Coyote Creek Trail Design

Location Hydraulic Study: Coyote Creek

City of San Jose
Department of Public Works
City Facilities Architectural Services Division

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5. HEC-RAS Model Results
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Acronyms & Abbreviations

ADA	Americans with Disabilities Act
BFE	base flood elevation
bgs	below ground surface
cfs	cubic feet per second
City	City of San Jose
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
LOMR	Letter of Map Revision
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
SCVWD	Santa Clara Valley Water District
STA	Station
TOB	top of bank
UPRR	Union Pacific Railroad
U/S	upstream
D/S	downstream
USACE	U.S. Army Corps of Engineers
WSE	water surface elevation

Description

CH2M HILL has been retained by Callander Associates to prepare a Location Hydraulic Study for the City of San Jose's *Coyote Creek Trail Master Plan*.

The Coyote Creek Trail is included in the City's Greenprint and the Santa Clara County Countywide Trails Master Plan Update (1995), and the Santa Clara County General Plan (1995-2010). It is a sub-regional trail route that is identified in the regional/countywide trails network.

The *Coyote Creek Trail Master Plan* defines and explains the proposed trail alignment for a 4.1 mile extension of the Coyote Creek Trail within the corporate limits of the City of San Jose, from Montague Expressway in the north to Watson Park near Highway 101 in the south.

This memorandum discusses the impact of 10 bridge undercrossings and 4 new pedestrian bridges on the hydraulic performance of the Coyote Creek floodway using the Draft Mid Coyote HEC-RAS model for the analysis, as provided by the Santa Clara Valley Water District (District).

It should be noted that Coyote Creek flows north in this reach. Therefore, in this report all references to the channel banks will be made as the west bank and the east bank.

Setting

The project site is located on Coyote Creek in east San Jose, Santa Clara County, California. Coyote Creek's watershed extends from the Diablo Range foothills east of the Santa Clara Valley to San Francisco Bay. Coyote Creek is one of sixteen major creeks in the Coyote Watershed as well as its main waterway. It is also the longest creek in the County and is within the San José city limits (SCVWD 1984). The City trail under consideration sits between Montague Expressway and US Highway 101.

This reach of Coyote Creek Trail would contribute 4.1 miles to a continuous accessible corridor through San José, linking the community to open space, public transportation nodes, retail and employment centers, and regional trails. Approximately 2.2 miles of the 4.1 mile reach would be constructed on existing unpaved service roads owned by the Santa Clara Valley Water District (SCVWD) or the City of San José. Most of the remaining portions would be located at the top of bank (TOB) or at the outside edge of a 100 foot riparian corridor setback.

Montague Expressway to O'Toole Avenue (1.1 miles)

The proposed trail would begin at a trail access point on the west side of Coyote Creek on the south side of Montague Expressway. The trail would connect to an existing paved ramp

and undercrossing leading to a gravel segment of trail extending north. A freespan bridge, about 180 feet long, would bring the trail to the east side of the creek. On the east side, the trail would follow along an existing SCVWD service road. The trail would continue through an undercrossing beneath Charcot Avenue, with at-grade access points provided on both sides of Charcot Avenue to approach O'Toole Avenue.

O'Toole Avenue to Union Pacific Railroad (0.5 miles)

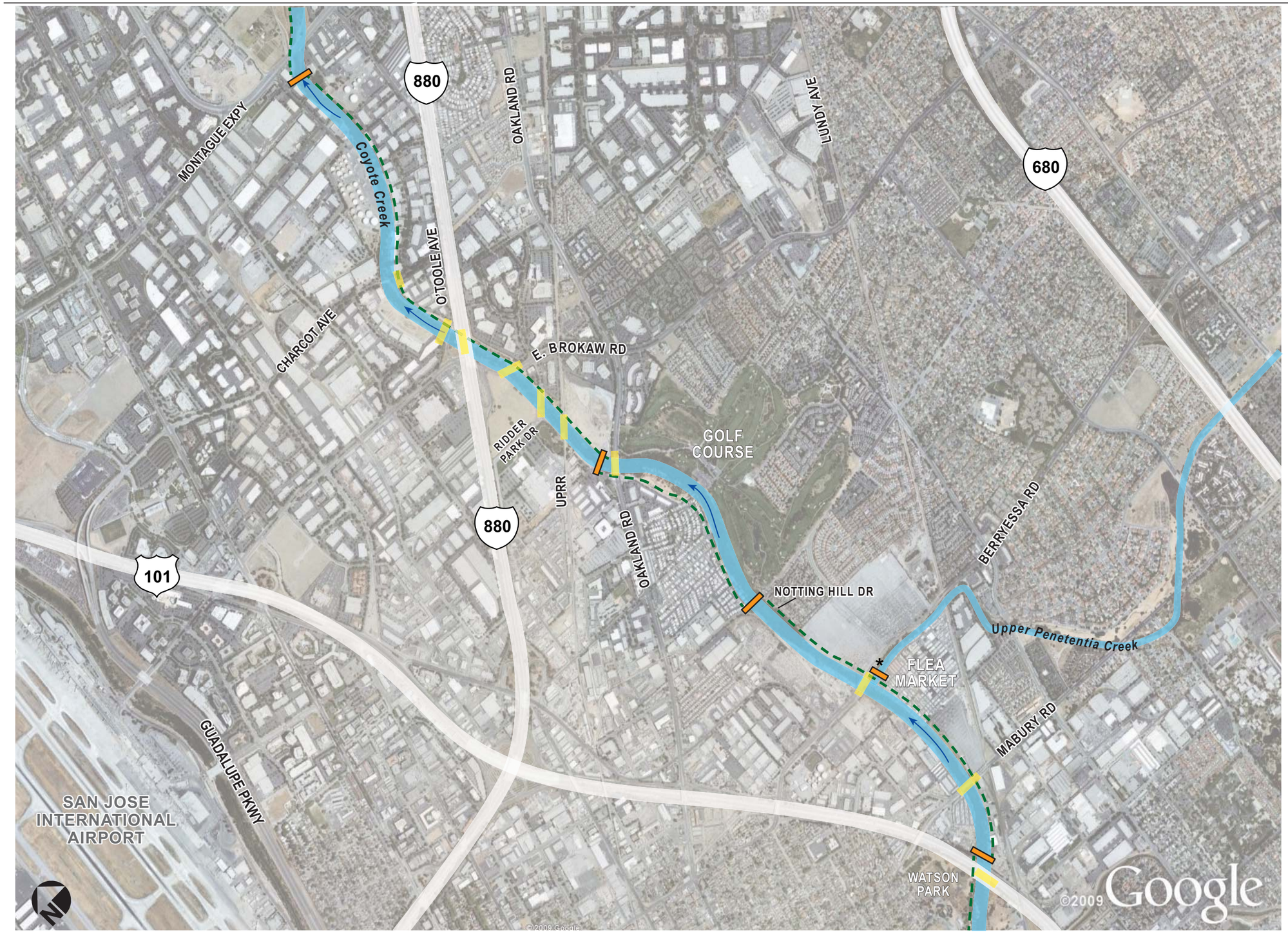
Undercrossings would be provided to continue the trail beneath O'Toole Avenue (which also serves as an off-ramp for I-880 at this location) and beneath I-880. The trail would continue along existing service roads on the east side of Coyote Creek, with undercrossings beneath and at-grade access points at Brokaw Road and Ridder Park Drive. The service road ends at Ridder Park Drive, however the trail would continue along the edge of the riparian corridor and cross beneath the Union Pacific Railroad trestle.

Union Pacific Railroad to Notting Hill Drive (1.1 miles)

The trail would then continue through a 100 foot private open space setback on a property slated for development. There would be at-grade access points on the north side of Oakland Road and at the end of Corie Court. A bridge would connect the trail to the west side of Coyote Creek, south of the intersection of Shallenberger Road and Oakland Road. The trail would cross beneath Oakland Road, continue along Corie Court, and join an existing service road on City of San José property. A bridge near Hazlett Way would bring the trail back to the east side of Coyote Creek at Notting Hill Drive, where a grade-separated 10 foot wide trail continues along the edge of the street.

Notting Hill Drive to Lower Silver Creek (1.4 miles)

The trail would continue on the east side of Coyote Creek, within a 100 foot private open space setback along the Flea Market property, also a planned development site. At-grade trail access points would be provided at three locations within the redeveloped area, located to coincide with a planned future road network. After an at-grade trail access point at Berryessa Road and an undercrossing beneath the road, the trail would cross over Penitencia Creek on a bridge before connecting with the planned Penitencia Creek Trail. Continuing southward through the Flea Market property, the trail would have at-grade access points and an undercrossing at Mabury Road, and would continue south to align with an existing City-owned unpaved service road. North of Highway 101, the trail would cross on a bridge to the west side of Coyote Creek, where it would continue south with an undercrossing beneath Highway 101 and enter Watson Park. The trail would meander through Watson Park before connecting with the planned southern continuation of the Coyote Creek Trail at Coyote Creek's confluence with Lower Silver Creek.



Vicinity Map

Legend

- UNDERCROSSING
- PEDESTRIAN BRIDGE
- TRAIL ALIGNMENT
- DIRECTION OF FLOW

Aerial from Google Earth Pro © 2009. Additional information added by CH2M HILL.

* Note: Bridge not in model scope

FIGURE 1
Project Location Map
Coyote Creek Trail

Flood History

The mean annual precipitation within the Coyote Watershed varies from 12 inches at the Coyote Creek connection to the San Francisco Bay to 30 inches in the Diablo Mountains above Anderson and Coyote Reservoirs. The Coyote Watershed has flooded numerous times (SCVWD 1984). The worst flood recorded since the Anderson Reservoir was constructed in 1950 occurred in January 1997. The creek inundated several homes and businesses. Properties were flooded with as much as six feet of water and evacuations were widespread.

The District is currently evaluating multiple alternatives for the Coyote Creek Flood Protection Project (Planning Study Phase) that is located in the central portion of the Coyote Watershed. The limits of this study extend approximately 4.1 miles between Montague Expressway and Watson Park. See Attachment 1 for a map of the District planned project locations along the Coyote Creek. The flood protection project's primary objective is to enhance the creek's conveyance to protect homes, schools, businesses, and highways from the 1% (100-year) flood event. The 1% (100-year) flood is a flood producing a discharge from a drainage area that has a 1 percent (0.01) probability of occurring in any given year. Other project criteria include improving fisheries and habitat values and providing public access opportunities in cooperation with the City of San José.

Existing Conditions

The District's proposed flood protection project is considering alternatives that will contain a 1% (100-year) flood event within District right-of-way, with the exception of two locations adjacent to the Coyote Creek channel, the Fox and Flea Market properties, where the District would like to get flood easements should this event occur. In addition to these land easements, the District will also need to acquire land in other areas in order to construct the Project.

The City trail under consideration sits between Montague Expressway and Watson Park. The District's preliminary hydraulic analysis indicates that Coyote Creek, within the trail project limits, does not have sufficient capacity to convey the 1% (100-year) design flow. The District also estimates that several bridges within the Mid-Coyote Project limits are incapable of conveying the 100-year design flow under existing conditions. The District reports that part of the problem is attributed to the urban encroachment on the creek, which has reduced and altered the hydraulic conditions surrounding Coyote Creek.

The HEC-RAS model used for the District's Planning Study analysis is known as the Mid-Coyote Creek Draft HEC-RAS model and is based on the 1988 survey datum. This model extends from Montague Expressway to Interstate 280 and is currently under revision by the District. This will be referred to as the Existing Conditions model throughout this report.

A meeting with District staff on November 17, 2009 provided information about the Mid-Coyote Creek Draft HEC-RAS model and the District's current flood protection project alternatives. Some of the information that was provided includes the following:

- The District indicated that supplemental surveys to establish the thalweg of the channel were performed at the end of 2007.

- The existing conditions model shows the water surface to be at or higher than the top of the bank. As a result, several miles of floodwalls or levees were considered in the alternatives to provide additional freeboard. The existing conditions model does not reflect bridge modifications or channel improvements at this time.
- The District was in the process of presenting the alternatives to the community and initial response or reaction to the proposed alternatives was not favorable without the consideration of upstream detention. The District would be revisiting the alternatives that would include a component of upstream detention.
- The District would be pursuing flood easements at San Jose Flea Market parking lots adjacent to the Coyote Creek channel.
- Locations in the model that were designated by the floodwall symbol were actually limits of District ROW. Locations of project floodwalls or levees were designated by the ineffective flow symbol.

