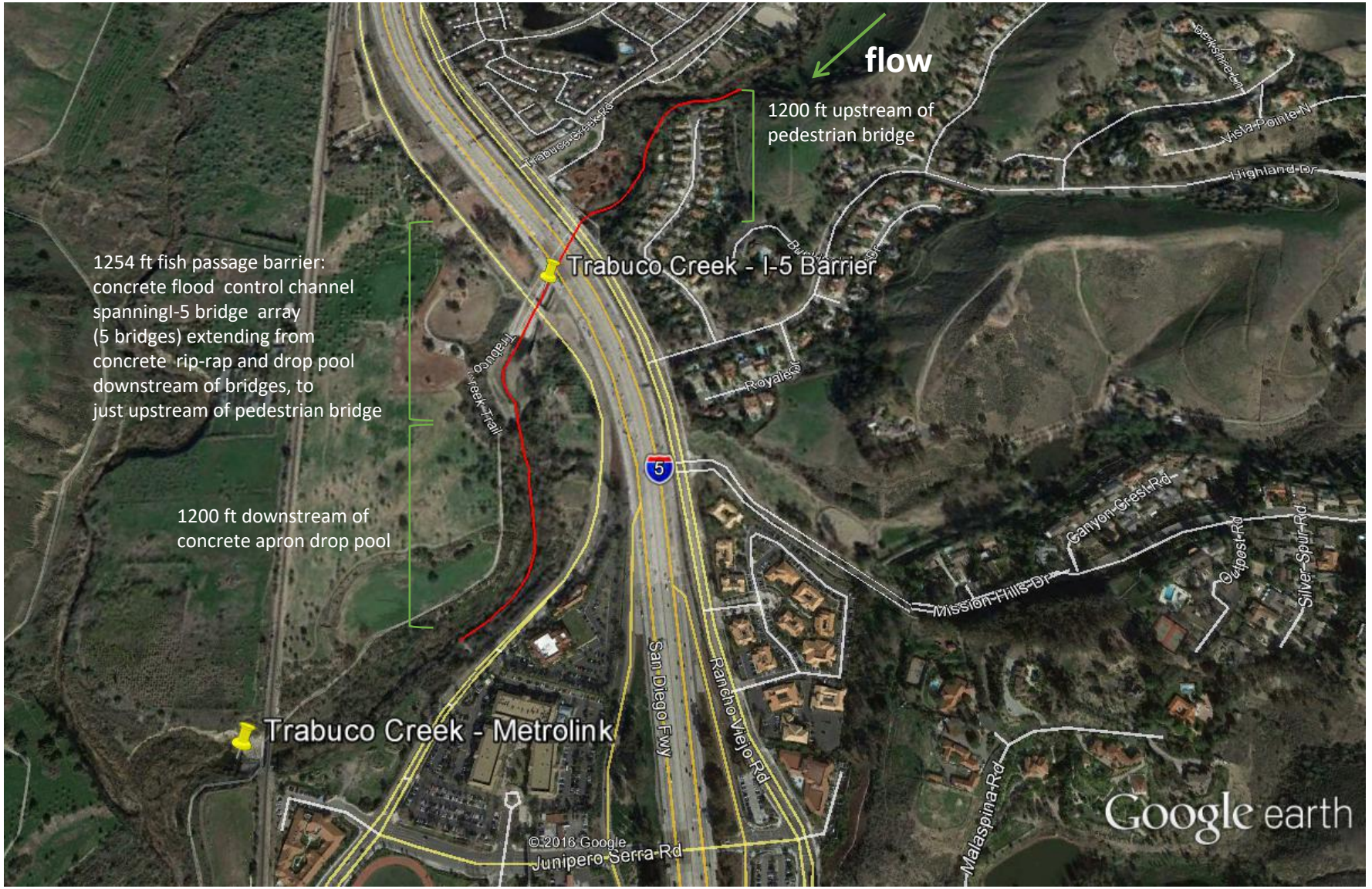
Trabuco Creek Fish Passage Project - Interstate 5 Bridge Array

Cal Fish Passage Forum 8-9-2018 Jacobson (CalTrout)



Trabuco Fish Passage Barrier Project Area (red line) including 1200 ft downstream and upstream of I-5 Bridge Array barrier (shown as central section). Metrolink barrier downstream shown for reference.

Project Site: The area beneath the five bridges consists of twin rectangular flood control channels with centerline V-notches extending into a concrete stilling basin west of Camino Capistrano, downstream through a grouted riprap channel, terminating in a grouted apron drop of ~2 feet into boulder cluster and more natural soft-bottom channel (~1254' total)

Project Funding: CDFW – Prop 1 and NFWF for 65% design over 18+ months: July 2017 – Dec 2018. WCB for physical model and permitting through Dec 2019.
Lead grantee and project management = California Trout
Engineering Team: NHC (lead, Ed Wallace and Nami Tanaka), MLA (Michael Love), SAGE Engineering (Tom Sell, Amy Deakyne), Stillwater Sciences (Wendy Katagi). In partnership with Trout Unlimited.

