

Appendix G. Hydrology Report

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OC River Walk

Hydrology and Hydraulics Appendix to OC River Walk EIR

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PACE B710

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1 Introduction

The OC River Walk project is a set of planned improvements to a 1.5-mile-long reach of the Santa Ana River along the boundary of the City of Orange and City of Anaheim, as shown on **Figure 2-1**. PACE analyzed the hydrology and hydraulics on the project reach in existing conditions and in proposed conditions. The results were used to assess hydraulic changes, changes to hydrology, and effects of human contact associated with the proposed project improvements. This report documents the analysis approach, results, and conclusions.

2 Project Overview

The OC River Walk project plans to improve and revitalize a segment of the Santa Ana River. The project will transform a segment of this regional flood control facility into a community asset. The planned improvements are designed to achieve multiple objectives, including:

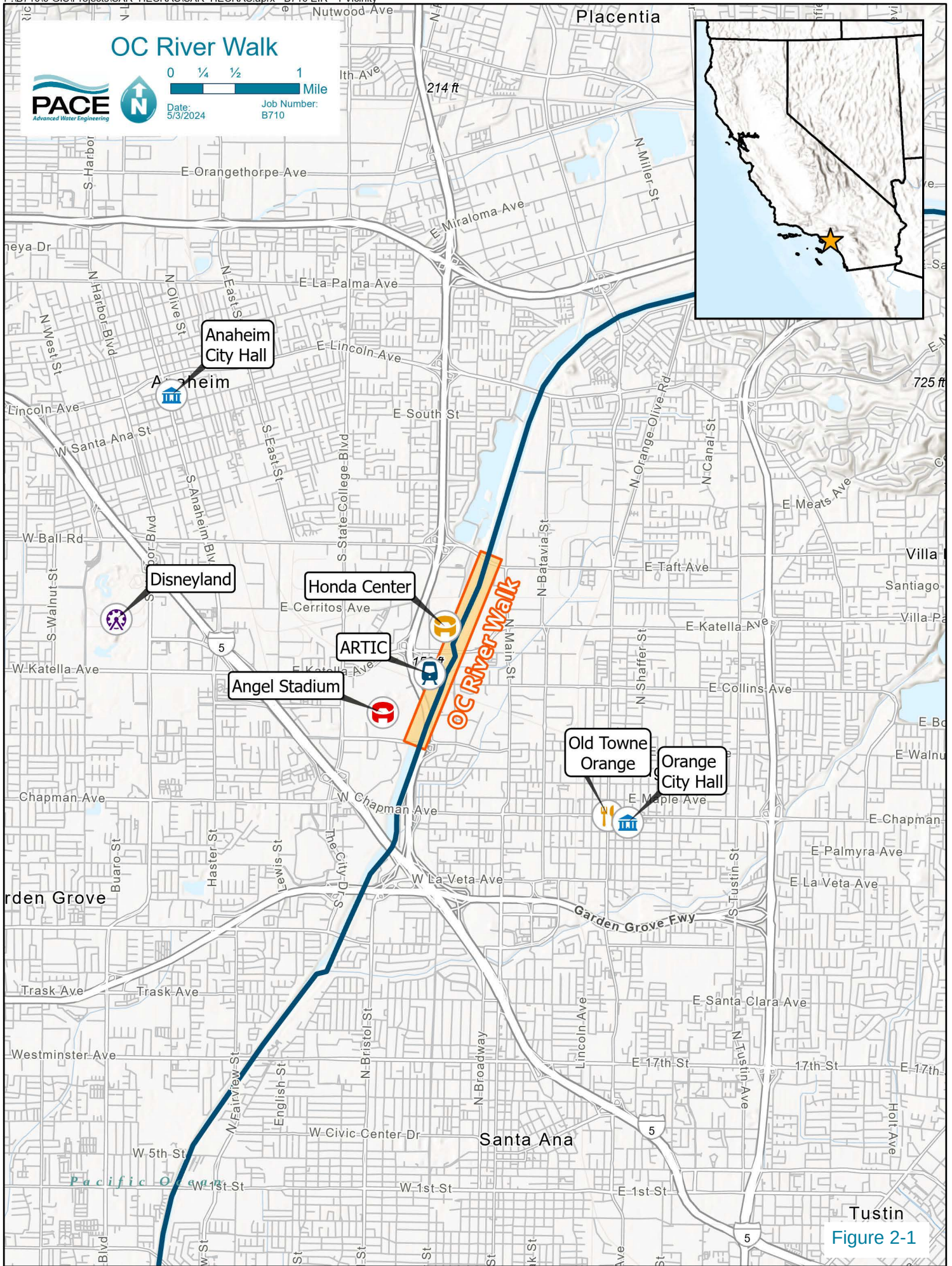
- Improving area flood protection
- Increasing access and use
- Adding groundwater recharge
- Improving water quality
- Adding open space
- Augmenting and connecting bike paths and pedestrian paths

The project will be located within the Santa Ana River corridor between the Ball Road and Orangewood Avenue bridge crossings, encompassing an area approximately 450 feet wide by 9,000 feet long. The project site is surrounded by urban development, including Angel Stadium, the Anaheim Regional Transportation Intermodal Center (ARTIC), and the Honda Center (**Figure 2-2**).

The existing Santa Ana River corridor within the study area generally consists of a trapezoidal cross section with a natural soft bottom and riprap bank lining. The proposed OC River Walk project aims to transform the study area into a community destination by:

- Removing the existing riprap bank lining and replacing it with soil cement stepped terraces
- Extending the existing Santa Ana River Trail (SART) bike path
- Adding two additional pedestrian bridges across the Santa Ana River
- Creating two river impoundments for municipal reuse water that will produce groundwater recharge and facilitate recreation

Hydrology for the project site was taken from the U.S. Army Corps of Engineers (USACE) Design Memorandum for Phase II GDM on the Santa Ana River Mainstem, Volume 3 for the Lower Santa Ana River (USACE, 1988). The general design manual (GDM) document specifies the design flow rates used for OC River Walk. Hydraulic modeling of the project reach was completed using HEC-RAS to analyze existing and proposed flow depths, velocities, freeboard, and scour. The OC River Walk project conforms with the design goals and function of the SAR described in the 1988 GDM. The OC River Walk project design will be reviewed and permitted by USACE and Orange County Flood Control District (OCFCD) through the 408 permitting process.



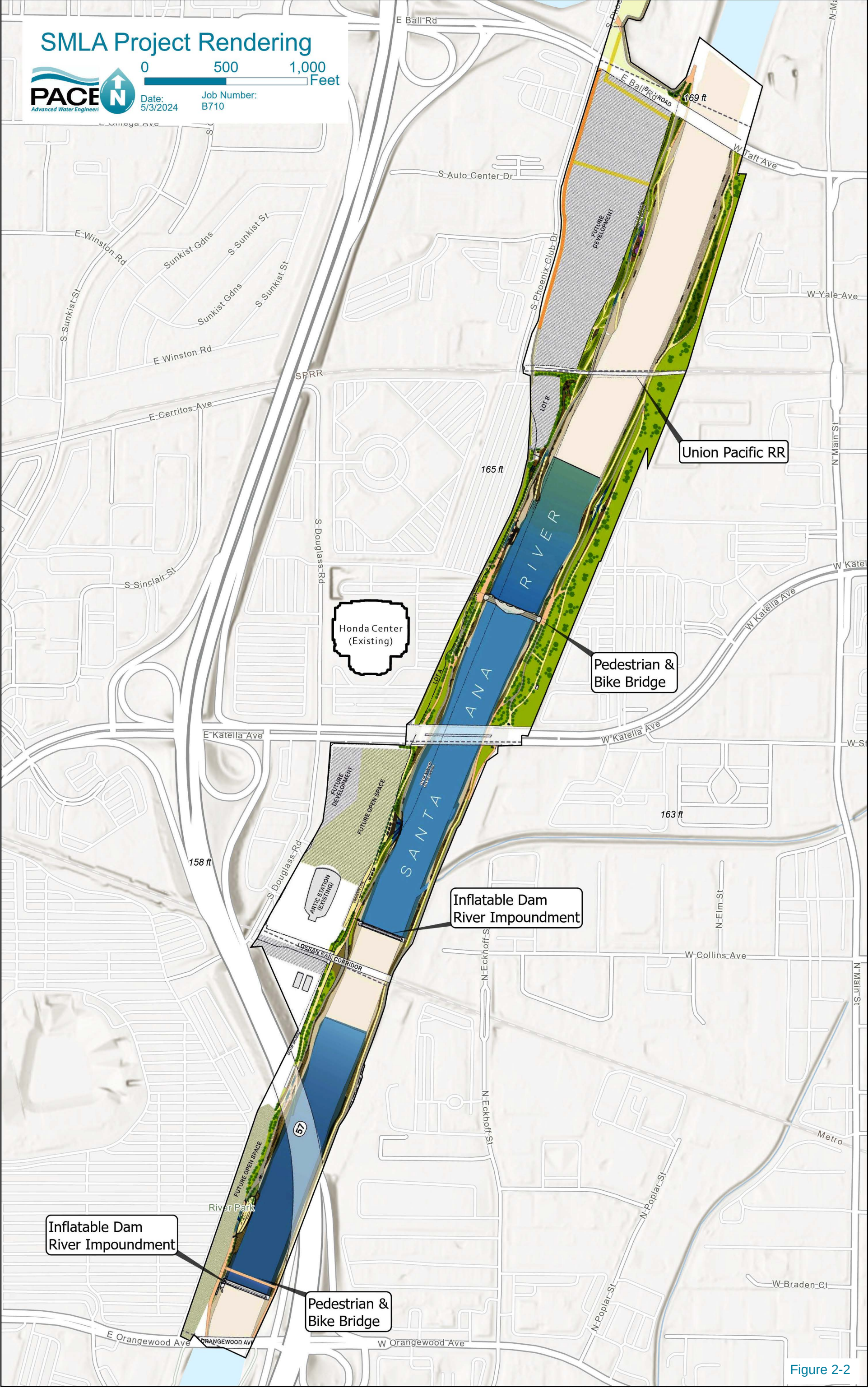


Figure 2-2

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, City of Anaheim, County of Los Angeles

3 Study Area Description

3.1 Lower Santa Ana River Overview

The lower Santa Ana River watershed (approximately 200 square miles) runs from Prado Dam to the Pacific Ocean, traversing about 31 miles through the cities of Yorba Linda, Anaheim, Orange, Santa Ana, Fountain Valley, Costa Mesa, and Huntington Beach (**Figure 3-1**).

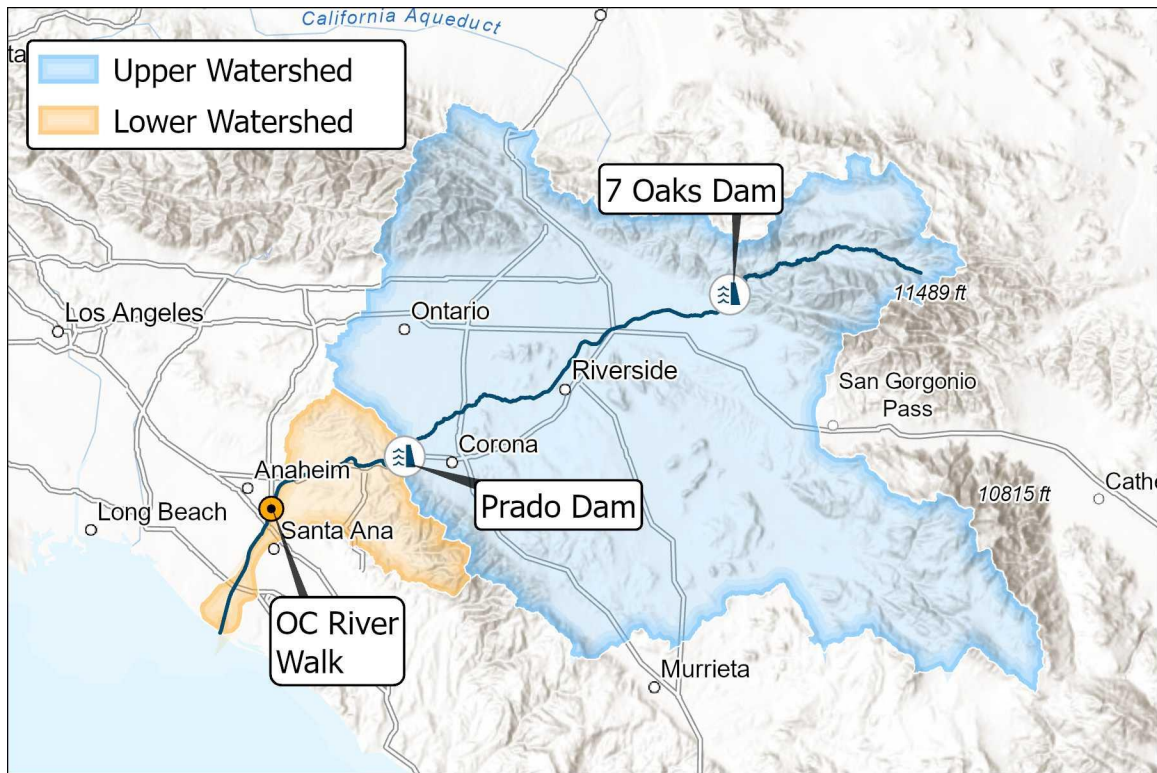


Figure 3-1: Upper and Lower Santa Ana River Watershed

The Santa Ana River Mainstem project was proposed by the USACE and authorized in the Water Resources Development Act of 1986 to increase the flood stage capacity of Prado Dam and improve downstream channel conveyance and capacity after a series of floods caused catastrophic damage to the increasingly urbanized areas downstream of Prado Dam in the early 1980s. The project included channelization of the Santa Ana River from Weir Canyon Road to the Pacific Ocean, which involved constructing a levee embankment for flood protection.

The OC River Walk project is located in the USACE Lower Santa Ana River Reaches 5 and 6. Reach 5 spans from Riverview Golf Course to the Orange Freeway (SR 57), and reach 6 spans from the Orange Freeway to Glassell Street. Cross sections of the channel are typically trapezoidal with a soft bottom and stone revetted side slopes between 1V to 1.5H and 1V to 3H. A series of reinforced concrete drop structures ranging in height from 4.5 to 9.7 feet and buried rip rap stabilizer structures are constructed at approximately 2,000 ft intervals. These act to maintain a stable grade and control channel scour within the Lower Santa Ana River channel reach.

Construction of the Santa Ana River levee system was completed in September 1995, and the operation and maintenance of the levee was passed to the Orange County Flood Control District (OCFCD), which is administered by Orange County Public Works (OCPW). The primary purpose of the levee is for flood control, as it protects over 1 million people (USACE National Structure Inventory, 2023). However, the

Orange County Water District (OCWD) also uses the soft-bottom channel of the Santa Ana River to recharge the groundwater basin by impounding water in a series of sand levees ("T and L" levees) that slow water within the Santa Ana River for infiltration and groundwater recharge (OCWD, 2006).

3.2 OC River Walk Study Area

OC River Walk consists of an approximately 90-acre area that covers both banks of the Santa Ana River. The project area is bound between Orangewood Avenue and Ball Road within the City of Orange and City of Anaheim.

3.2.1 Existing Major Elements

There are many existing elements within the project study area including six bridges over the Santa Ana River, two drop structures, the Collins Channel tributary, and the levee embankment.

3.2.1.1 *Levee Embankment and Bike Path*

The levee embankment within the project area consists of riprap lined riverbank. The Santa Ana River trail runs along the top of the bank between Orangewood Ave and Katella on the west bank and between Katella Avenue and Ball Road on the east bank. According to the ACOE as-built records, the riverbank protection is comprised of loose and grouted riprap at a 2(H):1(V) slope. The channel has a base width ranging from 300- to 320 feet and channel depths ranging from 12 to 18.5 feet. The top of bank freeboard provided is a minimum of 2.5 feet (USACE GDM Volume 3, 1988). Loose riprap along the embankments have d_{50} 's that range from 15 inches to 33 inches with thicknesses of 24 inches to 48 inches, respectively. Embankment areas around the drop structures have grouted rip rap with a d_{50} of 10 inches and a thickness of 15 inches.

Currently, the Santa Ana River Trail bike path runs along the top of the river embankment. The public is authorized to use the bike path areas for recreational activities. The public is currently not authorized to be within the Santa Ana River channel or on the channel's grouted rip-rap embankments.

3.2.1.2 *Drop Structures*

Two reinforced concrete drop structures are located within the study area. The downstream structure is located approximately 350 feet downstream of the LOSSAN bridge with a drop height of 7.27 feet. The upstream structure is located approximately 400 feet downstream of the Ball Road bridge with a drop height of 9.15 feet. The drop structures provide energy dissipation and minimize river bed and bank scour. Each structure uses a parabolic curved chute downstream of the crest, two rows of baffle blocks, and a sloping end sill (USACE GDM Volume 3, 1988).

3.2.1.3 *Bridges*

There are six existing bridges that span the Santa Ana River within the project study location at Orangewood Avenue, State Route (SR) 57, the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Metrolink bridge, Katella Avenue, the Union Pacific railroad (UPRR), and Ball Road. The relevant hydraulic parameters for each bridge are summarized in **Table 3-1**.

Table 3-1: Existing Bridge Descriptions

Bridge Name	Bridge Deck Data	Bridge Pier Data	Bridge Undercrossing Notes
Orangewood Ave. Bridge	Width = 72 ft	6 piers	SART undercrossing on west bank
SR 57 Bridge	Width = 344 ft	6 piers	SART undercrossing on west bank and maintenance road undercrossing on the East bank
LOSSAN Metrolink Bridge	Width = 48 ft	3 piers	SART undercrossing on west bank and maintenance road undercrossing on the East bank

Katella Ave. Bridge	Width = 130 ft	3 piers	SART undercrossing on west bank and maintenance road undercrossing on the East bank
UPRR Bridge	Width = 18 ft	5 piers	SART undercrossing on East bank
Ball Road Bridge	Width = 80 ft	5 piers	Maintenance road undercrossing on the West bank and SART undercrossing on East Bank

*Santa Ana River Trail (SART)

3.2.2 *Proposed Major Elements*

There are four main improvements related to the OC River Walk project that are within or will interact with the Santa Ana River hydraulics, including:

- Two river impoundments in the Santa Ana River for increased groundwater recharge capabilities
- Two non-motorized (pedestrian and bicycle) bridges across the Santa Ana River
 - Approximately 400 feet upstream of Orangewood Avenue
 - Approximately 800 feet upstream of Katella Avenue
- Riverbank modifications replacing existing riprap with soil cement terraces and steps
- Two new SART bike undercrossings
 - At the west bank at the ARTIC station
 - At the Union Pacific railroad

3.2.2.1 *River Impoundments*

The water impoundment within the Santa Ana River will be similar to OCWD's existing rubber dam impoundments currently in place for river flow diversion to groundwater recharge (**Figure 3-2**). However, instead of being used to divert water to offline basins, the OC River Walk impoundment structures would be installed to create semi-permanent water bodies in the Santa Ana River for groundwater recharge. Identical to the existing OCWD structures, the impoundment structures will lower automatically during large storm events or to drain impounded water when otherwise desired.

The first impoundment will be located upstream of the LOSSAN bridge crossing and create about 23 acres of water surface, with a depth up to 7 feet at the location of the impoundment structure. The second impoundment location will be upstream of the Orangewood Avenue bridge crossing and create about 14.4 acres of water surface, with an impoundment depth up to 10 feet at the location of the dam structure.

1. The City of Anaheim for the project's California Environmental Quality Act (CEQA) approval
 2. Amendment of existing California Division of Drinking Water (DDW) reuse permit to impound OCWD's advanced treated recycled water and use for groundwater recharge
 3. Amendment of existing National Pollutant Discharge Elimination System (NPDES) Permit (of which the DDW permit is a subpart)
 4. California Department of Fish and Wildlife (CDFW) Section 1602 notification of construction activity in the vicinity of a river
 5. U.S. Army Corps of Engineers (USACE) Section 404 and Section 408 permits
- To receive regulatory approval and obtain required permits for the OC River Walk impoundments, the project will need to meet the requirements of the following key agencies and regulatory programs:

3.3 Regulatory Setting

The public will access the terraced and stepped embankments in the proposed condition. OCFCDD will review and approve project elements providing public access to the Santa Ana River and ensure public use of OC River Walk Project area is safe.

The embankments on both sides of the Santa Ana River will be transformed by removing the existing riprap and adding stepped terraces, new soil cement banks, and riverbank planters. The proposed improvements include changing the existing riprap bank slope of 2H:1V to a soil cement slope of 1.5H:1V. The proposed riverbank modifications will maintain river flood control hydraulic capacity and bank stability.

3.2.2.3 River Embankment Modifications

Two new pedestrian bridges are proposed over the Santa Ana River to facilitate pedestrian and bicycle access and to connect the west and east banks of the SART. The first bridge crossing would be located near the Honda Center, approximately 800 feet upstream of Katella Avenue. The bridge is proposed to have three piers and a width of 35 feet. The second bridge would be approximately 400 feet upstream of Orangewood Avenue, across from Angel Stadium. The pedestrian bridge is proposed to have one pier and a width of 16 feet.

3.2.2.2 Pedestrian Bridges

Figure 3-2: Five Covers Rubber Dam along the Santa Ana River, Operated by OCWD

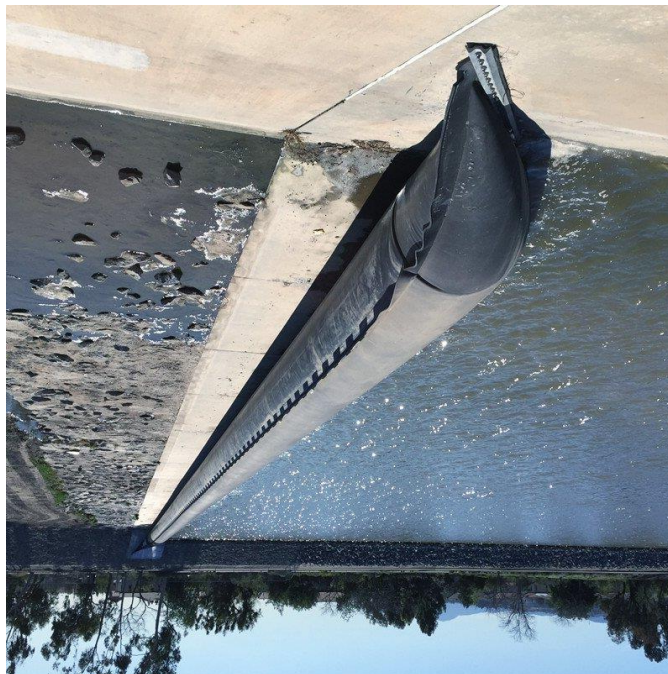




Figure 3-3: Agencies Involved with Approval of OC River Walk

4 Hydrology

4.1 Santa Ana River Flowrates

Design flowrates in the lower Santa Ana River watershed were established as part of the USACE design plan described in the GDM, Volume 7. The lower Santa Ana River reach was designed for flowrates equal to a 190-year storm event. The 190-year event represents a Prado Dam reservoir design flood that results in a spillway crest water surface elevation of 563 feet National Geodetic Vertical Datum of 1929 (NGVD 29) with 92% of the standard project flood hydrograph being routed through Prado Dam, with the release of flood flows as soon as possible within the storm event. This results in an outflow discharge of 30,000 cubic feet per second from Prado Dam, which is routed downstream and combined with tributaries to determine the design flood peak discharges at various locations along the lower Santa Ana River.

The GDM provides design flowrates in Table III-1 of Volume 3 at several locations along the Santa Ana River, as shown on **Figure 4-1**. The OC River Walk project location is between two locations where the GDM flowrates are specified. Design documents for the Lower Santa Ana River Channel Plan and Profile, from Station 674+20 to 704+20 in the GDM Volume 3, included in **Appendix A**, provided the exact USACE design flowrate at the OC River Walk project location. At the OC River Walk study area, the 190-year design discharge is 40,000 cubic feet per second with an increase to 41,000 cubic feet per second downstream of Collins Channel (USACE GDM Vol 3, 1988). The OC River Walk project is designed using the USACE 190-year event flowrate of 40,000 to 41,000 cubic feet per second.

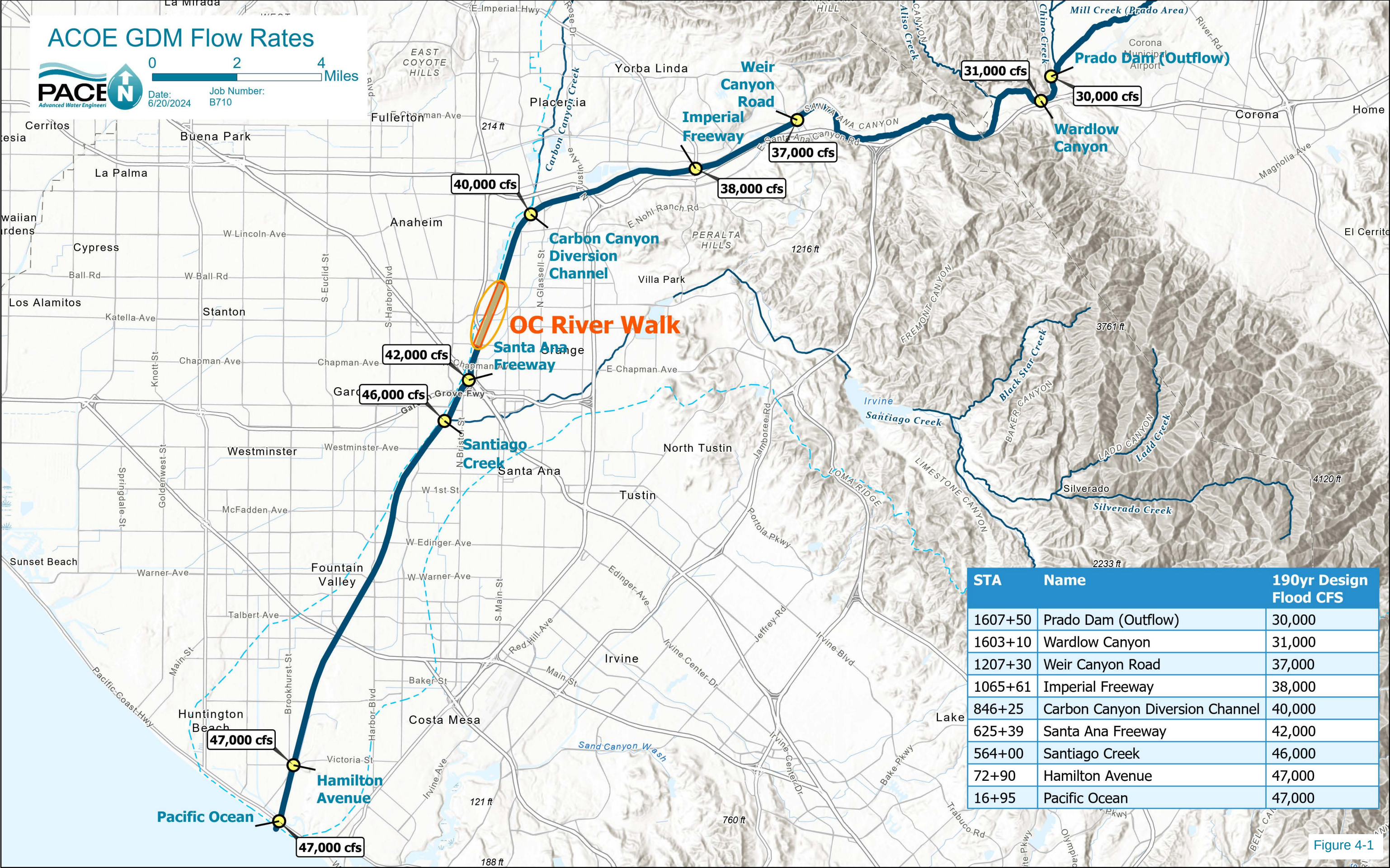


Figure 4-1

5 HEC-RAS Hydraulic Modeling

PACE developed a detailed hydraulic model of the study reach using the Hydraulic Engineering Center River Analysis System (HEC-RAS), version 6.4.1. Steady and unsteady models were created to simulate various flows within the river channel. Hydraulic models were used to evaluate changes in water surface elevations and velocity, freeboard within the river, sediment transport potential, potential bridge scour, and an impoundment deflation scenario.

5.1 Summary of HEC-RAS Models

Multiple HEC-RAS models were used for the OC River Walk hydraulic analysis, summarized below:

- **Santa Ana River Received USACE Model (Steady-State)** – Model received from the USACE. Geometry of the channel is simplified to a trapezoidal channel based on the as-built condition from USACE as-builts dated 1990–1994. This model represents the as-built condition of the Santa Ana River.
- **Santa Ana River Existing Condition Model (Steady-State)** – The received USACE model was modified by updating the cross sections with new topography while preserving the as-built channel invert. This model represents the existing condition of the Santa Ana River and provides a baseline for comparison to any proposed improvements.
- **Santa Ana River Proposed Condition Model (Steady-State)** – The proposed condition model represents the condition where the Santa Ana River improvements related to the OC River Walk development have been constructed. The channel side slopes and top of bank are modified to the OC River Walk design.
- **Impoundment Deflation Scenario (Unsteady-State)** – The impoundment deflation scenario uses the proposed condition model to analyze various inflatable impoundment deflation scenarios. The model extends downstream to include the River View Golf Course.

5.2 HEC-RAS Modeling

The USACE Santa Ana River model was obtained and used as the baseline for the existing condition model. The model received from the USACE extends from Prado Dam to the Pacific Ocean, so it was truncated to only span the project area, from approximately 1,100 feet downstream of Orangewood Avenue to approximately 2,600 feet upstream of Ball Road. The cross sections are spaced roughly 200 feet apart except for sections located near bridges, drop structures, or other abrupt changes in channel geometry. The USACE model elevations were originally in NGVD 29, but were converted and georeferenced to the North American Vertical Datum of 1988 (NAVD 88) and California State Plane Coordinate System for this study.

An updated existing conditions model of the project reach was developed by revising the USACE model sections with new light detection and ranging (LIDAR) data. The HEC-RAS workmap is shown on **Figure 5-2**. The new LIDAR was flown on October 25, 2022, and compiled into 1-foot contours with elevations in North American Vertical Datum of 1988 (NAVD 88). New HEC-RAS cross sections were cut using the new terrain data. Existing earthen T and L levees in the channel bottom produced varied invert elevations, section to section, resulting in an unrealistic streambed profile. The earthen T and L levees are sacrificial and expected to erode away during a storm, so the inverts of the updated HEC-RAS sections were set to the invert elevations of the original USACE sections, resulting in a realistic streambed profile (see **Figure 5-1**).

