Stantec

Memo

To:	Colin Nemeroff Stantec	From:	Jun Wang, PE Zachary Elliott, PE Stantec
Project/File:	2042614000	Date:	March 15, 2023

Reference: Meier Canyon Creek Floodplain Study

Introduction

Stantec performed a surface water hydraulic analysis of Meier Canyon Creek in the vicinity of Camp Alonim (Study Reach) to evaluate the creek's 100-year flood hydraulic characteristics and delineate the floodplain boundary under existing and proposed conditions. Meier Canyon Creek is an ephemeral natural stream which runs northwesterly and confluences with Arroyo Simi. The total drainage area of Meier Canyon is approximately 5.9 square miles. The proposed project includes the addition of a new visitor center building and parking lot to the Camp property on the north side of the East Tributary of Meier Canyon Creek. **Figure 1** shows an overview of the study reach and proposed project facilities.

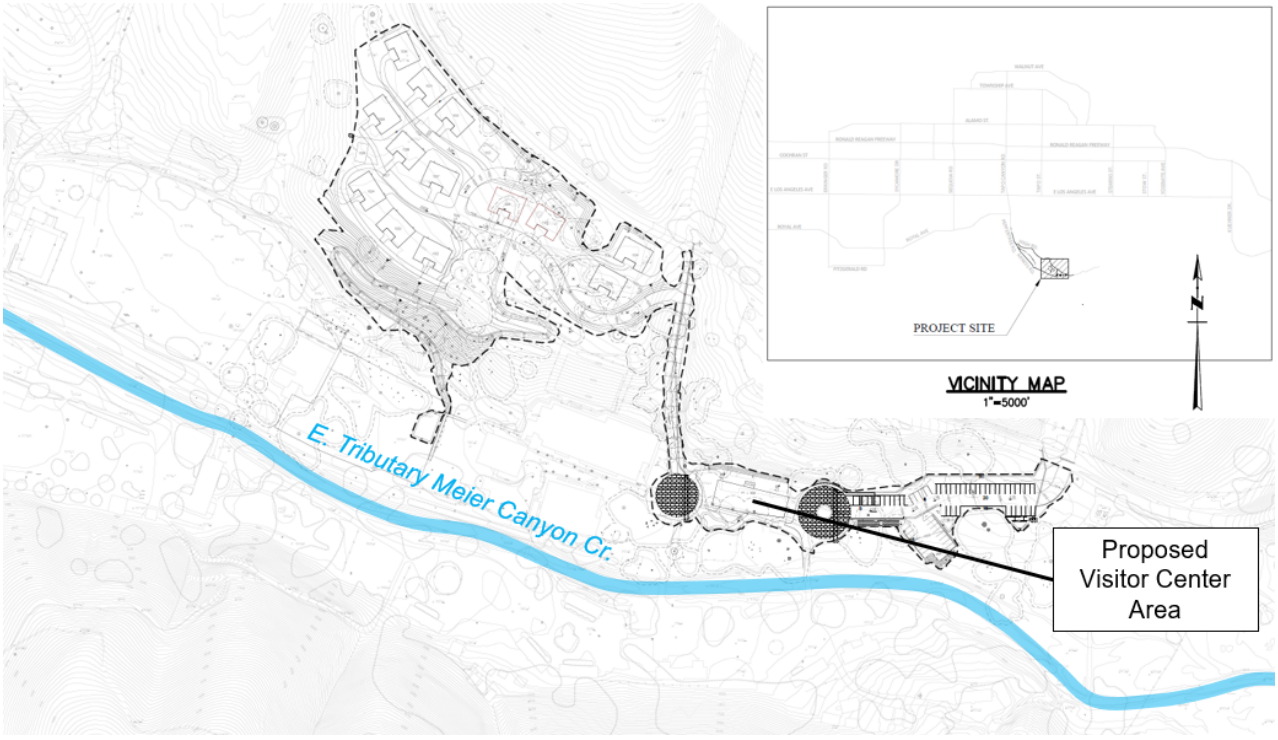

Figure 1. Meier Canyon Creek and Camp Alonim facilities study area

Reference: Meier Canyon Floodplain Study Update

This technical memorandum (memo) was prepared to document the results of the hydraulic analysis and the 100-year floodplain characteristics for the proposed Camp visitor center development along the East Tributary of Meier Canyon Creek. Outcomes for the estimated changes in hydraulics resulting from the proposed development are summarized.