Existing Conditions & Alternatives Analysis

Timeline

Project Kick-Off Meeting/Stakeholder Meetings
July and Sep 2017 (and other site visits)

Scoping and Site Characterization Memo
Jan 2018 (Agency Review), Mar 2018 (Final)

Alternatives Analysis and 30% Design
May 1, 2018 Agency/Stakeholder Review
June 20, 2018 draft AA released
August 2, 2018 Agency/Stakeholder Preview
August 15, 2018 – comments due
Final AA Report with 30% Design Plans (Sep 2018)

65% design development – through Dec 2018
Physical model construction and testing
In 2019 using preferred alt at 65%

I-5 Trabuco Fish Passage Project Site downstream end of flood control channel near Camino Capistrano (CC) bridge

View to NE directly at flood control channel below CC bridge

View to E from edge of retaining wall

View to NE looking upstream at CC bridge

View to E looking at flood control channel

Interstate 5 Trabuco Fish Passage Project Site

View from end of flood control channel looking downstream at Trabuco Creek channel

Interstate 5 Trabuco Fish Passage Project Site – Middle Section

View of CC bridge, looking upstream

Under I-5 NB on bike path looking upstream

View of CC bridge, looking downstream

Under I-5 NB looking upstream at access path

Interstate 5 Trabuco Fish Passage Project Site – Upstream Section

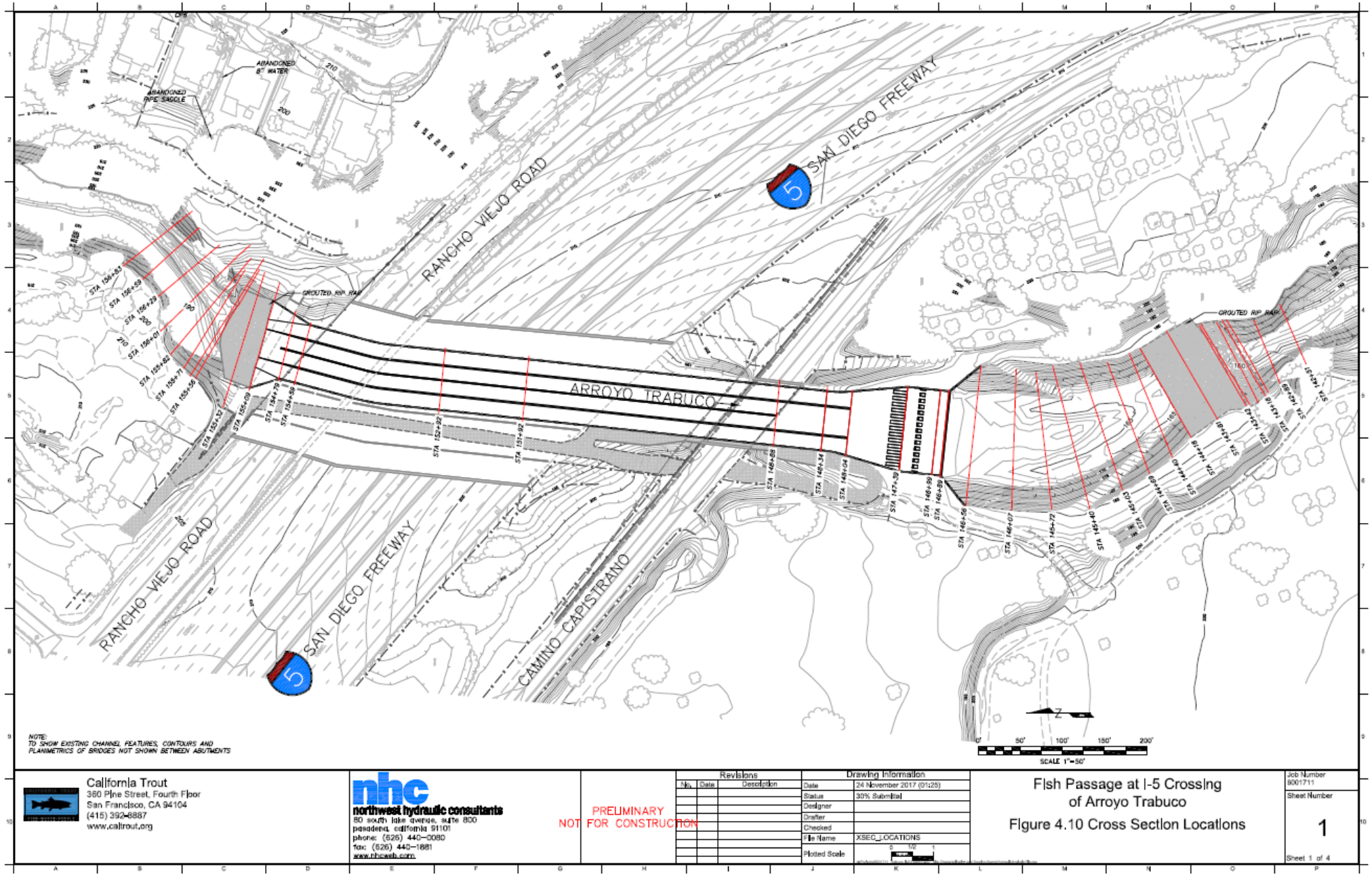
Upstream end of project site

Start of flood control twin channels

View looking downstream into E channel

View looking downstream into W channel

EXISTING CONDITIONS



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Fish Passage at I-5 Crossing of Arroyo Trabuco