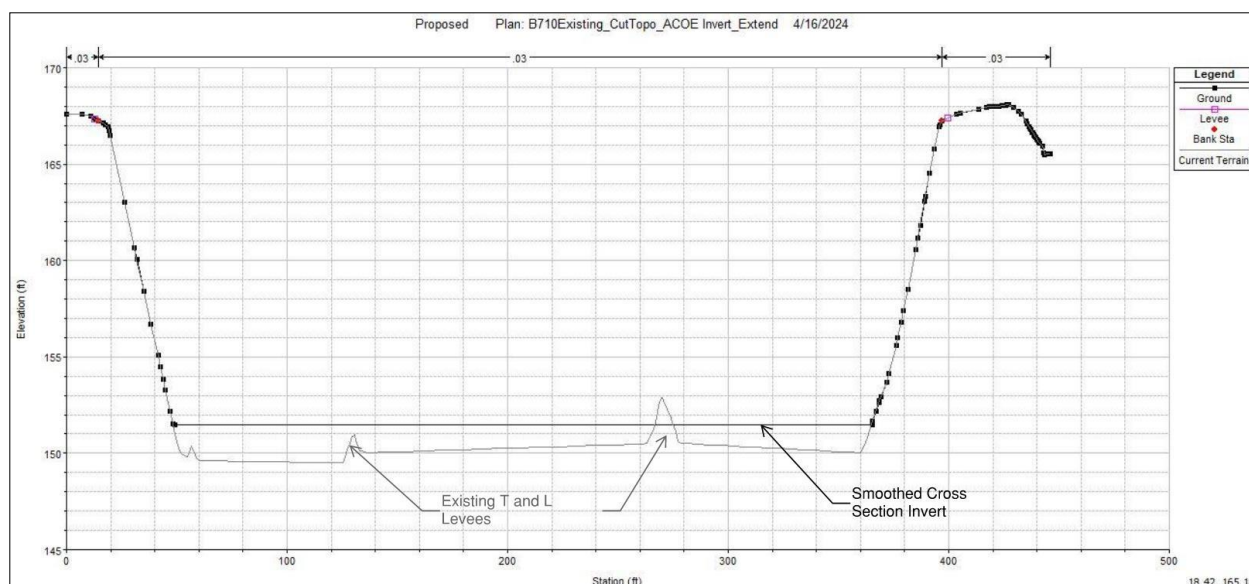


Figure 5-1: HEC-RAS Cross Section 71772, T and L Levee Invert “Smoothing”

The Manning’s roughness values for the HEC-RAS models are consistent with the values used in the received USACE model. The Manning’s values for the left and right overbanks are consistently set to $n = 0.03$, while the main channel Manning’s values vary from $n = 0.03$ to $n = 0.05$.

The boundary condition was taken as a “normal depth slope” or slope-area method, which is determined from the natural downstream slope of the existing streambed. The selection of the boundary conditions in the model is not critical for this study since the upstream and downstream limits of the model are a significant distance away from the revision reach.

All steady-state models were run with a subcritical flow regime. The subcritical flow regime produces the most conservative estimate of water surface elevations, which is preferable to determine the impact to freeboard in the proposed condition.

The Energy and Momentum methods were used to calculate the hydraulics of each bridge within the HEC-RAS model. The model was set to use the highest energy answer.

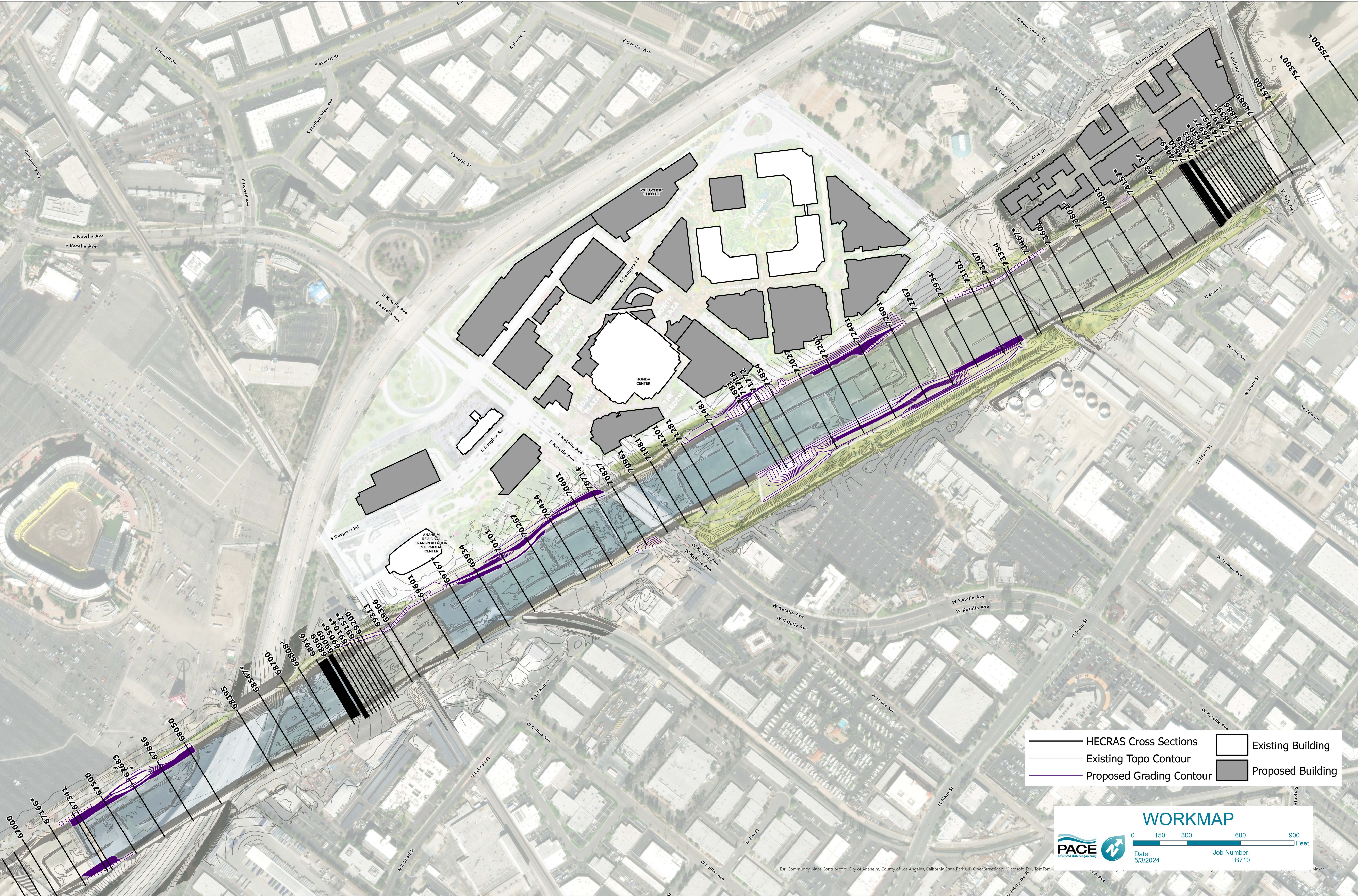
The drop structures were modeled as inline structures, with flow going through the structure modeled as a broad-crested weir.

5.3 Floodplain Hydraulics

The existing and proposed condition models were compared to quantify any changes to hydraulics as a result of the proposed improvements. The purpose of the existing condition model is to serve as a baseline that represents the as-is, as-built condition of the Santa Ana River. The proposed condition model includes all channel improvements and modifications.

The existing condition HEC-RAS model shows that flow depths for the design discharge [$Q_{190} = 40,000$ to 41,000 cubic feet per second (cfs)] range from 11.2 to 17.6 feet, and channel velocity ranges from 7.6 to 11.5 feet per second (fps).

The proposed condition analysis shows that flow depths for the design discharge range from 11.2 to 17.7 feet. Channel velocity for the design event ranges from 7.6 to 11.7 fps. **Appendix E** compares the flow depths and velocities from the two conditions.



— HECRAS Cross Sections	Existing Building
— Existing Topo Contour	Proposed Building
— Proposed Grading Contour	



WORKMAP

0 150 300 600 900 Feet

Date: 5/3/2024 Job Number: B710

Esri Community Maps Contributors: City of Anaheim, County of Los Angeles, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, L

6 Inflatable Dams and Operations

A key element of the OC River Walk project is the proposed water impoundments that provide nearly a year round water body for the river walk experience. Three inflatable dams will create two impoundments, which are designated as the “north” impoundment and “south” impoundment, as shown on **Figure 6-1**. The impoundments provide multiple benefits, including groundwater recharge, outdoor recreation, and aesthetic improvements.

The first impoundment will be located upstream of the LOSSAN bridge crossing and create about 23 acres of water surface, with a depth up to 7 feet at the location of the impoundment structure. The second impoundment location will be upstream of the Orangewood Avenue bridge crossing and create about 14.4 acres of water surface, with an impoundment depth up to 10 feet at the location of the dam structure. The total volume of water held by both impoundments is 200 acre-feet.

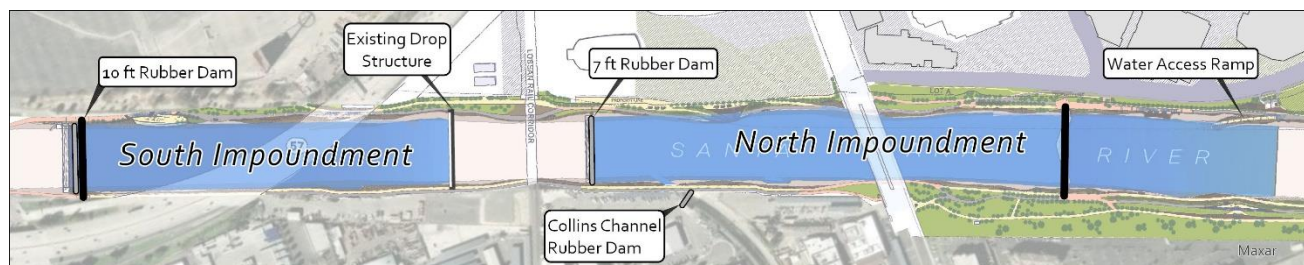


Figure 6-1: OC River Walk Impoundments

6.1 Inflatable Dams

Inflatable rubber dams have been selected to create the impoundments because they can be deflated during major river flow storm events to maintain full flood flow capacity in the Santa Ana River channel. The inflatable dams are constructed with a reinforced rubber structure, which will be resilient enough to withstand extended exposure to ultraviolet light and scouring resulting from normal operation of the Santa Ana River during the rainy season. The rubber structure will be designed with a robust anchoring system in order to secure it to its riverbed foundation and the sidewalls of the embankment, preventing slippage of or damage to the inflatable dam. The design and operation is similar to the inflatable dams OCWD has operated for 30 years, upstream of the project area in the Santa Ana River at the Imperial and Five Coves diversion locations.

Each dam will be equipped with an automated inflation and deflation system, including an inlet/outlet compressed air piping system, compressor, pressure relief valve, and a control and monitoring system that will be housed within a sound attenuating enclosure (precast vault or aboveground building).

Operational procedures of the impoundments are built on extensive analysis of the Santa Ana River hydrology and Prado Dam release procedures. The goals are effective utilization of Groundwater Replenishment System (GWRS) supply through increased groundwater recharge, channel flood conveyance capacity, and water quality of the impoundments. Three operational conditions are defined: dry weather operation, low river flow operation, and high river flow operation.

6.1.1 Dry Weather Operation

The Santa Ana River watershed is located in an arid region that receives little precipitation during the dry season, so there is generally no local tributary flow into the project reach of the river. The Santa Ana River base flow comes from Prado Dam, operated by the U.S. Army Corps of Engineers (USACE), which coordinates releases with OCWD of up to 1,000 cfs from the reservoir for OCWD groundwater recharge. It is intended that OCWD will coordinate releases of Prado Dam to ensure that, in most cases, this base flow is not sufficient to reach the project site, as it percolates either in offline basins through rubber dam diversions at Imperial and Five Coves or into the riverbed upstream of OC River Walk. Thus, the Santa Ana

River reach at OC River Walk will be mostly dry without the use of GWRS water from OCWD. This condition is defined as dry weather operation.

During dry weather operation, the impoundment water levels will be maintained using GWRS water supplied by OCWD. To address impoundment water quality concerns, dry weather nuisance flows in all adjacent tributary storm drain lines will be captured/diverted by gravity. These nuisance flows will be pumped to Orange County Sanitation District sewer lines and treatment facilities, with a few storm drain lines on the east side of the project discharged to the river channel downstream of the lower impoundment. This will minimize the possibility of any dry weather flows reaching the impoundments and mixing with GWRS water. In this operational condition, the impoundments will be filled to within 6 to 12 inches of the impoundment overflow elevation and maintained.

To summarize, dry weather operation is the condition where no surface flow, from any combination of tributary runoff and Prado Dam release, reaches the project site. In this condition, the impoundments are filled with only GWRS water to maximize water quality for aesthetics and potential recreational use.

6.1.2 Low River Flow Operation

A low flow event is defined as a precipitation event that produces expected flow volumes at the project site of less than 200 acre-feet (the volume of water retained by the two impoundments). Forecast monitoring of rainfall is already utilized for the operation of the Imperial and Five Coves rubber dams, as well as releases from Prado Dam, and OCWD has systems in place to anticipate precipitation events and volumes in the Lower Santa Ana River watershed. During a rain event, the dry weather nuisance diversion systems are turned off, allowing flow from the tributaries to enter the river. Flows to the project site will consist of a combination of flows from the surrounding tributaries and from Prado Dam releases.

Generally, in low flow conditions the GWRS water supply to the impoundments will be halted, and the GWRS water will be allowed to infiltrate or may be pumped to off-river basins operated by OCWD. Santa Ana River flows, either tributary or from Prado, will fill the impoundments up to the 200-acre-foot capacity. In any event where flows over the rubber dam reach a 6-inch nappe (approximately 320 cfs), the inflatable dams will be deflated.

To summarize, low flow is the condition where there is flow in the channel at the project site, with the total expected volume less than 200 acre-feet and the peak flow during the event less than 320 cfs.

6.1.3 High River Flow Operation

High flow events are defined as events where the flows reaching the project site, which include tributary runoff and flows from Prado Dam, are 200 acre-feet or greater. In these conditions, both impoundments will be evacuated and the rubber dams will be deflated to allow complete storm conveyance in the Santa Ana River channel.

For this operation, GWRS inflows to the impoundments will be halted and allowed to fully infiltrate, which takes approximately 10 days, or the GWRS water will be drained and pumped to Burris Basin, which is anticipated to take approximately 3 days. The impoundments will then be fully deflated to maintain peak flood capacity of the Santa Ana River channel. In the later parts of the storm, the dams will be reinflated with the intent of capturing the full operation volume, or 200 acre-feet, in both impoundments.

During any event, regardless of expected volume, when the flow exceeds 320 cfs (6 inch nappe) over the dams, they will automatically deflate as a safety mechanism to prevent damage.

6.1.4 Collins Channel

There is an inflatable dam located in Collins Channel where it meets the SAR. This inflatable dam prevents GWRS water from backing up into Collins Channel and prevents dry weather runoff from Collins Channel from entering the impoundments. The crest of the Collins Channel inflatable dam will be at the same elevation as the north SAR dam.

The Collins Channel dam will be operated in conjunction with the OC River Walk impoundments and will be raised and lowered to facilitate various operating conditions. During dry weather, with the Collins Channel dam inflated, a pump station will pump flow in Collins Channel to the SAR downstream of the OCRW impoundments. During storm events, the Collins Channel dam will be lowered in conjunction with the OCRW dams. The operation of the Collins Channel dam will maintain the flow pattern of the Collins Channel, and will not impact existing Collins Channel drainage capacity.

6.2 Hydraulic Analysis for Rapid Drop of Rubber Dam Impoundments

The inflatable dams will be managed to account for projected storm events that will cause large flows through OC River Walk. Any necessary evacuation of the impoundments is expected to occur through infiltration within 10 days; however, the hydraulics of a sudden deflation and resultant release of impounded water were investigated.

Approximately 9,500 feet downstream of the south impoundment is the Riverview Golf Course. This 18-hole golf course is located within the Santa Ana River floodplain, with the Santa Ana River running directly through the fairway. Potential impacts to the Riverview Golf Course and downstream areas were analyzed considering an emergency deflation of the dams holding full impoundment volumes. The analysis involved the following tasks, which will be discussed in detail in the following sections:

- Development of a design hydrograph for use in the hydraulic analysis
- Development of a HEC-RAS model of the study reach to characterize hydraulics
- Analysis of results and determination of downstream impacts

6.2.1 Hydrology

In order to model impacts to the golf course, a hydrograph of the inflatable dam deflation scenario was developed using the anticipated deflation time along with a stage-volume relationship. Three scenarios were analyzed resulting in three inflow hydrographs, described below:

- **North Impoundment Deflation** – Scenario where only the filled north impoundment is deflated.
- **South Impoundment Deflation** – Scenario where only the filled south impoundment is deflated.
- **Simultaneous North and South Impoundment Deflation** – Scenario where both the north and south impoundments are deflated concurrently.

Each deflation scenario was modeled using weir discharge equations. The scenarios assume that the deflation of the rubber dam will behave in the following manner. First, the behavior of the rubber dam will act as a rectangular weir from t_0 ($time = 0$) to $t = \frac{1}{4}$ deflation time. During this stage, the discharge is calculated by the rectangular weir equation:

$$Q = CLH^{\frac{3}{2}}$$

Where:

Q = discharge (cfs)

C = weir constant, assume 3

L = weir length (ft)

H = head above horizontal crest (ft)

Deflation will then transition to act as a rectangular weir with a v-notch, or a combination weir. This assumption is used from $t = \frac{1}{4}$ deflation time to the end of deflation. During this stage, a combination of the rectangular weir discharge and v-notch weir discharge equations are used:

$$Q = CLH^{\frac{3}{2}} + 3.9 h^{1.72} - 1.5$$

Where:

Q = discharge (cfs)

C = weir constant, assume 3

L = weir length (ft)

H = head above horizontal crest (ft)

h = head above horizontal crest (ft)

6.2.2 Summary of Results

The resultant hydrographs for each of the three scenarios are shown in **Figure 6-2**. The north impoundment deflation will result in a peak discharge of 2,833 cfs, the south impoundment deflation will result in a peak discharge of 2,071 cfs, and the combined north/south simultaneous deflation scenario will result in a peak discharge of 4,850 cfs.

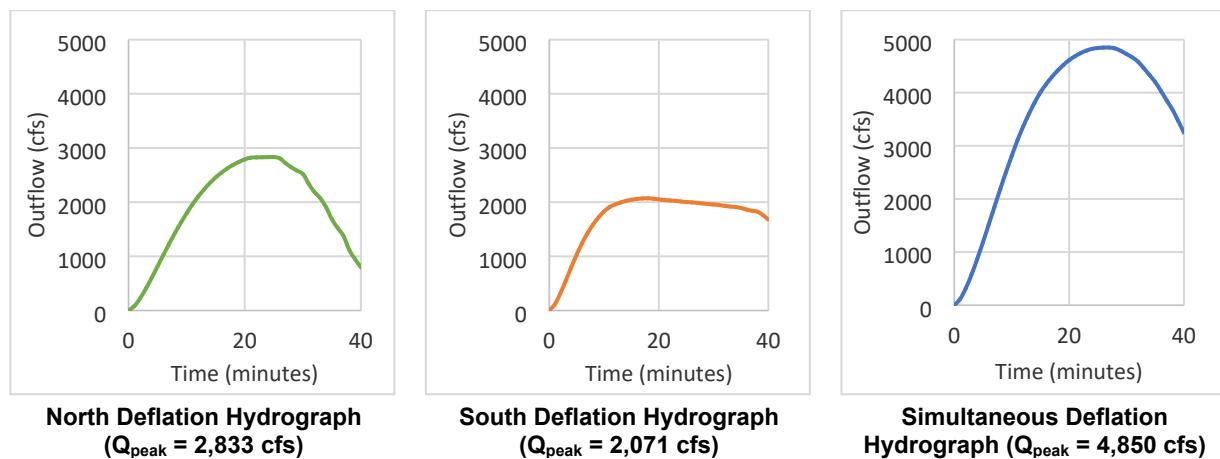


Figure 6-2: Deflation Hydrographs

6.3 Hydraulic Modeling

An unsteady one-dimensional HEC-RAS model of the Santa Ana River was created to analyze the dam deflation scenarios.

6.3.1 Modeling Parameters

The USACE has an existing model of the Santa Ana River that extends from Prado Dam to the Pacific Ocean that was used as a basis of the analysis. The model was truncated to span the study area, with the downstream cross section as RS 53380, at the downstream of the Riverview Golf Course, and the upstream cross section as RS 69601, approximately 240 feet upstream of the OCTA/SCRRA railroad bridge.

The cross sections are spaced roughly 200 feet apart except for sections located near bridges, drop structures, or other abrupt changes in channel geometry. The USACE model elevations were originally in NGVD 29, but were converted and geo-referenced to NAVD 88 and California State Plane Coordinate System for this study.

6.3.1.1 Analysis Inflow

The inflow hydrographs were created through the analysis described in Section 6.1. To obtain a stable model, each hydrograph was modeled with a minimum flow of 500 cfs.

6.3.1.2 *Downstream Boundary Condition*

The model features a normal depth boundary condition at the downstream end of the model, with a friction slope of 0.001 ft/ft. This normal depth boundary condition is more appropriate for an unsteady model with varying flow rates than the original known water surface elevation boundary condition.

6.3.1.3 *Unsteady Flow Simulation Parameters*

The unsteady flow simulation was run for 1 hour and 35 minutes with a 1-second computation interval.

6.3.2 *HEC-RAS Results*

The unsteady flow results show that the golf course will not be negatively impacted by rapid dam deflation within the OC River Walk development. The results of the simultaneous discharge of the north and south impoundment areas show a peak flow of approximately 4,850 cfs. The maximum profile from the simultaneous discharge was compared to a steady-state 2-year storm event.

The discharge frequency flow events for the OC River Walk project reach are available in the Santa Ana River Design Memorandum Phase II GDM on the Santa Ana River Mainstem, Volume 7, in Table 7-10 (USACE, 1988). The GDM shows that the 2-year storm event peak discharge is 4,700 cfs.

The results show that the maximum profile has lower water surface elevations than the 2-year steady-state event. This indicates that the dam deflation scenario has smaller impacts than a 2-year storm event. The Riverview Golf Course will not be impacted by the worst-case dam deflation scenario associated with the OC River Walk development. Each of the three dam deflation scenarios analyzed shows impacts less than those of a 2-year storm event.

7 Pedestrian Bridge Scour Analysis

This section summarizes the preliminary scour analysis completed for the proposed pedestrian bridge upstream of Katella Avenue.

7.1 Total Scour Analysis

Using the 190-year design flow rate, the total anticipated scour at the proposed bridge is determined by analyzing channel adjustments possible from long-term degradation, general scour, bend scour, contraction scour, local scour, low-flow incisement, and bed form scour.

$$Z_{Total} = Z_{Long-Term} + Z_{General} + Z_{Bend} + Z_{Bed\ form} + Z_{Low\ flow\ incisement} + Z_{Local\ Scour\ (Contraction,\ Pier,\ and\ Abutment)}$$

7.1.1 Long-Term Scour

Long-term scour adjustments aim to estimate scour from fluvial processes that occur over several years. In the case of the Santa Ana River, there are a series of grade control structures periodically spaced along the riprap-lined trapezoidal channel. These grade control structures will control the fluvial processes in the river and keep the channel from eroding past the top of each structure. Therefore, the long-term erosion of the study area is controlled by the downstream grade control structure. To conservatively calculate the long-term adjustment, it is assumed that the reach will erode to the top elevation of the downstream grade control, essentially causing a zero slope projected from the top of the grade control to the next upstream hydraulic structure. At the location of the bridge, the long-term scour, calculated by subtracting the top elevation of the grade control from the existing invert elevation, was found to be 2.4 feet.

7.1.2 General Scour

General scour is the lowering of the stream bed over a relatively short time period such as a single flow event. In order to estimate general scour, a series of equations were used. HEC-RAS includes a series of hydraulic design calculators, including a riprap calculator and a scour calculator. The scour calculator includes various widely used empirical local scour equations to provide a range of scour depths expected at a cross section. Both the upstream and downstream cross sections were analyzed using this tool. General scour was also found using the Los Angeles County Flood Control District (LACFCD) Hydraulic Design Manual, Table F-31, which estimates cutoff depth based on velocity. The equations analyzed and the resultant general scour are summarized below. The D50 used in the general scour calculations was 1.396 millimeters (mm) as specified in the grain size analysis for the Orangewood Avenue Bridge Improvement project, which was taken from the riverbed at Orangewood Avenue, downstream of the proposed pedestrian bridge.

The final general scour value was chosen as 6.4 feet, specified from the Neil method. This value was selected as a median, conservative, empirical estimate of general scour at the proposed pedestrian bridge.

7.1.3 Bend Scour

Bend scour occurs on the outside of a river bend and is largely based on the “radius of curvature” for the bend. The reach in the vicinity of the proposed pedestrian bridge is very straight, so bend scour is not expected to occur within the study area.

7.1.4 Bedform Scour

Bedform scour can develop in sand beds as a result of the interaction between hydraulic curves and the bed sediment. Bed forms include dunes, antidunes, bars, and ripples within the main channel. The LA County Sedimentation Manual uses a nomograph to relate channel velocity to a bed form height. Using the HEC-RAS velocity for the bridge cross sections, a bed form height of 1 foot is anticipated based on the LA County method.

Table 7-1: General Scour Calculation Method Summary

Method	Equation	General Scour Result (ft)	
		U/S Cross Section	D/S Cross Section
Neil	$\Delta y = Z \cdot \overline{D_{bf}} \left(\frac{Q_d/W}{Q_{bf}/W_{bf}} \right)^m$ Δy = scour depth $Z = 0.5$ for straight reaches $m = 0.67$ for sandy reaches $\overline{D_{bf}}$ = average bankfull cross section depth, approximated with hydraulic depth Q_d = design flow Q_{bf} = bankfull flow W = flow width of design event W_{bf} = bankfull flow width	6.4'	6.3'
Lacey	$\Delta y = Z \cdot 0.47 \left(\frac{Q_d}{1.76 \sqrt{d_m}} \right)^{\frac{1}{3}}$ Δy = scour depth $Z = 0.25$ for straight reaches Q_d = design flow d_m = median grain size	3.1'	3'
USBR Mean Velocity	$\Delta y = Z \overline{D}$ Δy = scour depth $Z = 0.25$ for straight reaches $\overline{D}$ = Depth	3'	3'
Blench	$\Delta y = Z \cdot \frac{\left(Q_d/W \right)^{\frac{2}{3}}}{\left(F_{B0} \right)^{\frac{1}{3}}}$ Δy = scour depth $Z = 0.6$ for straight reaches Q_d = design flow W = flow width of design event F_{B0} = Blench's Zero Bed Factor	10.9'	10.9'
USBR	$\Delta y = 2.47 + \frac{0.937 \left(Q_d/W \right)}{3.45}, \text{ if } \left(Q_d/W \right) < 3.45$ and $\Delta y = K \left(Q_d/W \right)^{0.24}, \text{ if } \left(Q_d/W \right) \geq 3.45$ Δy = scour depth $K = 2.45$ Q_d = design flow W = flow width of design event	7.6'	7.6'
LA County Cut of Depth	NA	8'	8'
Note: 1. Values <i>italicized in red</i> indicate that the D_{50} is not within the range anticipated to use the equation, and therefore should not be considered for general scour.			

7.1.5 Low-Flow Incisement

The low-flow channel incisement generally represents a small channel formed by smaller 5- to 10-year return storms. The incisement is formed as these low flows seek the most hydraulically efficient path downstream. The LA County Sedimentation manual specifies the use of 2 feet for a conservative estimate of low-flow incisement.

7.1.6 Local Pier Scour

Local scour occurs as the result of the proposed pedestrian bridge. The impacts of the local scour components are generally limited to the vicinity of the bridge that causes them; however, they are significant because they are frequently many times larger than the long-term or general adjustment components of scour. Local scour components are contraction scour, pier scour, and abutment scour. All three are calculated in HEC-RAS, following the procedures outlined in HEC-18: Evaluating Scour at Bridges, 5th Edition (FHWA, 2012).

According to the hydraulic output of the HEC-RAS modeling, contraction scour is computed based on the live-bed equation and pier scour based on the CSU equation. The proposed pedestrian bridge shows 3.7 feet of contraction scour and 4 feet of pier scour. This results in 7.7 feet of local scour.

7.2 Summary of Total Scour

The total scour anticipated at the proposed pedestrian bridge is the sum of all individual scour components analyzed. Each scour component analyzed and the total scour for the proposed pedestrian bridge is summarized below.

Table 7-2: Summary of Each Scour Component

Scour Component	Expected Adjustment (ft)
Long-Term	2.4
General	6.5
Bend	0
Bedform	1
Low Flow Incisement	2
Local Scour	7.7
Total Scour	19.6

8 OC River Walk Development Impact Analysis

8.1 Hydraulic Impacts

Hydraulic impacts encompass changes to depth, velocity, freeboard, and scour within the Santa Ana River as a result of the proposed OC River Walk development.

8.1.1 *Depth and Velocity*

Depths within the Santa Ana River were analyzed through the existing and proposed HEC-RAS modeling. The change in depth as a result of the proposed project shows a maximum increase of 0.5 feet, and in some areas a decrease in depth up to 0.2 feet. The changes to depth are generally upstream of the two proposed pedestrian bridges. These changes in depth are minimal; see **Figure 8-1**.

Similarly to depth data, velocity data was analyzed by comparing the existing and proposed HEC-RAS model results. The changes to velocity as a result of the proposed project include increases up to 0.6 fps and decreases up to 0.9 fps. The decreases are generally located around the proposed pedestrian bridges, where the addition of piers within the main channel slows down the flow, decreasing velocity. The maximum increase in velocity is localized to the proposed Meadow Park, which includes a small change in the bank alignment that slightly decreases flow area, therefore increasing velocity. Changes in velocity between the existing and proposed conditions are plotted in **Figure 8-2**.

8.1.2 *Freeboard*

The Santa Ana River is designated as a levee, which has minimum freeboard requirements. Freeboard is the vertical distance between the design water level and the top of bank. The USACE GDM Volume 3 specifies the minimum freeboard in the project reach as 2.5 feet. Freeboard was calculated for the existing and proposed condition HEC-RAS models by subtracting the design water surface elevation from the top of bank. A comparison of the freeboard provided in the existing and proposed condition models is detailed in **Appendix E**.