Existing Condition Analysis

An existing condition hydraulic model for the Study Reach in the vicinity of the Camp project area was developed based upon the 2018 one-foot contour aerial photometric data (Cooper Aerial Surveys Co.). The model is a one-dimensional (1D), steady-state HEC-RAS model that includes an approximately 2,900-foot reach of Meier Canyon Creek from south of the Camp to the western edge of the Camp as well as an approximately 2,900-foot reach of the East Tributary Meier Canyon Creek (reach adjacent to the proposed new visitor center structure). A schematic of the existing condition 1D HEC-RAS model geometry of the Study Reach, including cross-section locations, is shown on **Figure 2**.

The 100-year flood discharge values for the Meier Canyon Creek reaches within the hydraulic model utilized the peak flows developed for future conditions in the 2014 Simi Valley Drainage Plan provided by the Ventura County Watershed Protection District (VCWPD, 2014) and are summarized in **Table 1**.

Reference: Meier Canyon Floodplain Study Update

Figure 2. Schematic of 1D HEC-RAS hydraulic model geometry for Meier Canyon Creek Study Reach, existing condition

Table 1.100-year flood discharge values for Meier Canyon Creek (VCWPD, 2014)

Reach	Discharge (cfs)
Meier Canyon East Tributary	2,409
Upper Meier Canyon	1,917
Lower Meier Canyon	3,930

Manning's n surface roughness coefficients of the study reach were estimated using the values described in *Open-Channel Hydraulics* (Chow, 1959) based upon Google Earth aerial imagery and available field photo observations. The estimated Manning's n values range from 0.04 within the main channel to 0.06 in the overbank areas considering channel bed materials, vegetation, and other obstructions. A 'mixed flow' regime model simulation was run to allow for computation of supercritical flow and/or hydraulic jumps and assuming normal depths at the upstream and downstream boundaries.

Proposed Condition Analysis

To evaluate the potential changes in the Meier Canyon Creek hydraulic characteristics, Stantec updated the HEC-RAS model to include the proposed structures and topography for the new visitor center and adjacent infrastructure at 17 model cross-sections between stations 5032 and 4350. **Figure 3** shows the updated model geometry, including the additional interpolated cross-sections added along the East Tributary Meier Canyon Creek reach (light green lines with a minimum spacing of 25 feet) and the updated terrain for the proposed visitor center structure and adjacent infrastructure.

Reference: Meier Canyon Floodplain Study Update

Figure 3. Schematic of 1D HEC-RAS hydraulic model geometry for Meier Canyon Creek Study Reach, proposed condition

Analysis Results

Based on the 1D hydraulic models described in the previous sections of this memo, the floodplain limits for the existing vs. proposed conditions were delineated and are shown on **Figure 4**. **Figure 5** shows a closer view of the estimated floodplain limits for the existing vs. proposed conditions with the proposed visitor center footprint and surface contour details.

A profile of the channel thalweg for the East Tributary of Meier Canyon Creek and maximum water surface elevation for the existing and proposed conditions is shown on **Figure 6**. **Figure 7 – Figure 11** show cross-section results at selected cross-sections upstream, adjacent to, and downstream of the proposed visitor center development area. Note, the blue and red vertical lines on **Figure 8 – Figure 10** show the approximate lateral limits of the floodplain boundary for the existing vs. proposed conditions, respectively.