The option of upstream detention is being considered. However, the use of levees and/or floodwalls is also a viable alternative which may raise the water elevation. See Attachment 1 for a map of the District planned project locations along the Coyote Creek. It was decided that the District's Mid-Coyote Creek hydraulic model, referred to as the existing conditions model in this report, would be considered a baseline condition or a snapshot in time, but most likely, it would be represent the worst case scenario.

Project Description

As described in the following section, the trail would include at-grade access points at several surface streets; undercrossings beneath streets, freeways, and a railroad trestle; bridges to cross creeks; connections to existing and planned portions of Coyote Creek Trail at either end of the project; and connections to planned portions of Penitencia Creek Trail and Lower Silver Creek Trail.

Access to the trail would be from existing public parks, trails and streets. All components of the trail would be constructed in accordance with the Americans with Disabilities Act (ADA).

The majority of the trail would be a 16-foot wide (12 foot paved with 2 foot wide compacted base rock shoulders) Class I trail, which is defined as a trail that is separated from streets and open to non-motorized uses. Physically constrained portions (such as a portion along Notting Hill Drive) would be narrowed to a 10 foot wide paved trail. The soffit elevation of the four freespan pedestrian bridges is located 4 feet above the 1% flood event WSE. This is the District and FEMA freeboard requirement for new bridges. However, it is likely that when the Planning Study is complete, the resulting water surface profile will be lower. Please see Attachment 2 for Callander Associates design details.

Montague Pedestrian Bridge

Tying into an existing paved trail on the west side of the creek, the proposed trail begins on the south side of Montague Expressway. A freespan bridge brings the trail to the east side of the creek and follows along an existing District service road. The proposed trail continues along the east side of the creek to Charcot Avenue. See Figure 2.

Charcot Undercrossing

At Charcot Avenue, the trail continues along the east side of the creek. The trail ramps down underneath Charcot Avenue and reconnects with the top of bank (TOB) trail about 200 feet upstream of the face of the bridge. There are access nodes at the street level on both the north and south sides of Charcot. The trail continues on the east side of the creek as it approaches O'Toole Avenue and I-880 at the TOB. See Figure 3.

O'Toole/I-880 Undercrossing

An extended trail undercrossing was designed under O'Toole Avenue and I-880 along the east side of the creek. There is a planned seating and picnic area north of O'Toole Avenue at the trail TOB location. The proposed design also calls for a retaining wall along the O'Toole Avenue trail undercrossing. Under I-880, the proposed trail continues along the east side of the creek. See Figure 4.

Brokaw Undercrossing

The street-level access nodes on both sides of Brokaw Road are located outside of the channel area, approximately 200 feet from the creek's low flow channel. The trail continues under Brokaw Road on the east side of the creek. See Figure 5.

Ridder Park Drive Undercrossing

At Ridder Park Drive, access points are located on both sides of the street outside of the channel area. The 12 foot trail continues under Ridder Park Drive with shoulders on both sides. The existing service road ends at Ridder Park Drive, but the trail continues along the east bank of the creek at the edge of the riparian corridor. See Figure 6.

UPRR Undercrossing

As the trail continues along the east bank of Coyote Creek under the Union Pacific Railroad (UPRR) trestle, there will be a protective structure around the trail to protect trail users from any falling debris from the railroad tracks above. This structure will extend beyond both sides of the trestle, for a total of 75 feet. There will be 1 foot of clearance between the soffit of the railroad trestle and the top of the protective structure. See Figure 7.

Oakland Road Pedestrian Bridge & Undercrossing

There is a planned pedestrian bridge on the north (downstream) side of Oakland Road. The trail ramps up to the 68 ft. elevation of the freespan, pedestrian bridge deck. There is a planned access node on the north side of Oakland Road on the east side of the creek outside of the channel area. The trail crosses Coyote Creek to the west bank and ramps down from the pedestrian bridge under Oakland Road. The trail narrows to 10 feet wide under Oakland Road and continues to an access node on the south side. The trail continues along Corie Court and joins an existing service road on the west side of the creek. See Figure 8.

Notting Hill Pedestrian Bridge

The trail would cross to the east bank of Coyote Creek at Notting Hill Drive. A 225 foot long freespan, pedestrian bridge would extend across the creek. The trail ramps up to grade with retaining walls on both sides of the ramp. See Figure 9.

Berryessa Road Undercrossing

On the east side of Coyote Creek, the trail would continue past the Flea Market property. There would be an at-grade access point on the north side on Berryessa Road. The trail would go under Berryessa Road on the east bank of the creek. There will be a small freespan pedestrian bridge crossing the Upper Penitencia Creek which is a tributary of Coyote Creek that connects just upstream of the Berryessa Road undercrossing. The pedestrian access over Penitencia Creek is currently built on top of an 86 inch diameter culvert. The trail improvements proposed include removing the culvert and replacing with an 80 foot freespan pedestrian bridge. Based on the Coyote Creek hydraulic model, this bridge location will be inundated by Coyote Creek during pre and post-project conditions. The hydraulic performance of Penitencia Creek was not part of the scope of this study. As the trail continues upstream, there is a proposed seating area on the south side of Berryessa Road on the trail. See Figure 10.

Mabury Road Undercrossing

At Mabury Road, the trail would ramp down under the road with retaining walls on both sides of the trail. There would be a street-level access point on the south side of Mabury Rd. The trail would then continue on the east bank of Coyote Creek. See Figure 11.

Highway 101 Pedestrian Bridge & Undercrossing

A proposed pedestrian bridge would be located north of Highway 101. The trail on the east bank of the creek will ramp up to the pedestrian bridge deck elevation. The trail also will connect to an existing service road on the east bank via a ramp down to grade. The trail ramps down from the pedestrian bridge on the west bank and continues under Highway 101. Retaining walls will be located on both sides of the trail ramps and on one side of the trail at the highway undercrossing. See Figure 12.

Hydrology

The mean annual precipitation within the Coyote Watershed varies from 12 inches at the Coyote Creek connection to the San Francisco Bay to 30 inches in the Diablo Mountains above Anderson and Coyote Reservoirs. The Coyote Creek area was studied by detailed methods as part of the Federal Emergency Management Administration (FEMA) Flood Insurance Study (FIS) for the City of San Jose and Santa Clara County. The FIS effective date is May 18, 2009. See Attachment 3 for the FEMA Flood Insurance Rate Maps details.

The Existing Conditions model is based on NAVD 88 survey datum. The water surface profile resulting from the 100-year discharges reported in the FIS is based on a flood of 11,400 cfs. The current District reported discharge used for the Draft HEC-RAS existing conditions model is a flood of 17,100 cfs. Impacts as a result of this larger storm could be reduced if the upstream detention alternative is approved by the Board. However, if the levee and/or floodwall alternative is selected, WSE may increase.

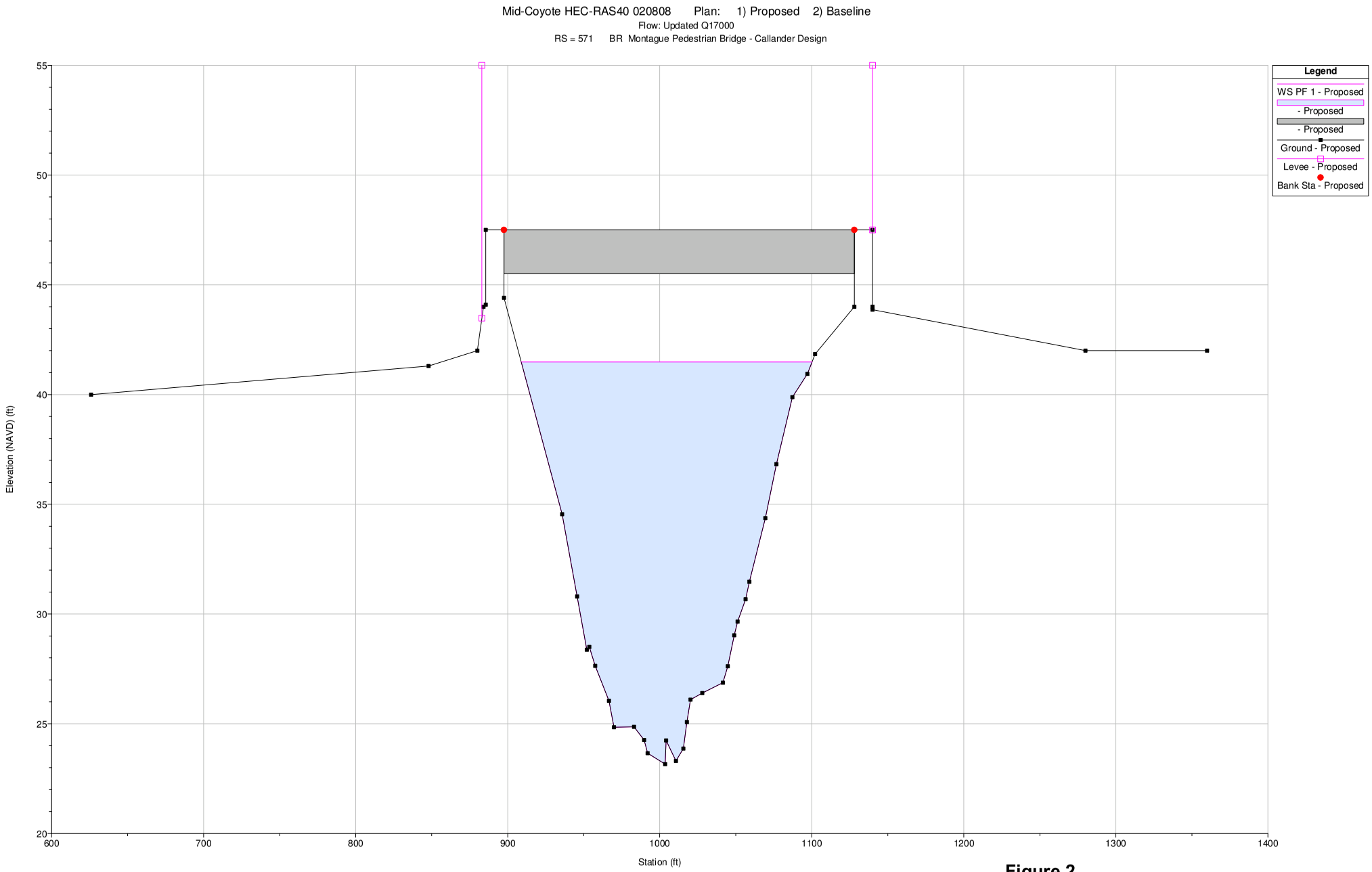


Figure 2

Montague Pedestrian Bridge Cross-section

Location Hydraulic Study: Coyote Creek Trail

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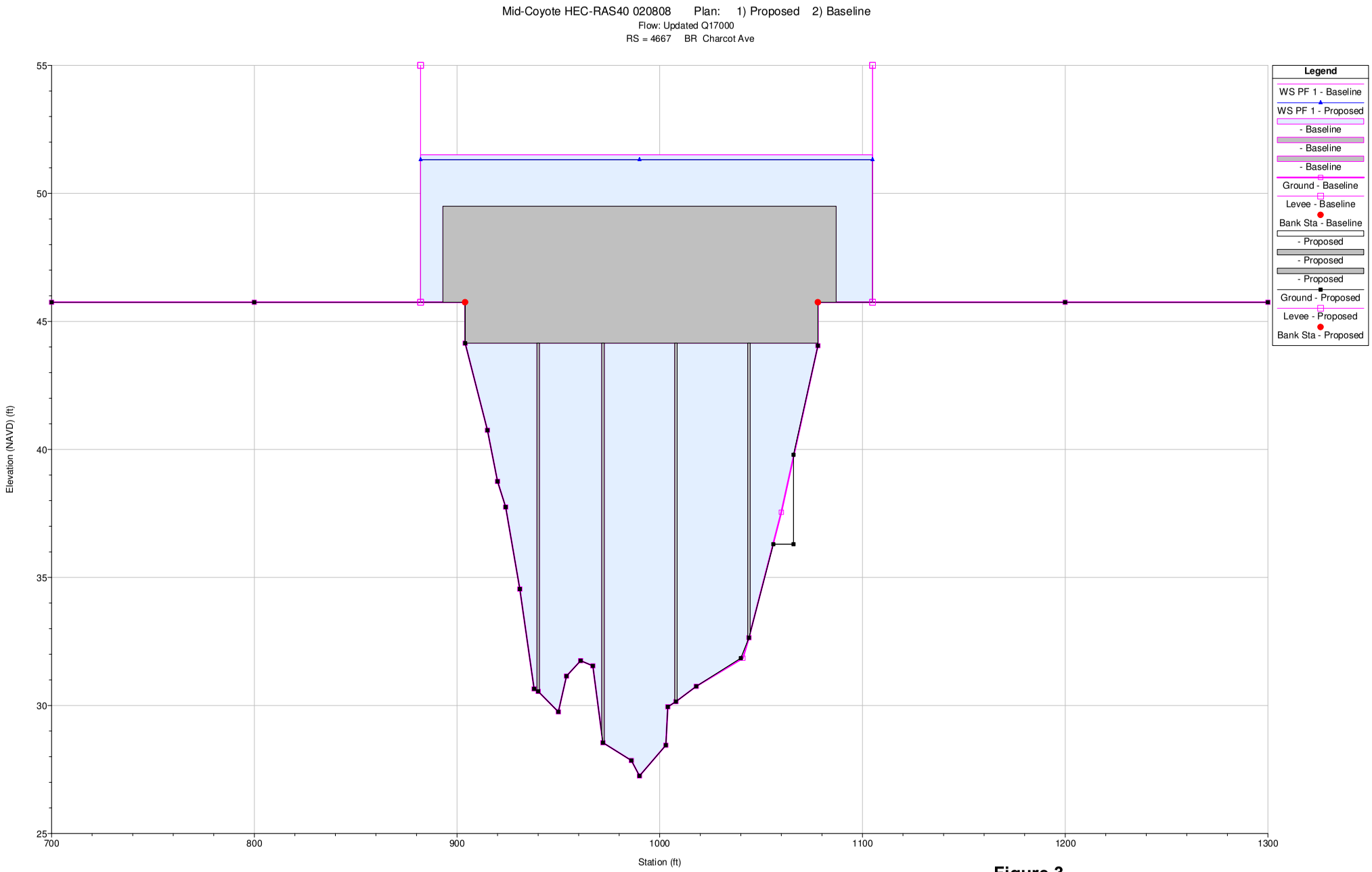