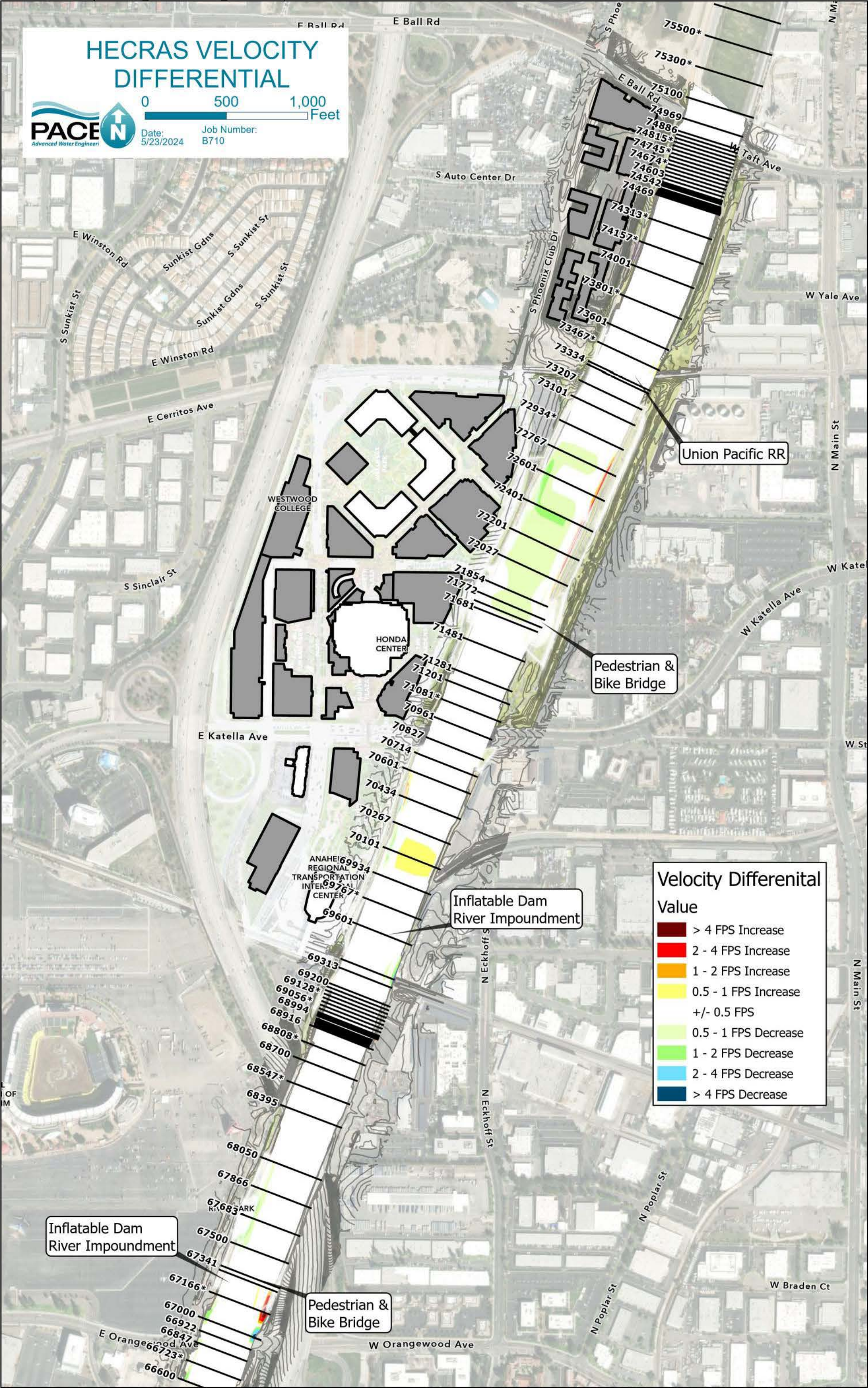
The freeboard analysis shows there is generally sufficient freeboard (greater than 2.5 feet) in the existing condition, with some deficiencies located just upstream of the SR 57 bridge, LOSSAN railroad bridge, and Katella Avenue bridge and around the crest of the downstream drop structure. In the proposed condition, the amount of freeboard gained or lost is directly related to the change in water surface elevation. The proposed project aims to fix any deficiencies in freeboard in the existing condition by raising the top of bank to meet the freeboard requirement specified in the USACE GDM. Freeboard will improve as a result of the proposed project.

8.1.3 *Scour*

The as-built/existing toe elevations range from a minimum of 5 feet along the channel up to 10-15 feet at drop structures and stabilization structures. A preliminary cutoff depth analysis was completed using the LACFCD Hydraulic Design Manual Table F-31, Levee Criteria, Cut-Off Depths. As discussed in Sections 5.3 and 8.1.1, changes in velocity are minimal, which means changes in scour depth are also minimal. There are no anticipated changes to scour depth as a result of the proposed channel improvements.

8.2 Hydrologic Impacts

Hydrologic changes are related to the ground cover within the project site. The proposed project will change 26,400 linear feet of grouted/un-grouted riprap to soil cement and riprap. This may result in a small increase to impervious area within the project site. However, in the perspective of the lower Santa Ana River watershed, this is a negligible increase. The lower Santa Ana River watershed covers an approximately 200 square mile area, while the change in pervious area is less than 0.01 square mile. There would be no significant impacts to the Santa Ana River hydrology as a result of the proposed bank modifications.



8.3 Water Quality Changes

Surface drainage in the project site will primarily remain the same, with the river trails and surrounding areas draining to the Santa Ana River. A Water Quality Management Plan (WQMP) will be developed which will address the required water quality components for the project elements. Best Management Practices (BMP's) will be implemented as required following the Santa Ana Region Technical Guidance Document (TGD).

8.4 Human Contact Changes and Impacts

One of the largest changes to the Santa Ana River as a result of the OC River Walk project is human access to the river and surrounding project site. The existing condition of the project site primarily only allows for access through the SART bike path. This unsupervised travel path allows for nuisance use of the dirt areas adjacent to the river, promoting poor trash management and creating the potential for bacterial and biological pollution. In addition, there are no trash receptacles or public restrooms in the vicinity of the SART.

During operation of the proposed impoundments, there are opportunities to divert trash from the Santa Ana River. During dry weather operation, trash from the storm drain diversions will be captured and no longer enter the Santa Ana River. In the event of large storms, the Santa Ana River will operate as it currently does, any trash and debris within the river will continue downstream.

In the proposed condition, there will be an anticipated increase in human access to the Santa Ana River. This increased access and site development will include the construction of public sanitary facilities and trash receptacles. The presence of these facilities will divert trash and other pollutants away from the Santa Ana River and into proper disposal pathways using source control. In addition, the City will maintain the project area and proposed impoundments, removing any accumulations of debris. It is anticipated there will be a decrease in pollutant loading through the construction of the proposed development and related facilities.

Any recreational elements as part of OC River Walk will generally operate between 5:30am and 10:30pm, which aligns with the City of Anaheim's standard operating schedule. The City of Orange's standard park operating hours are from 5:00am to 11:00pm.

9 Conclusion

The OC River Walk project, located within the Santa Ana River corridor between the Ball Road and Orangewood Avenue bridge crossings, will transform the Santa Ana River by removing the existing riprap bank lining and replacing it with soil cement stepped terraces, extending the existing SART bike path, adding two additional pedestrian bridges across the Santa Ana River, and creating two river impoundments that allow for infiltration.

HEC-RAS modeling of the project site was completed using hydrology from the USACE Design Memorandum for Phase II GDM on the Santa Ana River Mainstem, Volume 3, for the lower Santa Ana River. The final design flow rate represents a 190-year storm with a flow rate of 40,000 to 41,000 cfs within the project reach. Hydraulic modeling of the project reach included floodplain hydraulics, freeboard, and scour. Comparison between the existing and proposed conditions showed minimal changes in depth, velocity, freeboard, and scour.

The proposed project will also change the way that users can interface with the Santa Ana River. The development improves human impacts on the Santa Ana River by decreasing pollutant loading through the inclusion of sanitary facilities and trash receptacles in the proposed design. In addition, management of the two impoundments will include maintenance activities that divert trash from washing downstream to the Pacific Ocean.

Operation of the dam impoundments will have minimal impacts on downstream flood control facilities and users. Modeling of three deflation scenarios showed that the hydraulic impacts would be the same as those from a 2-year return storm. Minimal flow depth and velocity changes would occur.

References

Federal Highway Administration (FHWA), Hydraulic Engineering Circular Number 18. April 2012.

Orange County Water District, *Orange County Water District Application to Appropriate Santa Ana River Water*. March 2006.

U.S. Army Corps of Engineers, and Federal Emergency Management Agency (FEMA). *National Levee Database*, USACE, June 2017, levees.sec.usace.army.mil/map-viewer/index.html.

U.S. Army Corps of Engineers, *Santa Ana River Design Memorandum No. 1, Phase II GDM on the Santa Ana River Mainstem including Santiago Creek. Volume 3, Lower Santa Ana River*. August 1988.

U.S. Army Corps of Engineers, *Santa Ana River Design Memorandum No. 1, Phase II GDM on the Santa Ana River Mainstem including Santiago Creek. Volume 7, Hydrology*. August 1988.



Appendix A – ACOE GDM Hydrology Documentation

Appendix A
Pages from USACE Design Memorandum No. 1 Phase II GDM on the
Santa Ana River Mainstem, Volume 3 Lower Santa Ana River



US Army Corps
of Engineers

Los Angeles District

AD-A204 544

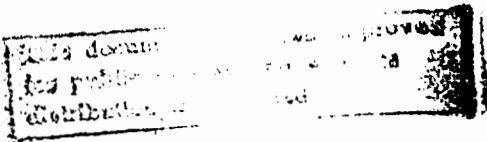
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SANTA ANA RIVER BASIN, CALIFORNIA

Santa Ana River

Design Memorandum No. 1

PHASE II GDM ON THE SANTA ANA RIVER MAINSTEM including Santiago Creek



DTIC
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VOLUME 3
LOWER SANTA ANA RIVER
(PRADO DAM TO PACIFIC OCEAN)

August 1988 89 2 2 005

Mainstem Design Flood Peak Discharges

3-03 Table III-1 lists the design flood peak discharges (based on future conditions) at several locations along the Lower Santa Ana River as shown in figure 7. The design flood peak discharges on the Santa Ana River below Prado Dam are produced by a general storm critically centered above Prado Dam with contemporaneous rainfall from the same general storm falling on the drainage area below Prado Dam. This storm resulted in a outflow discharge of 30,000 ft³/sec from Prado Dam, which was routed downstream and combined with the contemporaneous flow of downstream subareas to determine the design flood peak discharges at each location. A storm centered below Prado Dam, whether a local storm or a general storm, will not be more critical than the selected storm centered upstream from Prado Dam.

Table III-1. Design Flood Peak Discharges Along the Lower Santa Ana River.

Location	Station	Design Discharge (cfs)*
Prado Dam Outflow	1607+50	30,000
Downstream from:		
Wardlow Canyon	1603+10	31,000
Weir Canyon Road	1207+30	37,000
Imperial Highway	1065+61	38,000
Carbon Canyon Diversion Channel	846+25	40,000
Santa Ana Freeway	625+39	42,000
Santiago Creek	564+00	46,000
Hamilton Avenue	72+90	47,000
Pacific Ocean	16+95	47,000

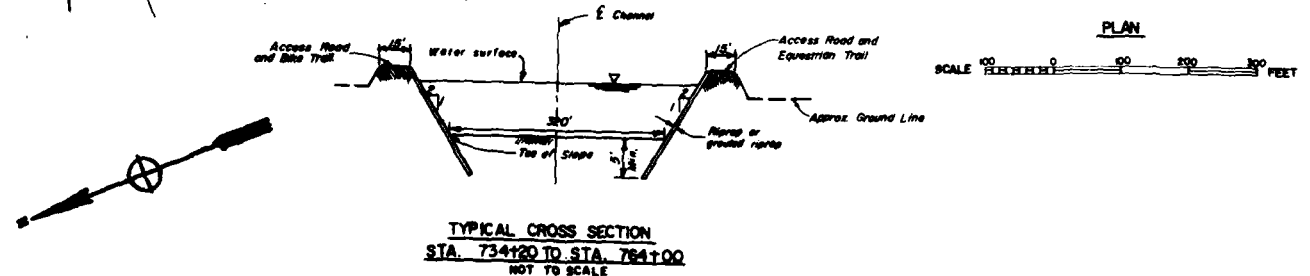
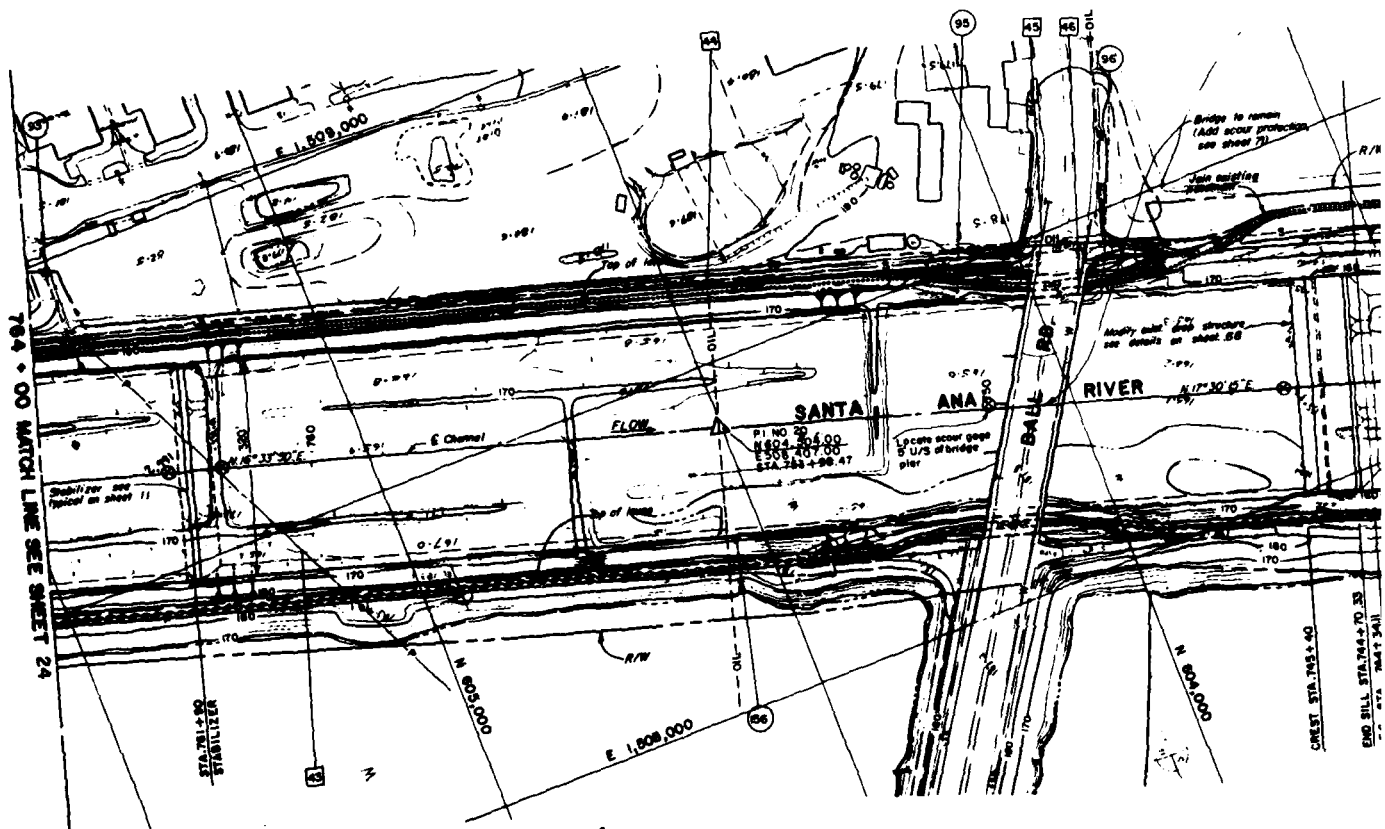
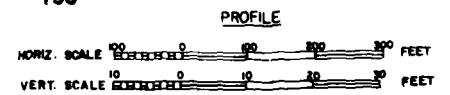
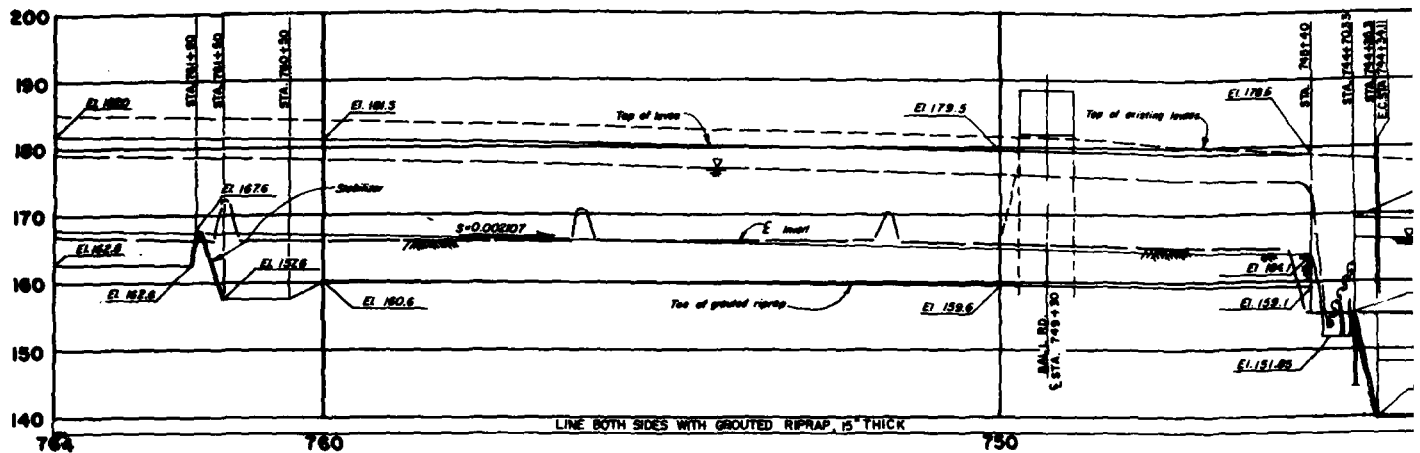
*Based on general storm upstream from Prado Dam. Design discharges below Prado Dam are approximately a 190-year event.

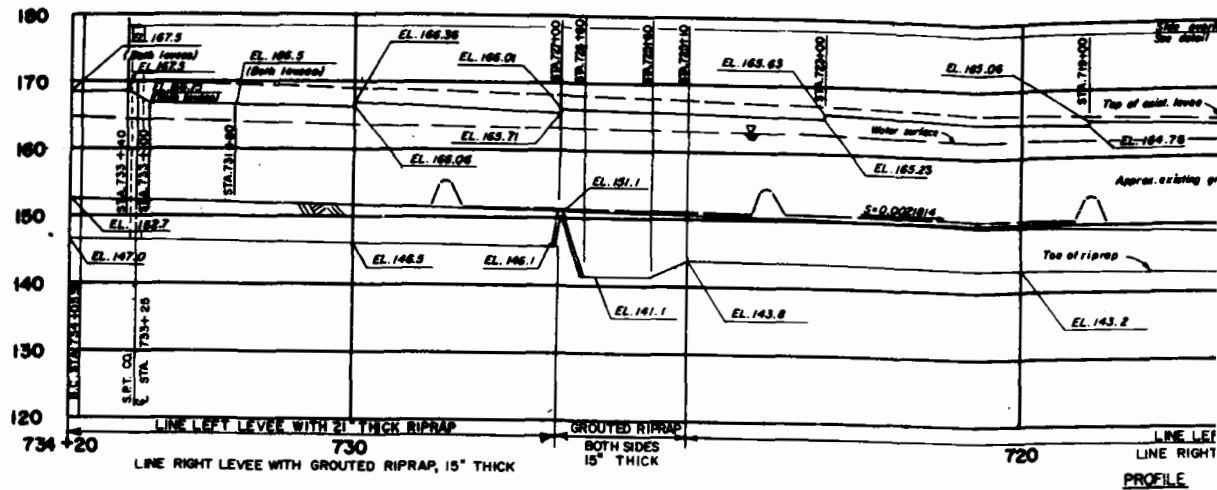
Interior Flood Control

3-04 Interior flood control refers to drainage from areas protected from direct river flooding by levees or floodwalls. From the end of the canyon reach at Weir Canyon Road to 17th Street in Santa Ana, the project channel levee heights are generally 2-4 feet above the natural ground line. From 17th Street to the Pacific Ocean, the levee heights increase to about 10-15 feet above the natural ground line. Peak discharges and runoff volumes were determined for all interior drainage areas for the following three conditions:

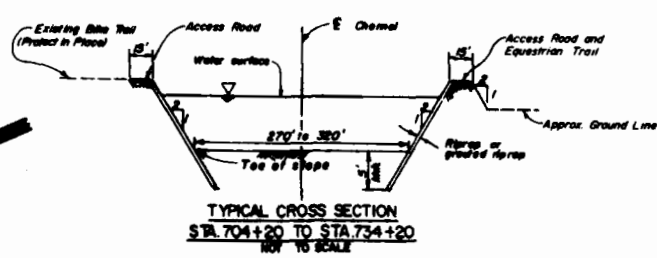
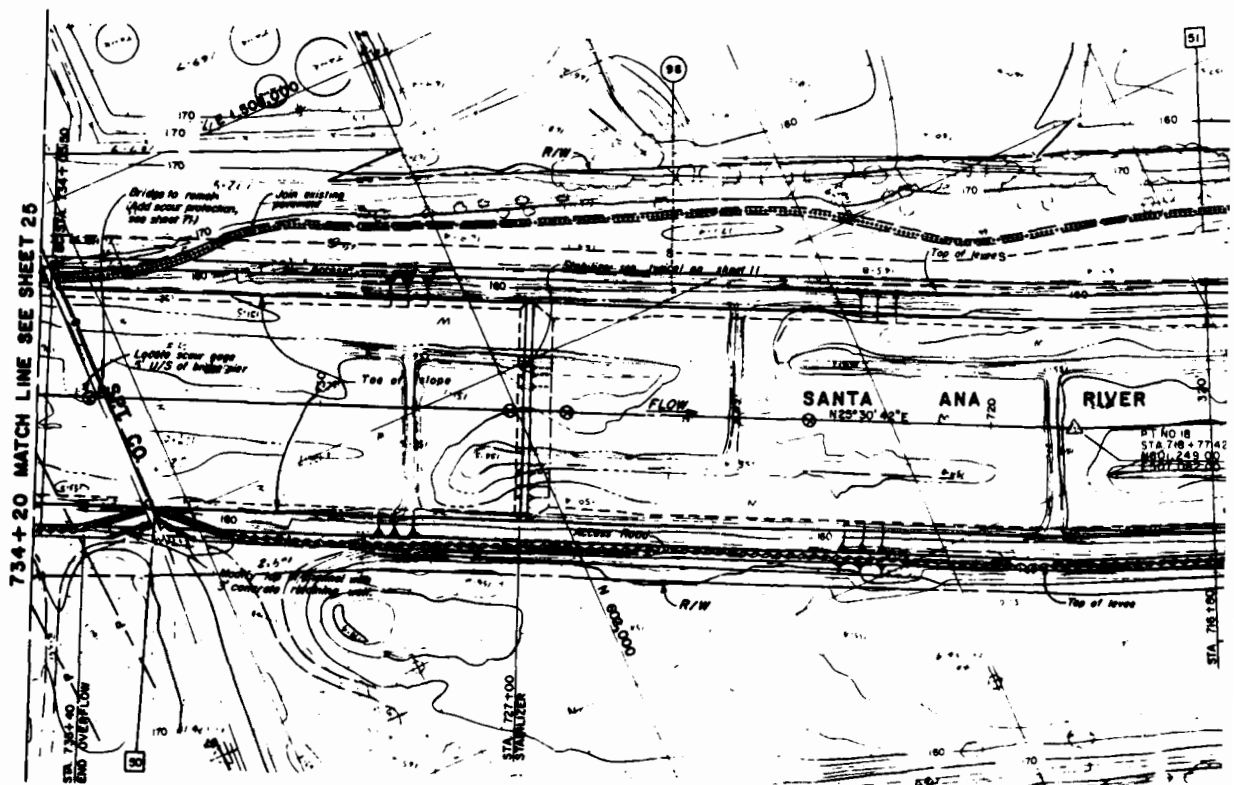
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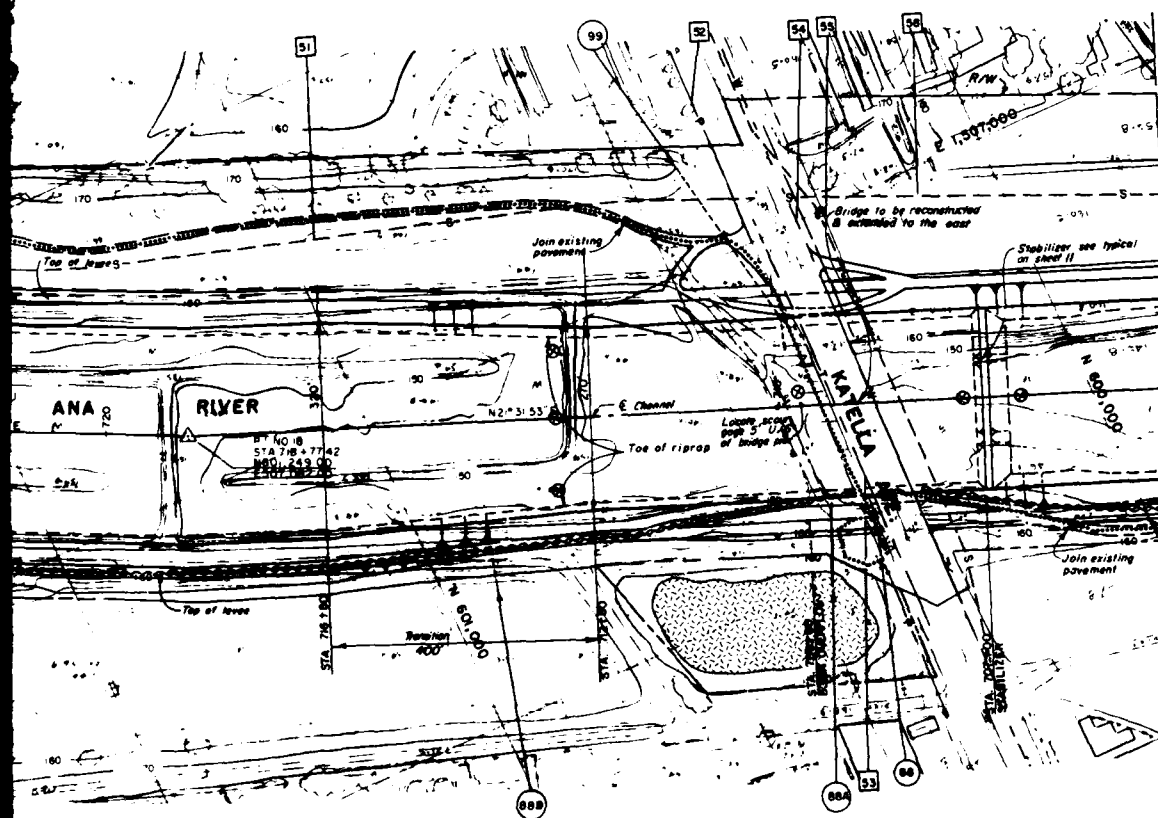
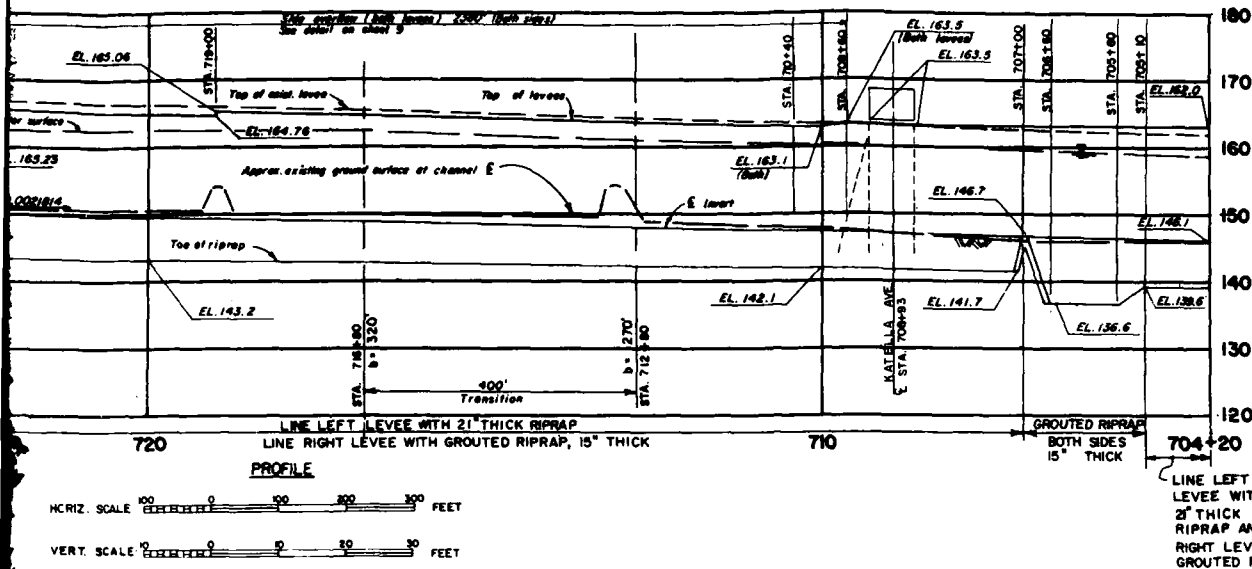
HORIZ. SCALE: 1" = 100'
 VERT. SCALE: 1" = 10'



PLAN
 SCALE 1" = 100'

STA.	TO
704+20	708+00
708+00	712+00
712+00	716+00
716+00	720+00
720+00	724+00
724+00	728+00
728+00	732+00
732+00	736+00
736+00	740+00

VALUE ENGINEERING PAYS



NOTES

1. REMOVE AND REUSE EXISTING SLOPE PROTECTION (18" FACING STONE W/6" FILTER)
2. D/S OF KATELLA REMOVE 8" REINFORCED CONCRETE FROM SIDE SLOPES.
3. SEE SHEET 9 FOR TYPICAL ACCESS ROAD A.C. PAVING DETAILS.