Reference: **Meier Canyon Floodplain Study Update**

Figure 4. Comparison of existing vs. proposed conditions for 100-year flood along East Tributary of Meier Canyon Creek

Reference: **Meier Canyon Floodplain Study Update**

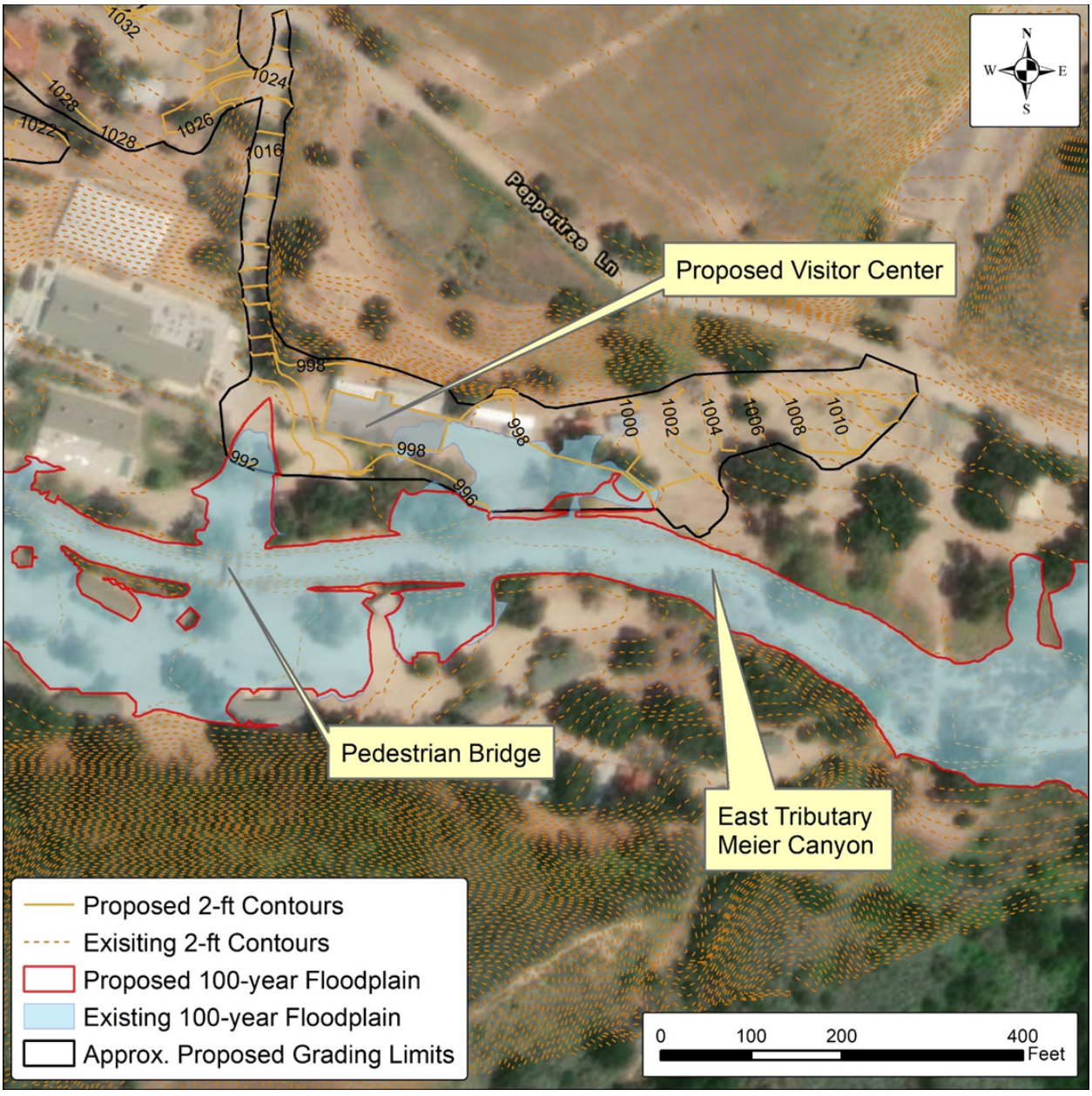

Figure 5. Comparison of existing vs. proposed conditions for 100-year flood along East Tributary of Meier Canyon Creek, closer view of visitor center footprint and surface contours