Figure 3

Charcot Ave. Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

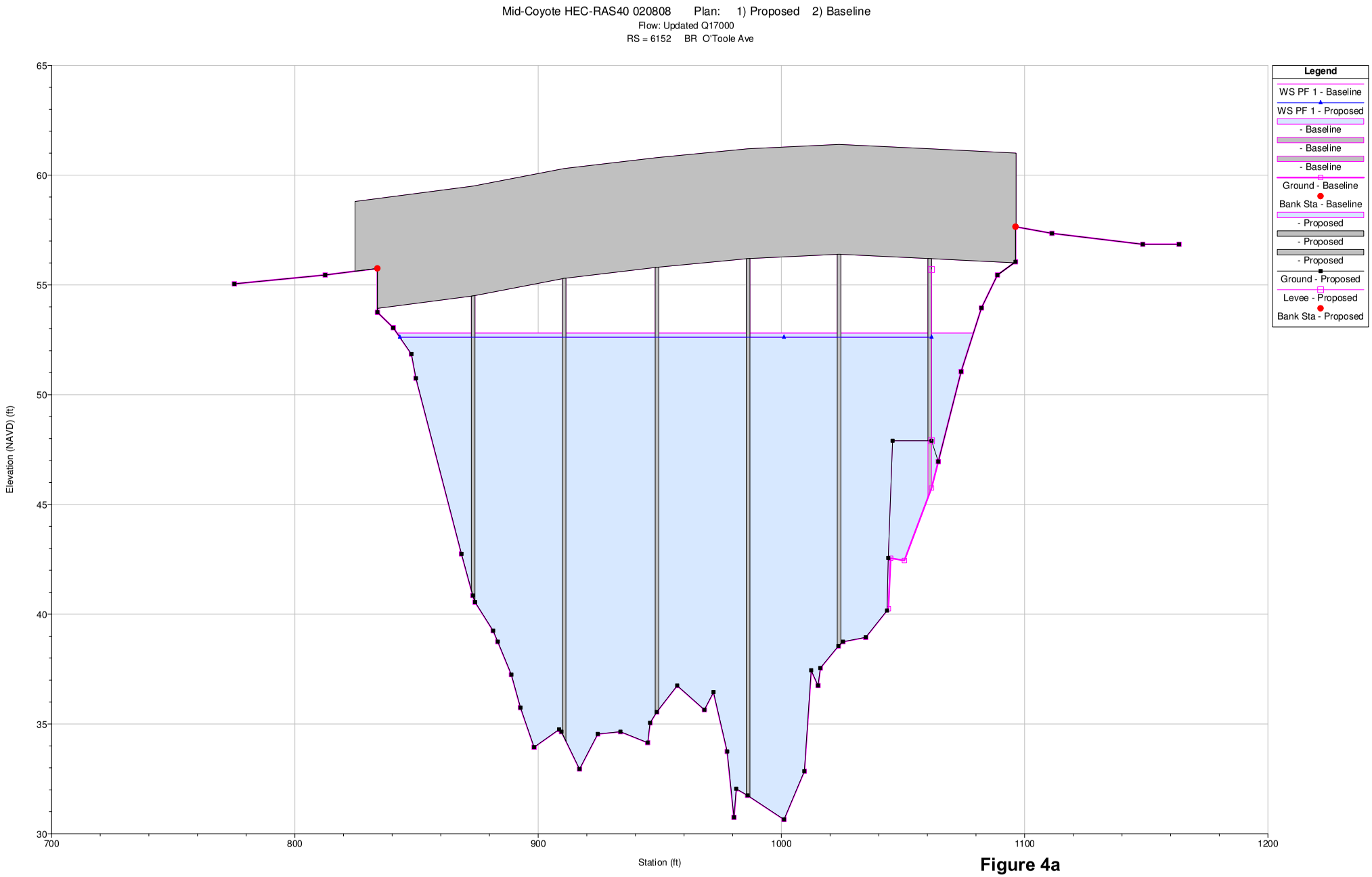

Figure 4a

O'Toole Cross-section

Location Hydraulic Study: Coyote Creek Trail

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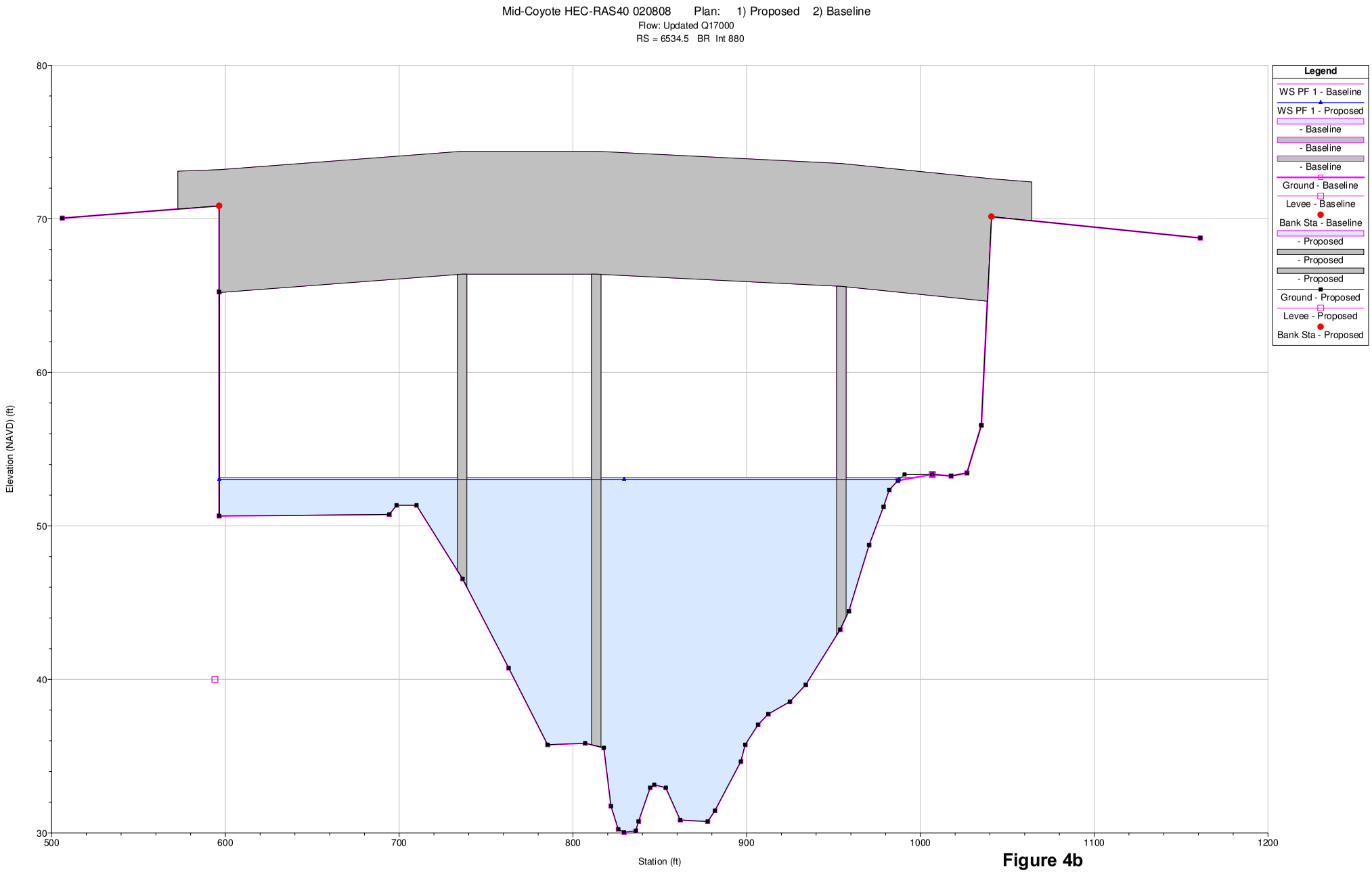