LEGEND

- (NO) UTILITY. SEE SHEET 62 FOR TABULATION.
- (NO) SIDE DRAIN. SEE SHEET 70 FOR DETAILS.
- EQUESTRIAN/HIKING TRAIL
- NEW ACCESS RD. AND BIKE TRAIL
- EXISTING BIKE TRAIL-PROTECT IN PLACE
- DESIGNATED PONDING AREA
- SCOUR GAGE-SEE SHEET 9 FOR DETAIL
- ADDITIONAL R/W REQUIRED

DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929

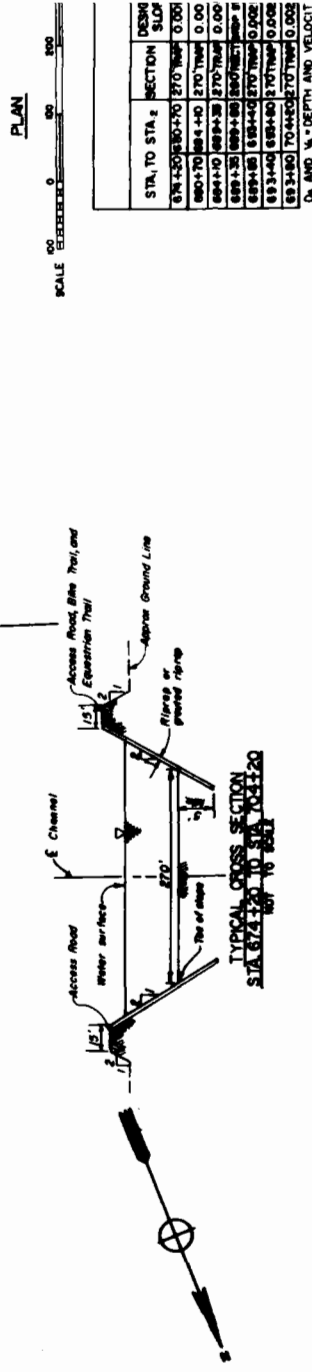
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DESIGNED BY:	U. S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS				
DRAWN BY:	SANTA ANA RIVER MAINSTEM CALIFORNIA PHASE II GENERAL DESIGN MEMORANDUM				
CHECKED BY:	LOWER SANTA ANA RIVER CHANNEL				
APPROVED BY:	PLAN AND PROFILE				
DATE:	STA. 704+20 TO STA. 734+20				
DATE:	DISTRICT FILE NO.				
DATE:	SHEET 26 OF 100				

HYDRAULIC ELEMENTS							
STA. TO STA.	SECTION	DESIGN SLOPE	Q (cfs)	Dc (ft)	n = 0.30		
					Da	Va	Da2
704+20	708+80	270' TRAP	0.0021H	40,000	8.6	12.9	10.8
708+80	708+80	270' TRAP	0.0021H	40,000	8.6	12.8	10.8
708+80	712+80	270' TRAP	0.0021H	40,000	8.6	13.1	10.8
712+80	718+80	270' TRAP	0.0021H	40,000	8.6	13.2	10.8
718+80	724+80	270' TRAP	0.0021H	40,000	7.7	13.1	10.8
724+80	730+80	270' TRAP	0.0021H	40,000	7.7	11.6	10.1
730+80	734+20	270' TRAP	0.0021H	40,000	7.7	12.0	9.7

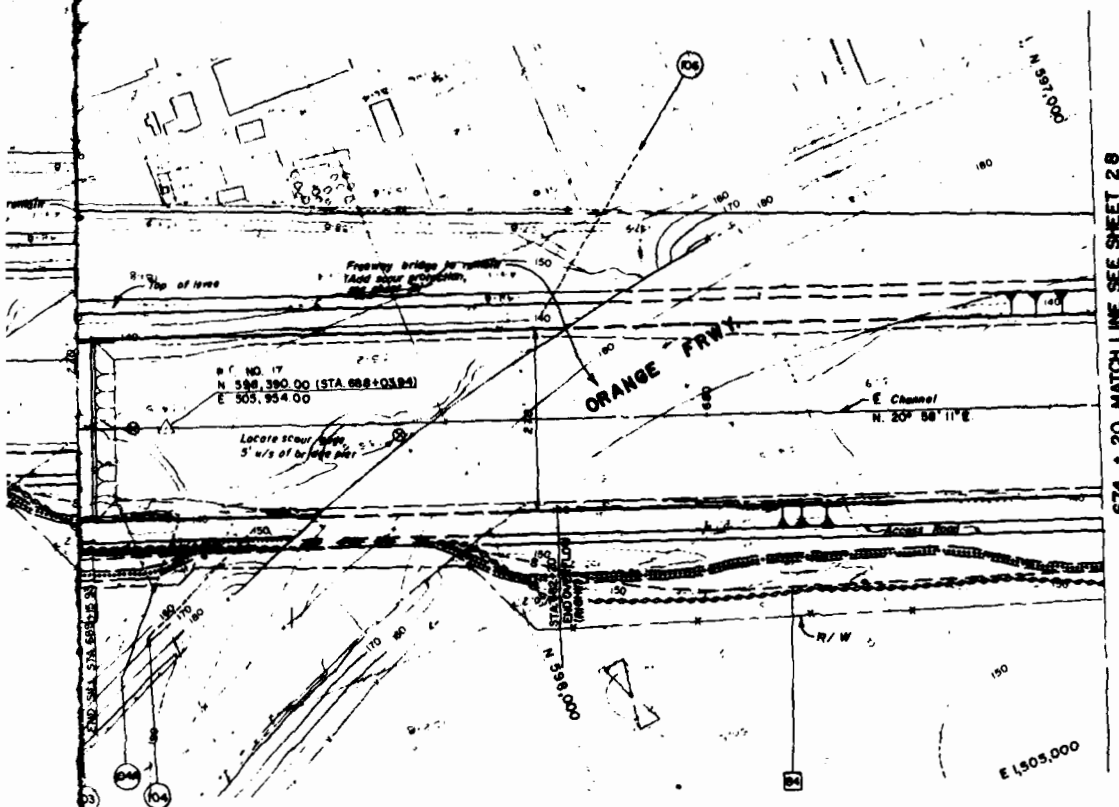
Da AND Va = DEPTH AND VELOCITY OF FLOW WITH AIR ENTRAINMENT

SAFETY PAYS

ENVIRONMENTAL
ENHANCEMENT
THRU ENGINEERING

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SAFETY PA



LEGEND

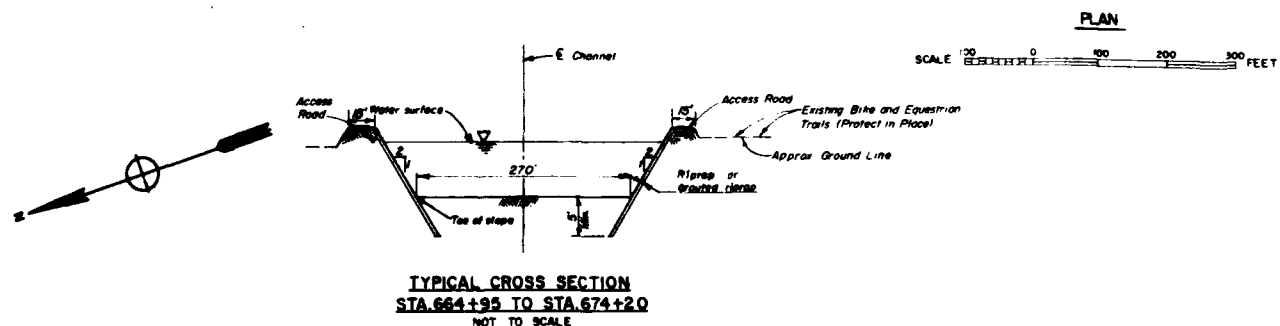
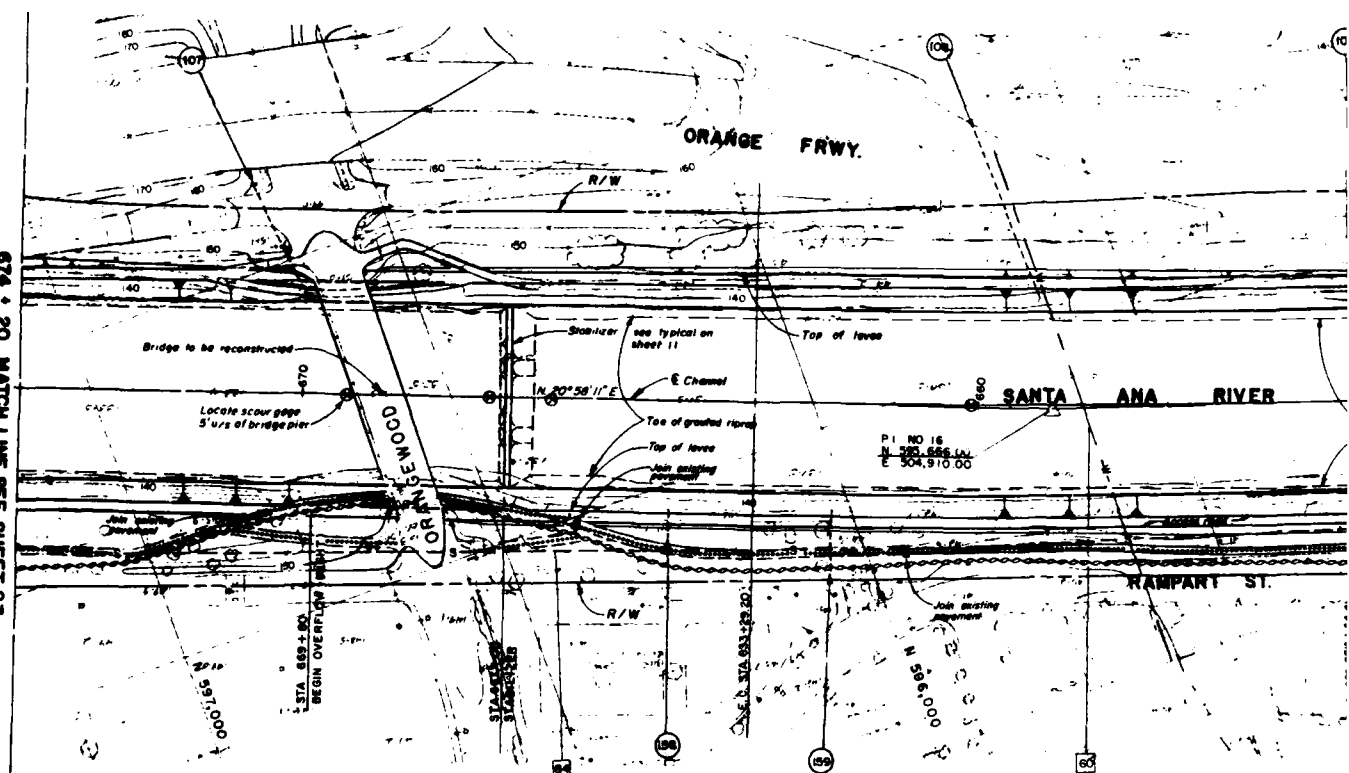
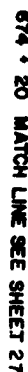
-  UTILITY. SEE SHEET 62 FOR TABULATOR
 SIDE DRAIN. SEE SHEET 70 FOR DETAILS
 EQUESTRIAN / HIKING TRAIL
 NEW ACCESS ROAD AND BIKE TRAIL
 EXISTING BIKE TRAIL - PROTECT IN PLACE
 SCOUR GAGE - SEE SHEET 9 FOR DETAIL

HYDRAULIC ELEMENTS									
STA ₁ TO STA ₂	SECTION	DESIGN SLOPE	Q (cfs)	Dc (ft)	n = 0.30				
					D ₁	V ₁	D ₂	V ₂	
674+30.00 TO 710	270° TRAP	0.001682	41,000	8.8	13.4	10.3	13.5	10.8	
680+70	684+40	270° TRAP	0.001682	41,000	8.8	13.3	10.4	13.7	10.0
684+10	689+30	270° TRAP	0.001682	41,000	8.8	13.7	10.0	13.6	10.2
689+30	689+85	30° SLOPE	SEMP STRUCT						
689+85	689+40	270° TRAP	0.001681	41,000	8.8	12.6	11.1	12.4	11.2
689+40	689+30	270° TRAP	0.001681	41,000	8.8	12.4	11.2	13.5	10.3
689+30	700+40	270° TRAP	0.001681	40,000	8.8	13.8	10.3	12.9	10.9

D₁ AND V₁ = DEPTH AND VELOCITY OF FLOW WITH AIR ENTRAINED

SAFETY PAYS

DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929			
PROJECT	DESCRIPTION	DATE	APPROVAL
REVISIONS			
		U. S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS	
DESIGNED BY:		SANTA ANA RIVER MAINSTEM CALIFORNIA PROJECT & GENERAL DESIGN MEMORANDUM	
DRAWN BY:		LOWER SANTA ANA RIVER CHANNEL PLAN AND PROFILE STA. 674+20 TO STA. 704+20	
CHECKED BY:			
SUBMITTED BY:		DATE APPROVED:	SHEET 27 OF 106 NOV 68
DRAWN BY: _____		DESIGN FOR NO. _____	



Appendix A
***Pages from USACE Design Memorandum No. 1 Phase II GDM on the
Santa Ana River Mainstem, Volume 7 Hydrology***



**US Army Corps
of Engineers**

Los Angeles District

AD-A204 547

DTIC FILE CO.

082

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SANTA ANA RIVER BASIN, CALIFORNIA

Santa Ana River

Design Memorandum No. 1

PHASE II GDM ON THE SANTA ANA RIVER MAINSTEM including Santiago Creek

**VOLUME 7
HYDROLOGY**

**DTIC
ELFATE
FEB 07 1989**
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H

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

August 1988 89 2 6 101

Table 7-10. Santa Ana River Mainstem Discharge-Frequency Values.
(Future Conditions)

Location	Frequency of Peak Discharge						
	200-YR	100-YR	50-YR	25-YR (in ft ³ /s)	10-YR	5-YR	2-YR
at Seven Oaks Dam (D.A. = 177 mi ²)							
Inflow							
w/o project	88,000	58,000	34,000	20,500	8,800	4,300	1,100
and w/project							
Outflow							
w/o project			same as inflow				
w/project	6,900	5,500	4,200	3,150	2,150	2,000	500
D/S of Mill Creek (D.A. = 242 mi ²)							
w/o project	120,000	76,000	45,000	26,000	11,700	5,600	1,400
w/project	37,000	25,000	15,500	9,300	4,300	2,050	760
D/S of City Creek (D.A. = 290 mi ²)							
w/o project	125,000	80,000	48,000	28,000	12,500	5,800	1,400
w/project	50,000	33,000	21,000	13,000	5,600	2,600	800
at E Street (D.A. = 500 mi ²)							
w/o project	170,000	111,000	64,000	36,000	14,500	6,300	1,450
w/project	110,000	70,000	42,000	24,000	9,400	4,000	920
at Riverside Narrows (D.A. = 824 mi ²)							
w/o project	280,000	190,000	115,000	62,000	26,000	11,000	2,200
w/project	220,000	140,000	82,000	47,000	19,000	8,100	1,680
at Prado Dam (D.A. = 2255 mi ²)							
Inflow							
w/o project	380,000	270,000	155,000	85,000	34,000	14,000	3,400
w/project	320,000	230,000	135,000	75,000	30,000	13,000	3,100
Outflow							
w/o project	240,000	115,000	21,000	6,900	6,400	4,700	2,400
w/project	30,000	30,000	30,000	22,000	11,000	6,000	3,200
at Imperial Hwy (D.A. = 2306 mi ²)							
w/o project	240,000	110,000	22,000	7,000	6,500	4,800	2,500
w/project	40,000	36,000	34,000	25,000	13,000	7,200	3,800
at Santa Ana (D.A. = 2447 mi ²)							
w/o project	220,000	90,000	30,000	20,400	13,000	8,400	4,700
w/project	50,000	42,000	37,000	27,500	18,000	11,000	4,700

Note: D.A. = drainage area.



Appendix B – Existing Condition HEC-RAS Output

HEC-RAS Plan: Existing_Topo_ACOE_Extend River: Santa Ana River Reach: Below Prado Profile: 190yr ACOE

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	77600	190yr ACOE	40000.00	172.94	184.18	180.49	185.74	0.001799	10.01	3996.02	379.15	0.54
Below Prado	77433*	190yr ACOE	40000.00	172.57	183.85	180.18	185.43	0.001819	10.08	3966.48	375.21	0.55
Below Prado	77266*	190yr ACOE	40000.00	172.21	183.51	179.87	185.12	0.001854	10.19	3927.23	371.21	0.55
Below Prado	77100	190yr ACOE	40000.00	171.84	183.16	179.57	184.80	0.001889	10.29	3888.74	367.16	0.56
Below Prado	76933*	190yr ACOE	40000.00	171.51	182.85	179.24	184.48	0.001871	10.24	3905.58	368.61	0.55
Below Prado	76766*	190yr ACOE	40000.00	171.17	182.56	178.89	184.17	0.001842	10.18	3930.32	370.24	0.55
Below Prado	76600	190yr ACOE	40000.00	170.84	182.27	178.54	183.86	0.001817	10.12	3953.16	371.94	0.55
Below Prado	76433*	190yr ACOE	40000.00	170.37	181.93	178.18	183.55	0.001839	10.21	3917.16	366.66	0.55
Below Prado	76266*	190yr ACOE	40000.00	169.91	181.57	177.84	183.24	0.001877	10.34	3867.89	360.45	0.56
Below Prado	76100	190yr ACOE	40000.00	169.44	181.21	177.50	182.92	0.001877	10.47	3818.71	348.69	0.56
Below Prado	75900*	190yr ACOE	40000.00	169.14	180.85	177.12	182.53	0.001944	10.40	3845.79	364.66	0.56
Below Prado	75700*	190yr ACOE	40000.00	168.84	180.48	176.76	182.13	0.001922	10.32	3875.37	368.69	0.56
Below Prado	75500*	190yr ACOE	40000.00	168.54	180.11	176.39	181.74	0.001899	10.24	3906.29	372.80	0.56
Below Prado	75300*	190yr ACOE	40000.00	168.24	179.75	176.03	181.36	0.001875	10.15	3939.09	377.23	0.55
Below Prado	75100	190yr ACOE	40000.00	167.94	179.40	175.67	180.98	0.001846	10.06	3974.73	381.51	0.55
Below Prado	74969	190yr ACOE	40000.00	167.24	179.27	175.08	180.72	0.001564	9.65	4144.72	366.63	0.51
Below Prado	74927	Bridge										
Below Prado	74886	190yr ACOE	40000.00	167.24	178.87	175.12	180.40	0.001775	9.92	4034.17	382.80	0.54
Below Prado	74862*	190yr ACOE	40000.00	167.19	178.78	175.12	180.35	0.001872	10.06	3976.11	382.99	0.55
Below Prado	74839*	190yr ACOE	40000.00	167.13	178.72	175.04	180.31	0.001882	10.10	3959.03	380.63	0.55
Below Prado	74815*	190yr ACOE	40000.00	167.08	178.73	174.71	180.24	0.001719	9.85	4060.91	377.07	0.53
Below Prado	74792*	190yr ACOE	40000.00	167.03	178.66	174.74	180.20	0.001768	9.95	4022.05	380.21	0.54
Below Prado	74768	190yr ACOE	40000.00	166.97	178.66	174.58	180.14	0.001619	9.77	4094.53	371.30	0.52
Below Prado	74745*	190yr ACOE	40000.00	166.92	178.65	174.49	180.09	0.001565	9.63	4151.98	375.07	0.51
Below Prado	74721*	190yr ACOE	40000.00	166.87	178.63	174.43	180.05	0.001549	9.58	4176.25	378.08	0.51
Below Prado	74697	190yr ACOE	40000.00	166.81	178.57	174.43	180.01	0.001576	9.63	4152.60	377.82	0.51
Below Prado	74674*	190yr ACOE	40000.00	166.76	178.48	174.51	179.97	0.001658	9.80	4081.43	375.74	0.52
Below Prado	74650*	190yr ACOE	40000.00	166.71	178.39	174.57	179.92	0.001740	9.95	4020.96	375.40	0.54
Below Prado	74627*	190yr ACOE	40000.00	166.65	178.30	174.46	179.88	0.001816	10.08	3969.80	375.50	0.55
Below Prado	74603	190yr ACOE	40000.00	166.60	178.24	174.42	179.84	0.001777	10.16	3938.68	361.70	0.54
Below Prado	74580*	190yr ACOE	40000.00	166.55	178.20	174.36	179.79	0.001763	10.12	3951.66	362.67	0.54
Below Prado	74556	190yr ACOE	40000.00	166.49	178.21	174.19	179.73	0.001667	9.91	4038.10	366.70	0.53
Below Prado	74552*	190yr ACOE	40000.00	166.48	178.20	174.18	179.72	0.001659	9.88	4047.94	367.80	0.53
Below Prado	74547	190yr ACOE	40000.00	166.47	178.20	174.17	179.71	0.001660	9.87	4051.10	368.70	0.53
Below Prado	74542	190yr ACOE	40000.00	166.46	178.21	174.12	179.69	0.001622	9.77	4093.05	371.97	0.52
Below Prado	74537	190yr ACOE	40000.00	166.45	178.22	174.06	179.67	0.001578	9.66	4142.27	375.46	0.51
Below Prado	74533	190yr ACOE	40000.00	166.44	178.21	174.06	179.66	0.001584	9.67	4136.34	375.07	0.51
Below Prado	74524	Inl Struct										
Below Prado	74515	190yr ACOE	40000.00	154.19	169.81	162.21	170.74	0.002077	7.77	5147.15	359.31	0.36
Below Prado	74510	190yr ACOE	40000.00	154.19	169.80	162.23	170.73	0.002056	7.73	5177.65	362.85	0.36
Below Prado	74505	190yr ACOE	40000.00	154.19	169.81	162.20	170.72	0.002019	7.66	5224.65	366.25	0.36
Below Prado	74500	190yr ACOE	40000.00	154.19	169.80	162.18	170.70	0.001985	7.60	5260.44	369.40	0.36
Below Prado	74496	190yr ACOE	40000.00	154.19	169.80	162.17	170.69	0.001959	7.58	5280.13	370.33	0.35
Below Prado	74491	190yr ACOE	40000.00	154.19	169.79	162.15	170.68	0.001949	7.58	5274.76	369.87	0.35
Below Prado	74486	190yr ACOE	40000.00	154.19	169.78	162.15	170.67	0.001945	7.59	5269.57	369.36	0.35
Below Prado	74481	190yr ACOE	40000.00	154.19	169.77	162.12	170.66	0.001933	7.59	5271.07	368.89	0.35
Below Prado	74477	190yr ACOE	40000.00	154.19	169.75	162.13	170.65	0.001942	7.60	5260.35	368.64	0.35
Below Prado	74469	190yr ACOE	40000.00	157.29	169.02	165.06	170.56	0.004727	9.98	4009.46	365.19	0.53
Below Prado	74313*	190yr ACOE	40000.00	156.94	168.51	164.77	170.13	0.001814	10.21	3917.68	363.00	0.55
Below Prado	74157*	190yr ACOE	40000.00	156.59	168.22	164.42	169.84	0.001796	10.22	3914.79	359.02	0.55
Below Prado	74001	190yr ACOE	40000.00	156.24	167.96	164.10	169.56	0.001764	10.16	3935.64	359.18	0.54
Below Prado	73801*	190yr ACOE	40000.00	155.79	167.65	163.62	169.20	0.001684	10.01	3996.34	359.97	0.53
Below Prado	73601	190yr ACOE	40000.00	155.34	167.39	163.11	168.85	0.001550	9.71	4121.57	365.40	0.51
Below Prado	73467*	190yr ACOE	40000.00	155.19	167.08	163.18	168.63	0.001717	9.98	4007.02	368.08	0.53
Below Prado	73334	190yr ACOE	40000.00	155.04	166.86	162.99	168.39	0.001771	9.91	4036.46	381.00	0.54
Below Prado	73324	Bridge										
Below Prado	73314	190yr ACOE	40000.00	155.04	166.38	162.93	168.06	0.001947	10.37	3856.24	364.27	0.56
Below Prado	73207*	190yr ACOE	40000.00	154.69	166.12	162.73	167.84	0.001999	10.51	3805.30	359.83	0.57
Below Prado	73101	190yr ACOE	40000.00	154.34	166.05	162.23	167.59	0.001736	9.95	4018.35	374.35	0.54
Below Prado	72934*	190yr ACOE	40000.00	153.97	165.72	161.79	167.30	0.001727	10.07	3971.56	361.60	0.54
Below Prado	72767	190yr ACOE	40000.00	153.61	165.46	161.44	167.00	0.001670	9.96	4015.30	362.40	0.53
Below Prado	72601	190yr ACOE	40000.00	153.24	165.18	161.08	166.73	0.001650	9.97	4011.23	357.56	0.52
Below Prado	72401	190yr ACOE	40000.00	152.84	164.90	160.66	166.38	0.001577	9.76	4098.79	365.51	0.51
Below Prado	72201	190yr ACOE	40000.00	152.44	164.63	160.23	166.06	0.001504	9.62	4159.37	365.64	0.50
Below Prado	72027	190yr ACOE	40000.00	152.04	164.43	159.76	165.79	0.001386	9.35	4279.43	368.81	0.48
Below Prado	71854*	190yr ACOE	40000.00	151.64	164.22	159.37	165.55	0.001326	9.23	4332.02	367.54	0.47
Below Prado	71772	190yr ACOE	40000.00	151.46	164.12	159.22	165.43	0.001307	9.21	4345.14	366.50	0.47
Below Prado	71718	190yr ACOE	40000.00	151.32	164.06	159.08	165.36	0.001286	9.17	4361.38	365.20	0.47
Below Prado	71681	190yr ACOE	40000.00	151.24	164.00	159.03	165.31	0.001294	9.20	4346.52	363.91	0.47
Below Prado	71481*	190yr ACOE	40000.00	150.79	163.64	158.81	165.04	0.001370	9.48	4220.55	352.95	0.48
Below Prado	71281	190yr ACOE	40000.00	150.34	163.23	158.61	164.74	0.001489	9.86	4054.78	339.71	0.50
Below Prado	71201	190yr ACOE	40000.00	150.14	163.05	158.62	164.61	0.001650	10.02	3992.17	353.41	0.53
Below Prado	71081*	190yr ACOE	40000.00	149.74	162.91	158.56	164.39	0.001544	9.77	4092.49	358.52	0.51
Below Prado	70961	190yr ACOE	40000.00	149.34	162.84	158.04	164.18	0.001350	9.29	4307.76	368.04	0.48
Below Prado	70894	Bridge										
Below Prado	70827	190yr ACOE	40000.00	149.34	162.45	157.77	163.86	0.001405	9.51	4206.27	354.75	0.49
Below Prado	70714	190yr ACOE	40000.00	148.94	162.37	157.28	163.68	0.001260	9.16	4367.03	360.67	0.46
Below Prado	70601	190yr ACOE	40000.00	148.54	162.28	156.67	163.52	0.001172	8.94	4472.32	362.66	0.45
Below Prado	70434*	190yr ACOE	40000.00	148.31	162.10	156.41	163.32	0.001108	8.87	4507.55	354.74	0.44
Below Prado	70267*	190yr ACOE	40000.00	148.07	161.62	156.60	163.09	0.001374	9.73	4110.69	331.00	0.49
Below Prado	70101	190yr ACOE	40000.00	147.84	161.25	156.51	162.84	0.001515	10.13	3946.90	321.50	0.51

HEC-RAS Plan: Existing_Topo_ACOE_Extend River: Santa Ana River Reach: Below Prado Profile: 190yr ACOE (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	69934*	190yr ACOE	41000.00	147.41	161.05	155.88	162.58	0.001397	9.90	4141.24	321.20	0.49
Below Prado	69767*	190yr ACOE	41000.00	146.97	160.69	155.87	162.32	0.001511	10.25	3998.37	319.04	0.51
Below Prado	69601	190yr ACOE	41000.00	146.54	160.50	155.35	162.06	0.001398	10.01	4096.90	319.10	0.49
Below Prado	69366	190yr ACOE	41000.00	146.17	160.26	154.99	161.71	0.001318	9.66	4243.97	334.53	0.48
Below Prado	69341	Bridge										
Below Prado	69313	190yr ACOE	41000.00	146.00	159.55	154.81	161.13	0.001506	10.10	4059.71	330.82	0.51
Below Prado	69200	190yr ACOE	41000.00	145.78	159.25	154.71	160.94	0.001665	10.43	3929.91	328.42	0.53
Below Prado	69176*	190yr ACOE	41000.00	145.73	159.14	154.69	160.90	0.001768	10.62	3861.75	329.05	0.55
Below Prado	69152*	190yr ACOE	41000.00	145.68	159.11	154.58	160.85	0.001640	10.59	3873.08	312.83	0.53
Below Prado	69128*	190yr ACOE	41000.00	145.63	159.07	154.55	160.81	0.001643	10.58	3875.05	313.93	0.53
Below Prado	69104*	190yr ACOE	41000.00	145.58	159.02	154.55	160.77	0.001661	10.62	3860.46	313.87	0.53
Below Prado	69080*	190yr ACOE	41000.00	145.54	158.97	154.57	160.73	0.001684	10.64	3851.77	315.79	0.54
Below Prado	69056*	190yr ACOE	41000.00	145.49	158.94	154.48	160.68	0.001655	10.57	3877.79	316.73	0.53
Below Prado	69032*	190yr ACOE	41000.00	145.44	158.92	154.38	160.64	0.001628	10.52	3898.27	317.17	0.53
Below Prado	69009	190yr ACOE	41000.00	145.39	158.93	154.21	160.58	0.001551	10.31	3976.90	321.20	0.52
Below Prado	69004	190yr ACOE	41000.00	145.38	158.93	154.19	160.56	0.001536	10.26	3995.60	322.61	0.51
Below Prado	68999	190yr ACOE	41000.00	145.37	158.94	154.12	160.54	0.001497	10.15	4038.23	324.75	0.51
Below Prado	68994	190yr ACOE	41000.00	145.36	158.95	154.04	160.52	0.001466	10.05	4079.46	328.15	0.50
Below Prado	68989	190yr ACOE	41000.00	145.35	158.96	153.99	160.50	0.001434	9.95	4121.20	330.97	0.50
Below Prado	68985	190yr ACOE	41000.00	145.34	158.97	153.94	160.48	0.001403	9.86	4159.96	333.49	0.49
Below Prado	68977	Inl Struct										
Below Prado	68969	190yr ACOE	41000.00	135.14	152.76	144.25	153.80	0.002021	8.21	4993.54	315.57	0.36
Below Prado	68964	190yr ACOE	41000.00	135.14	152.78	143.99	153.78	0.001929	8.03	5106.65	318.20	0.35
Below Prado	68959	190yr ACOE	41000.00	135.14	152.76	144.11	153.77	0.001940	8.06	5085.98	320.70	0.36
Below Prado	68955	190yr ACOE	41000.00	135.14	152.75	144.25	153.76	0.001974	8.09	5071.08	323.19	0.36
Below Prado	68950	190yr ACOE	41000.00	135.14	152.75	144.14	153.75	0.001911	8.00	5127.06	325.75	0.36
Below Prado	68945	190yr ACOE	41000.00	135.14	152.75	144.16	153.73	0.001890	7.96	5151.62	327.78	0.35
Below Prado	68940	190yr ACOE	41000.00	135.14	152.75	144.13	153.72	0.001874	7.93	5169.93	328.70	0.35
Below Prado	68936	190yr ACOE	41000.00	135.14	152.74	144.12	153.71	0.001862	7.91	5182.99	329.47	0.35
Below Prado	68931	190yr ACOE	41000.00	135.14	152.74	144.06	153.70	0.001841	7.88	5204.06	330.19	0.35
Below Prado	68926	190yr ACOE	41000.00	135.14	152.72	144.11	153.69	0.001851	7.90	5191.91	330.68	0.35
Below Prado	68922	190yr ACOE	41000.00	135.14	152.71	144.11	153.68	0.001868	7.92	5175.27	329.01	0.35
Below Prado	68916	190yr ACOE	41000.00	138.07	152.13	146.83	153.62	0.003693	9.78	4191.22	326.09	0.48
Below Prado	68808*	190yr ACOE	41000.00	137.85	151.20	147.48	153.26	0.002085	11.53	3556.58	304.49	0.59
Below Prado	68700	190yr ACOE	41000.00	137.64	151.28	146.54	152.95	0.001557	10.37	3953.71	317.00	0.52
Below Prado	68547*	190yr ACOE	41000.00	137.29	151.14	146.34	152.68	0.001496	9.97	4112.47	341.42	0.51
Below Prado	68395	190yr ACOE	41000.00	136.94	150.82	146.05	152.44	0.001542	10.22	4011.78	327.99	0.52
Below Prado	68222	Bridge										
Below Prado	68050	190yr ACOE	41000.00	136.40	149.14	145.46	151.17	0.002060	11.43	3587.55	306.96	0.59
Below Prado	67866*	190yr ACOE	41000.00	136.07	148.73	145.12	150.79	0.002109	11.50	3565.68	307.85	0.60
Below Prado	67683*	190yr ACOE	41000.00	135.71	148.42	144.66	150.39	0.002009	11.26	3641.43	313.06	0.58
Below Prado	67500	190yr ACOE	41000.00	135.34	148.07	144.27	150.01	0.001973	11.19	3665.50	313.98	0.58
Below Prado	67341	190yr ACOE	41000.00	134.98	147.74	143.94	149.70	0.001984	11.22	3652.65	312.47	0.58
Below Prado	67313	190yr ACOE	41000.00	134.91	147.68	143.87	149.64	0.001979	11.23	3650.81	311.25	0.58
Below Prado	67166*	190yr ACOE	41000.00	134.58	147.42	143.49	149.34	0.001917	11.12	3685.70	311.14	0.57
Below Prado	67000	190yr ACOE	41000.00	134.20	147.31	142.96	148.97	0.001646	10.34	3965.54	329.00	0.53
Below Prado	66922	190yr ACOE	41000.00	134.14	147.16	142.72	148.84	0.001629	10.38	3949.64	323.23	0.52
Below Prado	66884	Bridge										
Below Prado	66847	190yr ACOE	41000.00	133.94	146.31	142.79	148.27	0.002113	11.24	3647.49	324.43	0.59
Below Prado	66723*	190yr ACOE	41000.00	133.64	145.99	142.69	148.00	0.002328	11.36	3608.04	342.86	0.62
Below Prado	66600	190yr ACOE	41000.00	133.34	145.78	142.08	147.71	0.002013	11.15	3676.47	321.30	0.58
Below Prado	66433*	190yr ACOE	41000.00	133.01	145.43	141.76	147.37	0.002026	11.19	3665.20	320.28	0.58
Below Prado	66266*	190yr ACOE	41000.00	132.67	145.08	141.42	147.04	0.002032	11.21	3657.96	319.35	0.58
Below Prado	66100	190yr ACOE	41000.00	132.34	144.73	141.10	146.70	0.002048	11.25	3645.80	318.40	0.59
Below Prado	65933*	190yr ACOE	41000.00	132.01	144.39	140.77	146.35	0.002048	11.23	3649.72	319.44	0.59
Below Prado	65766*	190yr ACOE	41000.00	131.67	144.06	140.42	146.01	0.002041	11.21	3658.00	320.56	0.58