Figure 4.10 Cross Section Locations

Job Number 9001711

Sheet Number 1

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Table 2.1 Fish passage design criteria and targets

Parameter	Criterion	Source/Notes
Design Flows		
Adult Steelhead Low Passage Flow	3 cfs	Alternative Minimum Flow (CDFG 2002; NMFS, 2001)
Adult Steelhead High Passage Flow	206 cfs	1% Migration Period Exceedance Flow for Station at Camino Capistrano from 1932-1972; 1980-1981 (n = 43 years)
Juvenile Steelhead Low Passage Flow	1 cfs	Alternative Minimum Flow (CDFG 2002; NMFS, 2001)
Juvenile Steelhead High Passage Flow	16 cfs	10% Migration Period Exceedance Flow for Station at Camino Capistrano from 1932-1972; 1980-1981 (n = 43 years)
Min Proportion of Flow in Fishway	5%-10%	NMFS 2011, for Fish Attraction. Great than 10% is desirable
Base Flood Discharge (100-year)	13,700 cfs	PACE 2008 Expected Value
Chutes-and-Pools or Step-Pool Roughened Channel Fishway (Target values[1])		
Max Overall Slope	4.5%	Most roughened channels have overall slopes 5% or less when placed in low-gradient systems.
Max Chute Slope	7%	Recommended in CDFG 2009
Max Drop Across Chute	2 ft	Recommended in CDFG 2009
Chute Length	60-100 ft	Used to establish maximum water velocity criterion
Adult Max Water Velocity (for Length 60-100 ft)	5 ft/s	NMFS 2001; CFDG 2002
Adult Min Water Depth	1.0 ft	NMFS 2001; CFDG 2002
Juvenile Min Water Depth	0.5 ft	NMFS 2001; CFDG 2002
Max Water Drop over Rock Steps	1.0 ft	CFDG 2002
Adult Max Energy Dissipation Factor (EDF) in Chutes	Varies with Slope: 8 ft-lb/s/ft^3 @ 4% 8 ft-lb/s/ft^3 @ 7%	WDFW 2013, Figure 6.9 (from Tappel, 2010)
Min Depth in Pools	2 ft	NMFS 2001; CFDG 2002
Adult Max Energy Dissipation Factor (EDF) in Pools	4 ft-lb/s/ft^3	NMFS 2011