Figure 4b

I-880 Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

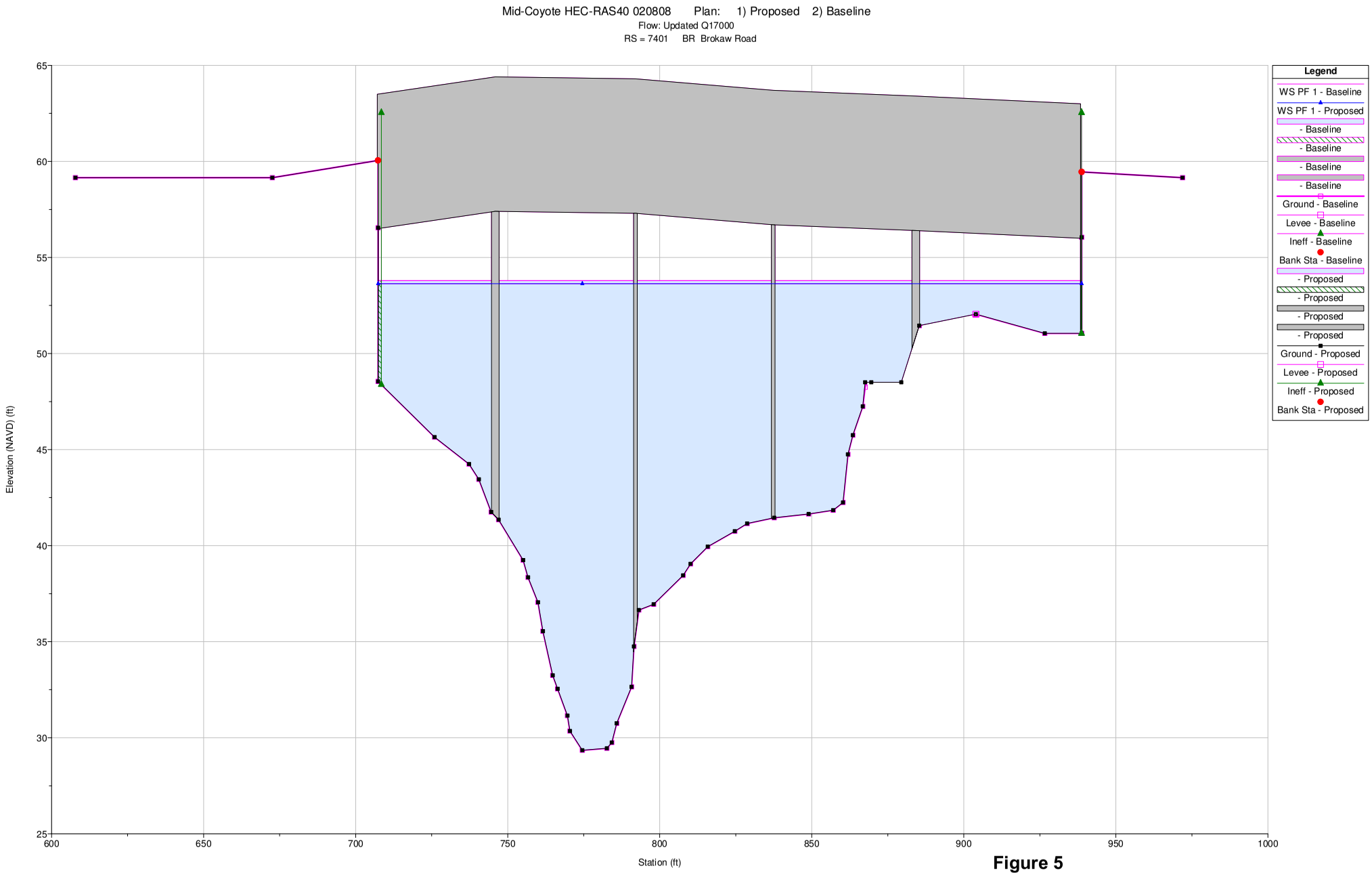

Figure 5

Brokaw Rd. Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

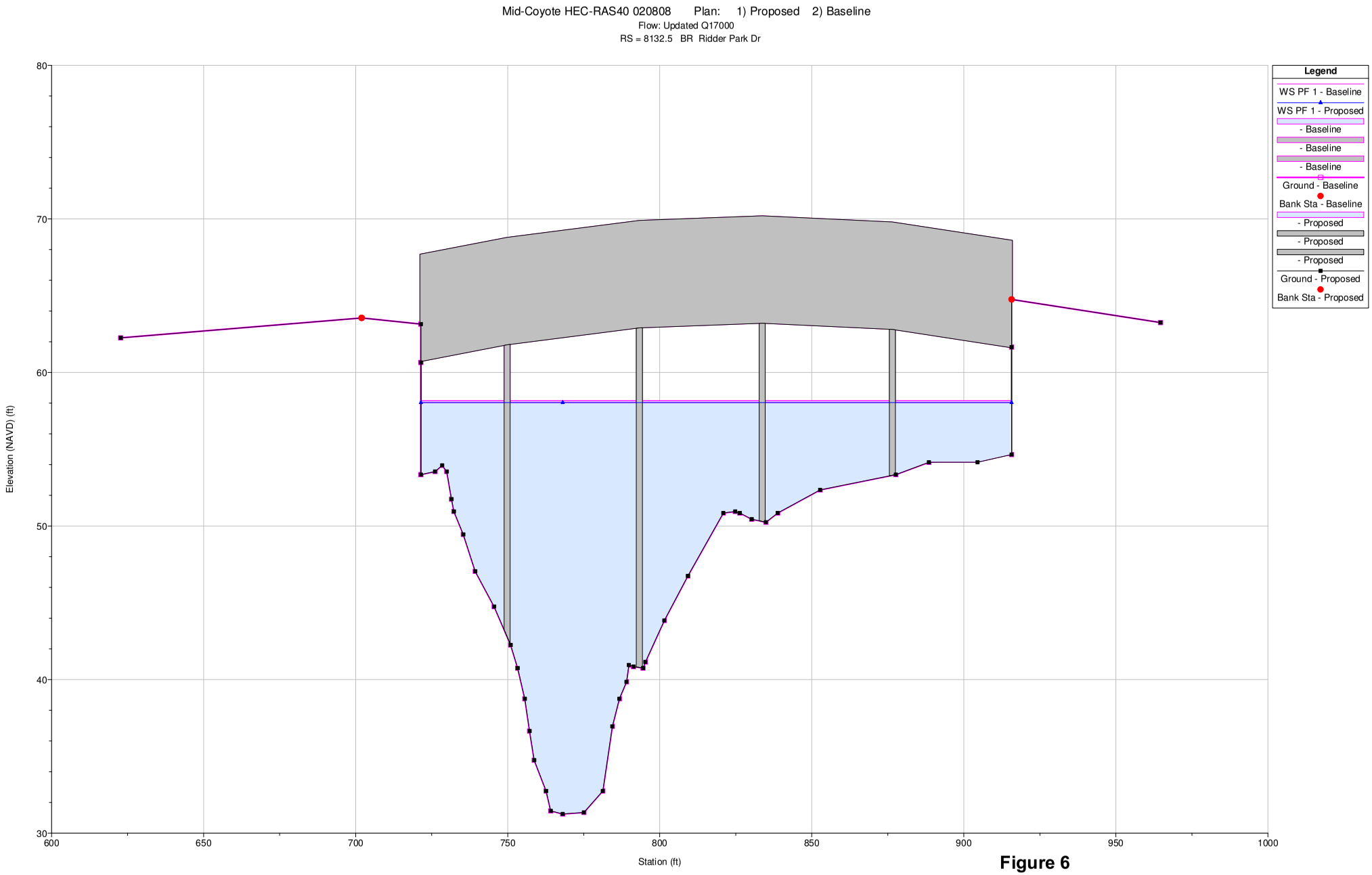

Figure 6

Ridder Park Dr. Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

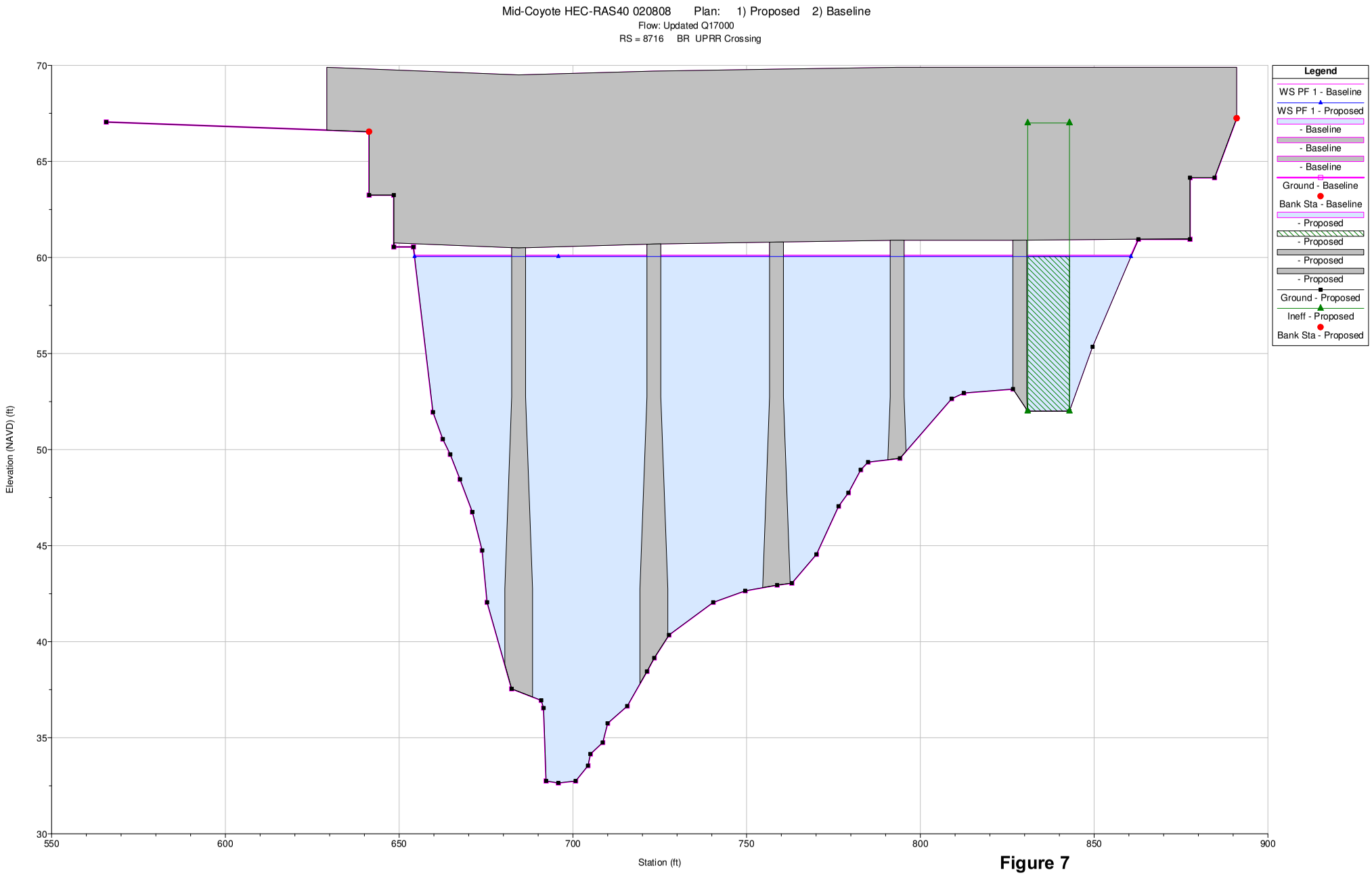

Figure 7

UPRR Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

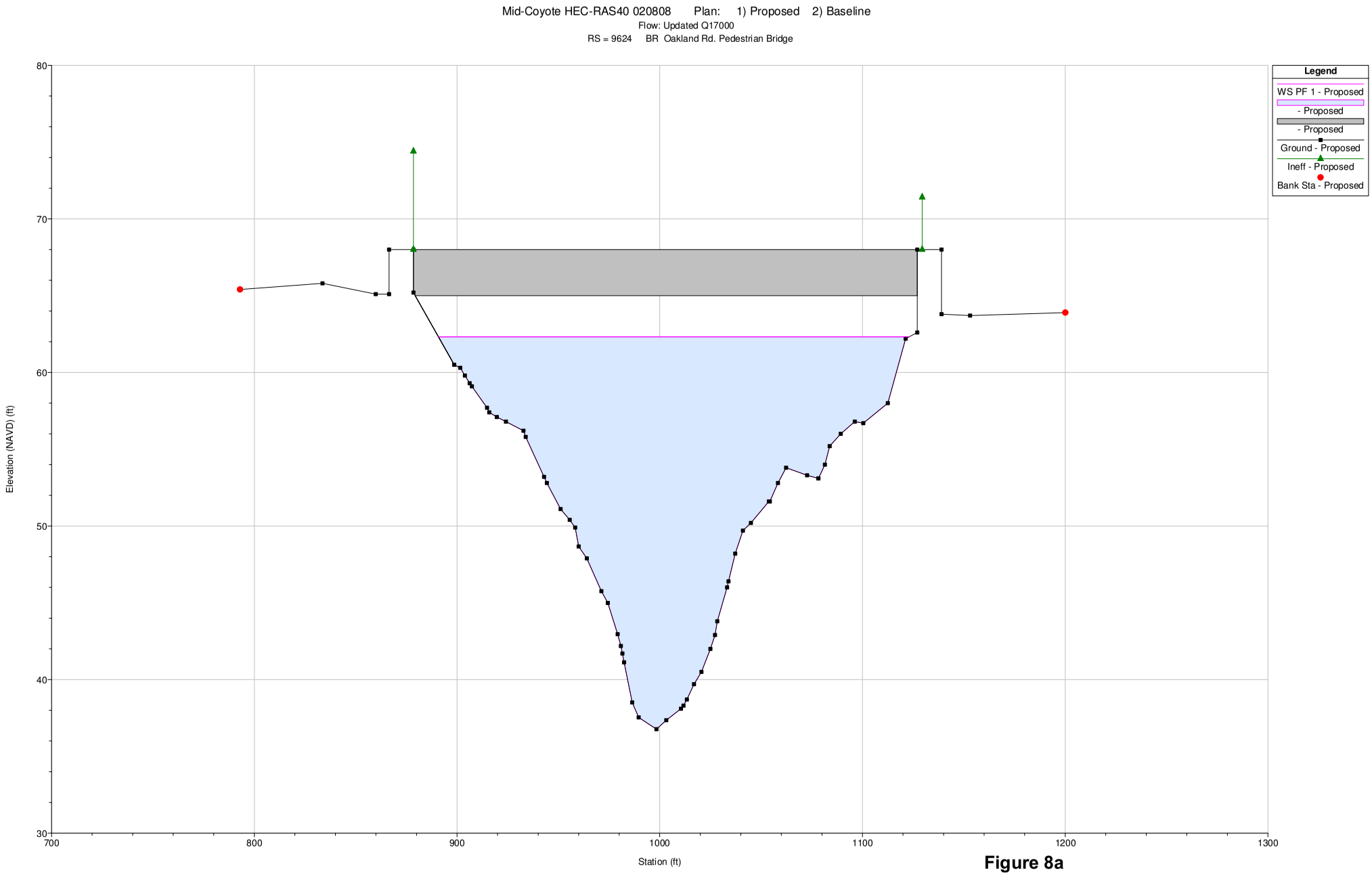

Figure 8a

Oakland Rd. Pedestrian Bridge Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