Appendix C – Proposed Condition HEC-RAS Output

HEC-RAS Plan: Proposed_Cut_Extend_v2 River: Santa Ana River Reach: Below Prado Profile: 190yr ACOE

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	77600	190yr ACOE	40000.00	172.94	184.18	180.49	185.74	0.001799	10.01	3996.02	379.15	0.54
Below Prado	77433*	190yr ACOE	40000.00	172.57	183.85	180.18	185.43	0.001819	10.08	3966.48	375.21	0.55
Below Prado	77266*	190yr ACOE	40000.00	172.21	183.51	179.87	185.12	0.001854	10.19	3927.23	371.21	0.55
Below Prado	77100	190yr ACOE	40000.00	171.84	183.16	179.57	184.80	0.001889	10.29	3888.74	367.16	0.56
Below Prado	76933*	190yr ACOE	40000.00	171.51	182.85	179.24	184.48	0.001871	10.24	3905.58	368.61	0.55
Below Prado	76766*	190yr ACOE	40000.00	171.17	182.56	178.89	184.17	0.001842	10.18	3930.32	370.24	0.55
Below Prado	76600	190yr ACOE	40000.00	170.84	182.27	178.54	183.86	0.001817	10.12	3953.16	371.94	0.55
Below Prado	76433*	190yr ACOE	40000.00	170.37	181.93	178.18	183.55	0.001839	10.21	3917.16	366.66	0.55
Below Prado	76266*	190yr ACOE	40000.00	169.91	181.57	177.84	183.24	0.001877	10.34	3867.90	360.45	0.56
Below Prado	76100	190yr ACOE	40000.00	169.44	181.21	177.50	182.92	0.001877	10.47	3818.72	348.69	0.56
Below Prado	75900*	190yr ACOE	40000.00	169.14	180.85	177.12	182.53	0.001944	10.40	3845.80	364.66	0.56
Below Prado	75700*	190yr ACOE	40000.00	168.84	180.48	176.76	182.13	0.001922	10.32	3875.39	368.69	0.56
Below Prado	75500*	190yr ACOE	40000.00	168.54	180.11	176.39	181.74	0.001899	10.24	3906.31	372.80	0.56
Below Prado	75300*	190yr ACOE	40000.00	168.24	179.75	176.03	181.36	0.001875	10.15	3939.12	377.23	0.55
Below Prado	75100	190yr ACOE	40000.00	167.94	179.40	175.67	180.98	0.001846	10.06	3974.76	381.51	0.55
Below Prado	74969	190yr ACOE	40000.00	167.24	179.27	175.08	180.72	0.001564	9.65	4144.74	366.63	0.51
Below Prado	74927	Bridge										
Below Prado	74886	190yr ACOE	40000.00	167.24	178.87	175.12	180.40	0.001775	9.92	4034.17	382.80	0.54
Below Prado	74862*	190yr ACOE	40000.00	167.19	178.78	175.12	180.35	0.001872	10.06	3976.11	382.99	0.55
Below Prado	74839*	190yr ACOE	40000.00	167.13	178.72	175.04	180.31	0.001882	10.10	3959.05	380.59	0.55
Below Prado	74815*	190yr ACOE	40000.00	167.08	178.73	174.71	180.24	0.001719	9.85	4060.95	377.07	0.53
Below Prado	74792*	190yr ACOE	40000.00	167.03	178.66	174.74	180.20	0.001768	9.95	4022.06	380.21	0.54
Below Prado	74768	190yr ACOE	40000.00	166.97	178.66	174.59	180.14	0.001619	9.77	4094.54	371.30	0.52
Below Prado	74745*	190yr ACOE	40000.00	166.92	178.65	174.49	180.09	0.001565	9.63	4152.00	375.08	0.51
Below Prado	74721*	190yr ACOE	40000.00	166.87	178.63	174.43	180.05	0.001549	9.58	4176.26	378.08	0.51
Below Prado	74697	190yr ACOE	40000.00	166.81	178.57	174.43	180.01	0.001576	9.63	4152.59	377.82	0.51
Below Prado	74674*	190yr ACOE	40000.00	166.76	178.48	174.50	179.97	0.001658	9.80	4081.43	375.74	0.52
Below Prado	74650*	190yr ACOE	40000.00	166.71	178.39	174.57	179.92	0.001740	9.95	4020.95	375.40	0.54
Below Prado	74627*	190yr ACOE	40000.00	166.65	178.30	174.46	179.88	0.001816	10.08	3969.80	375.50	0.55
Below Prado	74603	190yr ACOE	40000.00	166.60	178.24	174.40	179.84	0.001777	10.16	3938.68	361.70	0.54
Below Prado	74580*	190yr ACOE	40000.00	166.55	178.20	174.36	179.79	0.001763	10.12	3951.66	362.67	0.54
Below Prado	74556	190yr ACOE	40000.00	166.49	178.21	174.19	179.73	0.001666	9.91	4038.06	366.70	0.53
Below Prado	74552*	190yr ACOE	40000.00	166.48	178.20	174.18	179.72	0.001659	9.88	4047.94	367.80	0.53
Below Prado	74547	190yr ACOE	40000.00	166.47	178.20	174.17	179.71	0.001660	9.87	4051.10	368.70	0.53
Below Prado	74542	190yr ACOE	40000.00	166.46	178.21	174.12	179.69	0.001622	9.77	4093.05	371.97	0.52
Below Prado	74537	190yr ACOE	40000.00	166.45	178.22	174.06	179.67	0.001578	9.66	4142.27	375.46	0.51
Below Prado	74533	190yr ACOE	40000.00	166.44	178.21	174.06	179.66	0.001584	9.67	4136.34	375.07	0.51
Below Prado	74524	Inl Struct										
Below Prado	74515	190yr ACOE	40000.00	154.19	169.84	162.21	170.77	0.002062	7.75	5159.62	359.45	0.36
Below Prado	74510	190yr ACOE	40000.00	154.19	169.84	162.23	170.76	0.002041	7.71	5190.27	362.99	0.36
Below Prado	74505	190yr ACOE	40000.00	154.19	169.84	162.21	170.75	0.002004	7.64	5237.40	366.39	0.36
Below Prado	74500	190yr ACOE	40000.00	154.19	169.84	162.18	170.73	0.001970	7.59	5273.32	369.54	0.35
Below Prado	74496	190yr ACOE	40000.00	154.19	169.83	162.17	170.72	0.001944	7.56	5293.05	370.47	0.35
Below Prado	74491	190yr ACOE	40000.00	154.19	169.82	162.15	170.71	0.001934	7.56	5287.70	370.01	0.35
Below Prado	74486	190yr ACOE	40000.00	154.19	169.81	162.15	170.70	0.001930	7.57	5282.51	369.50	0.35
Below Prado	74481	190yr ACOE	40000.00	154.19	169.80	162.13	170.69	0.001918	7.57	5284.02	369.03	0.35
Below Prado	74477	190yr ACOE	40000.00	154.19	169.79	162.13	170.68	0.001927	7.59	5273.34	368.78	0.35
Below Prado	74469	190yr ACOE	40000.00	157.29	169.07	165.05	170.60	0.004643	9.93	4029.06	365.37	0.53
Below Prado	74313*	190yr ACOE	40000.00	156.94	168.56	164.77	170.17	0.001784	10.16	3938.15	363.22	0.54
Below Prado	74157*	190yr ACOE	40000.00	156.59	168.29	164.42	169.89	0.001764	10.16	3937.55	359.28	0.54
Below Prado	74001	190yr ACOE	40000.00	156.24	168.03	164.10	169.61	0.001729	10.10	3960.68	359.47	0.54
Below Prado	73801*	190yr ACOE	40000.00	155.79	167.72	163.62	169.26	0.001647	9.94	4024.36	360.27	0.52
Below Prado	73601	190yr ACOE	40000.00	155.34	167.47	163.12	168.92	0.001513	9.63	4152.78	365.69	0.50
Below Prado	73467*	190yr ACOE	40000.00	155.19	167.17	163.16	168.70	0.001669	9.89	4042.63	368.41	0.53
Below Prado	73334	190yr ACOE	40000.00	155.04	166.97	162.99	168.46	0.001715	9.81	4076.73	381.19	0.53
Below Prado	73324	Bridge										
Below Prado	73314	190yr ACOE	40000.00	155.04	166.50	162.94	168.14	0.001878	10.26	3899.77	364.48	0.55
Below Prado	73207*	190yr ACOE	40000.00	154.69	166.28	162.74	167.94	0.001907	10.33	3873.06	363.40	0.56
Below Prado	73101	190yr ACOE	40000.00	154.34	166.16	162.23	167.71	0.001762	9.99	4005.66	371.42	0.54
Below Prado	72934*	190yr ACOE	40000.00	153.97	165.89	161.79	167.42	0.001646	9.92	4032.17	362.25	0.52
Below Prado	72767	190yr ACOE	40000.00	153.61	165.77	161.36	167.11	0.001388	9.30	4354.32	398.19	0.48
Below Prado	72601	190yr ACOE	40000.00	153.24	165.42	161.21	166.85	0.001604	9.59	4187.81	396.69	0.51
Below Prado	72401	190yr ACOE	40000.00	152.84	165.29	160.48	166.50	0.001216	8.89	4572.01	406.86	0.46
Below Prado	72201	190yr ACOE	40000.00	152.44	165.05	160.09	166.26	0.001194	8.85	4567.27	397.34	0.45
Below Prado	72027	190yr ACOE	40000.00	152.04	164.87	159.65	166.05	0.001165	8.75	4594.87	396.70	0.45
Below Prado	71854*	190yr ACOE	40000.00	151.64	164.63	159.29	165.85	0.001151	8.87	4510.07	357.99	0.44
Below Prado	71772	190yr ACOE	40000.00	151.46	164.62	158.79	165.72	0.001012	8.43	4744.44	367.10	0.41
Below Prado	71740	Bridge										
Below Prado	71718	190yr ACOE	40000.00	151.32	164.29	158.65	165.43	0.001063	8.56	4671.68	366.75	0.42
Below Prado	71681	190yr ACOE	40000.00	151.24	164.11	158.97	165.37	0.001213	9.02	4433.46	357.07	0.45
Below Prado	71481*	190yr ACOE	40000.00	150.79	163.73	158.81	165.11	0.001339	9.41	4251.09	353.30	0.48
Below Prado	71281	190yr ACOE	40000.00	150.34	163.33	158.60	164.82	0.001449	9.78	4089.27	340.04	0.50
Below Prado	71201	190yr ACOE	40000.00	150.14	163.16	158.62	164.69	0.001599	9.92	4032.16	353.80	0.52
Below Prado	71081*	190yr ACOE	40000.00	149.74	163.03	158.56	164.48	0.001495	9.67	4135.12	358.95	0.50
Below Prado	70961	190yr ACOE	40000.00	149.34	162.96	158.04	164.27	0.001306	9.19	4352.90	368.60	0.47
Below Prado	70894	Bridge										
Below Prado	70827	190yr ACOE	40000.00	149.34	162.59	157.77	163.96	0.001354	9.40	4254.97	355.01	0.48
Below Prado	70714	190yr ACOE	40000.00	148.94	162.50	157.38	163.79	0.001255	9.09	4399.17	367.62	0.46
Below Prado	70601	190yr ACOE	40000.00	148.54	162.48	156.80	163.61	0.001050	8.53	4690.21	376.51	0.43
Below Prado	70434*	190yr ACOE	40000.00	148.31	162.32	156.45	163.43	0.001015	8.45	4731.95	375.37	0.42
Below Prado	70267*	190yr ACOE	40000.00	148.07	161.68	156.84	163.19	0.001455	9.88	4049.40	331.11	0.50

HEC-RAS Plan: Proposed_Cut_Extend_v2 River: Santa Ana River Reach: Below Prado Profile: 190yr ACOE (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	70101	190yr ACOE	40000.00	147.84	161.08	157.06	162.89	0.001915	10.77	3714.84	329.03	0.56
Below Prado	69934*	190yr ACOE	41000.00	147.41	160.98	156.03	162.54	0.001461	10.02	4091.22	321.47	0.50
Below Prado	69767*	190yr ACOE	41000.00	146.97	160.63	155.87	162.28	0.001535	10.31	3978.42	318.82	0.51
Below Prado	69601	190yr ACOE	41000.00	146.54	160.44	155.35	162.01	0.001420	10.06	4075.78	318.83	0.50
Below Prado	69366	190yr ACOE	41000.00	146.17	160.24	154.83	161.64	0.001276	9.52	4308.77	334.38	0.47
Below Prado	69341	Bridge										
Below Prado	69313	190yr ACOE	41000.00	146.00	159.62	154.68	161.13	0.001430	9.87	4152.33	331.13	0.49
Below Prado	69200	190yr ACOE	41000.00	145.78	159.25	154.71	160.94	0.001665	10.43	3929.85	328.42	0.53
Below Prado	69176*	190yr ACOE	41000.00	145.73	159.14	154.69	160.90	0.001768	10.62	3861.69	329.05	0.55
Below Prado	69152*	190yr ACOE	41000.00	145.68	159.11	154.59	160.85	0.001640	10.59	3873.04	312.83	0.53
Below Prado	69128*	190yr ACOE	41000.00	145.63	159.07	154.55	160.81	0.001643	10.58	3875.00	313.93	0.53
Below Prado	69104*	190yr ACOE	41000.00	145.58	159.02	154.55	160.77	0.001661	10.62	3860.41	313.87	0.53
Below Prado	69080*	190yr ACOE	41000.00	145.54	158.97	154.57	160.73	0.001684	10.64	3851.72	315.79	0.54
Below Prado	69056*	190yr ACOE	41000.00	145.49	158.94	154.48	160.68	0.001655	10.57	3877.73	316.73	0.53
Below Prado	69032*	190yr ACOE	41000.00	145.44	158.92	154.40	160.64	0.001628	10.52	3898.21	317.17	0.53
Below Prado	69009	190yr ACOE	41000.00	145.39	158.93	154.21	160.58	0.001551	10.31	3976.84	321.20	0.52
Below Prado	69004	190yr ACOE	41000.00	145.38	158.93	154.18	160.56	0.001536	10.26	3995.54	322.61	0.51
Below Prado	68999	190yr ACOE	41000.00	145.37	158.94	154.11	160.54	0.001497	10.15	4038.17	324.75	0.51
Below Prado	68994	190yr ACOE	41000.00	145.36	158.95	154.06	160.52	0.001466	10.05	4079.40	328.15	0.50
Below Prado	68989	190yr ACOE	41000.00	145.35	158.96	153.99	160.50	0.001434	9.95	4121.14	330.98	0.50
Below Prado	68985	190yr ACOE	41000.00	145.34	158.97	153.93	160.48	0.001403	9.86	4159.90	333.49	0.49
Below Prado	68977	Inl Struct										
Below Prado	68969	190yr ACOE	41000.00	135.14	152.82	144.25	153.86	0.001996	8.18	5014.08	315.83	0.36
Below Prado	68964	190yr ACOE	41000.00	135.14	152.84	143.99	153.84	0.001906	8.00	5127.28	318.48	0.35
Below Prado	68959	190yr ACOE	41000.00	135.14	152.83	144.12	153.83	0.001916	8.03	5106.87	320.97	0.35
Below Prado	68955	190yr ACOE	41000.00	135.14	152.83	144.17	153.81	0.001888	7.97	5144.60	326.05	0.35
Below Prado	68950	190yr ACOE	41000.00	135.14	152.82	144.14	153.81	0.001886	7.96	5148.85	326.01	0.35
Below Prado	68945	190yr ACOE	41000.00	135.14	152.82	144.16	153.79	0.001866	7.92	5173.57	328.03	0.35
Below Prado	68940	190yr ACOE	41000.00	135.14	152.81	144.13	153.78	0.001850	7.90	5191.97	328.99	0.35
Below Prado	68936	190yr ACOE	41000.00	135.14	152.81	144.11	153.77	0.001838	7.88	5205.13	329.77	0.35
Below Prado	68931	190yr ACOE	41000.00	135.14	152.80	144.07	153.76	0.001816	7.85	5226.26	330.49	0.35
Below Prado	68926	190yr ACOE	41000.00	135.14	152.79	144.10	153.75	0.001826	7.86	5214.20	330.98	0.35
Below Prado	68922	190yr ACOE	41000.00	135.14	152.78	144.11	153.74	0.001844	7.89	5197.52	329.27	0.35
Below Prado	68916	190yr ACOE	41000.00	138.06	152.21	146.82	153.68	0.003620	9.72	4218.61	326.39	0.48
Below Prado	68808*	190yr ACOE	41000.00	137.85	151.31	147.48	153.33	0.002028	11.42	3589.22	305.08	0.59
Below Prado	68700	190yr ACOE	41000.00	137.64	151.39	146.55	153.03	0.001517	10.28	3987.22	317.51	0.51
Below Prado	68547*	190yr ACOE	41000.00	137.29	151.25	146.35	152.76	0.001454	9.88	4150.78	342.12	0.50
Below Prado	68395	190yr ACOE	41000.00	136.94	150.94	146.03	152.53	0.001495	10.12	4052.14	328.65	0.51
Below Prado	68222	Bridge										
Below Prado	68050	190yr ACOE	41000.00	136.40	149.49	145.40	151.36	0.001853	10.97	3738.23	314.74	0.56
Below Prado	67866*	190yr ACOE	41000.00	136.07	149.06	145.13	151.00	0.001970	11.18	3666.94	313.91	0.58
Below Prado	67683*	190yr ACOE	41000.00	135.71	148.70	144.78	150.62	0.002131	11.12	3686.72	335.92	0.59
Below Prado	67500	190yr ACOE	41000.00	135.34	148.38	144.30	150.23	0.001868	10.92	3755.03	319.78	0.56
Below Prado	67341	190yr ACOE	41000.00	134.98	147.85	144.14	149.90	0.002062	11.49	3569.11	303.12	0.59
Below Prado	67324	Bridge										
Below Prado	67313	190yr ACOE	41000.00	134.91	147.59	144.07	149.71	0.002173	11.69	3508.21	302.02	0.60
Below Prado	67166*	190yr ACOE	41000.00	134.58	147.43	143.50	149.35	0.001912	11.11	3690.17	311.22	0.57
Below Prado	67000	190yr ACOE	41000.00	134.20	147.32	142.96	148.98	0.001640	10.33	3970.70	329.03	0.52
Below Prado	66922	190yr ACOE	41000.00	134.14	147.11	142.86	148.84	0.001713	10.55	3886.49	323.09	0.54
Below Prado	66884	Bridge										
Below Prado	66847	190yr ACOE	41000.00	133.94	146.23	143.06	148.31	0.002315	11.57	3543.61	324.26	0.62
Below Prado	66723*	190yr ACOE	41000.00	133.64	145.99	142.69	148.00	0.002328	11.36	3608.04	342.86	0.62
Below Prado	66600	190yr ACOE	41000.00	133.34	145.78	142.08	147.71	0.002013	11.15	3676.47	321.30	0.58
Below Prado	66433*	190yr ACOE	41000.00	133.01	145.43	141.76	147.37	0.002026	11.19	3665.20	320.28	0.58
Below Prado	66266*	190yr ACOE	41000.00	132.67	145.08	141.42	147.04	0.002032	11.21	3657.96	319.35	0.58
Below Prado	66100	190yr ACOE	41000.00	132.34	144.73	141.10	146.70	0.002048	11.25	3645.80	318.40	0.59
Below Prado	65933*	190yr ACOE	41000.00	132.01	144.39	140.77	146.35	0.002048	11.23	3649.72	319.44	0.59
Below Prado	65766*	190yr ACOE	41000.00	131.67	144.06	140.42	146.01	0.002041	11.21	3658.00	320.56	0.58



Appendix D – Dam Deflation Scenarios HEC-RAS Output

Appendix D
North Deflation HEC-RAS Model Output

HEC-RAS Plan: North_Short River: Santa Ana River Reach: Below Prado Profile: Max WS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	69601	Max WS	2832.88	144.20	146.97		147.18	0.001486	3.70	766.32	283.34	0.40
Below Prado	69366	Max WS	2832.24	143.83	146.63	145.33	146.84	0.001444	3.68	769.64	280.08	0.39
Below Prado	69341		Bridge									
Below Prado	69313	Max WS	2832.21	143.66	146.12		146.39	0.002219	4.20	675.05	278.62	0.48
Below Prado	69200	Max WS	2831.55	143.44	145.85		146.14	0.002354	4.28	662.57	279.14	0.49
Below Prado	69176*	Max WS	2831.38	143.39	145.80		146.08	0.002391	4.29	660.46	279.24	0.49
Below Prado	69152*	Max WS	2831.20	143.34	145.74		146.02	0.002421	4.30	658.00	279.34	0.49
Below Prado	69128*	Max WS	2831.11	143.29	145.68		145.97	0.002456	4.32	655.26	279.44	0.50
Below Prado	69104*	Max WS	2830.94	143.24	145.61		145.91	0.002495	4.34	652.18	279.56	0.50
Below Prado	69080*	Max WS	2830.89	143.20	145.55		145.85	0.002593	4.39	644.76	279.64	0.51
Below Prado	69056*	Max WS	2830.74	143.15	145.48		145.78	0.002655	4.42	640.31	279.76	0.52
Below Prado	69032*	Max WS	2830.55	143.10	145.41		145.72	0.002727	4.46	635.22	279.91	0.52
Below Prado	69009	Max WS	2830.43	143.05	145.34		145.65	0.002813	4.50	629.42	280.05	0.53
Below Prado	69004*	Max WS	2830.34	143.04	145.32		145.64	0.002832	4.51	628.17	280.09	0.53
Below Prado	68999*	Max WS	2830.39	143.03	145.31		145.63	0.002852	4.52	626.86	280.11	0.53
Below Prado	68994*	Max WS	2830.37	143.02	145.29		145.61	0.002873	4.52	625.52	280.15	0.53
Below Prado	68989*	Max WS	2830.35	143.01	145.28		145.60	0.002895	4.53	624.13	280.19	0.54
Below Prado	68985	Max WS	2830.36	143.00	145.26	144.50	145.58	0.002917	4.55	622.72	280.22	0.54
Below Prado	68977		Ini Struct									
Below Prado	68969	Max WS	2830.15	132.80	138.62		138.67	0.000344	1.74	1630.75	280.00	0.13
Below Prado	68964*	Max WS	2830.14	132.80	138.62		138.67	0.000347	1.74	1624.39	279.00	0.13
Below Prado	68959*	Max WS	2830.13	132.80	138.62		138.67	0.000349	1.75	1618.01	278.00	0.13
Below Prado	68955*	Max WS	2830.12	132.80	138.62		138.67	0.000352	1.76	1611.61	277.00	0.13
Below Prado	68950*	Max WS	2830.07	132.80	138.62		138.66	0.000356	1.76	1605.24	276.00	0.13
Below Prado	68945*	Max WS	2830.01	132.80	138.61		138.66	0.000359	1.77	1598.85	275.00	0.13
Below Prado	68940*	Max WS	2829.95	132.80	138.61		138.66	0.000362	1.78	1592.55	274.64	0.13
Below Prado	68936*	Max WS	2830.04	132.80	138.61		138.66	0.000366	1.78	1586.73	275.03	0.13
Below Prado	68931*	Max WS	2830.07	132.80	138.61		138.66	0.000370	1.79	1581.49	275.38	0.13
Below Prado	68926*	Max WS	2830.05	132.80	138.61		138.66	0.000373	1.79	1576.84	275.70	0.13
Below Prado	68922	Max WS	2830.02	132.80	138.60		138.65	0.000376	1.80	1572.72	275.98	0.13
Below Prado	68916	Max WS	2829.98	135.73	138.44		138.67	0.004004	3.61	751.49	285.36	0.39
Below Prado	68808*	Max WS	2829.59	135.51	138.11		138.35	0.001832	3.94	718.40	282.61	0.44
Below Prado	68700	Max WS	2829.47	135.30	137.92		138.16	0.001800	3.93	720.75	281.07	0.43
Below Prado	68547*	Max WS	2829.45	134.95	137.68		137.90	0.001560	3.76	753.07	281.70	0.41
Below Prado	68395	Max WS	2830.01	134.60	137.49	136.10	137.68	0.001295	3.55	797.43	282.62	0.37
Below Prado	68222		Bridge									
Below Prado	68050	Max WS	2826.61	134.10	136.62		136.88	0.002023	4.06	695.75	281.49	0.46
Below Prado	67866*	Max WS	2822.49	133.73	136.26		136.51	0.002015	4.06	695.26	280.70	0.45
Below Prado	67683*	Max WS	2816.79	133.37	135.88		136.14	0.002045	4.08	690.68	279.88	0.46
Below Prado	67500	Max WS	2809.71	133.00	135.51		135.77	0.002046	4.08	688.80	279.13	0.46
Below Prado	67333*	Max WS	2804.69	132.62	135.21		135.45	0.001836	3.92	715.27	283.81	0.44
Below Prado	67166*	Max WS	2796.94	132.24	134.95		135.16	0.001568	3.70	756.14	291.15	0.40
Below Prado	67000	Max WS	2793.96	131.86	134.75		134.93	0.001265	3.40	821.11	304.87	0.37
Below Prado	66922	Max WS	2793.29	131.80	134.63	133.29	134.83	0.001341	3.56	784.60	284.16	0.38
Below Prado	66884		Bridge									
Below Prado	66847	Max WS	2790.75	131.60	134.01		134.29	0.002290	4.20	664.77	280.97	0.48
Below Prado	66723*	Max WS	2784.43	131.30	133.75		134.01	0.002181	4.14	673.09	280.31	0.47
Below Prado	66600	Max WS	2778.14	131.00	133.50		133.75	0.002018	4.04	688.03	280.31	0.45
Below Prado	66433*	Max WS	2770.49	130.67	133.17		133.42	0.002022	4.04	686.31	280.10	0.45
Below Prado	66266*	Max WS	2763.44	130.33	132.84		133.09	0.001983	4.01	689.19	279.96	0.45
Below Prado	66100	Max WS	2755.96	130.00	132.51		132.76	0.001960	3.99	690.34	279.81	0.45
Below Prado	65933*	Max WS	2749.48	129.67	132.19		132.44	0.001919	3.96	693.95	280.07	0.44
Below Prado	65766*	Max WS	2742.86	129.33	131.89		132.13	0.001815	3.89	705.08	280.46	0.43
Below Prado	65600	Max WS	2737.64	129.00	131.61		131.84	0.001697	3.81	718.98	280.90	0.42
Below Prado	65425*	Max WS	2733.25	128.73	131.30		131.53	0.001779	3.86	708.25	280.96	0.43
Below Prado	65250*	Max WS	2730.12	128.45	130.97		131.21	0.001890	3.93	694.94	280.95	0.44
Below Prado	65075*	Max WS	2727.03	128.18	130.60		130.86	0.002174	4.10	665.64	280.69	0.47
Below Prado	64900	Max WS	2723.44	127.90	130.08		130.40	0.003044	4.54	600.41	279.83	0.55
Below Prado	64734*	Max WS	2720.85	127.34	129.64		129.93	0.002662	4.36	624.24	279.25	0.51
Below Prado	64568	Max WS	2719.99	126.78	129.25		129.52	0.002291	4.17	652.91	279.14	0.48
Below Prado	64559*	Max WS	2720.01	126.78	129.23		129.50	0.002306	4.17	651.60	279.08	0.48
Below Prado	64550*	Max WS	2719.94	126.78	129.21		129.48	0.002315	4.18	650.76	279.03	0.48
Below Prado	64541*	Max WS	2719.93	126.79	129.18		129.46	0.002381	4.22	645.22	278.94	0.49
Below Prado	64532*	Max WS	2719.94	126.79	129.16		129.44	0.002418	4.24	642.18	278.88	0.49
Below Prado	64522*	Max WS	2719.92	126.79	129.13		129.42	0.002479	4.27	637.29	278.80	0.50
Below Prado	64513*	Max WS	2719.91	126.79	129.10		129.39	0.002547	4.30	632.05	278.73	0.50
Below Prado	64504*	Max WS	2719.90	126.80	129.07		129.37	0.002691	4.38	621.64	278.61	0.52
Below Prado	64495	Max WS	2719.90	126.80	129.04		129.34	0.002811	4.43	613.46	278.53	0.53
Below Prado	64490*	Max WS	2719.89	126.80	129.02		129.33	0.002884	4.47	608.70	278.46	0.53
Below Prado	64486	Max WS	2719.88	126.80	129.00	128.26	129.32	0.002965	4.51	603.61	278.41	0.54
Below Prado	64478		Ini Struct									
Below Prado	64470	Max WS	2698.47	117.80	123.82		123.86	0.000302	1.66	1625.72	270.00	0.12
Below Prado	64465*	Max WS	2698.86	117.80	123.82		123.86	0.000302	1.66	1625.32	270.00	0.12
Below Prado	64460*	Max WS	2698.46	117.80	123.82		123.86	0.000302	1.66	1624.94	270.00	0.12
Below Prado	64455*	Max WS	2698.84	117.80	123.82		123.86	0.000303	1.66	1624.54	270.00	0.12
Below Prado	64450*	Max WS	2698.45	117.80	123.82		123.86	0.000303	1.66	1624.13	270.00	0.12
Below Prado	64445*	Max WS	2698.82	117.80	123.81		123.86	0.000303	1.66	1623.75	270.00	0.12
Below Prado	64440*	Max WS	2698.80	117.80	123.81		123.86	0.000304	1.66	1623.47	270.93	0.12
Below Prado	64435*	Max WS	2698.43	117.80	123.81		123.85	0.000305	1.66	1623.75	272.30	0.12