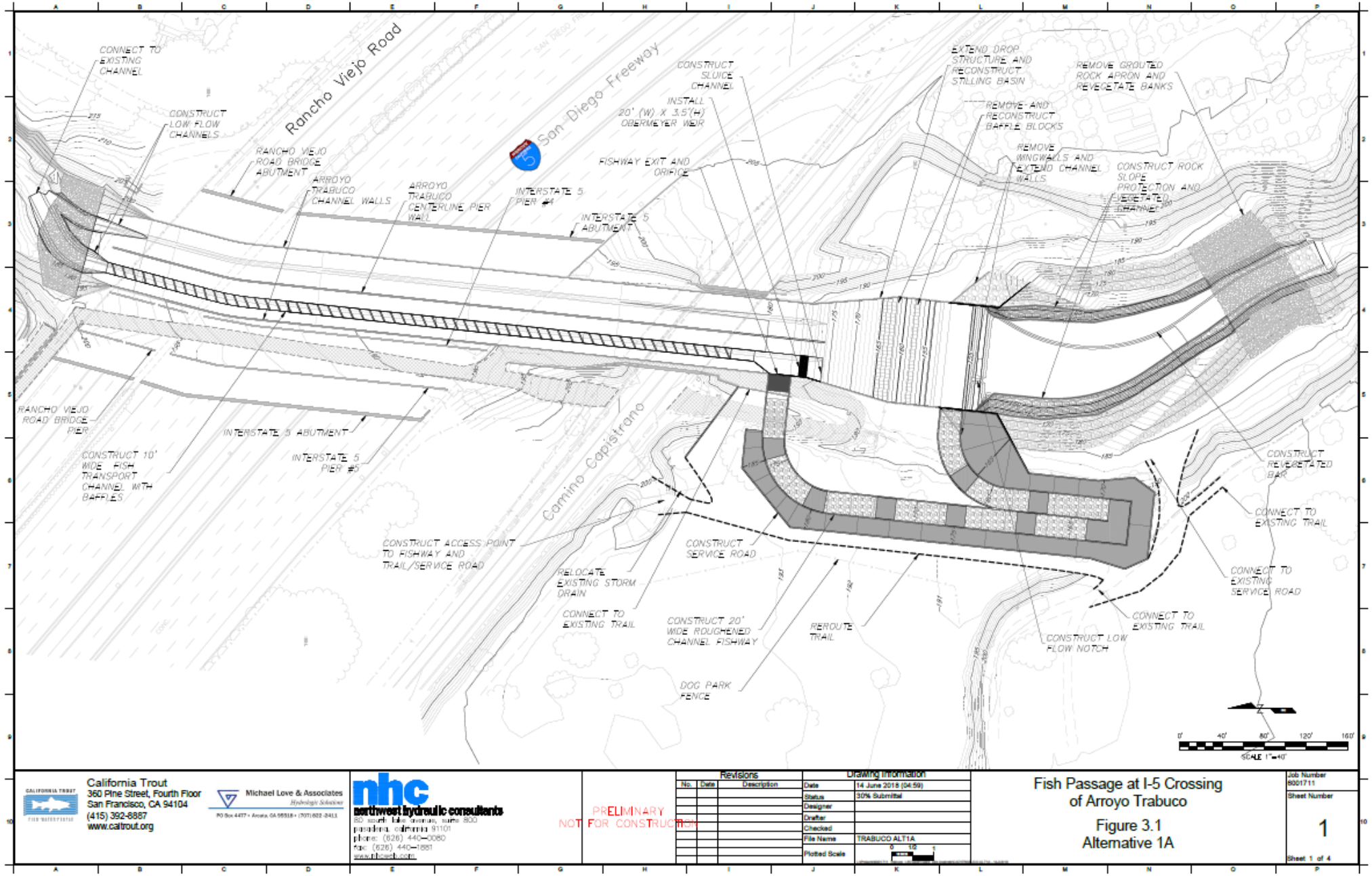
Parameter	Criterion	Source/Notes
Trash Racks and Gates		
Min Trash Rack Opening	8 inches	NMFS (2011)
Max Trash Rack Approach Velocity	2.0 ft/s	Accommodate cleaning
Min Depth Over Exit Gates and Trashrack Sills	1 ft	
Max Drop across Gates	1 ft	
Baffled Channels/Transport Channels		
Adult Min Depth	1.0 ft	NMFS 2001; CFDG 2002
Adult Max Water Velocity (for Length > 300 ft)	2 ft/s	NMFS 2001; CFDG 2002

[1]Values listed for roughened channel fishways are considered targets rather than fixed criteria, recognizing that roughened channel fishways are best evaluated on a case by case basis in the context of natural channel morphology

Alternatives Under Development

- Alternative 1a – West Bank Bypass Roughened Channel with Instream Transport Channel
- Alternative 1b – West Bank Bypass Roughened Channel with Bypass Transport Channel
- Alternative 2 – East Bank Straight Roughened Channel with Instream Transport Channel
- Alternative 3 –Roughened Channel with Partial Width Inset into Concrete Channel

ALTERNATIVE 1A: WEST BANK BYPASS ROUGHENED CHANNEL WITH INSTREAM FISH TRANSPORT CHANNEL



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Fish Passage at I-5 Crossing of Arroyo Trabuco

Figure 3.1
Alternative 1A

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Alternative 1a - West Bank Bypass Roughened Channel with Instream Fish Transport Channel

