes_SBC 2013-01-17" was used to estimate the reductions in overflow volumes for both creeks. Overflow volumes under the with-project condition are reduced by 112 MG, on average, for flood events exceeding a 10-year return interval – 21 MG is associated with overflow from Las Vegas Creek and 91 MG is associated with overflow from San Pedro Creek. It is estimated that half of this volume, 56 MG, would otherwise be discharged to the Goleta Sanitary System and require treatment.

The expected annual reduction in stormwater flow is 7.9 MG/year and the expected annual reduction in stormwater treatment is half this quantity or 3.95 MG/year. A unit cost of \$1,230/MG for treating incremental stormwater flows was applied to the expected annual reduction in treatment to estimate avoided treatment costs. The unit cost was estimated by applying standard industry percentages for allocating sewer O&M costs between flow, BOD, and TSS functions reported in Shook and Ivey (2012)¹ to the Goleta Sanitary System's annual operating cost per MG in 2007 (as reported in Goleta Sanitary District Annual Audit Report 2007-2008).² Flow-related costs were set to 32.5% of total operating costs, which is the mid-point percentage for the allocation of flow-related cost reported in Shook and Ivey.

¹ Shook, Robert and Jennifer Ivey, "GETTING IT RIGHT: A STUDY OF COST OF SERVICE WASTEWATER TREATMENT ALLOCATIONS," Fort Worth Water Department. AWWA Texas-Water 2012 Conference Proceedings. Downloaded from www.tawwa.org/TW12Proceedings/P120428.pdf.

² 2007 operating costs were used to maintain consistency with other F-RAM monetary assumptions, which are denominated in 2007 dollars.

Indirect Costs

The benefits of avoiding the indirect costs of emergency response, and disruption to employment, commerce, transportation, and communications were calculated. These costs are set by F-RAM to equal 25% of direct residential, commercial, and roadway damages. Traffic delay costs for State Route 101 are the product of total delay time (from Table 8-6), average vehicle occupancy, and the hourly value of travel time savings. Average vehicle occupancy is set to 1.204. The estimate is from Levine and Wachs (1996) for the Los Angeles – Ventura region.³ Travel time is valued at \$14.52/hr (2012 dollars). The estimate is based on U.S. DOT guidelines.⁴ Expected annual damages of traffic delay for State Route 101 are counted separately for Las Vegas and San Pedro Creeks in the calculation of total expected annual damages since flooding of State Route 101 can occur if blockages occur to culverts and underpasses along either creek and it is appropriate to treat such blockage events as independent of one another.

Habitat restoration

The UPRR Bridge Project has the additional benefit of adding 0.584 acres of riparian habitat to the watershed of the Las Vegas and San Pedro creeks. The value of added riparian habitat is summarized in Table 8-9. The unit value is based on costs of habitat credits at the Los Carneros Mitigation Bank, located near the project site.

Biological resources and impacts are documented in the Project’s MND entitled, “Final Mitigated Negative Declaration, Las Vegas-San Pedro Creeks Capacity Improvement Project.” Additional information was taken from associated files, HEC-HMS files (HEC-HMS Analysis Results_Attenuated Volumes_SBC 2013-01-17, HDR Engineering, Inc.

New Facilities Required to Achieve Benefit

Replacement of the two existing UPRR bridges is needed to be constructed to obtain the physical benefits as well as widening the creek channel to increase habitat areas.

Project A must be completed in order to obtain all of the physical benefits. Project A and Project B of the UPRR Bridge Project both need to be constructed for Las Vegas Creek and San Pedro Creek to convey a 25-year storm event. By increasing the capacity at the Calle Real and Route 101 (Project A), the debris blockage will occur at the UPRR bridge and cause flooding to the surrounding streets, residences and businesses if the UPRR bridges on both creeks are not upsized (UPRR Bridge Project, also known as Project B).

³ Levine, Ned and Martin Wachs (1996). “Factors Affecting Vehicle Occupancy Measurement,” University of California Transportation Center Working Paper No. 350.

⁴ Based on the U.S. Department of Transportation’s recommended value of \$13.44/hr (2007 \$) for travel time for surface modes of transportation. The estimate is a weighted average of personal and business travel using the following distribution of travel by trip purpose: 94.4% personal, 5.6% business. U.S. Department of Transportation, “Revised Departmental Guidance: Valuation of Travel Time in Economic Analysis,” February 11, 2003.

Uncertainty of Benefits

The only uncertainties are the normal ones that include: climate change brings far fewer flood events to the region; financial constraints reduce the partnering agencies ability to follow through with the project; the anadromous fish population declines due to other problems and do not utilize the habitat restoration.

Uncertainty of benefits could also be assessment-based. Damages to roadways and properties is based on return periods of 10-year to 100-yr storms; however, blockages of the undersized culverts during lesser storm events also results in flooding.

Potential Adverse Physical Effects

Adverse physical effects will be temporary and will be mitigated as listed in the MND. Water quality and air quality issues will occur during construction activities, but the those are ephemeral and not significant.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the project. One table is completed for each physically quantifiable benefit.

Residential Property

The table below provides information regarding the annual physical benefit for residential property with and without the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Residential Structures in 25-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): Residential Structures			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project⁵	With Project⁶	Change Resulting from Project
2016-2090	36	0	-36
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to construct an inventory of impacted residential and commercial structures for the without- and with-project conditions. The number of residential structures was counted in AutoCAD and GIS.			