HEC-RAS Plan: North_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/s)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	64430*	Max WS	2698.06	117.80	123.81		123.85	0.000305	1.66	1624.58	273.66	0.12
Below Prado	64426*	Max WS	2697.69	117.80	123.81		123.85	0.000306	1.66	1625.96	275.00	0.12
Below Prado	64421	Max WS	2697.31	117.80	123.81		123.85	0.000305	1.66	1627.86	276.32	0.12
Below Prado	64416	Max WS	2691.56	120.80	123.68		123.86	0.003273	3.37	797.87	284.29	0.36
Below Prado	64308*	Max WS	2673.81	120.60	123.44		123.61	0.001211	3.39	788.49	284.61	0.36
Below Prado	64200	Max WS	2667.23	120.40	123.33		123.49	0.001075	3.27	816.72	285.14	0.34
Below Prado	64063*	Max WS	2657.57	120.20	123.19		123.35	0.001003	3.20	829.67	282.96	0.33
Below Prado	63927	Max WS	2651.86	120.00	123.07	121.43	123.22	0.000933	3.14	843.26	279.72	0.32
Below Prado	63878		Bridge									
Below Prado	63829	Max WS	2638.53	119.50	122.32		122.50	0.001225	3.41	774.63	279.24	0.36
Below Prado	63600	Max WS	2619.40	119.20	122.07		122.24	0.001109	3.28	799.59	284.29	0.34
Below Prado	63400*	Max WS	2602.27	119.05	121.83		122.01	0.001216	3.36	774.24	283.96	0.36
Below Prado	63200	Max WS	2587.07	118.90	121.56		121.75	0.001402	3.50	738.84	283.50	0.38
Below Prado	63000*	Max WS	2579.28	118.45	121.35		121.50	0.001043	3.20	807.09	284.52	0.33
Below Prado	62800	Max WS	2576.68	118.00	121.20		121.33	0.000747	2.88	893.45	285.79	0.29
Below Prado	62601	Max WS	2576.21	117.84	121.05	119.24	121.18	0.000745	2.89	892.48	284.66	0.29
Below Prado	62451		Bridge									
Below Prado	62301	Max WS	2566.89	117.35	119.67		119.92	0.002174	4.00	642.43	281.21	0.47
Below Prado	62300	Max WS	2567.93	117.20	119.71		119.92	0.001663	3.68	698.62	283.40	0.41
Below Prado	62100*	Max WS	2560.03	116.90	119.36		119.58	0.001760	3.73	685.52	283.40	0.42
Below Prado	61900	Max WS	2543.63	116.60	118.98		119.21	0.001944	3.84	662.59	283.26	0.44
Below Prado	61733*	Max WS	2527.74	116.27	118.67		118.89	0.001866	3.78	668.64	283.64	0.43
Below Prado	61566*	Max WS	2514.60	115.93	118.39		118.60	0.001708	3.67	685.03	284.18	0.42
Below Prado	61400	Max WS	2497.57	115.60	118.14		118.33	0.001517	3.53	707.54	284.84	0.39
Below Prado	61200*	Max WS	2480.80	115.30	117.84		118.03	0.001484	3.50	709.36	284.74	0.39
Below Prado	61000	Max WS	2467.07	115.00	117.56		117.74	0.001437	3.46	713.86	284.69	0.38
Below Prado	60800*	Max WS	2459.45	114.60	117.32		117.48	0.001161	3.23	760.54	285.49	0.35
Below Prado	60600	Max WS	2456.18	114.20	117.14	115.56	117.28	0.000894	2.98	823.16	286.63	0.31
Below Prado	60550		Bridge									
Below Prado	60505	Max WS	2456.36	113.95	117.13		117.25	0.000697	2.77	886.27	285.71	0.28
Below Prado	60500	Max WS	2455.73	113.95	116.91	115.31	117.05	0.000884	2.98	823.83	284.73	0.31
Below Prado	60372		Bridge									
Below Prado	60245	Max WS	2455.33	113.70	115.83		116.10	0.002688	4.19	585.32	279.42	0.51
Below Prado	60222*	Max WS	2455.30	113.66	115.76		116.04	0.002811	4.25	577.37	279.28	0.52
Below Prado	60199*	Max WS	2455.23	113.62	115.68		115.98	0.002986	4.33	566.83	279.09	0.54
Below Prado	60176*	Max WS	2455.18	113.58	115.60		115.90	0.003215	4.43	554.20	278.88	0.55
Below Prado	60153	Max WS	2455.18	113.54	115.50		115.83	0.003531	4.56	538.63	278.61	0.58
Below Prado	60148*	Max WS	2455.17	113.51	115.49		115.81	0.003409	4.51	544.41	278.69	0.57
Below Prado	60144*	Max WS	2455.15	113.48	115.49		115.79	0.003290	4.46	550.30	278.77	0.56
Below Prado	60139*	Max WS	2455.16	113.46	115.47		115.78	0.003252	4.45	552.27	278.78	0.56
Below Prado	60134*	Max WS	2455.15	113.43	115.46		115.77	0.003137	4.40	558.33	278.86	0.55
Below Prado	60130	Max WS	2455.14	113.40	115.46	114.77	115.75	0.003025	4.35	564.53	278.94	0.54
Below Prado	60122		Ini Struct									
Below Prado	60115	Max WS	2452.90	103.40	109.54		109.58	0.000239	1.47	1670.37	283.02	0.11
Below Prado	60110*	Max WS	2452.90	103.40	109.54		109.58	0.000239	1.47	1665.28	279.93	0.11
Below Prado	60105*	Max WS	2452.89	103.40	109.54		109.58	0.000238	1.48	1661.50	276.85	0.11
Below Prado	60101*	Max WS	2453.00	103.40	109.54		109.57	0.000237	1.48	1658.98	273.79	0.11
Below Prado	60096*	Max WS	2452.77	103.40	109.54		109.57	0.000235	1.48	1657.76	270.74	0.11
Below Prado	60092*	Max WS	2452.76	103.40	109.54		109.57	0.000234	1.48	1657.42	270.00	0.11
Below Prado	60087*	Max WS	2452.65	103.40	109.54		109.57	0.000234	1.48	1657.12	270.00	0.11
Below Prado	60082*	Max WS	2452.75	103.40	109.54		109.57	0.000234	1.48	1656.83	270.00	0.11
Below Prado	60078*	Max WS	2452.64	103.40	109.54		109.57	0.000234	1.48	1656.53	270.00	0.11
Below Prado	60073*	Max WS	2452.74	103.40	109.53		109.57	0.000235	1.48	1656.26	270.00	0.11
Below Prado	60069	Max WS	2452.85	103.40	109.53		109.57	0.000235	1.48	1655.96	270.00	0.11
Below Prado	60061	Max WS	2452.13	106.93	109.37		109.58	0.004758	3.67	668.96	278.33	0.42
Below Prado	59931	Max WS	2447.04	106.80	108.84		109.10	0.002652	4.06	602.84	299.35	0.50
Below Prado	59766*	Max WS	2441.13	106.40	108.48		108.70	0.002201	3.75	651.54	317.27	0.46
Below Prado	59601	Max WS	2436.96	106.00	108.22		108.39	0.001588	3.32	734.18	335.52	0.40
Below Prado	59434*	Max WS	2434.38	105.83	107.95		108.12	0.001681	3.31	734.53	351.26	0.40
Below Prado	59267*	Max WS	2431.84	105.67	107.63		107.81	0.001966	3.41	712.47	366.79	0.43
Below Prado	59101	Max WS	2426.22	105.50	107.16		107.39	0.003168	3.87	626.33	381.67	0.53
Below Prado	58934*	Max WS	2413.63	104.99	106.67		106.89	0.002859	3.72	648.69	388.74	0.51
Below Prado	58767*	Max WS	2402.12	104.47	106.31		106.48	0.002017	3.32	723.80	396.33	0.43
Below Prado	58601	Max WS	2398.37	103.96	106.10		106.22	0.001185	2.80	855.33	404.46	0.34
Below Prado	58464	Max WS	2397.05	103.63	105.90		106.05	0.001365	3.11	771.09	347.51	0.37
Below Prado	58353	Max WS	2396.90	103.44	105.77	104.59	105.91	0.001181	2.96	810.95	353.39	0.34
Below Prado	58307		Bridge									
Below Prado	58260	Max WS	2396.71	103.30	105.15		105.37	0.002503	3.70	647.07	353.33	0.48
Below Prado	58252*	Max WS	2396.74	103.28	105.13		105.34	0.002510	3.71	646.77	353.63	0.48
Below Prado	58243*	Max WS	2396.73	103.26	105.11		105.32	0.002518	3.71	646.38	353.92	0.48
Below Prado	58234*	Max WS	2396.71	103.24	105.09		105.30	0.002525	3.71	646.00	354.22	0.48
Below Prado	58225*	Max WS	2396.68	103.21	105.07		105.28	0.002473	3.69	650.35	354.58	0.48
Below Prado	58216*	Max WS	2396.69	103.19	105.04		105.26	0.002478	3.69	650.13	354.88	0.48
Below Prado	58207	Max WS	2396.67	103.17	105.02		105.23	0.002484	3.69	649.90	355.18	0.48
Below Prado	58198	Max WS	2396.67	103.15	104.95	104.35	105.21	0.003191	4.09	586.59	331.91	0.54
Below Prado	58188		Ini Struct									
Below Prado	58178	Max WS	2352.02	93.15	100.55		100.57	0.000027	0.95	2482.11	350.47	0.06
Below Prado	58174*	Max WS	2352.51	93.15	100.55		100.57	0.000027	0.94	2493.33	351.94	0.06
Below Prado	58169*	Max WS	2352.03	93.15	100.55		100.57	0.000027	0.94	2504.65	353.43	0.06

HEC-RAS Plan: North_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	58164*	Max WS	2352.97	93.15	100.55		100.57	0.000027	0.94	2515.87	354.90	0.06
Below Prado	58159*	Max WS	2352.50	93.15	100.55		100.57	0.000026	0.93	2527.16	356.38	0.06
Below Prado	58154*	Max WS	2352.95	93.15	100.55		100.57	0.000026	0.93	2538.38	357.85	0.06
Below Prado	58149*	Max WS	2352.94	93.15	100.55		100.57	0.000026	0.92	2549.68	359.33	0.06
Below Prado	58144*	Max WS	2352.94	93.15	100.55		100.57	0.000026	0.92	2560.89	360.80	0.06
Below Prado	58139*	Max WS	2352.49	93.15	100.55		100.57	0.000025	0.91	2572.14	362.28	0.06
Below Prado	58134*	Max WS	2353.37	93.15	100.55		100.57	0.000025	0.91	2583.35	363.75	0.06
Below Prado	58130*	Max WS	2352.48	93.15	100.55		100.57	0.000025	0.91	2594.64	365.22	0.06
Below Prado	58125*	Max WS	2353.33	93.15	100.55		100.57	0.000025	0.90	2605.88	366.69	0.06
Below Prado	58120*	Max WS	2352.90	93.15	100.55		100.57	0.000024	0.90	2617.08	368.16	0.06
Below Prado	58115*	Max WS	2352.46	93.15	100.55		100.57	0.000024	0.90	2628.32	369.63	0.06
Below Prado	58110*	Max WS	2352.87	93.15	100.55		100.57	0.000024	0.89	2639.56	371.10	0.06
Below Prado	58105*	Max WS	2352.86	93.15	100.55		100.57	0.000024	0.89	2650.79	372.58	0.06
Below Prado	58100	Max WS	2353.25	93.15	100.55		100.57	0.000024	0.88	2661.98	374.04	0.06
Below Prado	58094	Max WS	2350.42	97.40	100.51		100.57	0.000373	2.01	1168.94	381.70	0.20
Below Prado	57997*	Max WS	2348.14	97.20	100.43		100.53	0.000573	2.50	939.89	306.71	0.25
Below Prado	57900	Max WS	2344.46	97.00	100.27		100.45	0.001165	3.39	691.55	243.19	0.35
Below Prado	57800*	Max WS	2342.29	96.83	100.13		100.33	0.001265	3.55	659.24	229.77	0.37
Below Prado	57700*	Max WS	2340.48	96.67	99.97		100.19	0.001421	3.77	621.07	216.15	0.39
Below Prado	57600	Max WS	2339.20	96.50	99.79		100.04	0.001635	4.03	580.58	203.08	0.42
Below Prado	57550*	Max WS	2338.45	96.38	99.68		99.96	0.001803	4.21	555.49	195.70	0.44
Below Prado	57500*	Max WS	2338.06	96.25	99.56		99.86	0.001962	4.41	530.22	185.50	0.46
Below Prado	57450*	Max WS	2337.81	96.12	99.43		99.76	0.002058	4.62	505.82	170.71	0.47
Below Prado	57400	Max WS	2337.39	96.00	99.29		99.65	0.002284	4.86	481.22	162.86	0.50
Below Prado	57375*	Max WS	2337.12	95.94	99.21		99.59	0.002394	4.98	469.55	158.69	0.51
Below Prado	57350*	Max WS	2336.95	95.88	99.13		99.53	0.002496	5.09	459.48	155.11	0.52
Below Prado	57325*	Max WS	2336.86	95.81	99.06		99.47	0.002621	5.16	452.87	155.19	0.53
Below Prado	57300*	Max WS	2336.71	95.75	98.98		99.40	0.002761	5.24	446.07	155.44	0.55
Below Prado	57275*	Max WS	2336.63	95.69	98.89		99.33	0.002871	5.31	439.91	154.65	0.56
Below Prado	57250*	Max WS	2336.50	95.62	98.81		99.26	0.002928	5.36	435.99	153.47	0.56
Below Prado	57225*	Max WS	2336.43	95.56	98.73		99.19	0.003021	5.43	430.34	152.07	0.57
Below Prado	57200	Max WS	2336.37	95.50	98.64		99.11	0.003114	5.50	424.79	150.59	0.58
Below Prado	57175*	Max WS	2336.31	95.45	98.54		99.03	0.003272	5.59	418.02	150.15	0.59
Below Prado	57150*	Max WS	2336.26	95.40	98.44		98.95	0.003473	5.70	410.03	149.63	0.61
Below Prado	57125*	Max WS	2336.24	95.35	98.33		98.86	0.003737	5.83	400.44	149.01	0.63
Below Prado	57100*	Max WS	2336.18	95.30	98.20		98.76	0.004107	6.02	388.38	148.22	0.66
Below Prado	57075	Max WS	2336.17	95.25	98.04		98.65	0.004689	6.28	372.14	147.15	0.70
Below Prado	57067*	Max WS	2336.16	95.24	98.07		98.61	0.004113	5.93	394.05	153.92	0.65
Below Prado	57059*	Max WS	2336.16	95.24	98.08		98.58	0.003713	5.65	413.44	160.84	0.62
Below Prado	57050	Max WS	2336.15	95.23	98.10	97.28	98.55	0.003314	5.37	435.39	168.12	0.59
Below Prado	57040		Int Struct									
Below Prado	57030	Max WS	2312.55	85.25	91.57		91.58	0.000038	1.01	2281.14	372.08	0.07
Below Prado	57020*	Max WS	2313.62	85.25	91.57		91.58	0.000038	1.01	2281.02	372.08	0.07
Below Prado	57010*	Max WS	2313.26	85.25	91.57		91.58	0.000038	1.01	2280.90	372.08	0.07
Below Prado	57000*	Max WS	2312.54	85.24	91.57		91.58	0.000038	1.01	2284.49	372.11	0.07
Below Prado	56990*	Max WS	2313.21	85.24	91.57		91.58	0.000038	1.01	2284.37	372.11	0.07
Below Prado	56980*	Max WS	2312.53	85.24	91.57		91.58	0.000038	1.01	2284.24	372.10	0.07
Below Prado	56970*	Max WS	2312.85	85.24	91.57		91.58	0.000038	1.01	2284.12	372.10	0.07
Below Prado	56960*	Max WS	2312.83	85.23	91.57		91.58	0.000037	1.01	2287.70	372.13	0.07
Below Prado	56950	Max WS	2312.50	85.23	91.57		91.58	0.000037	1.01	2287.58	372.13	0.07
Below Prado	56947	Max WS	2306.80	89.44	91.46		91.62	0.001700	3.23	714.35	358.42	0.40
Below Prado	56868*	Max WS	2298.30	89.33	91.34		91.49	0.001612	3.13	733.18	369.46	0.39
Below Prado	56789*	Max WS	2290.49	89.22	91.22		91.37	0.001512	3.03	754.73	380.52	0.38
Below Prado	56710*	Max WS	2283.57	89.11	91.12		91.25	0.001403	2.93	779.53	391.61	0.37
Below Prado	56630	Max WS	2279.44	89.00	91.02		91.14	0.001287	2.82	808.07	402.72	0.35
Below Prado	56537*	Max WS	2273.80	88.73	90.90		91.03	0.001247	2.90	783.21	365.13	0.35
Below Prado	56444*	Max WS	2269.78	88.47	90.76		90.91	0.001290	3.06	741.71	327.62	0.36
Below Prado	56350	Max WS	2264.91	88.20	90.62		90.79	0.001397	3.29	689.16	290.23	0.38
Below Prado	56258*	Max WS	2260.69	88.07	90.49		90.66	0.001416	3.31	683.50	288.12	0.38
Below Prado	56165*	Max WS	2256.60	87.94	90.35		90.52	0.001442	3.33	677.09	285.99	0.38
Below Prado	56072*	Max WS	2252.68	87.81	90.21		90.39	0.001475	3.36	669.78	283.86	0.39
Below Prado	55979*	Max WS	2248.67	87.69	90.07		90.25	0.001547	3.42	657.51	281.66	0.39
Below Prado	55886*	Max WS	2245.19	87.56	89.92		90.10	0.001616	3.47	646.38	279.47	0.40
Below Prado	55793*	Max WS	2240.41	87.43	89.75		89.95	0.001709	3.54	632.68	277.23	0.41
Below Prado	55700	Max WS	2236.31	87.30	89.58		89.78	0.001847	3.63	615.38	274.93	0.43
Below Prado	55608*	Max WS	2231.66	87.13	89.41		89.62	0.001816	3.61	618.60	275.78	0.42
Below Prado	55515*	Max WS	2227.18	86.95	89.26		89.45	0.001738	3.55	626.82	276.70	0.42
Below Prado	55423*	Max WS	2222.67	86.78	89.10		89.29	0.001676	3.51	633.82	277.60	0.41
Below Prado	55330	Max WS	2217.58	86.60	88.96		89.14	0.001567	3.43	646.78	278.59	0.40
Below Prado	55240*	Max WS	2213.11	86.48	88.82		89.00	0.001573	3.42	647.73	281.27	0.40
Below Prado	55150*	Max WS	2206.61	86.37	88.68		88.86	0.001610	3.42	644.47	283.88	0.40
Below Prado	55060*	Max WS	2199.22	86.25	88.53		88.72	0.001625	3.42	643.67	286.53	0.40
Below Prado	54970*	Max WS	2191.03	86.13	88.39		88.57	0.001645	3.41	642.23	289.18	0.40
Below Prado	54880*	Max WS	2180.05	86.02	88.24		88.42	0.001702	3.43	636.03	291.75	0.41
Below Prado	54790	Max WS	2165.82	85.90	88.08		88.26	0.001739	3.43	631.71	294.36	0.41
Below Prado	54692.5*	Max WS	2150.45	85.70	87.92		88.10	0.001624	3.36	640.66	292.79	0.40
Below Prado	54595.0*	Max WS	2136.58	85.50	87.78		87.95	0.001491	3.27	653.44	291.29	0.38
Below Prado	54497.5*	Max WS	2125.18	85.30	87.65		87.81	0.001346	3.17	670.34	289.84	0.37
Below Prado	54400	Max WS	2116.83	85.10	87.54		87.69	0.001197	3.06	691.46	288.46	0.35

HEC-RAS Plan: North_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	54300.0*	Max WS	2108.22	84.95	87.43		87.57	0.001145	3.02	697.27	286.60	0.34
Below Prado	54200.0*	Max WS	2102.64	84.80	87.32		87.46	0.001091	2.98	704.49	284.76	0.33
Below Prado	54100.0*	Max WS	2098.13	84.65	87.22		87.35	0.001034	2.94	713.18	282.94	0.33
Below Prado	54000	Max WS	2095.20	84.50	87.12		87.26	0.000975	2.90	723.38	281.15	0.32
Below Prado	53912*	Max WS	2092.65	84.36	87.04		87.17	0.000969	2.92	715.93	273.10	0.32
Below Prado	53823*	Max WS	2091.30	84.21	86.95		87.09	0.000953	2.94	710.70	265.09	0.32
Below Prado	53735*	Max WS	2089.86	84.07	86.86		87.00	0.000954	2.98	701.55	257.04	0.32
Below Prado	53646*	Max WS	2089.53	83.93	86.78		86.92	0.000961	3.02	691.30	248.99	0.32
Below Prado	53558*	Max WS	2089.08	83.79	86.69		86.83	0.000972	3.07	679.80	240.92	0.32
Below Prado	53469*	Max WS	2089.06	83.64	86.60		86.75	0.000977	3.12	669.70	232.90	0.32
Below Prado	53380	Max WS	2088.95	83.50	86.50	84.93	86.66	0.001001	3.19	655.56	224.82	0.33

Appendix D
South Deflation HEC-RAS Model Output

HEC-RAS Plan: South_Short River: Santa Ana River Reach: Below Prado Profile: Max WS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	69601	Max WS	2068.25	144.20	146.50		146.67	0.001472	3.26	634.16	281.08	0.38
Below Prado	69366	Max WS	2066.84	143.83	146.17	145.05	146.33	0.001399	3.22	641.46	278.43	0.37
Below Prado	69341		Bridge									
Below Prado	69313	Max WS	2066.15	143.66	145.70		145.92	0.002194	3.69	559.23	277.16	0.46
Below Prado	69200	Max WS	2065.03	143.44	145.44		145.66	0.002357	3.77	547.13	277.57	0.47
Below Prado	69176*	Max WS	2064.97	143.39	145.38		145.60	0.002393	3.79	544.96	277.64	0.48
Below Prado	69152*	Max WS	2064.90	143.34	145.32		145.55	0.002430	3.81	542.46	277.72	0.48
Below Prado	69128*	Max WS	2064.78	143.29	145.26		145.49	0.002473	3.83	539.63	277.80	0.48
Below Prado	69104*	Max WS	2064.75	143.24	145.20		145.43	0.002524	3.85	536.38	277.88	0.49
Below Prado	69080*	Max WS	2064.72	143.20	145.13		145.37	0.002649	3.91	528.70	277.93	0.50
Below Prado	69056*	Max WS	2064.68	143.15	145.06		145.30	0.002735	3.94	523.71	278.01	0.51
Below Prado	69032*	Max WS	2064.83	143.10	144.99		145.24	0.002841	3.99	517.79	278.10	0.52
Below Prado	69009	Max WS	2064.78	143.05	144.91		145.17	0.002975	4.04	510.74	278.18	0.53
Below Prado	69004*	Max WS	2064.79	143.04	144.90		145.15	0.003006	4.06	509.15	278.20	0.53
Below Prado	68999*	Max WS	2064.78	143.03	144.88		145.14	0.003039	4.07	507.51	278.22	0.53
Below Prado	68994*	Max WS	2064.78	143.02	144.87		145.12	0.003074	4.08	505.77	278.23	0.53
Below Prado	68989*	Max WS	2064.77	143.01	144.85		145.11	0.003110	4.10	504.01	278.25	0.54
Below Prado	68985	Max WS	2064.77	143.00	144.83	144.22	145.09	0.003149	4.11	502.13	278.27	0.54
Below Prado	68977		Ini Struct									
Below Prado	68969	Max WS	2060.87	132.80	138.13		138.16	0.000244	1.38	1491.70	280.00	0.11
Below Prado	68964*	Max WS	2061.21	132.80	138.13		138.16	0.000246	1.39	1485.98	279.00	0.11
Below Prado	68959*	Max WS	2061.57	132.80	138.12		138.15	0.000248	1.39	1480.29	278.00	0.11
Below Prado	68955*	Max WS	2061.45	132.80	138.12		138.15	0.000250	1.40	1474.58	277.00	0.11
Below Prado	68950*	Max WS	2061.33	132.80	138.12		138.15	0.000252	1.40	1468.87	276.00	0.11
Below Prado	68945*	Max WS	2061.32	132.80	138.12		138.15	0.000255	1.41	1463.14	275.00	0.11
Below Prado	68940*	Max WS	2061.31	132.80	138.12		138.15	0.000257	1.41	1457.43	274.00	0.11
Below Prado	68936*	Max WS	2061.42	132.80	138.12		138.15	0.000259	1.42	1451.76	273.42	0.11
Below Prado	68931*	Max WS	2061.31	132.80	138.12		138.15	0.000262	1.43	1446.50	273.80	0.11
Below Prado	68926*	Max WS	2061.41	132.80	138.11		138.15	0.000264	1.43	1441.86	274.14	0.11
Below Prado	68922	Max WS	2061.41	132.80	138.11		138.15	0.000267	1.43	1437.76	274.44	0.11
Below Prado	68916	Max WS	2060.13	135.73	137.98		138.16	0.003945	3.17	621.76	282.77	0.38
Below Prado	68808*	Max WS	2056.16	135.51	137.66		137.85	0.001830	3.48	591.38	280.42	0.42
Below Prado	68700	Max WS	2054.32	135.30	137.47		137.65	0.001777	3.45	595.25	279.18	0.42
Below Prado	68547*	Max WS	2053.63	134.95	137.24		137.41	0.001477	3.26	629.68	279.82	0.38
Below Prado	68395	Max WS	2053.64	134.60	137.06	135.81	137.21	0.001159	3.03	678.22	280.77	0.34
Below Prado	68222		Bridge									
Below Prado	68050	Max WS	2049.38	134.10	136.18		136.38	0.002024	3.58	571.87	279.48	0.44
Below Prado	67866*	Max WS	2044.77	133.73	135.81		136.01	0.002013	3.58	571.52	278.82	0.44
Below Prado	67683*	Max WS	2039.99	133.37	135.44		135.64	0.002055	3.60	566.67	278.13	0.44
Below Prado	67500	Max WS	2036.29	133.00	135.06		135.26	0.002088	3.62	562.84	277.48	0.45
Below Prado	67333*	Max WS	2033.33	132.62	134.74		134.93	0.001869	3.48	584.04	280.88	0.43
Below Prado	67166*	Max WS	2031.62	132.24	134.48		134.65	0.001561	3.28	619.93	285.38	0.39
Below Prado	67000	Max WS	2030.89	131.86	134.27		134.41	0.001261	3.00	675.88	301.98	0.35
Below Prado	66922	Max WS	2030.63	131.80	134.16	133.00	134.31	0.001302	3.12	651.38	281.80	0.36
Below Prado	66884		Bridge									
Below Prado	66847	Max WS	2028.52	131.60	133.59		133.80	0.002301	3.71	546.49	279.05	0.47
Below Prado	66723*	Max WS	2026.11	131.30	133.32		133.53	0.002186	3.66	554.25	278.52	0.46
Below Prado	66600	Max WS	2024.10	131.00	133.07		133.27	0.002002	3.56	568.74	278.55	0.44
Below Prado	66433*	Max WS	2021.07	130.67	132.74		132.94	0.002012	3.56	567.24	278.38	0.44
Below Prado	66266*	Max WS	2018.64	130.33	132.41		132.60	0.001974	3.54	570.03	278.27	0.44
Below Prado	66100	Max WS	2015.82	130.00	132.08		132.28	0.001956	3.53	571.08	278.14	0.43
Below Prado	65933*	Max WS	2013.14	129.67	131.76		131.96	0.001917	3.51	574.22	278.36	0.43
Below Prado	65766*	Max WS	2010.80	129.33	131.46		131.65	0.001798	3.44	585.25	278.71	0.42
Below Prado	65600	Max WS	2009.13	129.00	131.19		131.36	0.001653	3.35	600.26	279.13	0.40
Below Prado	65425*	Max WS	2007.92	128.73	130.89		131.07	0.001725	3.39	592.44	279.19	0.41
Below Prado	65250*	Max WS	2007.16	128.45	130.57		130.76	0.001819	3.44	582.99	279.21	0.42
Below Prado	65075*	Max WS	2006.35	128.18	130.22		130.42	0.002089	3.59	558.85	279.00	0.45
Below Prado	64900	Max WS	2005.38	127.90	129.71		129.96	0.003106	4.05	495.38	278.13	0.53
Below Prado	64734*	Max WS	2004.89	127.34	129.25		129.48	0.002719	3.89	515.15	277.63	0.50
Below Prado	64568	Max WS	2004.64	126.78	128.85		129.07	0.002304	3.70	541.37	277.59	0.47
Below Prado	64559*	Max WS	2004.64	126.78	128.83		129.05	0.002323	3.71	540.00	277.52	0.47
Below Prado	64550*	Max WS	2004.64	126.78	128.81		129.02	0.002335	3.72	539.15	277.48	0.47
Below Prado	64541*	Max WS	2004.61	126.79	128.78		129.00	0.002415	3.76	533.62	277.39	0.48
Below Prado	64532*	Max WS	2004.61	126.79	128.76		128.98	0.002462	3.78	530.52	277.34	0.48
Below Prado	64522*	Max WS	2004.57	126.79	128.73		128.96	0.002538	3.81	525.61	277.25	0.49
Below Prado	64513*	Max WS	2004.59	126.79	128.70		128.93	0.002626	3.85	520.23	277.19	0.50
Below Prado	64504*	Max WS	2004.59	126.80	128.67		128.91	0.002810	3.93	509.67	277.07	0.51
Below Prado	64495	Max WS	2004.59	126.80	128.63		128.88	0.002973	4.00	501.06	276.98	0.52
Below Prado	64490*	Max WS	2004.58	126.80	128.61		128.87	0.003074	4.04	495.99	276.91	0.53
Below Prado	64486	Max WS	2004.58	126.80	128.59	127.99	128.85	0.003189	4.09	490.53	276.86	0.54
Below Prado	64478		Ini Struct									
Below Prado	64470	Max WS	1993.24	117.80	123.33		123.36	0.000217	1.33	1493.59	270.00	0.10
Below Prado	64465*	Max WS	1992.85	117.80	123.33		123.36	0.000218	1.33	1493.32	270.00	0.10
Below Prado	64460*	Max WS	1992.95	117.80	123.33		123.36	0.000218	1.33	1493.02	270.00	0.10
Below Prado	64455*	Max WS	1993.14	117.80	123.33		123.36	0.000218	1.34	1492.75	270.00	0.10
Below Prado	64450*	Max WS	1992.95	117.80	123.33		123.36	0.000218	1.34	1492.45	270.00	0.10
Below Prado	64445*	Max WS	1992.94	117.80	123.33		123.35	0.000218	1.34	1492.15	270.00	0.10
Below Prado	64440*	Max WS	1992.85	117.80	123.33		123.35	0.000218	1.34	1491.86	270.00	0.10
Below Prado	64435*	Max WS	1992.94	117.80	123.32		123.35	0.000219	1.34	1491.65	270.66	0.10