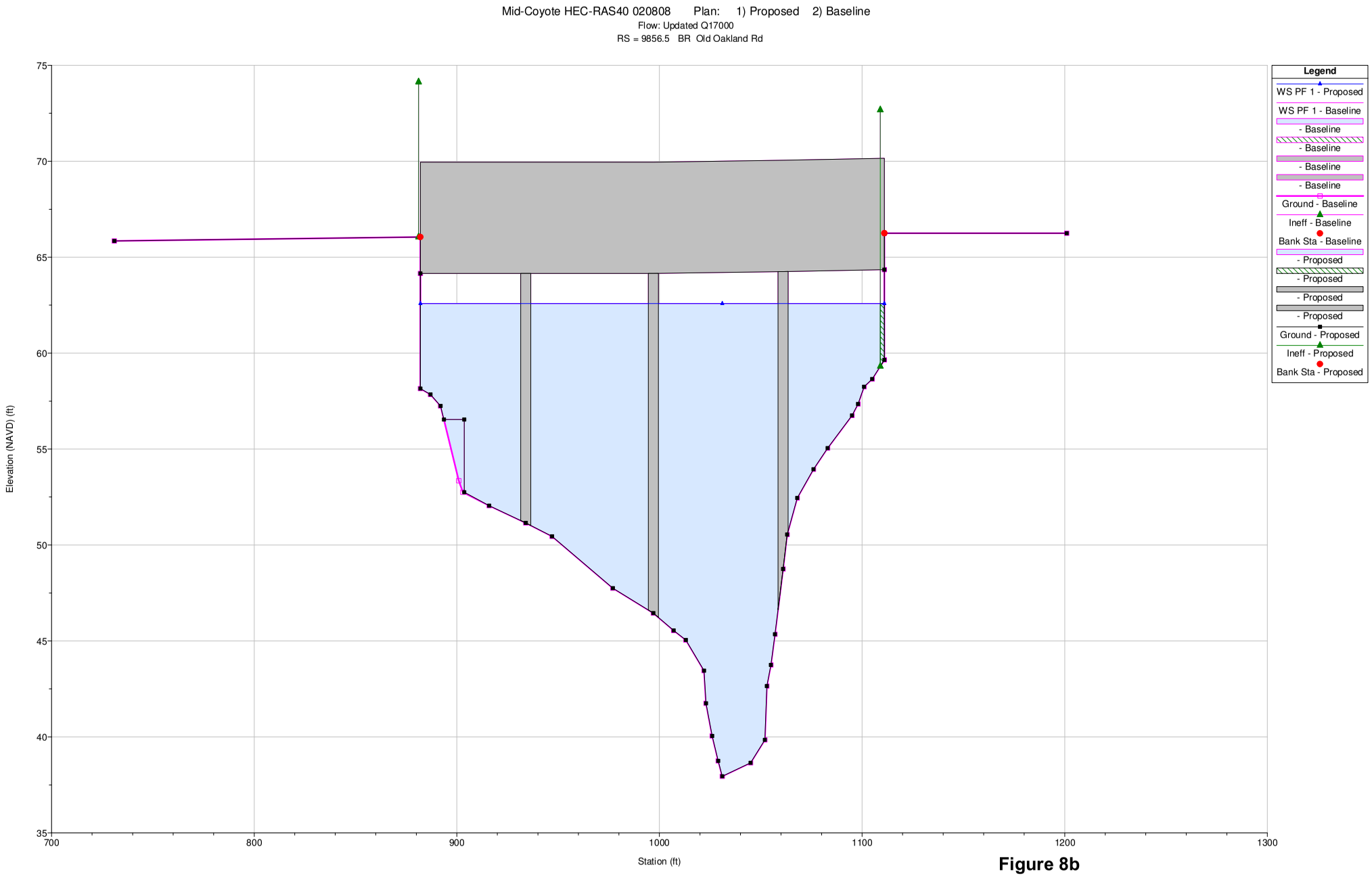

Figure 8b

Oakland Rd. Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

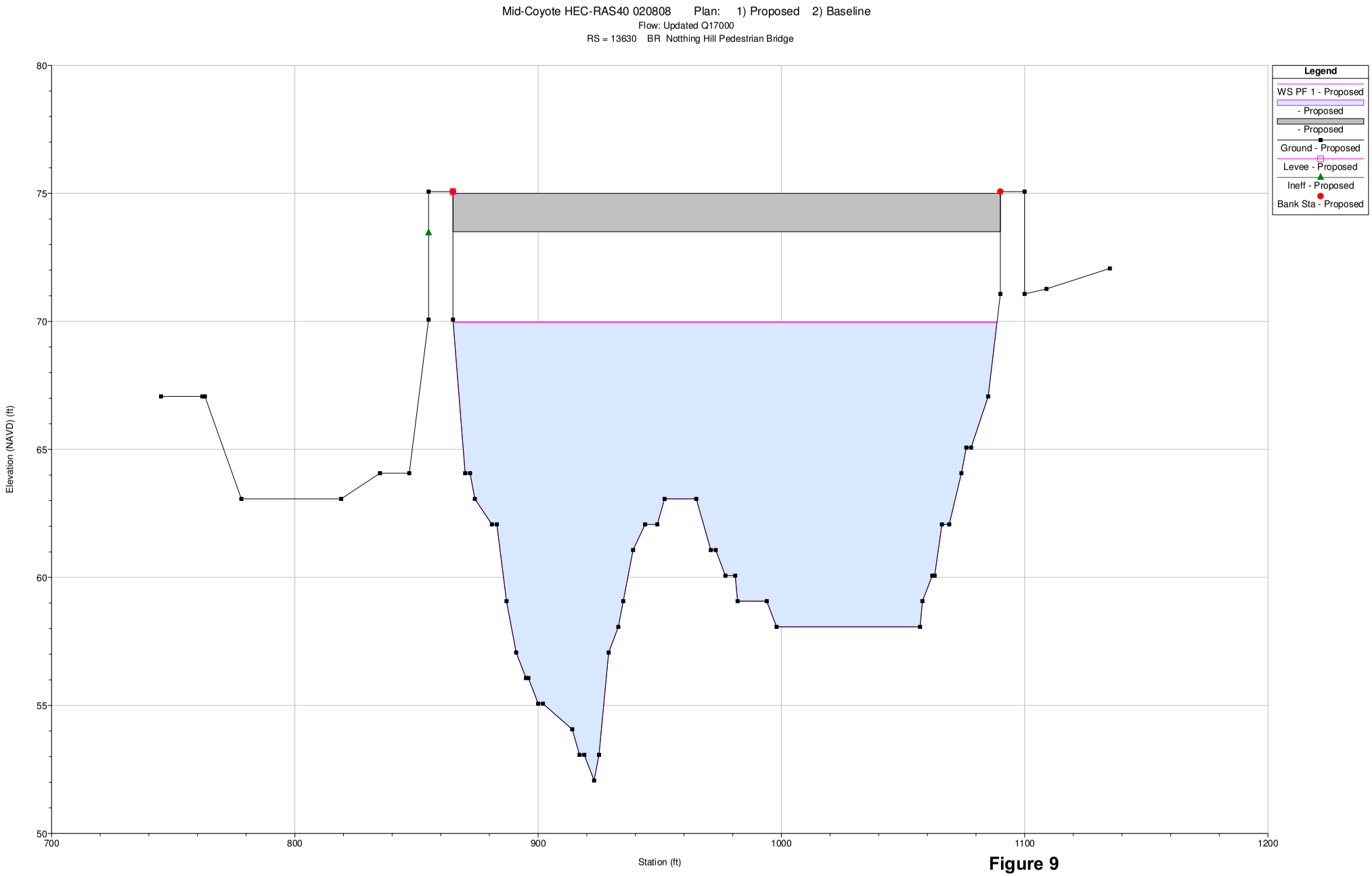

Figure 9

Notting Hill Pedestrian Bridge Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