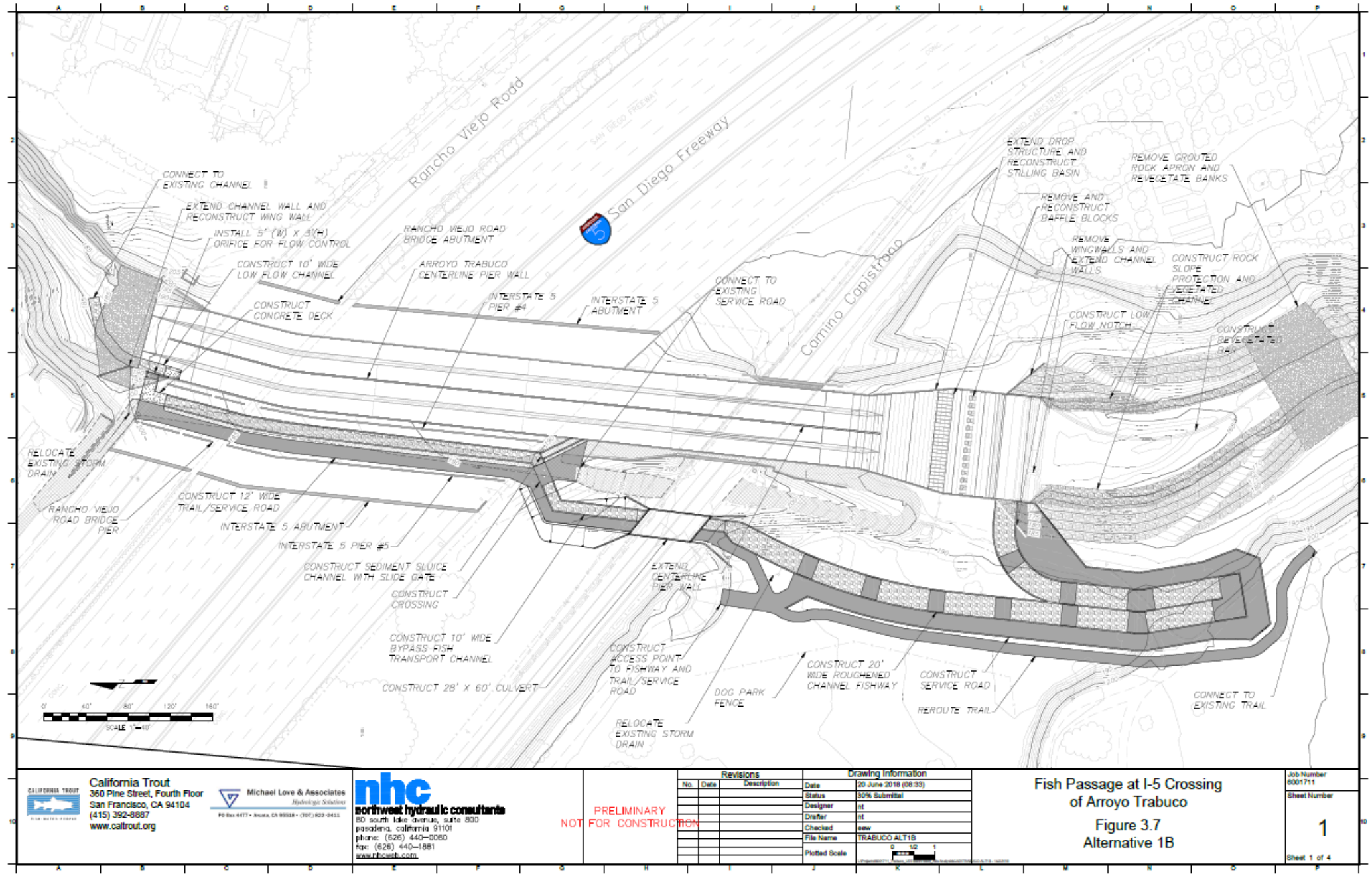
Overview: The bypass roughened channel fishway lies on west (river right) bank of the stream to provide fish passage.

- Constructs a 545-foot long rock-filled roughened channel switchback bypass fishway with entrance at the stilling basin and exit at the top of the drop structure transitioning into the fish transport channel;
- Constructs a 655-foot long concrete fish transport channel recessed into the floor of the concrete channel R bay, extending from the fishway exit located at the top of the drop structure to the upstream end of the concrete channel inlet apron, upstream of the Rancho Viejo Road crossing;
- Remove grouted rock apron downstream of the outlet drop structure
- Lower channel 8 feet between the outlet drop structure and grouted rock apron to match the ds elevation
- Extend existing concrete drop structure at its existing slope of 22.5% to accommodate 8 feet of fall.
- Construct new concrete apron and dentates at the base of the extended drop structure.
- Place ESM between concrete retaining walls to form chutes and pools.

Characteristics:

- Overall drop = 20.5 feet
- Overall length and slope of roughened channel = 655 feet at 3.2%
- Roughened channel width = 20 feet
- Length and slope of roughened channel chutes = ~49 feet at 4.5%
- Length and residual depth of pools = 18 feet long and 3 feet deep; Turn pool is 40 ft long, residual depth 5 ft
- New retaining walls 15 to 30 feet high
- Service road along one side of fishway
- Trail rerouted along west side of fishway
- Potential issues: debris and sediment clog baffles in fish Tx channel; possible stranding during low flow; orifice clogs