Reference: Meier Canyon Floodplain Study Update

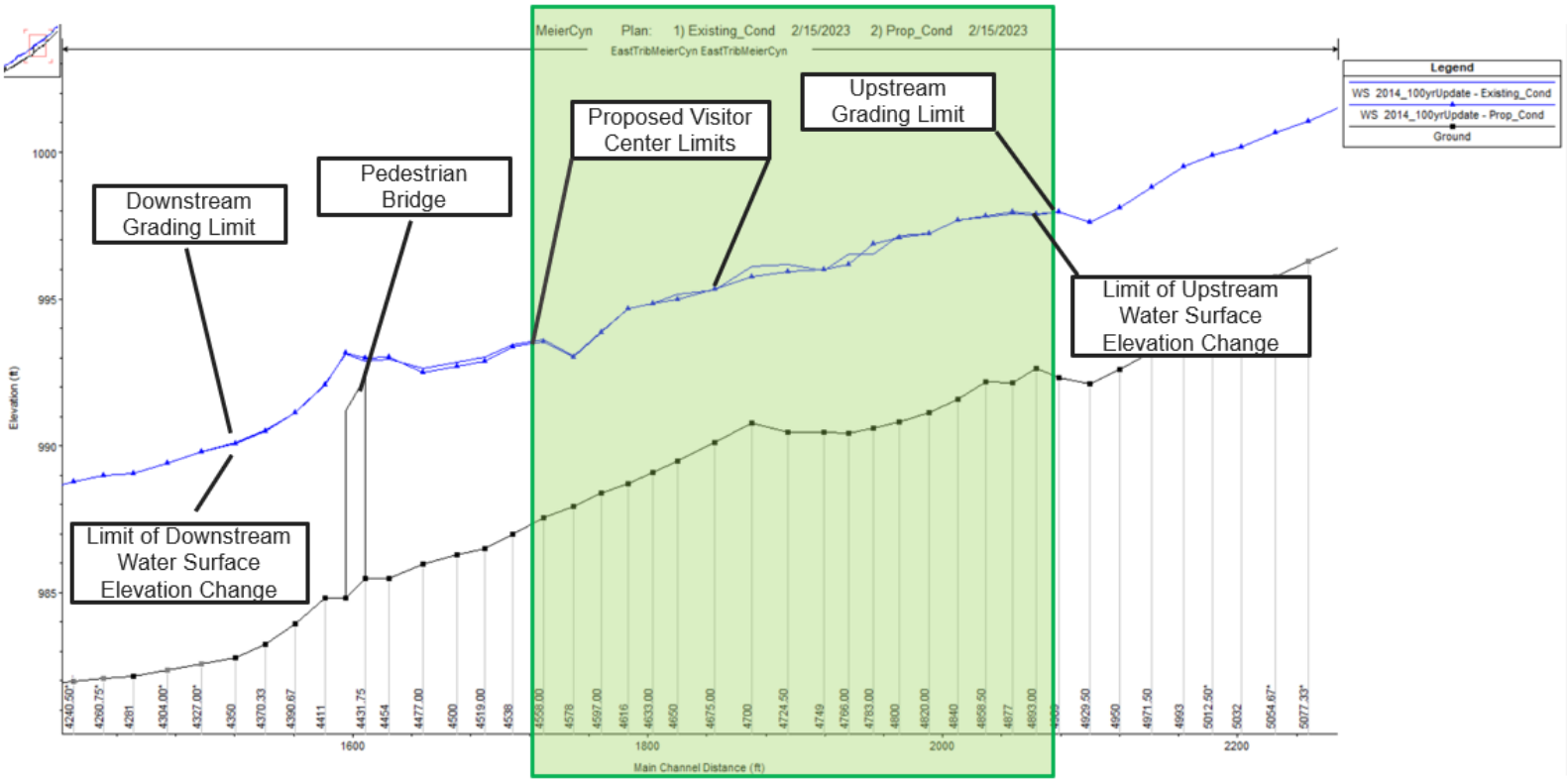

Figure 6. Profile of East Tributary of Meier Canyon Creek HEC-RAS model water surface profiles for existing vs. proposed conditions