HEC-RAS Plan: South_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	64430*	Max WS	1992.85	117.80	123.32		123.35	0.000219	1.34	1491.90	272.03	0.10
Below Prado	64426*	Max WS	1992.84	117.80	123.32		123.35	0.000220	1.34	1492.73	273.38	0.10
Below Prado	64421	Max WS	1992.75	117.80	123.32		123.35	0.000220	1.33	1494.10	274.71	0.10
Below Prado	64416	Max WS	1989.18	120.80	123.22		123.36	0.003203	2.98	667.45	282.00	0.34
Below Prado	64308*	Max WS	1984.69	120.60	122.98		123.12	0.001202	3.01	658.76	282.50	0.35
Below Prado	64200	Max WS	1981.37	120.40	122.87		123.00	0.001048	2.89	686.59	283.24	0.33
Below Prado	64063*	Max WS	1979.38	120.20	122.74		122.86	0.000966	2.82	701.26	281.22	0.32
Below Prado	63927	Max WS	1977.06	120.00	122.62	121.19	122.74	0.000881	2.75	717.63	278.29	0.30
Below Prado	63878		Bridge									
Below Prado	63829	Max WS	1974.41	119.50	121.89		122.03	0.001194	3.02	654.27	277.83	0.35
Below Prado	63600	Max WS	1970.49	119.20	121.64		121.77	0.001080	2.91	677.69	282.59	0.33
Below Prado	63400*	Max WS	1967.89	119.05	121.40		121.54	0.001218	3.02	652.67	282.27	0.35
Below Prado	63200	Max WS	1964.38	118.90	121.11		121.27	0.001484	3.20	614.03	281.75	0.38
Below Prado	63000*	Max WS	1962.41	118.45	120.89		121.02	0.001073	2.90	677.34	282.70	0.33
Below Prado	62800	Max WS	1961.77	118.00	120.74		120.84	0.000729	2.58	761.81	283.94	0.28
Below Prado	62601	Max WS	1960.92	117.84	120.59	119.01	120.69	0.000723	2.57	762.46	282.76	0.28
Below Prado	62451		Bridge									
Below Prado	62301	Max WS	1959.00	117.35	119.32		119.52	0.002206	3.61	542.56	279.72	0.46
Below Prado	62300	Max WS	1959.06	117.20	119.35		119.52	0.001621	3.28	597.09	281.91	0.40
Below Prado	62100*	Max WS	1956.13	116.90	119.01		119.19	0.001714	3.33	586.58	281.93	0.41
Below Prado	61900	Max WS	1952.28	116.60	118.64		118.82	0.001930	3.45	565.26	281.78	0.43
Below Prado	61733*	Max WS	1948.18	116.27	118.33		118.51	0.001865	3.41	570.68	282.11	0.42
Below Prado	61566*	Max WS	1943.63	115.93	118.04		118.21	0.001703	3.32	585.95	282.59	0.41
Below Prado	61400	Max WS	1939.50	115.60	117.79		117.94	0.001506	3.19	607.81	283.20	0.38
Below Prado	61200*	Max WS	1936.43	115.30	117.49		117.65	0.001490	3.18	609.18	283.18	0.38
Below Prado	61000	Max WS	1933.65	115.00	117.20		117.35	0.001464	3.16	611.93	283.19	0.38
Below Prado	60800*	Max WS	1932.20	114.60	116.96		117.09	0.001160	2.94	656.57	283.88	0.34
Below Prado	60600	Max WS	1931.40	114.20	116.78	115.35	116.89	0.000861	2.69	718.85	284.94	0.30
Below Prado	60550		Bridge									
Below Prado	60505	Max WS	1931.37	113.95	116.77		116.86	0.000644	2.47	783.50	284.10	0.26
Below Prado	60500	Max WS	1931.27	113.95	116.57	115.11	116.68	0.000826	2.66	726.06	283.19	0.29
Below Prado	60372		Bridge									
Below Prado	60245	Max WS	1931.22	113.70	115.54		115.77	0.002700	3.82	505.09	278.14	0.50
Below Prado	60222*	Max WS	1931.18	113.66	115.47		115.71	0.002846	3.89	497.04	278.00	0.51
Below Prado	60199*	Max WS	1931.15	113.62	115.40		115.64	0.003060	3.97	486.22	277.82	0.53
Below Prado	60176*	Max WS	1931.15	113.58	115.31		115.57	0.003355	4.08	472.82	277.59	0.55
Below Prado	60153	Max WS	1931.14	113.54	115.20		115.48	0.003795	4.24	455.44	277.30	0.58
Below Prado	60148*	Max WS	1931.13	113.51	115.19		115.47	0.003652	4.19	460.78	277.37	0.57
Below Prado	60144*	Max WS	1931.13	113.48	115.18		115.45	0.003512	4.14	466.26	277.44	0.56
Below Prado	60139*	Max WS	1931.13	113.46	115.17		115.43	0.003473	4.13	467.83	277.46	0.56
Below Prado	60134*	Max WS	1931.13	113.43	115.16		115.42	0.003337	4.08	473.56	277.53	0.55
Below Prado	60130	Max WS	1931.13	113.40	115.15	114.57	115.40	0.003204	4.03	479.41	277.61	0.54
Below Prado	60122		Ini Struct									
Below Prado	60115	Max WS	1930.69	103.40	109.22		109.25	0.000176	1.22	1579.63	280.62	0.09
Below Prado	60110*	Max WS	1930.75	103.40	109.22		109.24	0.000176	1.23	1575.64	277.54	0.09
Below Prado	60105*	Max WS	1930.62	103.40	109.22		109.24	0.000175	1.23	1572.93	274.47	0.09
Below Prado	60101*	Max WS	1930.71	103.40	109.22		109.24	0.000174	1.23	1571.51	271.41	0.09
Below Prado	60096*	Max WS	1930.66	103.40	109.22		109.24	0.000173	1.23	1571.16	270.00	0.09
Below Prado	60092*	Max WS	1930.71	103.40	109.22		109.24	0.000173	1.23	1570.94	270.00	0.09
Below Prado	60087*	Max WS	1930.70	103.40	109.22		109.24	0.000173	1.23	1570.72	270.00	0.09
Below Prado	60082*	Max WS	1930.70	103.40	109.22		109.24	0.000173	1.23	1570.51	270.00	0.09
Below Prado	60078*	Max WS	1930.59	103.40	109.22		109.24	0.000173	1.23	1570.29	270.00	0.09
Below Prado	60073*	Max WS	1930.62	103.40	109.22		109.24	0.000173	1.23	1570.08	270.00	0.09
Below Prado	60069	Max WS	1930.62	103.40	109.21		109.24	0.000173	1.23	1569.86	270.00	0.09
Below Prado	60061	Max WS	1930.54	106.93	109.08		109.25	0.004486	3.28	588.89	277.35	0.40
Below Prado	59931	Max WS	1929.15	106.80	108.58		108.79	0.002619	3.68	523.83	298.27	0.49
Below Prado	59766*	Max WS	1927.28	106.40	108.22		108.40	0.002161	3.40	567.67	316.22	0.45
Below Prado	59601	Max WS	1926.12	106.00	107.96		108.09	0.001507	2.98	646.74	334.52	0.38
Below Prado	59434*	Max WS	1925.19	105.83	107.70		107.84	0.001590	2.97	647.92	350.30	0.39
Below Prado	59267*	Max WS	1924.45	105.67	107.40		107.55	0.001862	3.06	628.62	365.88	0.41
Below Prado	59101	Max WS	1923.25	105.50	106.94		107.13	0.003182	3.54	543.57	380.79	0.52
Below Prado	58934*	Max WS	1920.52	104.99	106.44		106.62	0.002989	3.44	557.49	387.80	0.51
Below Prado	58767*	Max WS	1916.78	104.47	106.05		106.20	0.002165	3.10	618.12	395.27	0.44
Below Prado	58601	Max WS	1914.83	103.96	105.81		105.91	0.001222	2.59	739.33	403.32	0.34
Below Prado	58464	Max WS	1914.28	103.63	105.61		105.74	0.001360	2.84	672.96	345.70	0.36
Below Prado	58353	Max WS	1914.17	103.44	105.49	104.43	105.60	0.001161	2.69	711.13	352.09	0.33
Below Prado	58307		Bridge									
Below Prado	58260	Max WS	1914.10	103.30	104.90		105.09	0.002584	3.42	559.27	352.21	0.48
Below Prado	58252*	Max WS	1914.08	103.28	104.88		105.06	0.002598	3.43	558.54	352.50	0.48
Below Prado	58243*	Max WS	1914.10	103.26	104.86		105.04	0.002614	3.43	557.69	352.77	0.48
Below Prado	58234*	Max WS	1914.07	103.24	104.83		105.02	0.002630	3.44	556.81	353.06	0.48
Below Prado	58225*	Max WS	1914.08	103.21	104.81		104.99	0.002575	3.41	560.61	353.40	0.48
Below Prado	58216*	Max WS	1914.07	103.19	104.79		104.97	0.002588	3.42	559.90	353.68	0.48
Below Prado	58207	Max WS	1914.06	103.17	104.77		104.95	0.002604	3.42	559.09	353.97	0.48
Below Prado	58198	Max WS	1914.05	103.15	104.70	104.18	104.92	0.003372	3.80	503.09	330.24	0.54
Below Prado	58188		Ini Struct									
Below Prado	58178	Max WS	1899.38	93.15	100.14		100.15	0.000022	0.81	2338.28	348.78	0.06
Below Prado	58174*	Max WS	1899.18	93.15	100.14		100.15	0.000021	0.81	2348.89	350.25	0.06
Below Prado	58169*	Max WS	1898.77	93.15	100.14		100.15	0.000021	0.80	2359.60	351.74	0.05

HEC-RAS Plan: South_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	58164*	Max WS	1898.97	93.15	100.14		100.15	0.000021	0.80	2370.21	353.22	0.05
Below Prado	58159*	Max WS	1898.97	93.15	100.14		100.15	0.000021	0.80	2380.86	354.71	0.05
Below Prado	58154*	Max WS	1899.36	93.15	100.14		100.15	0.000021	0.79	2391.47	356.18	0.05
Below Prado	58149*	Max WS	1899.35	93.15	100.14		100.15	0.000020	0.79	2402.16	357.67	0.05
Below Prado	58144*	Max WS	1899.15	93.15	100.14		100.15	0.000020	0.79	2412.76	359.14	0.05
Below Prado	58139*	Max WS	1899.15	93.15	100.14		100.15	0.000020	0.78	2423.41	360.62	0.05
Below Prado	58134*	Max WS	1899.32	93.15	100.14		100.15	0.000020	0.78	2434.01	362.10	0.05
Below Prado	58130*	Max WS	1899.14	93.15	100.14		100.15	0.000020	0.78	2444.65	363.57	0.05
Below Prado	58125*	Max WS	1898.96	93.15	100.14		100.15	0.000019	0.77	2455.29	365.05	0.05
Below Prado	58120*	Max WS	1899.13	93.15	100.14		100.15	0.000019	0.77	2465.88	366.52	0.05
Below Prado	58115*	Max WS	1898.78	93.15	100.14		100.15	0.000019	0.77	2476.51	368.00	0.05
Below Prado	58110*	Max WS	1899.11	93.15	100.14		100.15	0.000019	0.76	2487.15	369.48	0.05
Below Prado	58105*	Max WS	1898.95	93.15	100.14		100.15	0.000019	0.76	2497.78	370.96	0.05
Below Prado	58100	Max WS	1899.11	93.15	100.14		100.15	0.000019	0.76	2508.36	372.42	0.05
Below Prado	58094	Max WS	1898.29	97.40	100.10		100.16	0.000388	1.87	1014.32	380.18	0.20
Below Prado	57997*	Max WS	1897.19	97.20	100.03		100.11	0.000586	2.32	817.06	302.75	0.25
Below Prado	57900	Max WS	1895.57	97.00	99.87		100.03	0.001194	3.18	596.50	235.51	0.35
Below Prado	57800*	Max WS	1894.38	96.83	99.73		99.90	0.001290	3.33	569.39	222.34	0.37
Below Prado	57700*	Max WS	1893.55	96.67	99.57		99.77	0.001452	3.53	536.45	209.39	0.39
Below Prado	57600	Max WS	1892.88	96.50	99.39		99.61	0.001676	3.78	501.03	196.66	0.42
Below Prado	57550*	Max WS	1892.62	96.38	99.28		99.53	0.001828	3.95	479.39	187.92	0.44
Below Prado	57500*	Max WS	1892.44	96.25	99.17		99.43	0.001948	4.12	459.21	176.86	0.45
Below Prado	57450*	Max WS	1892.11	96.12	99.05		99.33	0.002058	4.29	441.08	166.56	0.46
Below Prado	57400	Max WS	1892.06	96.00	98.91		99.22	0.002274	4.50	420.42	159.09	0.49
Below Prado	57375*	Max WS	1891.91	95.94	98.84		99.17	0.002370	4.60	410.99	155.07	0.50
Below Prado	57350*	Max WS	1891.87	95.88	98.76		99.11	0.002468	4.70	402.77	151.98	0.51
Below Prado	57325*	Max WS	1891.83	95.81	98.69		99.04	0.002529	4.76	397.39	149.65	0.52
Below Prado	57300*	Max WS	1891.70	95.75	98.61		98.98	0.002654	4.84	390.96	149.03	0.53
Below Prado	57275*	Max WS	1891.72	95.69	98.54		98.91	0.002792	4.91	385.42	149.42	0.54
Below Prado	57250*	Max WS	1891.66	95.62	98.46		98.84	0.002858	4.95	382.32	149.04	0.54
Below Prado	57225*	Max WS	1891.61	95.56	98.38		98.77	0.002956	5.01	377.63	148.22	0.55
Below Prado	57200	Max WS	1891.52	95.50	98.29		98.69	0.003049	5.07	373.13	147.21	0.56
Below Prado	57175*	Max WS	1891.55	95.45	98.20		98.61	0.003209	5.15	367.05	146.81	0.57
Below Prado	57150*	Max WS	1891.48	95.40	98.10		98.53	0.003413	5.26	359.84	146.33	0.59
Below Prado	57125*	Max WS	1891.46	95.35	97.99		98.44	0.003686	5.39	351.04	145.74	0.61
Below Prado	57100*	Max WS	1891.45	95.30	97.86		98.35	0.004080	5.57	339.78	144.99	0.64
Below Prado	57075	Max WS	1891.45	95.25	97.71		98.24	0.004712	5.83	324.47	143.96	0.68
Below Prado	57067*	Max WS	1891.45	95.24	97.72		98.20	0.004182	5.53	342.20	150.43	0.65
Below Prado	57059*	Max WS	1891.44	95.24	97.73		98.17	0.003823	5.29	357.57	157.03	0.62
Below Prado	57050	Max WS	1891.44	95.23	97.74	97.01	98.14	0.003440	5.04	375.47	163.96	0.59
Below Prado	57040		Int Struct									
Below Prado	57030	Max WS	1883.31	85.25	91.31		91.33	0.000029	0.86	2186.89	371.20	0.06
Below Prado	57020*	Max WS	1883.29	85.25	91.31		91.33	0.000029	0.86	2186.79	371.20	0.06
Below Prado	57010*	Max WS	1883.00	85.25	91.31		91.33	0.000029	0.86	2186.69	371.19	0.06
Below Prado	57000*	Max WS	1883.14	85.24	91.31		91.33	0.000029	0.86	2190.30	371.22	0.06
Below Prado	56990*	Max WS	1883.13	85.24	91.31		91.33	0.000029	0.86	2190.20	371.22	0.06
Below Prado	56980*	Max WS	1883.11	85.24	91.31		91.32	0.000029	0.86	2190.10	371.22	0.06
Below Prado	56970*	Max WS	1882.97	85.24	91.31		91.32	0.000029	0.86	2190.00	371.22	0.06
Below Prado	56960*	Max WS	1882.70	85.23	91.31		91.32	0.000028	0.86	2193.61	371.24	0.06
Below Prado	56950	Max WS	1882.69	85.23	91.31		91.32	0.000028	0.86	2193.50	371.24	0.06
Below Prado	56947	Max WS	1880.90	89.44	91.22		91.36	0.001709	2.98	630.26	357.44	0.40
Below Prado	56868*	Max WS	1877.22	89.33	91.10		91.23	0.001643	2.91	644.91	368.54	0.39
Below Prado	56789*	Max WS	1873.90	89.22	90.98		91.10	0.001565	2.83	661.53	379.66	0.38
Below Prado	56710*	Max WS	1870.70	89.11	90.86		90.98	0.001474	2.75	680.71	390.81	0.37
Below Prado	56630	Max WS	1868.07	89.00	90.76		90.87	0.001371	2.66	703.06	401.98	0.35
Below Prado	56537*	Max WS	1865.36	88.73	90.63		90.75	0.001297	2.72	686.58	364.26	0.35
Below Prado	56444*	Max WS	1862.98	88.47	90.50		90.62	0.001309	2.84	655.08	326.63	0.35
Below Prado	56350	Max WS	1860.84	88.20	90.36		90.50	0.001378	3.03	613.93	289.13	0.37
Below Prado	56258*	Max WS	1858.53	88.07	90.23		90.37	0.001396	3.05	609.39	287.02	0.37
Below Prado	56165*	Max WS	1857.00	87.94	90.10		90.24	0.001420	3.07	604.17	284.90	0.37
Below Prado	56072*	Max WS	1854.97	87.81	89.96		90.11	0.001450	3.10	598.13	282.78	0.38
Below Prado	55979*	Max WS	1853.19	87.69	89.82		89.97	0.001523	3.16	587.23	280.59	0.38
Below Prado	55886*	Max WS	1851.26	87.56	89.67		89.83	0.001591	3.21	577.45	278.40	0.39
Below Prado	55793*	Max WS	1849.25	87.43	89.51		89.68	0.001688	3.27	565.10	276.17	0.40
Below Prado	55700	Max WS	1847.34	87.30	89.34		89.51	0.001834	3.36	549.01	273.88	0.42
Below Prado	55608*	Max WS	1844.95	87.13	89.17		89.35	0.001802	3.34	552.19	274.75	0.42
Below Prado	55515*	Max WS	1842.59	86.95	89.02		89.18	0.001719	3.29	560.39	275.69	0.41
Below Prado	55423*	Max WS	1839.99	86.78	88.86		89.03	0.001650	3.24	567.59	276.62	0.40
Below Prado	55330	Max WS	1837.54	86.60	88.73		88.88	0.001531	3.16	580.96	277.63	0.39
Below Prado	55240*	Max WS	1835.15	86.48	88.59		88.74	0.001536	3.15	582.11	280.31	0.39
Below Prado	55150*	Max WS	1832.44	86.37	88.45		88.60	0.001578	3.16	579.09	282.92	0.39
Below Prado	55060*	Max WS	1829.18	86.25	88.31		88.46	0.001599	3.16	578.27	285.58	0.39
Below Prado	54970*	Max WS	1825.15	86.13	88.16		88.32	0.001627	3.17	576.58	288.22	0.39
Below Prado	54880*	Max WS	1820.62	86.02	88.01		88.17	0.001705	3.20	569.70	290.79	0.40
Below Prado	54790	Max WS	1814.43	85.90	87.85		88.01	0.001773	3.22	563.85	293.37	0.41
Below Prado	54692.5*	Max WS	1807.58	85.70	87.69		87.84	0.001670	3.16	571.58	291.78	0.40
Below Prado	54595.0*	Max WS	1800.71	85.50	87.54		87.69	0.001542	3.09	582.86	290.24	0.38
Below Prado	54497.5*	Max WS	1794.84	85.30	87.40		87.54	0.001395	3.00	598.27	288.78	0.37
Below Prado	54400	Max WS	1789.40	85.10	87.29		87.42	0.001236	2.89	618.16	287.37	0.35

HEC-RAS Plan: South_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	54300.0*	Max WS	1784.70	84.95	87.17		87.30	0.001187	2.86	623.01	285.49	0.34
Below Prado	54200.0*	Max WS	1780.97	84.80	87.06		87.18	0.001134	2.83	629.27	283.63	0.33
Below Prado	54100.0*	Max WS	1777.68	84.65	86.95		87.07	0.001075	2.79	637.02	281.79	0.33
Below Prado	54000	Max WS	1775.66	84.50	86.85		86.97	0.001013	2.75	646.40	279.99	0.32
Below Prado	53912*	Max WS	1774.01	84.36	86.76		86.88	0.001004	2.77	640.34	271.92	0.32
Below Prado	53823*	Max WS	1772.71	84.21	86.67		86.79	0.000982	2.78	636.69	263.90	0.32
Below Prado	53735*	Max WS	1771.75	84.07	86.58		86.71	0.000979	2.82	629.35	255.84	0.32
Below Prado	53646*	Max WS	1771.47	83.93	86.49		86.62	0.000980	2.85	621.04	247.78	0.32
Below Prado	53558*	Max WS	1771.24	83.79	86.40		86.53	0.000987	2.90	611.63	239.71	0.32
Below Prado	53469*	Max WS	1771.07	83.64	86.31		86.45	0.000984	2.93	603.82	231.69	0.32
Below Prado	53380	Max WS	1771.05	83.50	86.22	84.79	86.36	0.001002	2.99	592.19	223.61	0.32

Appendix D
Simultaneous Deflation HEC-RAS Model Output

HEC-RAS Plan: Short_Sim_Short River: Santa Ana River Reach: Below Prado Profile: Max WS

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	69601	Max WS	4849.86	144.20	148.00		148.32	0.001511	4.57	1060.73	288.30	0.42
Below Prado	69366	Max WS	4848.04	143.83	147.64	145.98	147.97	0.001504	4.59	1055.83	283.74	0.42
Below Prado	69341		Bridge									
Below Prado	69313	Max WS	4847.47	143.66	147.06		147.47	0.002218	5.17	936.96	281.90	0.50
Below Prado	69200	Max WS	4846.70	143.44	146.79		147.22	0.002293	5.24	925.84	282.69	0.51
Below Prado	69176*	Max WS	4846.51	143.39	146.74		147.16	0.002326	5.24	924.64	282.85	0.51
Below Prado	69152*	Max WS	4846.39	143.34	146.68		147.11	0.002342	5.25	922.89	283.01	0.51
Below Prado	69128*	Max WS	4846.14	143.29	146.62		147.05	0.002359	5.26	921.02	283.18	0.51
Below Prado	69104*	Max WS	4845.97	143.24	146.56		146.99	0.002378	5.27	919.04	283.38	0.52
Below Prado	69080*	Max WS	4845.89	143.20	146.50		146.94	0.002433	5.31	912.93	283.56	0.52
Below Prado	69056*	Max WS	4845.79	143.15	146.44		146.88	0.002459	5.32	910.27	283.78	0.52
Below Prado	69032*	Max WS	4845.61	143.10	146.38		146.82	0.002487	5.34	907.48	284.05	0.53
Below Prado	69009	Max WS	4845.62	143.05	146.31		146.76	0.002518	5.36	904.42	284.33	0.53
Below Prado	69004*	Max WS	4845.61	143.04	146.30		146.75	0.002524	5.36	903.82	284.40	0.53
Below Prado	68999*	Max WS	4845.61	143.03	146.29		146.74	0.002531	5.37	903.15	284.46	0.53
Below Prado	68994*	Max WS	4845.61	143.02	146.28		146.72	0.002538	5.37	902.49	284.53	0.53
Below Prado	68989*	Max WS	4845.59	143.01	146.26		146.71	0.002545	5.37	901.87	284.60	0.53
Below Prado	68985	Max WS	4845.59	143.00	146.25	145.14	146.70	0.002552	5.38	901.18	284.67	0.53
Below Prado	68977		Inl Struct									
Below Prado	68969	Max WS	4839.77	132.80	139.73		139.82	0.000570	2.50	1939.28	280.00	0.17
Below Prado	68964*	Max WS	4839.06	132.80	139.72		139.82	0.000575	2.51	1931.38	279.00	0.17
Below Prado	68959*	Max WS	4839.53	132.80	139.72		139.82	0.000580	2.52	1923.48	278.00	0.17
Below Prado	68955*	Max WS	4839.29	132.80	139.72		139.81	0.000585	2.53	1915.59	277.02	0.17
Below Prado	68950*	Max WS	4839.28	132.80	139.71		139.81	0.000593	2.54	1908.03	277.48	0.17
Below Prado	68945*	Max WS	4839.27	132.80	139.71		139.81	0.000599	2.55	1901.08	277.89	0.17
Below Prado	68940*	Max WS	4839.06	132.80	139.71		139.81	0.000605	2.55	1894.71	278.26	0.17
Below Prado	68936*	Max WS	4839.24	132.80	139.70		139.80	0.000611	2.56	1888.90	278.60	0.17
Below Prado	68931*	Max WS	4839.04	132.80	139.70		139.80	0.000616	2.57	1883.66	278.90	0.17
Below Prado	68926*	Max WS	4839.03	132.80	139.69		139.80	0.000620	2.58	1878.94	279.17	0.18
Below Prado	68922	Max WS	4839.21	132.80	139.69		139.79	0.000623	2.58	1874.71	279.40	0.18
Below Prado	68916	Max WS	4837.59	135.73	139.46		139.81	0.003983	4.43	1046.21	291.17	0.41
Below Prado	68808*	Max WS	4834.25	135.51	139.14		139.49	0.001750	4.78	1011.92	287.61	0.45
Below Prado	68700	Max WS	4832.03	135.30	138.96		139.31	0.001713	4.76	1015.47	285.48	0.44
Below Prado	68547*	Max WS	4829.42	134.95	138.74		139.06	0.001523	4.59	1052.71	286.22	0.42
Below Prado	68395	Max WS	4829.08	134.60	138.55	136.74	138.85	0.001324	4.39	1099.53	287.26	0.40
Below Prado	68222		Bridge									
Below Prado	68050	Max WS	4820.85	134.10	137.59		137.97	0.001989	4.97	969.94	285.89	0.48
Below Prado	67866*	Max WS	4816.10	133.73	137.23		137.61	0.001970	4.96	970.84	284.83	0.47
Below Prado	67683*	Max WS	4809.16	133.37	136.87		137.25	0.001969	4.96	968.84	283.77	0.47
Below Prado	67500	Max WS	4800.71	133.00	136.52		136.90	0.001934	4.94	971.82	282.80	0.47
Below Prado	67333*	Max WS	4793.92	132.62	136.24		136.59	0.001739	4.74	1012.37	290.34	0.45
Below Prado	67166*	Max WS	4789.83	132.24	136.01		136.32	0.001517	4.47	1070.62	302.02	0.42
Below Prado	67000	Max WS	4787.81	131.86	135.82		136.09	0.001239	4.16	1151.81	311.36	0.38
Below Prado	66922	Max WS	4787.54	131.80	135.70	133.93	135.99	0.001428	4.32	1108.55	314.20	0.41
Below Prado	66884		Bridge									
Below Prado	66847	Max WS	4782.27	131.60	134.96		135.37	0.002212	5.12	934.08	285.29	0.50
Below Prado	66723*	Max WS	4776.98	131.30	134.71		135.10	0.002120	5.06	944.36	284.36	0.49
Below Prado	66600	Max WS	4773.72	131.00	134.47		134.85	0.001996	4.97	961.22	284.31	0.48
Below Prado	66433*	Max WS	4767.26	130.67	134.14		134.52	0.001994	4.96	960.42	284.04	0.48
Below Prado	66266*	Max WS	4760.39	130.33	133.81		134.19	0.001959	4.94	964.44	283.85	0.47
Below Prado	66100	Max WS	4755.93	130.00	133.49		133.87	0.001941	4.92	966.34	283.63	0.47
Below Prado	65933*	Max WS	4750.67	129.67	133.18		133.55	0.001909	4.89	971.02	284.00	0.47
Below Prado	65766*	Max WS	4745.79	129.33	132.87		133.24	0.001836	4.83	982.37	284.46	0.46
Below Prado	65600	Max WS	4742.99	129.00	132.58		132.94	0.001766	4.77	994.31	284.97	0.45
Below Prado	65425*	Max WS	4739.29	128.73	132.26		132.62	0.001860	4.84	978.45	285.02	0.46
Below Prado	65250*	Max WS	4736.59	128.45	131.91		132.28	0.001986	4.94	958.95	285.00	0.47
Below Prado	65075*	Max WS	4731.00	128.18	131.51		131.91	0.002254	5.13	922.19	284.70	0.50
Below Prado	64900	Max WS	4731.13	127.90	130.99		131.47	0.002870	5.52	856.58	283.92	0.56
Below Prado	64734*	Max WS	4730.34	127.34	130.58		131.02	0.002518	5.31	890.06	283.15	0.53
Below Prado	64568	Max WS	4729.41	126.78	130.23		130.63	0.002203	5.11	926.21	282.91	0.50
Below Prado	64559*	Max WS	4728.73	126.78	130.21		130.61	0.002211	5.11	925.04	282.85	0.50
Below Prado	64550*	Max WS	4728.58	126.78	130.18		130.59	0.002215	5.12	924.43	282.80	0.50
Below Prado	64541*	Max WS	4728.53	126.79	130.16		130.57	0.002258	5.15	919.04	282.70	0.50
Below Prado	64532*	Max WS	4728.50	126.79	130.14		130.55	0.002279	5.16	916.32	282.65	0.51
Below Prado	64522*	Max WS	4728.47	126.79	130.11		130.53	0.002316	5.19	911.80	282.56	0.51
Below Prado	64513*	Max WS	4728.44	126.79	130.08		130.51	0.002356	5.21	907.03	282.50	0.51
Below Prado	64504*	Max WS	4728.42	126.80	130.05		130.49	0.002442	5.27	897.18	282.38	0.52
Below Prado	64495	Max WS	4728.39	126.80	130.02		130.46	0.002509	5.31	889.87	282.30	0.53
Below Prado	64490*	Max WS	4728.37	126.80	130.01		130.45	0.002549	5.34	885.58	282.24	0.53
Below Prado	64486	Max WS	4728.36	126.80	129.99	128.92	130.44	0.002591	5.37	881.11	282.20	0.54
Below Prado	64478		Inl Struct									
Below Prado	64470	Max WS	4695.32	117.80	125.06		125.15	0.000495	2.39	1961.04	270.00	0.16
Below Prado	64465*	Max WS	4695.31	117.80	125.06		125.15	0.000495	2.40	1960.39	270.00	0.16
Below Prado	64460*	Max WS	4694.72	117.80	125.06		125.15	0.000496	2.40	1959.74	270.00	0.16
Below Prado	64455*	Max WS	4694.71	117.80	125.06		125.15	0.000498	2.40	1959.21	270.99	0.16
Below Prado	64450*	Max WS	4694.69	117.80	125.05		125.14	0.000499	2.40	1959.25	272.39	0.16
Below Prado	64445*	Max WS	4694.10	117.80	125.05		125.14	0.000501	2.40	1959.87	273.77	0.16
Below Prado	64440*	Max WS	4694.09	117.80	125.05		125.14	0.000501	2.39	1961.05	275.13	0.16
Below Prado	64435*	Max WS	4694.08	117.80	125.05		125.14	0.000502	2.39	1962.76	276.48	0.16