ALTERNATIVE 1B: WEST BANK BYPASS ROUGHENED CHANNEL WITH BYPASS FISH TRANSPORT CHANNEL



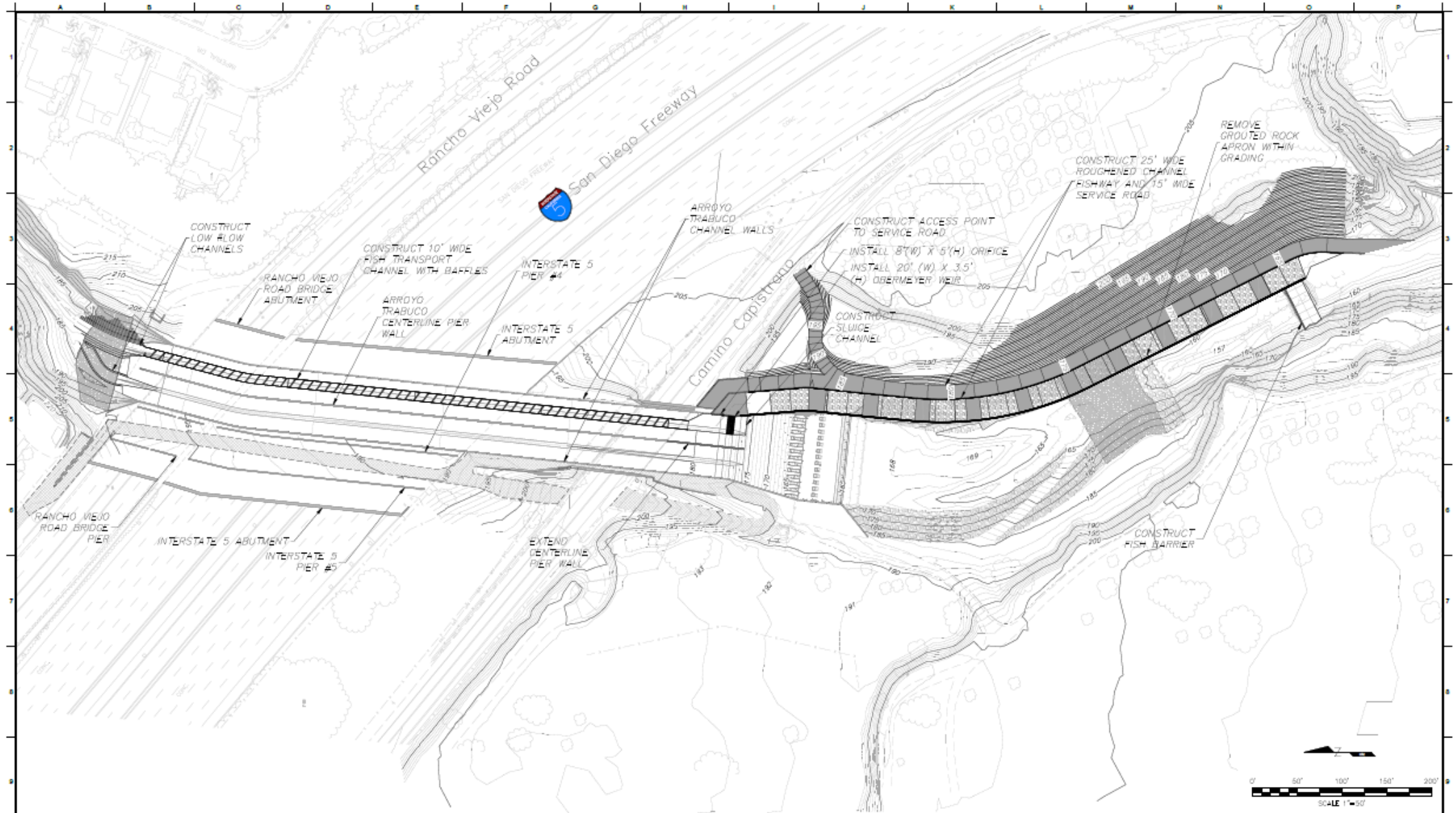
Alternative 1b – West Bank Bypass Roughened Channel with Bypass Transport Channel

Overview: Alternative 1b is similar to alternative 1a but uses a transport channel outside the existing flood control channel. The transport channel would cross under Camino Capistrano and pass through the bridge bays at I-5 and Rancho Viejo Road where the service road/trail is currently located. The transport channel is graded at lower slope than the existing concrete channel and the roughened channel fishway is lengthened to compensate for this difference. The transport channel would exit through a new wall near the upstream side of the Rancho Viejo Bridge.

The Camino Capistrano crossing would be through a culvert with adequate span to also accommodate a pedestrian and equestrian trail, providing an alternative to crossing the road at grade or through the narrow walkway at the Camino Capistrano bridge abutment. Service road layout varies somewhat from Alternative 1a to accommodate this layout, and the existing ramp on the south side of Camino Capistrano would be maintained.
Compared to Alternative 1a, the primary differences in the roughened channel fishway characteristics are: Overall drop = 24.5 feet; and Overall length and slope of roughened channel = 748 feet at 3.2%

Characteristics:
- The design of the chutes and pools is about the same as for Alternative 1a.
- Dimensions = 10 feet wide by variable depth to match existing ground constructed of reinforced concrete
- Overall length and slope of transport channel = 650 feet at 0.16%
- Rock lining for roughness
- 20-foot wide pneumatic gate (Obermeyer type) to push flow into fishway
- 3 foot by 5 foot opening for fishway exit to transport channel

ALTERNATIVE 2 EAST BANK STRAIGHT ROUGHEDED CHANNEL WITH INSTREAM TRANSPORT CHANNEL



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Fish Passage at I-5 Crossing of Arroyo Trabuco