⁵ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

⁶ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Residential Structures in 50-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): Residential Structures			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project⁷	With Project⁸	Change Resulting from Project
2016-2090	66	23	-43
<p>List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to construct an inventory of impacted residential and commercial structures for the without- and with-project conditions. The number of residential structures was counted in AutoCAD and GIS.</p>			

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Residential Structures in 100-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): Residential Structures			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project⁹	With Project¹⁰	Change Resulting from Project
2016-2090	102	63	-39
<p>List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to construct an inventory of impacted residential and commercial structures for the without- and with-project conditions. The number of residential structures was counted in AutoCAD and GIS.</p>			

⁷ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

⁸ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

⁹ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

¹⁰ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

Commercial Property

The table below provides information regarding the annual physical benefit for commercial property with and without the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Commercial Structures in 25-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): First floor square feet			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project¹¹	With Project¹²	Change Resulting from Project
2016-2090	315,200	0	-315,200
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to construct an inventory of impacted residential and commercial structures for the without- and with-project conditions. First floor square footage of commercial structures was counted in AutoCAD and GIS.			

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Commercial Structures in 50-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): First floor square feet			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project¹³	With Project¹⁴	Change Resulting from Project
2016-2090	562,200	406,200	-156,000
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to construct an inventory of impacted residential and commercial structures for the without- and with-project conditions. First floor square footage of commercial structures was counted in AutoCAD and GIS.			

¹¹ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

¹² Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

¹³ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

¹⁴ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Commercial Structures in 100-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): First floor square feet			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project¹⁵	With Project¹⁶	Change Resulting from Project
2016-2090	788,900	562,200	-226,700
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to construct an inventory of impacted residential and commercial structures for the without- and with-project conditions. First flood square footage of commercial structures was counted in AutoCAD and GIS.			

Roads and Highways

The table below provides information regarding the annual physical benefit for roads and highways with and without the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Roads Inundated in 25-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): miles			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project¹⁷	With Project¹⁸	Change Resulting from Project
2016-2090	1.43	0	-1.43
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to inventory miles of impacted roadways for the without- and with-project conditions using AutoCAD and GIS. Separate estimates were developed for arterial, major, and minor roads, per F-RAM input requirements. Total road miles of all types are shown in this table.			

¹⁵ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

¹⁶ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

¹⁷ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

¹⁸ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Roads Inundated in 50-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): miles			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project¹⁹	With Project²⁰	Change Resulting from Project
2016-2090	2.23	1.34	-0.89
<p>List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to inventory miles of impacted roadways for the without- and with-project conditions using AutoCAD and GIS. Separate estimates were developed for arterial, major, and minor roads, per F-RAM input requirements. Total road miles of all types are shown in this table.</p>			

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Roads Inundated in 100-Yr Floodplain			
Measure of Benefit Claimed (Name of Units): miles			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project²¹	With Project²²	Change Resulting from Project
2016-2090	2.79	1.82	-0.97
<p>List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): FEMA flood insurance reduction maps and creek profiles were used to inventory miles of impacted roadways for the without- and with-project conditions using AutoCAD and GIS. Separate estimates were developed for arterial, major, and minor roads, per F-RAM input requirements. Total road miles of all types are shown in this table.</p>			

¹⁹ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

²⁰ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

²¹ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

²² Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

Reduced Goleta Sanitary District Stormwater Discharge

The table below provides information regarding the annual physical benefit for the Goleta Sanitary District with and without the project.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Change in Expected Annual Stormwater Discharge Treated by Goleta Sewer System			
Measure of Benefit Claimed (Name of Units): million gallons			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project²³	With Project²⁴	Change Resulting from Project
2016-2090	Stormwater discharge to Goleta Sewer System is 3.95 MG/yr greater, on average, for the Without Project condition		-3.95 MG/yr
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): Reductions in overflow volumes for Las Vegas and San Pedro Creeks were estimated by HDR Engineering, Inc., and are summarized in the document “HEC-HMS Analysis Results_Attenuated Volumes_SBC 2013-01-17.” Overflow volumes under the with-project condition are reduced by 112 MG, on average, for flood events exceeding a 10-year return interval – 21 MG is associated with overflow from Las Vegas Creek and 91 MG is associated with overflow from San Pedro Creek. It is estimated that half of this volume, 56 MG, would otherwise be discharged to the Goleta Sanitary System and require treatment. The expected annual reduction in stormwater flow is 7.9 MG/year and the expected annual reduction in stormwater treatment is half this quantity or 3.95 MG/year.			

²³ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

²⁴ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

Habitat Restoration

The table below provides information regarding the annual physical benefit for riparian habitat restoration with and without the project. The following restoration will take place:

- A concrete drop structure in San Pedro Creek will be removed and the creek will be re-graded and restructured as a natural stream bed conducive to anadromous fish passage, increasing the creek channel riparian habitat by 0.29 acres;
- Sections of the Las Vegas Creek bed will be rehabilitated and returned to a natural state that is conducive to anadromous fish passage, increasing the creek channel riparian habitat by 0.30 acres.

Las Vegas and San Pedro Creeks UPRR Bridge Replacement Project			
Physical Benefit: Riparian Habitat			
Measure of Benefit Claimed (Name of Units): acres			
Additional Information about this Measure:			
Year	Physical Benefits		
	Without Project ²⁵	With Project ²⁶	Change Resulting from Project
2016-2090	0.466	1.05	0.584
List supporting sources and references that support the numbers listed in this table (provide page numbers if possible): Unit value of riparian habitat is the annualized cost of an acre of riparian mitigation credit from the Los Carneros Mitigation Bank. Mitigation credit cost is annualized at 6% over 75-year useful life of project. (2) Present value coefficient based on 6% discount rate, 75-year useful life, and project benefits commencing in 2016.			

²⁵ This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

²⁶ Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.

<<This page is intentionally left blank.>>