HEC-RAS Plan: Short_Sim_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	64430*	Max WS	4694.07	117.80	125.04		125.13	0.000501	2.39	1965.03	277.80	0.16
Below Prado	64426*	Max WS	4694.05	117.80	125.04		125.13	0.000501	2.39	1967.81	279.11	0.16
Below Prado	64421	Max WS	4693.51	117.80	125.04		125.13	0.000499	2.38	1971.13	280.40	0.16
Below Prado	64416	Max WS	4685.78	120.80	124.87		125.13	0.003113	4.11	1139.57	290.19	0.37
Below Prado	64308*	Max WS	4670.41	120.60	124.64		124.90	0.001131	4.12	1134.34	290.18	0.37
Below Prado	64200	Max WS	4665.91	120.40	124.54		124.79	0.001033	4.00	1165.16	290.16	0.35
Below Prado	64063*	Max WS	4660.00	120.20	124.41		124.65	0.000988	3.96	1176.09	287.61	0.35
Below Prado	63927	Max WS	4654.31	120.00	124.28	122.09	124.52	0.000945	3.93	1184.89	283.56	0.34
Below Prado	63878		Bridge									
Below Prado	63829	Max WS	4626.65	119.50	123.49		123.76	0.001233	4.16	1111.91	297.64	0.38
Below Prado	63600	Max WS	4618.86	119.20	123.24		123.50	0.001097	4.07	1135.53	288.89	0.36
Below Prado	63400*	Max WS	4611.78	119.05	123.01		123.27	0.001175	4.15	1110.82	288.60	0.37
Below Prado	63200	Max WS	4604.09	118.90	122.75		123.03	0.001286	4.27	1079.44	288.21	0.39
Below Prado	63000*	Max WS	4599.84	118.45	122.55		122.80	0.001035	3.99	1153.34	289.32	0.35
Below Prado	62800	Max WS	4596.66	118.00	122.40		122.62	0.000816	3.71	1240.47	290.61	0.32
Below Prado	62601	Max WS	4595.15	117.84	122.24	119.90	122.45	0.000827	3.73	1233.23	289.57	0.32
Below Prado	62451		Bridge									
Below Prado	62301	Max WS	4572.98	117.35	120.70		121.08	0.002028	4.90	933.79	285.52	0.48
Below Prado	62300	Max WS	4575.95	117.20	120.74		121.07	0.001668	4.60	993.73	287.68	0.44
Below Prado	62100*	Max WS	4563.70	116.90	120.40		120.74	0.001730	4.65	981.39	287.78	0.44
Below Prado	61900	Max WS	4544.57	116.60	120.04		120.38	0.001824	4.72	963.46	287.80	0.45
Below Prado	61733*	Max WS	4527.19	116.27	119.75		120.09	0.001727	4.63	977.93	288.43	0.44
Below Prado	61566*	Max WS	4511.88	115.93	119.50		119.81	0.001583	4.50	1002.87	289.22	0.43
Below Prado	61400	Max WS	4499.60	115.60	119.27		119.56	0.001435	4.36	1032.47	290.11	0.41
Below Prado	61200*	Max WS	4485.96	115.30	118.99		119.28	0.001390	4.31	1040.06	289.84	0.40
Below Prado	61000	Max WS	4474.80	115.00	118.73		119.01	0.001336	4.26	1050.82	289.59	0.39
Below Prado	60800*	Max WS	4471.22	114.60	118.51		118.77	0.001141	4.05	1103.08	290.73	0.37
Below Prado	60600	Max WS	4469.67	114.20	118.33	116.22	118.56	0.000951	3.83	1166.92	292.14	0.34
Below Prado	60550		Bridge									
Below Prado	60505	Max WS	4469.67	113.95	118.30		118.51	0.000808	3.65	1223.45	290.93	0.31
Below Prado	60500	Max WS	4469.12	113.95	118.04	115.97	118.28	0.000990	3.89	1149.07	289.79	0.34
Below Prado	60372		Bridge									
Below Prado	60245	Max WS	4468.40	113.70	116.80		117.22	0.002553	5.21	857.04	283.68	0.53
Below Prado	60222*	Max WS	4468.47	113.66	116.73		117.16	0.002621	5.26	850.12	283.55	0.54
Below Prado	60199*	Max WS	4468.46	113.62	116.66		117.10	0.002711	5.31	841.38	283.39	0.54
Below Prado	60176*	Max WS	4468.44	113.58	116.59		117.04	0.002816	5.37	831.60	283.22	0.55
Below Prado	60153	Max WS	4468.43	113.54	116.51		116.97	0.002942	5.45	820.57	283.02	0.56
Below Prado	60148*	Max WS	4468.42	113.51	116.50		116.96	0.002863	5.40	827.35	283.10	0.56
Below Prado	60144*	Max WS	4468.41	113.48	116.50		116.94	0.002787	5.36	834.20	283.18	0.55
Below Prado	60139*	Max WS	4468.42	113.46	116.49		116.93	0.002756	5.34	837.05	283.21	0.55
Below Prado	60134*	Max WS	4468.42	113.43	116.48		116.92	0.002682	5.29	844.01	283.29	0.54
Below Prado	60130	Max WS	4468.41	113.40	116.48	115.43	116.90	0.002610	5.25	851.00	283.37	0.53
Below Prado	60122		Ini Struct									
Below Prado	60115	Max WS	4466.45	103.40	110.58		110.66	0.000477	2.27	1966.30	290.72	0.15
Below Prado	60110*	Max WS	4466.30	103.40	110.57		110.65	0.000479	2.28	1957.57	287.61	0.15
Below Prado	60105*	Max WS	4466.43	103.40	110.57		110.65	0.000480	2.29	1950.15	284.50	0.15
Below Prado	60101*	Max WS	4466.15	103.40	110.57		110.65	0.000480	2.30	1944.05	281.40	0.15
Below Prado	60096*	Max WS	4466.29	103.40	110.57		110.65	0.000478	2.30	1939.26	278.32	0.15
Below Prado	60092*	Max WS	4466.28	103.40	110.56		110.65	0.000476	2.31	1935.77	275.25	0.15
Below Prado	60087*	Max WS	4466.41	103.40	110.56		110.64	0.000473	2.31	1933.59	272.20	0.15
Below Prado	60082*	Max WS	4466.28	103.40	110.56		110.64	0.000470	2.31	1932.66	270.00	0.15
Below Prado	60078*	Max WS	4466.15	103.40	110.56		110.64	0.000470	2.31	1932.07	270.00	0.15
Below Prado	60073*	Max WS	4466.14	103.40	110.55		110.64	0.000471	2.31	1931.47	270.00	0.15
Below Prado	60069	Max WS	4466.38	103.40	110.55		110.63	0.000471	2.31	1930.88	270.00	0.15
Below Prado	60061	Max WS	4465.32	106.93	110.28		110.65	0.005461	4.83	924.47	281.45	0.47
Below Prado	59931	Max WS	4458.02	106.80	109.69		110.11	0.002746	5.19	859.37	302.84	0.54
Below Prado	59766*	Max WS	4451.62	106.40	109.34		109.70	0.002320	4.82	924.04	320.67	0.50
Below Prado	59601	Max WS	4446.96	106.00	109.06		109.36	0.001799	4.36	1018.86	338.77	0.44
Below Prado	59434*	Max WS	4441.65	105.83	108.75		109.05	0.001899	4.35	1019.94	354.42	0.45
Below Prado	59267*	Max WS	4434.88	105.67	108.40		108.71	0.002164	4.45	996.48	369.84	0.48
Below Prado	59101	Max WS	4418.95	105.50	107.94		108.29	0.002893	4.77	925.76	384.81	0.54
Below Prado	58934*	Max WS	4405.26	104.99	107.55		107.85	0.002364	4.45	989.24	392.23	0.49
Below Prado	58767*	Max WS	4398.67	104.47	107.27		107.52	0.001671	3.98	1105.76	400.15	0.42
Below Prado	58601	Max WS	4396.71	103.96	107.10		107.29	0.001102	3.48	1262.87	408.43	0.35
Below Prado	58464	Max WS	4396.05	103.63	106.88		107.12	0.001374	3.94	1115.68	353.80	0.39
Below Prado	58353	Max WS	4395.99	103.44	106.75	105.16	106.98	0.001224	3.79	1160.79	357.88	0.37
Below Prado	58307		Bridge									
Below Prado	58260	Max WS	4395.82	103.30	106.05		106.37	0.002246	4.55	966.75	357.38	0.49
Below Prado	58252*	Max WS	4395.73	103.28	106.03		106.35	0.002240	4.54	967.88	357.72	0.49
Below Prado	58243*	Max WS	4395.80	103.26	106.01		106.33	0.002234	4.54	969.01	358.06	0.49
Below Prado	58234*	Max WS	4395.76	103.24	106.00		106.31	0.002228	4.53	970.18	358.41	0.49
Below Prado	58225*	Max WS	4395.73	103.21	105.98		106.30	0.002186	4.50	976.16	358.82	0.48
Below Prado	58216*	Max WS	4395.77	103.19	105.96		106.28	0.002178	4.50	977.52	359.17	0.48
Below Prado	58207	Max WS	4395.75	103.17	105.94		106.26	0.002171	4.49	978.91	359.53	0.48
Below Prado	58198	Max WS	4395.74	103.15	105.86	104.94	106.24	0.002740	4.94	890.26	337.92	0.54
Below Prado	58188		Ini Struct									
Below Prado	58178	Max WS	4336.98	93.15	102.17		102.20	0.000048	1.42	3055.06	357.13	0.09
Below Prado	58174*	Max WS	4336.20	93.15	102.17		102.20	0.000047	1.41	3068.68	358.59	0.09
Below Prado	58169*	Max WS	4336.97	93.15	102.17		102.20	0.000047	1.41	3082.43	360.06	0.08

HEC-RAS Plan: Short_Sim_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	58164*	Max WS	4337.72	93.15	102.17		102.20	0.000046	1.40	3096.04	361.51	0.08
Below Prado	58159*	Max WS	4336.96	93.15	102.17		102.20	0.000046	1.39	3109.69	362.97	0.08
Below Prado	58154*	Max WS	4338.45	93.15	102.17		102.20	0.000046	1.39	3123.30	364.42	0.08
Below Prado	58149*	Max WS	4336.21	93.15	102.17		102.20	0.000045	1.38	3137.04	365.89	0.08
Below Prado	58144*	Max WS	4337.69	93.15	102.17		102.20	0.000045	1.38	3150.65	367.33	0.08
Below Prado	58139*	Max WS	4337.68	93.15	102.17		102.20	0.000044	1.37	3164.28	368.80	0.08
Below Prado	58134*	Max WS	4337.67	93.15	102.17		102.20	0.000044	1.36	3177.88	370.24	0.08
Below Prado	58130*	Max WS	4336.94	93.15	102.17		102.20	0.000043	1.36	3191.53	371.69	0.08
Below Prado	58125*	Max WS	4336.93	93.15	102.17		102.20	0.000043	1.35	3205.15	373.15	0.08
Below Prado	58120*	Max WS	4336.92	93.15	102.17		102.20	0.000043	1.35	3218.74	374.59	0.08
Below Prado	58115*	Max WS	4337.62	93.15	102.17		102.20	0.000042	1.34	3232.40	376.05	0.08
Below Prado	58110*	Max WS	4336.21	93.15	102.17		102.20	0.000042	1.34	3246.00	377.49	0.08
Below Prado	58105*	Max WS	4337.60	93.15	102.17		102.20	0.000042	1.33	3259.64	378.95	0.08
Below Prado	58100	Max WS	4336.91	93.15	102.17		102.20	0.000041	1.32	3273.18	380.39	0.08
Below Prado	58094	Max WS	4332.71	97.40	102.11		102.21	0.000315	2.43	1786.34	387.74	0.20
Below Prado	57997*	Max WS	4326.46	97.20	102.03		102.17	0.000500	3.00	1442.22	322.38	0.25
Below Prado	57900	Max WS	4315.01	97.00	101.86		102.10	0.000975	3.91	1103.59	273.99	0.34
Below Prado	57800*	Max WS	4312.46	96.83	101.74		102.00	0.001084	4.06	1061.20	269.21	0.36
Below Prado	57700*	Max WS	4306.51	96.67	101.60		101.88	0.001282	4.27	1007.88	268.93	0.39
Below Prado	57600	Max WS	4299.76	96.50	101.42		101.73	0.001760	4.44	967.61	308.75	0.44
Below Prado	57550*	Max WS	4296.80	96.38	101.32		101.64	0.001867	4.53	948.86	307.69	0.45
Below Prado	57500*	Max WS	4294.89	96.25	101.21		101.54	0.001995	4.63	928.45	306.39	0.47
Below Prado	57450*	Max WS	4292.67	96.12	101.09		101.44	0.002166	4.75	904.10	304.97	0.49
Below Prado	57400	Max WS	4290.69	96.00	100.95		101.33	0.002422	4.92	872.29	303.25	0.51
Below Prado	57375*	Max WS	4289.98	95.94	100.86		101.26	0.002608	5.10	841.01	292.62	0.53
Below Prado	57350*	Max WS	4289.31	95.88	100.76		101.20	0.002798	5.29	811.00	281.75	0.55
Below Prado	57325*	Max WS	4288.98	95.81	100.66		101.12	0.003005	5.47	784.27	273.38	0.57
Below Prado	57300*	Max WS	4288.93	95.75	100.55		101.05	0.003271	5.68	755.71	265.52	0.59
Below Prado	57275*	Max WS	4288.66	95.69	100.42		100.96	0.003604	5.90	726.49	258.72	0.62
Below Prado	57250*	Max WS	4288.98	95.62	100.27		100.87	0.004054	6.17	695.52	253.38	0.66
Below Prado	57225*	Max WS	4289.06	95.56	100.10		100.76	0.004772	6.53	656.47	247.77	0.71
Below Prado	57200	Max WS	4289.21	95.50	99.93		100.66	0.003193	6.84	627.19	163.16	0.61
Below Prado	57175*	Max WS	4289.25	95.45	99.80		100.56	0.003407	6.99	613.87	162.37	0.63
Below Prado	57150*	Max WS	4289.27	95.40	99.68		100.46	0.003613	7.12	602.09	161.66	0.65
Below Prado	57125*	Max WS	4289.22	95.35	99.55		100.37	0.003846	7.27	589.80	160.91	0.67
Below Prado	57100*	Max WS	4289.19	95.30	99.41		100.27	0.004158	7.46	574.82	160.00	0.69
Below Prado	57075	Max WS	4289.18	95.25	99.24		100.16	0.004608	7.72	555.71	158.84	0.73
Below Prado	57067*	Max WS	4289.17	95.24	99.32		100.13	0.003915	7.21	594.84	166.73	0.67
Below Prado	57059*	Max WS	4289.17	95.24	99.38		100.10	0.003433	6.80	630.51	174.87	0.63
Below Prado	57050	Max WS	4289.17	95.23	99.43	98.24	100.07	0.003009	6.42	668.49	183.41	0.59
Below Prado	57040		Int Struct									
Below Prado	57030	Max WS	4245.69	85.25	92.61		92.65	0.000076	1.59	2671.48	375.73	0.11
Below Prado	57020*	Max WS	4244.98	85.25	92.61		92.65	0.000076	1.59	2671.22	375.73	0.11
Below Prado	57010*	Max WS	4245.64	85.25	92.61		92.65	0.000076	1.59	2670.96	375.73	0.11
Below Prado	57000*	Max WS	4244.96	85.24	92.61		92.65	0.000076	1.59	2674.46	375.75	0.10
Below Prado	56990*	Max WS	4244.94	85.24	92.61		92.65	0.000076	1.59	2674.21	375.75	0.10
Below Prado	56980*	Max WS	4244.91	85.24	92.61		92.65	0.000076	1.59	2673.95	375.75	0.10
Below Prado	56970*	Max WS	4244.89	85.24	92.61		92.65	0.000076	1.59	2673.69	375.74	0.10
Below Prado	56960*	Max WS	4244.26	85.23	92.61		92.65	0.000076	1.59	2677.19	375.77	0.10
Below Prado	56950	Max WS	4244.24	85.23	92.61		92.65	0.000076	1.59	2676.92	375.76	0.10
Below Prado	56947	Max WS	4230.82	89.44	92.44		92.68	0.001524	3.96	1067.54	362.51	0.41
Below Prado	56868*	Max WS	4223.49	89.33	92.34		92.57	0.001405	3.82	1105.90	373.31	0.39
Below Prado	56789*	Max WS	4215.50	89.22	92.25		92.46	0.001284	3.67	1147.98	384.13	0.37
Below Prado	56710*	Max WS	4211.30	89.11	92.17		92.36	0.001167	3.53	1193.96	394.95	0.36
Below Prado	56630	Max WS	4206.73	89.00	92.10		92.28	0.001054	3.38	1243.99	405.77	0.34
Below Prado	56537*	Max WS	4201.42	88.73	91.98		92.18	0.001099	3.56	1181.24	368.70	0.35
Below Prado	56444*	Max WS	4195.89	88.47	91.84		92.07	0.001217	3.82	1097.50	331.68	0.37
Below Prado	56350	Max WS	4186.69	88.20	91.67		91.95	0.001418	4.19	998.54	294.70	0.40
Below Prado	56258*	Max WS	4180.36	88.07	91.54		91.82	0.001444	4.23	989.33	292.59	0.41
Below Prado	56165*	Max WS	4174.30	87.94	91.40		91.68	0.001476	4.26	979.14	290.46	0.41
Below Prado	56072*	Max WS	4168.00	87.81	91.25		91.54	0.001515	4.31	967.83	288.32	0.41
Below Prado	55979*	Max WS	4161.78	87.69	91.10		91.40	0.001583	4.37	951.32	286.11	0.42
Below Prado	55886*	Max WS	4155.99	87.56	90.94		91.25	0.001649	4.44	936.11	283.91	0.43
Below Prado	55793*	Max WS	4149.65	87.43	90.78		91.09	0.001733	4.52	918.44	281.66	0.44
Below Prado	55700	Max WS	4140.82	87.30	90.60		90.93	0.001842	4.61	897.61	279.37	0.45
Below Prado	55608*	Max WS	4133.54	87.13	90.43		90.76	0.001812	4.58	902.18	280.15	0.45
Below Prado	55515*	Max WS	4125.40	86.95	90.28		90.60	0.001750	4.52	911.75	281.00	0.44
Below Prado	55423*	Max WS	4117.40	86.78	90.13		90.44	0.001700	4.48	919.64	281.83	0.44
Below Prado	55330	Max WS	4110.19	86.60	89.98		90.28	0.001622	4.40	933.07	282.73	0.43
Below Prado	55240*	Max WS	4101.11	86.48	89.84		90.14	0.001618	4.38	936.04	285.43	0.43
Below Prado	55150*	Max WS	4093.05	86.37	89.70		89.99	0.001637	4.38	935.04	288.08	0.43
Below Prado	55060*	Max WS	4084.36	86.25	89.55		89.85	0.001638	4.36	937.06	290.77	0.43
Below Prado	54970*	Max WS	4076.13	86.13	89.41		89.70	0.001641	4.34	938.88	293.47	0.43
Below Prado	54880*	Max WS	4068.37	86.02	89.26		89.55	0.001668	4.34	936.43	296.10	0.43
Below Prado	54790	Max WS	4058.78	85.90	89.11		89.40	0.001678	4.33	936.85	298.78	0.43
Below Prado	54692.5*	Max WS	4049.88	85.70	88.96		89.24	0.001611	4.28	945.17	297.22	0.42
Below Prado	54595.0*	Max WS	4042.36	85.50	88.81		89.09	0.001537	4.23	955.63	295.70	0.41
Below Prado	54497.5*	Max WS	4036.77	85.30	88.67		88.94	0.001456	4.17	968.44	294.22	0.41
Below Prado	54400	Max WS	4031.97	85.10	88.55		88.81	0.001370	4.10	983.70	292.78	0.39

HEC-RAS Plan: Short_Sim_Short River: Santa Ana River Reach: Below Prado Profile: Max WS (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Below Prado	54300.0*	Max WS	4027.02	84.95	88.41		88.67	0.001369	4.11	980.58	290.80	0.39
Below Prado	54200.0*	Max WS	4023.35	84.80	88.27		88.54	0.001369	4.12	977.36	288.83	0.39
Below Prado	54100.0*	Max WS	4019.69	84.65	88.14		88.40	0.001370	4.13	973.98	286.84	0.39
Below Prado	54000	Max WS	4017.21	84.50	88.00		88.26	0.001373	4.14	970.44	284.86	0.40
Below Prado	53912*	Max WS	4015.93	84.36	87.86		88.14	0.001461	4.27	941.09	276.58	0.41
Below Prado	53823*	Max WS	4014.35	84.21	87.71		88.01	0.001558	4.40	911.80	268.30	0.42
Below Prado	53735*	Max WS	4013.27	84.07	87.54		87.86	0.001712	4.59	875.12	259.89	0.44
Below Prado	53646*	Max WS	4012.40	83.93	87.34		87.70	0.001932	4.82	832.68	251.40	0.47
Below Prado	53558*	Max WS	4011.79	83.79	87.11		87.52	0.002279	5.13	781.39	242.72	0.50
Below Prado	53469*	Max WS	4011.59	83.64	86.80		87.29	0.002870	5.59	718.23	233.79	0.56
Below Prado	53380	Max WS	4011.50	83.50	86.24	85.71	86.94	0.005010	6.72	596.94	223.70	0.73



Appendix E – Existing vs. Proposed Comparisons

Appendix E
Existing vs Proposed Condition Comparison – Water Surface
Elevation

WSE Comparison

HEC-RAS Cross Section	Existing Condition WSE [ft]	Proposed Condition WSE [ft]	Difference (Proposed - Existing) [ft]
77600	184.18	184.18	0
77433*	183.85	183.85	0
77266*	183.51	183.51	0
77100	183.16	183.16	0
76933*	182.85	182.85	0
76766*	182.56	182.56	0
76600	182.27	182.27	0
76433*	181.93	181.93	0
76266*	181.57	181.57	0
76100	181.21	181.21	0
75900*	180.85	180.85	0
75700*	180.48	180.48	0
75500*	180.11	180.11	0
75300*	179.75	179.75	0
75100	179.4	179.4	0
74969	179.27	179.27	0
74927	Ball Road Bridge		
74886	178.87	178.87	0
74862*	178.78	178.78	0
74839*	178.72	178.72	0
74815*	178.73	178.73	0
74792*	178.66	178.66	0
74768	178.66	178.66	0
74745*	178.65	178.65	0
74721*	178.63	178.63	0
74697	178.57	178.57	0
74674*	178.48	178.48	0
74650*	178.39	178.39	0
74627*	178.3	178.3	0
74603	178.24	178.24	0
74580*	178.2	178.2	0
74556	178.21	178.21	0
74552*	178.2	178.2	0
74547	178.2	178.2	0
74542	178.21	178.21	0
74537	178.22	178.22	0
74533	178.21	178.21	0
74515	169.81	169.84	0.03
74510	169.8	169.84	0.04
74505	169.81	169.84	0.03
74500	169.8	169.84	0.04
74496	169.8	169.83	0.03
74491	169.79	169.82	0.03
74486	169.78	169.81	0.03
74481	169.77	169.8	0.03
74477	169.75	169.79	0.04
74469	169.02	169.07	0.05
74313*	168.51	168.56	0.05
74157*	168.22	168.29	0.07
74001	167.96	168.03	0.07
73801*	167.65	167.72	0.07
73601	167.39	167.47	0.08
73467*	167.08	167.17	0.09
73334	166.86	166.97	0.11
73324	SPT RR Bridge		
73314	166.38	166.5	0.12
73207*	166.12	166.28	0.16
73101	166.05	166.16	0.11
72934*	165.72	165.89	0.17
72767	165.46	165.77	0.31
72601	165.18	165.42	0.24
72401	164.9	165.29	0.39
72201	164.63	165.05	0.42
72027	164.43	164.87	0.44
71854*	164.22	164.63	0.41
71772	164.12	164.62	0.5
71740	Proposed Pedestrian Bridge		
71718	164.06	164.29	0.23
71681	164	164.11	0.11

HEC-RAS Cross Section	Existing Condition WSE [ft]	Proposed Condition WSE [ft]	Difference (Proposed - Existing) [ft]
71481*	163.64	163.73	0.09
71281	163.23	163.33	0.1
71201	163.05	163.16	0.11
71081*	162.91	163.03	0.12
70961	162.84	162.96	0.12
70894	Katella Ave Bridge		
70827	162.45	162.59	0.14
70714	162.37	162.5	0.13
70601	162.28	162.48	0.2
70434*	162.1	162.32	0.22
70267*	161.62	161.68	0.06
70101	161.25	161.08	-0.17
69934*	161.05	160.98	-0.07
69767*	160.69	160.63	-0.06
69601	160.5	160.44	-0.06
69366	160.26	160.24	-0.02
69341	OCTA RR Bridge		
69313	159.55	159.62	0.07
69200	159.25	159.25	0
69176*	159.14	159.14	0
69152*	159.11	159.11	0
69128*	159.07	159.07	0
69104*	159.02	159.02	0
69080*	158.97	158.97	0
69056*	158.94	158.94	0
69032*	158.92	158.92	0
69009	158.93	158.93	0
69004	158.93	158.93	0
68999	158.94	158.94	0
68994	158.95	158.95	0
68989	158.96	158.96	0
68985	158.97	158.97	0
68969	152.76	152.82	0.06
68964	152.78	152.84	0.06
68959	152.76	152.83	0.07
68955	152.75	152.83	0.08
68950	152.75	152.82	0.07
68945	152.75	152.82	0.07
68940	152.75	152.81	0.06
68936	152.74	152.81	0.07
68931	152.74	152.8	0.06
68926	152.72	152.79	0.07
68922	152.71	152.78	0.07
68916	152.13	152.21	0.08
68808*	151.2	151.31	0.11
68700	151.28	151.39	0.11
68547*	151.14	151.25	0.11
68395	150.82	150.94	0.12
68222	57 Freeway Bridge		
68050	149.14	149.49	0.35
67866*	148.73	149.06	0.33
67683*	148.42	148.7	0.28
67500	148.07	148.38	0.31
67341	147.74	147.85	0.11
67324	Proposed Pedestiran Bridge		
67313	147.68	147.59	-0.09
67166*	147.42	147.43	0.01
67000	147.31	147.32	0.01
66922	147.16	147.11	-0.05
66884	Orangewood Ave. Bridge		
66847	146.31	146.23	-0.08
66723*	145.99	145.99	0
66600	145.78	145.78	0
66433*	145.43	145.43	0
66266*	145.08	145.08	0
66100	144.73	144.73	0
65933*	144.39	144.39	0
65766*	144.06	144.06	0

Appendix E
Existing vs Proposed Condition Comparison – Velocity

Velocity Comparison

HEC-RAS Cross Section	Existing Condition Velocity [ft/s]	Proposed Condition Velocity [ft/s]	Difference (Proposed - Existing) [ft/s]
77600	10.01	10.01	0
77433*	10.08	10.08	0
77266*	10.19	10.19	0
77100	10.29	10.29	0
76933*	10.24	10.24	0
76766*	10.18	10.18	0
76600	10.12	10.12	0
76433*	10.21	10.21	0
76266*	10.34	10.34	0
76100	10.47	10.47	0
75900*	10.4	10.4	0
75700*	10.32	10.32	0
75500*	10.24	10.24	0
75300*	10.15	10.15	0
75100	10.06	10.06	0
74969	9.65	9.65	0
74927	Ball Road Bridge		
74886	9.92	9.92	0
74862*	10.06	10.06	0
74839*	10.1	10.1	0
74815*	9.85	9.85	0
74792*	9.95	9.95	0
74768	9.77	9.77	0
74745*	9.63	9.63	0
74721*	9.58	9.58	0
74697	9.63	9.63	0
74674*	9.8	9.8	0
74650*	9.95	9.95	0
74627*	10.08	10.08	0
74603	10.16	10.16	0
74580*	10.12	10.12	0
74556	9.91	9.91	0
74552*	9.88	9.88	0
74547	9.87	9.87	0
74542	9.77	9.77	0
74537	9.66	9.66	0
74533	9.67	9.67	0
74515	7.77	7.75	-0.02
74510	7.73	7.71	-0.02
74505	7.66	7.64	-0.02
74500	7.6	7.59	-0.01
74496	7.58	7.56	-0.02
74491	7.58	7.56	-0.02
74486	7.59	7.57	-0.02
74481	7.59	7.57	-0.02
74477	7.6	7.59	-0.01
74469	9.98	9.93	-0.05
74313*	10.21	10.16	-0.05
74157*	10.22	10.16	-0.06
74001	10.16	10.1	-0.06
73801*	10.01	9.94	-0.07
73601	9.71	9.63	-0.08
73467*	9.98	9.89	-0.09
73334	9.91	9.81	-0.1
73324	SPT RR Bridge		
73314	10.37	10.26	-0.11
73207*	10.51	10.33	-0.18
73101	9.95	9.99	0.04
72934*	10.07	9.92	-0.15
72767	9.96	9.3	-0.66
72601	9.97	9.59	-0.38
72401	9.76	8.89	-0.87
72201	9.62	8.85	-0.77
72027	9.35	8.75	-0.6
71854*	9.23	8.87	-0.36
71772	9.21	8.43	-0.78
71740	Proposed Pedestrian Bridge		
71718	9.17	8.56	-0.61
71681	9.2	9.02	-0.18

HEC-RAS Cross Section	Existing Condition Velocity [ft/s]	Proposed Condition Velocity [ft/s]	Difference (Proposed - Existing) [ft/s]
71481*	9.48	9.41	-0.07
71281	9.86	9.78	-0.08
71201	10.02	9.92	-0.1
71081*	9.77	9.67	-0.1
70961	9.29	9.19	-0.1
70894	Katella Ave Bridge		
70827	9.51	9.4	-0.11
70714	9.16	9.09	-0.07
70601	8.94	8.53	-0.41
70434*	8.87	8.45	-0.42
70267*	9.73	9.88	0.15
70101	10.13	10.77	0.64
69934*	9.9	10.02	0.12
69767*	10.25	10.31	0.06
69601	10.01	10.06	0.05
69366	9.66	9.52	-0.14
69341	OCTA RR Bridge		
69313	10.1	9.87	-0.23
69200	10.43	10.43	0
69176*	10.62	10.62	0
69152*	10.59	10.59	0
69128*	10.58	10.58	0
69104*	10.62	10.62	0
69080*	10.64	10.64	0
69056*	10.57	10.57	0
69032*	10.52	10.52	0
69009	10.31	10.31	0
69004	10.26	10.26	0
68999	10.15	10.15	0
68994	10.05	10.05	0
68989	9.95	9.95	0
68985	9.86	9.86	0
68969	8.21	8.18	-0.03
68964	8.03	8	-0.03
68959	8.06	8.03	-0.03
68955	8.09	7.97	-0.12
68950	8	7.96	-0.04
68945	7.96	7.92	-0.04
68940	7.93	7.9	-0.03
68936	7.91	7.88	-0.03
68931	7.88	7.85	-0.03
68926	7.9	7.86	-0.04
68922	7.92	7.89	-0.03
68916	9.78	9.72	-0.06
68808*	11.53	11.42	-0.11
68700	10.37	10.28	-0.09
68547*	9.97	9.88	-0.09
68395	10.22	10.12	-0.1
68222	57 Freeway Bridge		
68050	11.43	10.97	-0.46
67866*	11.5	11.18	-0.32
67683*	11.26	11.12	-0.14
67500	11.19	10.92	-0.27
67341	11.22	11.49	0.27
67324	Proposed Pedestiran Bridge		
67313	11.23	11.69	0.46
67166*	11.12	11.11	-0.01
67000	10.34	10.33	-0.01
66922	10.38	10.55	0.17
66884	Orangewood Ave. Bridge		
66847	11.24	11.57	0.33
66723*	11.36	11.36	0
66600	11.15	11.15	0
66433*	11.19	11.19	0
66266*	11.21	11.21	0
66100	11.25	11.25	0
65933*	11.23	11.23	0
65766*	11.21	11.21	0