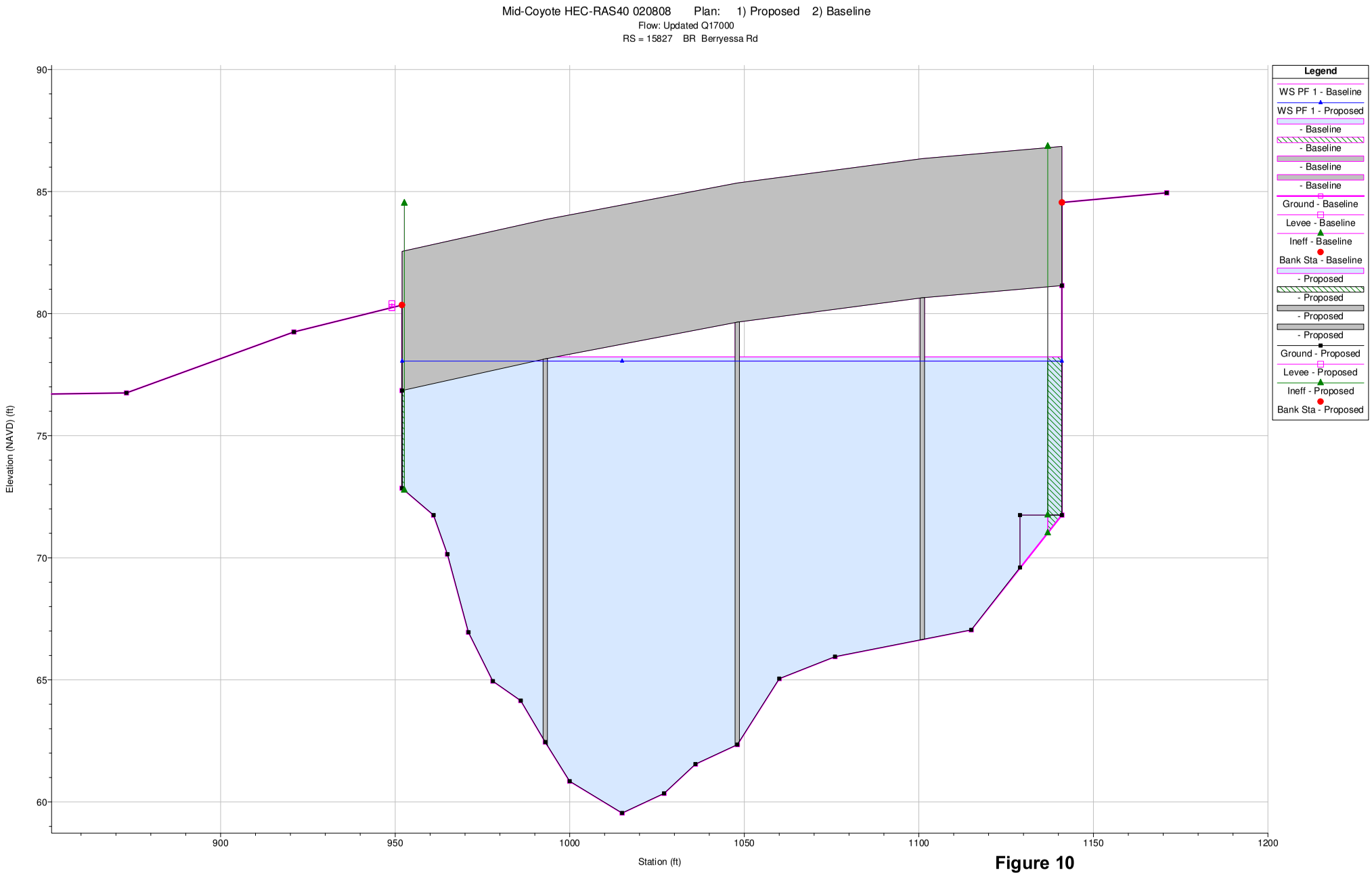

Figure 10

Berryessa Rd. Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

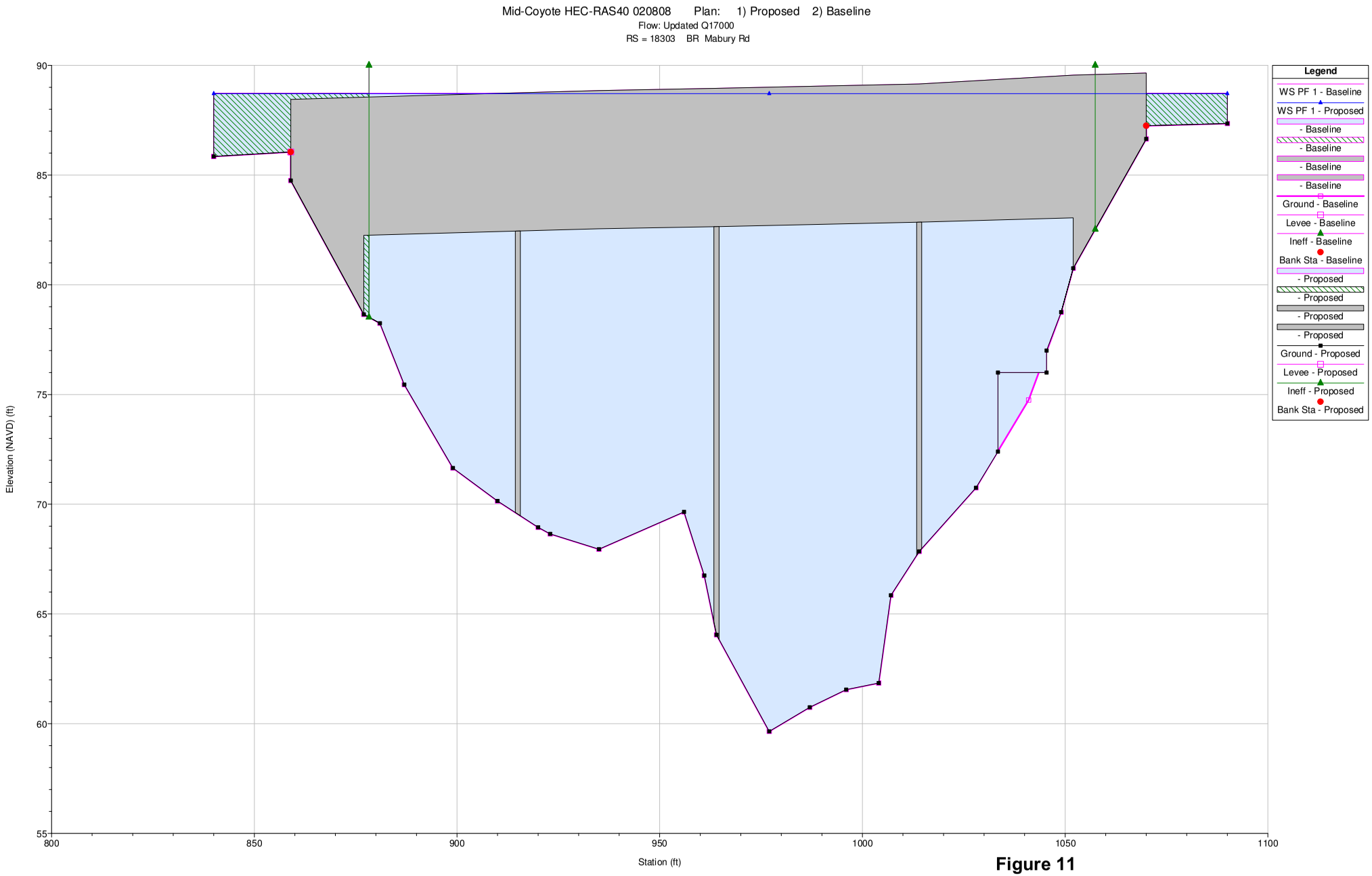

Figure 11

Mabury Rd. Cross-section

Location Hydraulic Study: Coyote Creek Trail

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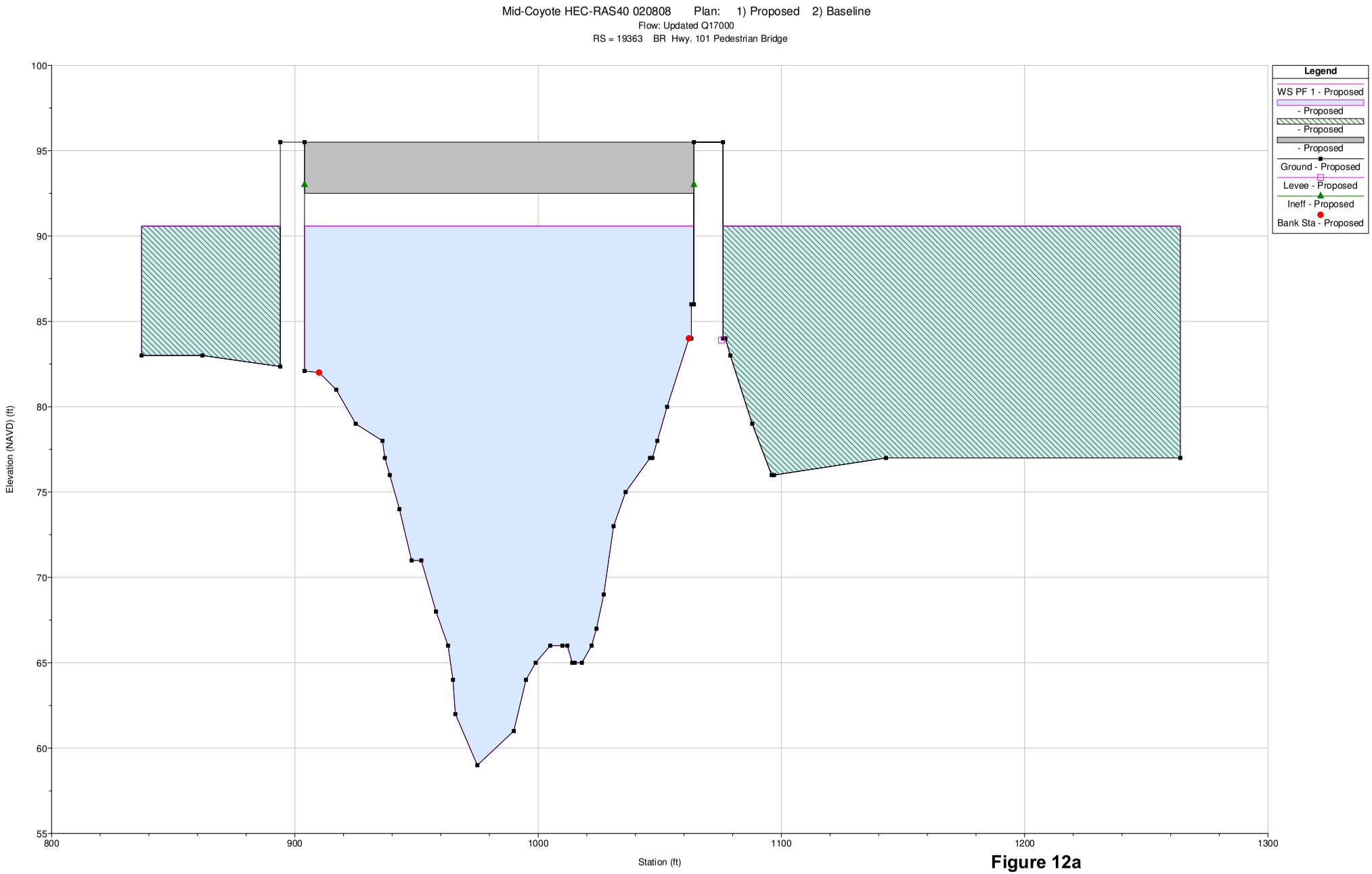

Figure 12a

Hwy. 101 Pedestrian Bridge Cross-section

Location Hydraulic Study: Coyote Creek Trail

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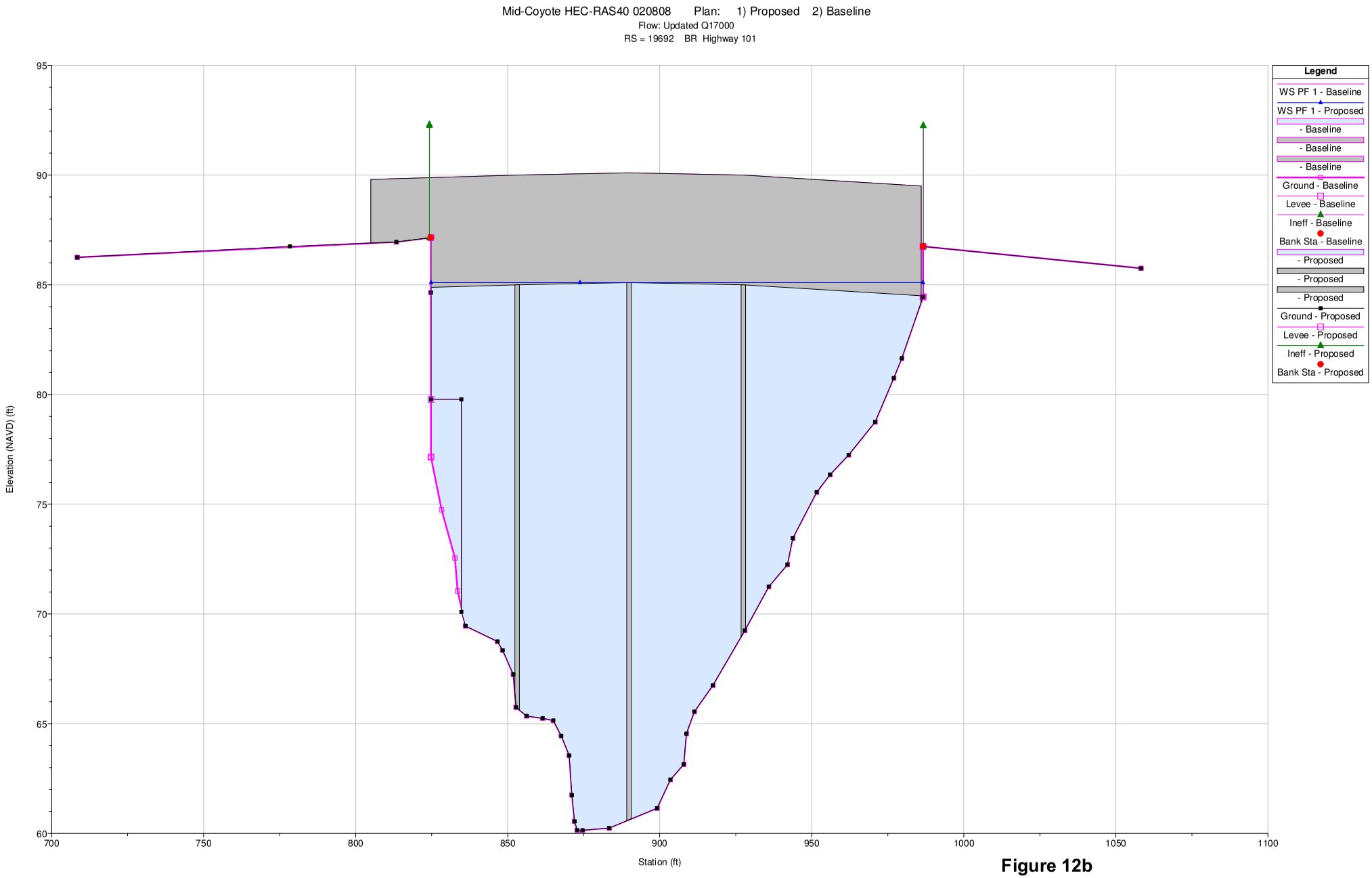

Figure 12b

Hwy. 101 Cross-section

Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

National Flood Insurance Map

In the Coyote Creek area, the 100-year floodplain of Coyote Creek is delineated by FEMA. FEMA floodplains for the study area are shown on the effective Flood Insurance Rate Map (FIRM). Please see Attachment 3 for the detailed FIRMs for this reach of the Coyote Creek.

Hydraulic Features

Estimated base flood elevations (BFE) are published for the Project area in the FIS. The City of San Jose, in collaboration with the District, will apply for a Letter of Map Revision (LOMR) once the District's project is built.

Boundary Conditions

The trail project limits are from Montague Expressway to 60 feet upstream of US Highway 101 along Coyote Creek. The hydraulic impacts of the in-channel design elements were evaluated only along this reach of the creek. These elements include channel bank modifications to accommodate the trail alignment within the floodway, trail undercrossings, and pedestrian bridge crossings. Any design element outside of the physical scope of the HEC-RAS model was not included in the design model. See Attachment 6 for the HEC-RAS model cross-section view of the design model.

Modeling Methodology & Assumptions

The hydraulic analysis was based on the U.S. Army Corps of Engineers (USACE) HEC-RAS (Hydraulic Engineering Center River Analysis System) model developed by the District for Mid-Coyote Creek, the Existing Conditions model. The hydraulic analysis results in this Location Hydraulic Study are presented in English Units throughout the report. Complete results from the HEC-RAS model are provided in Attachment 5 and 6.