Figure 3.8
Alternative 2

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Sheet Number
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Alternative 2 – East Bank Straight Roughened Channel with Instream Fish Transport Channel

Constructs a 632-foot long, nearly straight, rock-filled roughened channel fishway running along the east (left) bank of the existing channel with parallel service ramp running along the fishway, a fishway entrance located 525 downstream of the existing stilling basin, and a fishway exit at the top of the drop structure;

Constructs a 12 feet tall concrete fish guidance barrier immediately upstream of the fishway entrance;

Constructs a 655-foot long concrete fish transport channel recessed into the floor of the concrete channel left bay, extending from the fishway exit located at the top of the drop structure to the upstream end of the concrete channel inlet apron, upstream of the Rancho Viejo Road crossing;

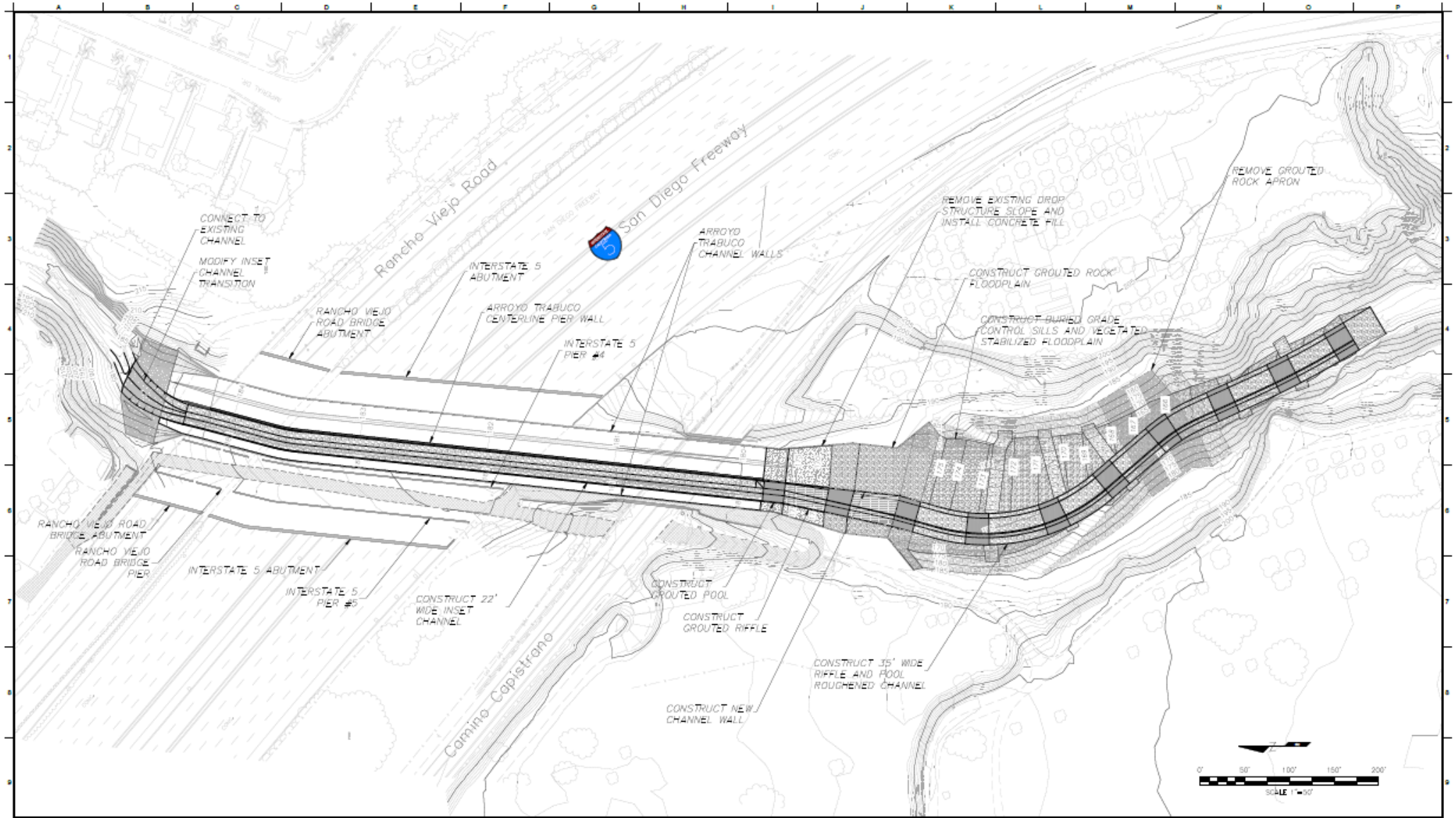
Constructs a sluice channel with adjustable Obermeyer-type weir at the downstream end of the fish transport channel to control flow into the fishway and convey high flows and sediment over the drop structure;

Reconstructs the grouted rock apron upstream of the concrete inlet to convey low flows into the fish transport channel;

Constructs a new 50-foot long low-flow channel through the western side of the inlet apron;

Potential issues: guidance barrier causes ponding; downstream scour.