Flow data provided by the District on August 2009, titled Updated Q17000, within the Existing Conditions model was used for this analysis for all modeled conditions. An additional 100 cfs was added per the District's direction at Berryessa Road where the Upper Penitencia Creek tributary meets Coyote Creek. All modeled conditions use an elevation of 39.81 feet as the downstream boundary condition. Discharges for this event within the Project limits are summarized below in Table 3.

TABLE 3
Summary of Flow Discharge by Storm Return Period within the Project Limits
Location Hydraulic Study: Coyote Creek Trail

Creek Location	Storm Return Period	Discharge (cfs)
Montague Expressway[1]	100 year	17,000
Berryessa Road[1]	100 year	17,100

Notes
1. Locations and flows provided by Santa Clara Valley Water District.

The District-provided Existing Conditions hydraulic model was modified by CH2M HILL to obtain the Baseline model that could be more easily and accurately compared to the model that incorporates the trail design elements, the Proposed Conditions model. Any added cross-sections in the Baseline model were added to more accurately define the channel where planned design elements would be located. Cross-sections added to the Baseline model were either copied from or interpolated between existing cross-sections in the SCWVD Existing Conditions model. Modifications were made at one added cross-section, Sta. 136+30, at the proposed Notting Hill Bridge location to match survey data provided by Callander Associates. No roughness factors were modified from the District-provided Existing Conditions model in the Baseline model. Any new Baseline model cross-sections mirror the Manning's n-values of the Existing Conditions model cross-sections both upstream and downstream of the new Baseline cross-section. The Baseline model was accepted by the District. For the Proposed Conditions model, cross-sections in the Baseline

model were modified to reflect the design and additional cross-sections were added to further define design elements as needed. Please see Attachment 4 for a comparison of the Existing Conditions, Baseline and Proposed Conditions model elements.

The 14 main design areas described in the Project Description section were modeled in HEC-RAS. This includes 10 street undercrossings and four pedestrian bridges. Pertinent design details, including the trail elevations, locations of retaining walls, approximate grading, etc., were incorporated from Callander Associates' design concept drawings prepared in August 2009. All the elements of design that are in the channel are reflected in the HEC-RAS proposed conditions model. If design elements were located outside of the baseline model boundaries, the proposed conditions model will not reflect these changes. Changes outside of the hydraulic model can be assumed to have no direct hydraulic impact on the floodplain.

Because structures may become inundated with debris in a flood event, areas with proposed structures within the conveyance area were modeled as ineffective flow areas. Some ineffective flow area boundaries were moved to begin at the edge of retaining walls and/or raised trails. For design details, see Project Description section and Attachment 2. Any other locations in between the trail transition areas were only minimally modified to show a TOB trail on the appropriate bank. The location of the trail alignment in these areas is approximate, but is not crucial in evaluating the hydraulic impact of the trail design as it is outside the 100-year storm event conveyance area. All the cross-sections within the Project area are included in Attachment 6 for reference.

Potential Project Impacts

This section discusses potential Project impacts with respects to content required by 23 CFR 650A §650, the seven items outlined in the Caltrans "Floodplain Encroachment Summary Form," the City's "Floodplain Evaluation Report Summary" and the Caltrans "Location Hydraulic Study Form."

Potential Floodplain Encroachment

The project element that would potentially encroach on the floodplain is the in-channel, pedestrian protection structure at the UPRR bridge undercrossing location.

Hydraulic Impacts of Potential Encroachment

Hydraulic impacts were determined by comparing results from the Baseline model to the Proposed Conditions model, which incorporates proposed improvements as described in the City of San Jose's *Coyote Creek Trail Master Plan,* including the pedestrian protection structure under UPRR.

The estimated WSE increase due to the proposed Project construction was found to be no greater than 0.10 feet upstream of the UPRR structure. Sufficient freeboard is available to meet the District's requirement for the Coyote Creek Trail Project of 4 feet at the new bridge locations.

Although the hydraulic performance of Penitencia Creek, more specifically the 86 inch corrugated metal pipe (CMP) in the creek that currently facilitates pedestrian access over the creek was not analyzed with a hydraulic model, no negative effects could result from replacing a pipe that could clog with debris during a significant storm with a freespan bridge. If the existing CMP were to clog, the water would leave its banks on Penitencia Creek and inundate the surrounding area. Based on the hydraulic analysis done as part of this LHS, during a flood event it is expected that this pedestrian crossing would be inundated by at least 3 feet for pre- and post-project conditions.

Figure 2 through Figure 12 present key HEC-RAS cross-sections from within the Project area. All of the HEC-RAS cross-sections within the Project area are included in Attachment 6. Figure 13 presents the WSE profile comparison between the draft District-provided model and the proposed conditions model.

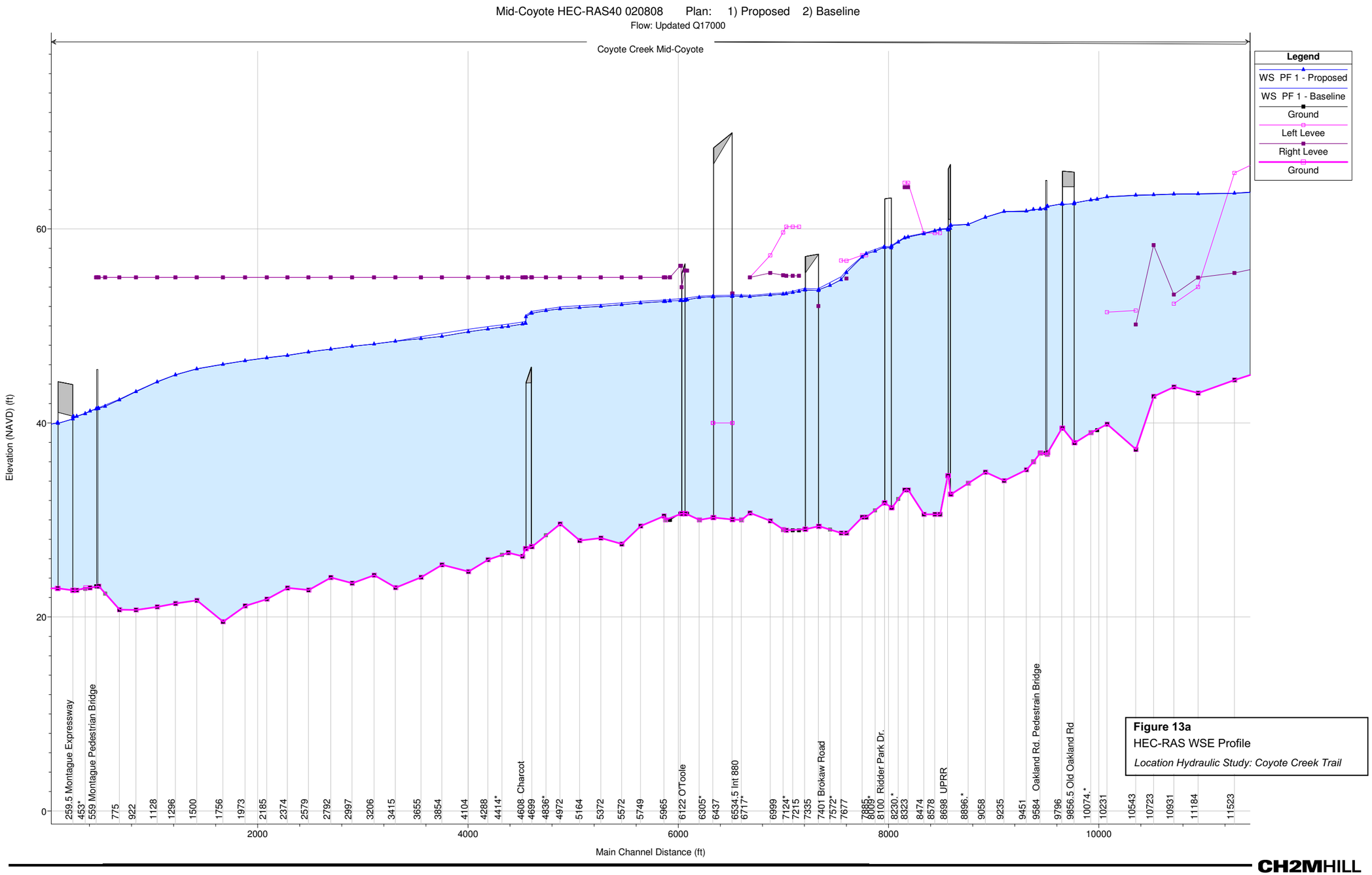

Figure 13a
HEC-RAS WSE Profile
Location Hydraulic Study: Coyote Creek Trail

CH2MHILL

Table 4 below compares the WSE in the Baseline and Proposed Conditions hydraulic models.

TABLE 4
Comparison of the Proposed Project WSE and Freeboard with Existing Conditions
Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
19+919	92.05	92.02	-0.03
19+840	91.99	91.96	-0.03
19+780	91.82	91.77	-0.05
19+775	91.81	91.77	-0.04
19+692	Hwy. 101		
19+609	90.97	90.87	-0.1
19+604	90.97	90.87	-0.1
19+459	90.65	90.6	-0.05
19+397	90.6	90.63	0.03
19+375	90.87	90.59	-0.28
19+370	90.87	90.58	-0.29
19+363	Hwy. 101 Pedestrian Bridge		
19+356*	90.81	90.48	-0.33
19+351	90.81	90.47	-0.34
19+286	90.41	90.46	0.05
19+190	90.32	90.36	0.04
19+160	-	90.31	
19+015	90.04	90.04	0
18+768	89.43	89.43	0
18+567	88.92	88.92	0
18+457*	88.83	88.82	-0.01
18+341	88.71	88.71	0
18+336	88.71	88.71	0
18+303	Mabury Rd.		
18+268	87.83	87.82	-0.01
18+263	87.83	87.81	-0.02

TABLE 4
Comparison of the Proposed Project WSE and Freeboard with Existing Conditions
Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
18+185*	87.78	87.72	-0.06
18+107*	87.62	87.64	0.02
17+951	87.26	87.23	-0.03
17+701	86.45	86.42	-0.03
17+484	85.93	85.89	-0.04
17+296	85.64	85.61	-0.03
17+042	84.84	84.8	-0.04
16+851	83.85	83.8	-0.05
16+687	83.18	83.12	-0.06
16+276	80.04	79.93	-0.11
16+096	79.28	79.16	-0.12
15+993	78.11	77.95	-0.16
15+893	78.33	78.16	-0.17
15+888	78.32	78.14	-0.18
15+827	Berryessa Rd.		
15+766	78.06	77.88	-0.18
15+761	78.05	77.87	-0.18
15+671*	-	77.45	
15+581*	77.13	77.12	-0.01
15+504	76.97	76.95	-0.02
15+352	75.6	75.59	-0.01
15+143	74.63	74.61	-0.02
14+850	73.51	73.49	-0.02
14+615	72.47	72.45	-0.02
14+368	72.07	72.05	-0.02
14+239	71.44	71.41	-0.03
14+053	71.85	71.82	-0.03
13+845	71	70.96	-0.04

TABLE 4

Comparison of the Proposed Project WSE and Freeboard with Existing Conditions

Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
13+758*	70.9	70.87	-0.03
13+672	70.16	70.15	-0.01
13+642	-	70.02	
13+637	-	69.98	
13+630	Notting Hill Pedestrian Bridge		
13+623*	69.86	69.87	0.01
13+618	-	69.83	
13+526*	69.2	69.2	0
13+465	68.86	68.86	0
13+350	68.62	68.62	0
13+241	68.35	68.35	0
12+986	67.28	67.28	0
12+814	66.84	66.85	0.01
12+650	66.43	66.44	0.01
12+477	65.87	65.88	0.01
12+247	64.63	64.65	0.02
12+050	64.22	64.24	0.02
11+825	63.87	63.9	0.03
11+523	63.66	63.69	0.03
11+184	63.59	63.62	0.03
10+931	63.57	63.6	0.03
10+723	63.49	63.53	0.04
10+543	63.44	63.48	0.04
10+231	63.27	63.31	0.04
10+134	-	63.04	
10+074*	63	62.97	-0.03
9+917	62.68	62.68	0
9+912	62.68	62.68	0

TABLE 4

Comparison of the Proposed Project WSE and Freeboard with Existing Conditions

Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
9+857	Oakland Rd.		
9+801	62.59	62.59	0
9+796	62.58	62.58	0
9+663	62.32	62.32	0
9+658*	62.31	62.32	0.01
9+624	Oakland Pedestrian Bridge		
9+589*	62.01	62.04	0.03
9+584	62.01	62.03	0.02
9+520*	61.99	62.02	0.03
9+451	61.77	61.84	0.07
9+235	61.77	61.8	0.03
9+058	61.2	61.19	-0.01
8+896*	60.48	60.46	-0.02
8+734	60.39	60.35	-0.04
8+729	60.39	60.35	-0.04
8+716	UPRR Bridge		
8+703	60.06	60	-0.06
8+698	60.06	59.99	-0.07
8+627	60	59.94	-0.06
8+578	59.87	59.8	-0.07
8+474	59.56	59.49	-0.07
8+323	59.24	59.15	-0.09
8+290	59.16	59.07	-0.09
8+230*	-	58.65	
8+170	58.33	58.22	-0.11
8+165	58.32	58.21	-0.11
8+133	Ridder Park Dr.		
8+100	58.23	58.12	-0.11

TABLE 4
Comparison of the Proposed Project WSE and Freeboard with Existing Conditions
Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
8+095	58.23	58.11	-0.12
8+009*	-	57.69	
7+923	57.55	57.44	-0.11
7+885	57.18	57.09	-0.09
7+728	55.77	55.5	-0.27
7+677	55.08	54.75	-0.33
7+572*	-	54.17	
7+467	53.88	53.73	-0.15
7+462	53.88	53.72	-0.16
7+401	Brokaw Rd.		
7+340	53.87	53.72	-0.15
7+335	53.87	53.71	-0.16
7+275	-	53.56	
7+215	-	53.44	
7+154	53.44	53.32	-0.12
7+124*	53.4	53.28	-0.12
6+999	53.32	53.19	-0.13
6+802	53.15	53.02	-0.13
6+717*	53.19	53.06	-0.13
6+632	53.19	53.07	-0.12
6+627	53.19	53.06	-0.13
6+535	I-880		
6+442	53.14	53.01	-0.13
6+437	53.13	53	-0.13
6+305*	53.06	52.93	-0.13
6+188	-	52.68	
6+173	52.86	52.68	-0.18
6+168	52.86	52.67	-0.19

TABLE 4

Comparison of the Proposed Project WSE and Freeboard with Existing Conditions

Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
6+152	O'Toole Ave.		
6+135	52.81	52.62	-0.19
6+130	52.81	52.6	-0.21
6+122	-	52.6	
6+024	-	52.58	
6+023	-	52.58	
5+978*	52.68	52.52	-0.16
5+965	52.67	52.52	-0.15
5+749	52.53	52.36	-0.17
5+572	52.37	52.19	-0.18
5+372	52.2	52.02	-0.18
5+164	52.08	51.88	-0.2
4+972	51.96	51.75	-0.21
4+836*	-	51.57	
4+699	51.5	51.31	-0.19
4+694	51.51	51.32	-0.19
4+667	Charcot Ave.		
4+639	50.46	50.26	-0.2
4+634	50.45	50.26	-0.19
4+608	50.4	50.18	-0.22
4+474	50.19	49.94	-0.25
4+414*	-	49.87	
4+288	49.93	49.68	-0.25
4+104	49.66	49.39	-0.27
3+854	49.23	48.92	-0.31
3+655	48.88	48.7	-0.18
3+415	48.43	48.42	-0.01
3+206	48.14	48.13	-0.01

TABLE 4
Comparison of the Proposed Project WSE and Freeboard with Existing Conditions
Location Hydraulic Study: Coyote Creek Trail

STA	Existing (ft)	Proposed Conditions (ft)	Δ WSE (ft)
2+997	47.9	47.89	-0.01
2+792	47.62	47.6	-0.02
2+579	47.32	47.3	-0.02
2+374	46.98	46.95	-0.03
2+185	46.73	46.7	-0.03
1+973	46.43	46.4	-0.03
1+756	46.07	46.03	-0.04
1+500	45.59	45.56	-0.03
1+296	44.98	44.94	-0.04
1+128	44.27	44.22	-0.05
0+922	43.27	43.22	-0.05
0+775	42.45	42.37	-0.08
0+643*	-	41.71	
0+583	41.58	41.51	-0.07
0+578	-	41.49	
0+571	Montague Pedestrian Bridge		
0+564	-	41.46	
0+559	-	41.44	
0+499	41.22	41.23	0.01
0+453*	41.03	40.96	-0.07
0+370	40.68	40.68	0
0+340	40.63	40.63	0
0+333	40.62	40.62	0
0+259.5	Montague Expy.		

The seven items outlined in the Caltrans "Floodplain Evaluation Report Summary" at the end of this report are discussed in the following section: "Evaluation of Risk Severity and/or Environmental Impact." This discussion is based on the Caltrans "Location Hydraulic Study Form."

Evaluation of Risk Severity and/or Environmental Impact

The Risk Associated with Implementation of the Action

The Project has no significant hydraulic impacts. The estimated WSE was found to increase less than 0.10 feet due to Project features.

The Impacts on Natural and Beneficial Floodplain Values

There will be minor impacts to the natural floodplain due to the construction of the in-channel trail where there is no existing service road below bridges.

The Support of Incompatible Floodplain Development

The Project would not support incompatible floodplain development either within or outside the floodplain, because it is a pedestrian and bicycle trail and does not provide public vehicular access. Any trail design features are being developed in collaboration with City of San Jose and SCVWD stakeholders.

Measures to Minimize Floodplain Impacts Associated with the Action

Project impacts have been minimized through the preliminary design process. The four proposed pedestrian bridges are all designed as freespan bridges, with the soffit at 4 feet above the 1% flood event WSE. The majority of the proposed trail will be located at the top of bank, outside of the channel area. The portions of in-channel trail have been located on the existing in-channel maintenance roads at grade to minimize cut and fill. Where there are no in-channel maintenance roads, the trail alignment has been located to minimize impacts.

Measures to Restore and Preserve the Natural and Beneficial Floodplain Values Impacted by the Action

The City will mitigate for all Project-related impacts to the floodplain natural wetlands by complying with the no net loss to wetland functions and values policy. The actual replacement ratio will be determined in collaboration with resources agencies and based on typical replacement values from high and low value vegetation removal and replacement ratios. The recommendations will be reviewed by others and modified during the environmental review process. Construction activities within the top of bank area will be

limited to the period between April 15 and October 15. Construction work within the channel would be limited to the period between June 1 and October 15.

The Practicality of Alternatives to any Significant Encroachment

The only practical alternative for the in-channel trail would be to only have the trail completely at TOB. This would require pedestrians and bicyclists to make at-grade crossings at the locations of all the major roads and freeways that bridge Coyote Creek in this area. At-grade crossings at these locations would pose significant safety problems and pedestrian bridges over these roads would have to be located well outside the original planned project right-of-way at a significant increase in cost.

The only practical alternative for the pedestrian bridges would be to direct pedestrian and bicyclists to cross the creek at the street crossings. This would also pose a significant safety hazard and would require additional measures taken at the street level and would not be possible at the proposed Notting Hill Pedestrian Bridge location.

The Practicality of Alternatives to any Longitudinal Encroachment

No practical route for a pedestrian and bicycle trail alignment was identified that did not run parallel to Coyote Creek. Alternative routes would require use of surface streets and numerous at-grade crossings of the street intersections that would not be equivalent to a Class I Trail.

Floodplain Evaluation Report Summary

Dist. 4 Co. Santa Clara Rte. N/A PM N/A

Project No. N/A Bridge No. N/A

Limits STA 19+190 to STA 0+333

Floodplain Description The floodplain is contained within the channel banks

		Yes	No
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
	For the preferred project alternative, the trail would be primarily above the 100-year event through this area at the top of bank. At street intersections along the Coyote Creek in this reach, portion of the trail are below the 100-year WSE. The proposed pedestrian bridges pass over the floodplain.		
2.	Are the risks associated with the implementation of the proposed action significant?		X
	There are no roadways, buildings, or other existing development within the 100-year floodplain. The results of the Location Hydraulic Study indicate that the change in WSE due to the proposed project would either not be significant or provide a beneficial hydraulic impact. Therefore, there will be no impact to existing or potential development.		
3.	Will the proposed action support probable incompatible floodplain development?		X
	The proposed project would not support development either within or outside the floodplain, because it is a pedestrian and bicycle trail		
4.	Are there any significant impacts on natural and beneficial floodplain values?		X
	Habitat mitigation plantings would restore and preserve the natural and beneficial floodplain values impacted by the proposed project.		
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
	The City will mitigate for all Project related impacts to the floodplain natural wetlands by complying with the no net loss to wetland functions and values policy. The actual replacement ratio will be determined in collaboration with resources agencies and based on comments received during the environmental review process. Construction work within the top of bank area will be limited to the period between April 15 and October 15. Construction work within the channel would be limited to the period between June 1 and October 15.		

6. Does the proposed action constitute a significant floodplain encroachment as defined in 23 CFR, Section 650.106(q)? _____ X

   Having trail undercrossings that are below the 100-year event WSE would not interrupt or terminate a transportation facility needed for emergency vehicles or a transportation facility providing a community's only evacuation route; will not constitute a significant risk to life or property; and will not cause a significant adverse impact to natural or beneficial floodplain values.

7. Are Location Hydraulic Studies that document the above answers on file? If not, explain. _____ X

   The Location Hydraulic Study is attached.

PREPARED BY:

Erika J. Powell 4/5/2010

Hydraulic Engineer Date

APPROVED BY:

City of San Jose Date

CONCURRENCE:

Caltrans – Hydraulic Engineer Date

Caltrans – Local Assistance Environmental Date

Caltrans – Local Assistance Engineer Date

FHWA Date

Location Hydraulic Study Form

Dist. 4 Co. Santa Clara Rte. N/A K.P. _____

EA _____ Bridge No. N/A

Floodplain Description The floodplain is contained within the channel banks

1. Description of Proposal (include any physical barriers i.e. concrete barriers, stonewalls, etc. and design elements to minimize floodplain impacts)
Retaining walls were used at US Highway 101, Mabury Road, Oakland Road and O'Toole Avenue to minimize the amount of fill in the channel necessary for the construction of the trail undercrossings.

2. ADT Current N/A Projected N/A

3. Hydraulic Data Base Flood Q_{100} = 17,100 cfs

WSE_{100} = 40.62 ft At the upstream face of Montague Expy.

The flood of record, if greater than Q_{100} :

Q = N/A cfs WSE = N/A ft

Overtopping flood Q = N/A cfs WSE = N/A ft

Are NFIP maps and studies available? YES X NO _____

4. Is the highway location alternative within a regulatory floodway?

YES X NO _____

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain

Potential Q_{100} backwater damages:

A. Residences?	NO	X	YES	
B. Other Bldgs?	NO	X	YES	
C. Crops?	NO	X	YES	
D. Natural and beneficial floodplain values?	NO	X	YES	

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	X	YES	
B. Emergency vehicle access?	NO	X	YES	
C. Practicable detour available?	NO	X	YES	

D. School bus or mail route? NO X YES _____

7. Estimated duration of traffic interruption for 100-year event: hours N/A

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A. Roadway	$	0
B. Property	$	0
Total	$	0

9. Assessment of Level of Risk

Low	X
Moderate	
High	

For High Risk projects, during design phase, additional Design Study Risk Analysis may be necessary to determine design alternative.

Signature – Local Hydraulic Engineer Erika L. Powell Date 4/5/2010
(Item numbers 3, 4, 5, 7, 9)

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible floodplain development?

NO _____ YES X

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113.
There is a proposed in-channel structure at the UPRR Bridge undercrossing location to protect the bike trail users from any falling debris from the railroad tracks. The structure is needed for pedestrian and bike traffic protection and no canopies are allowed to be attached to the existing railroad bridge.

Information developed to comply with the Federal requirements for the Location Hydraulic Study shall be retained in the project files.

Signature – Local Project Engineer _____ Date _____
(Item numbers 1, 2, 6, 8)

Signature – Caltrans Environmental Branch Chief _____ Date_____

References

Federal Emergency Management Agency (FEMA). 18 May 2009. Flood Insurance Rate Map, Santa Clara County, California. Community Panel Number 06085C 0068H, 0069H, 0232H, & 0251H. National Flood Insurance Program.

Federal Emergency Management Agency (FEMA). 18 May 2009. Flood Insurance Study: Santa Clara County, California.

Santa Clara Valley Water District (SCVWD). October 1984. Coyote Creek Planning Study: Engineer's Report and Final Environmental Impact Report. Santa Clara County, California.

US Army Corps of Engineers (USACE). March 2008. HEC-RAS River Analysis System, Davis, California.