ALTERNATIVE 3 –ROUGHENED CHANNEL WITH PARTIAL WIDTH INSET INTO CONCRETE CHANNEL



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Fish Passage at I-5 Crossing of Arroyo Trabuco
Figure 3.10
Alternative 3

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Sheet Number 1
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Alternative 3 –Roughened Channel with Partial Width Inset into Concrete Channel

Alternative 3 constructs passage improvements within the existing channel system, eliminating the need for a bypass or diversion. The fish passage channel downstream of the existing drop structure would be a roughened channel approximately 35 feet in width and passage through the concrete channel would be provided by an inset channel in the west (right) bay of the concrete channel approximately 22 feet in width, extending under the bridges for Camino Capistrano, I-5, and Rancho Viejo Road.

From downstream to upstream the alternative has the following components:
Removes the in-channel portion of the grouted rock apron located downstream of the drop structure; Constructs 725-foot long, 35-foot wide, roughened channel with chutes and pools downstream of the drop structure;

Constructs a variable-width stabilized floodplain adjacent to the roughened channel;

Removes/buries the existing drop structure so that the roughened channel upstream invert can match the invert of the inset channel at the outlet of the right bay;

Constructs a 650-foot long, 22-foot wide inset channel in the concrete channel;

Constructs a transition channel through the existing concrete and grouted rock channel apron at the inlet to the concrete channel to connect to the natural channel upstream.

Potential issues: footing proximity to I-5 bridge pier on L wall; downstream scour. WSE increase in middle of project but does not affect life or property.

Table 7.1 Comparison of alternatives. Metrics are rated qualitatively for each concept from 1 to 4, with 1 being least desirable and 4 being most desirable.

Fish Passage Alternative		Alternative 1a	Alternative 1b	Alternative 2	Alternative 3
Metric	Rating System Least Desirable= 1 Most Desirable= 4	West Bank Bypass Roughened Channel with Instream Transport Channel	West Bank Bypass Roughened Channel with Bypass Fish Transport Channel	East Bank Straight Roughened Channel with Instream Fish Transport Channel	Roughened Chanel with Partial Width Inset into Concrete Channel
Fish Passage Performance					
Fishway Category: Fishway Transport Channel		 Nature-Like Technical	 Nature-Like Technical	 Nature-Like Technical	 Nature-Like Nature-Like
Fishway Overall Slope		3.2%	3.2%	3.2%	2.9%
Transport Channel Overall Slope		0.7%	-	0.7	0.7%
Fish Attraction	Poor = 1/Good = 4	3	1	2	4
Maximum Adult Steelhead Passage Flow	Low=1/High=4	3	2	3	4
Low-Flow Passage Performance	Poor = 1/Good = 4	3	3	3	3
High-Flow Passage Performance	Poor = 1/Good = 4	3	2	3	3
Fall-Back Potential	High = 1/Low = 4	2	3	2	4
Stranding Potential in Fishway	High = 1/Low = 4	2	2	2	3
Safe Downstream Passage	Poor = 1/Good = 4	3	2	3	4
Pacific Lamprey passage	Poor = 1/Good = 4	3	2	2	4
Environmental and Public Use					
Native/Riparian Vegetation Impacts	High = 1/Low = 4	3	3	2	4
Effects to Public Trail Configuration	High = 1/Low = 4	3	3	4	4
Public Viewing and Educational Opportunities	Low = 1/High = 4	4	4	3	3
Benefits to Other Native Wildlife Species	Low = 1/High = 4	2	2	2	4
Consistency with Adjacent Land Use	High = 4/Low = 1	4	3	3	4
Constructability and Footprint					
Relative Cost	High = 1/Low = 4	2	1	4	3
Overall Construction Complexity	High = 1/Low = 4	3	1	3	2
Modifications to Existing Flood Control Channel Infrastructure	High = 1/Low = 4	2	3	3	1
Temporary Construction Impacts	High = 1/Low = 4	3	1	4	2
Potential Utility Conflicts	High = 1/Low = 4	3	1	3	3
Operations, Maintenance, and Durability					
Risk to Downstream Channel	High = 1/Low = 4	4	4	2	2
Risk of Damage from Extreme Flows	High = 1/Low = 4	3	3	2	1
Long-Term Durability of Fishway	Poor = 1/Good = 4	2	2	3	2
Conveys Sediment and Small Debris	Poor = 1/Good = 4	2	1	3	3
Operational Requirements	High = 1/Low = 4	2	3	2	4
Relative Frequency of Inspections	High = 1/Low = 4	2	2	2	4
Ease of Timely Access for Clearing of Debris and Sediment	Poor = 1/Good = 4	3	3	3	2