Reference: Meier Canyon Floodplain Study Update

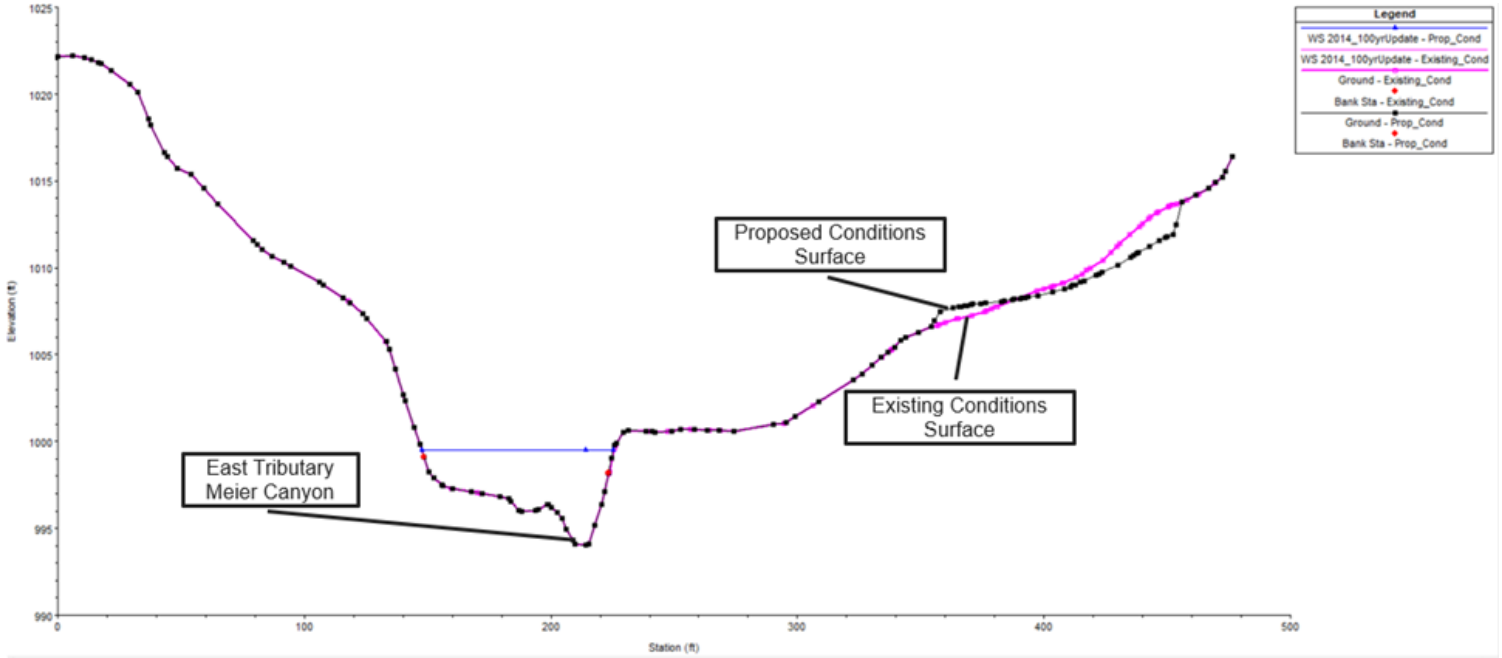

Figure 7. Cross-section 4993 – approximately 400 feet upstream of proposed visitor center

Reference: Meier Canyon Floodplain Study Update

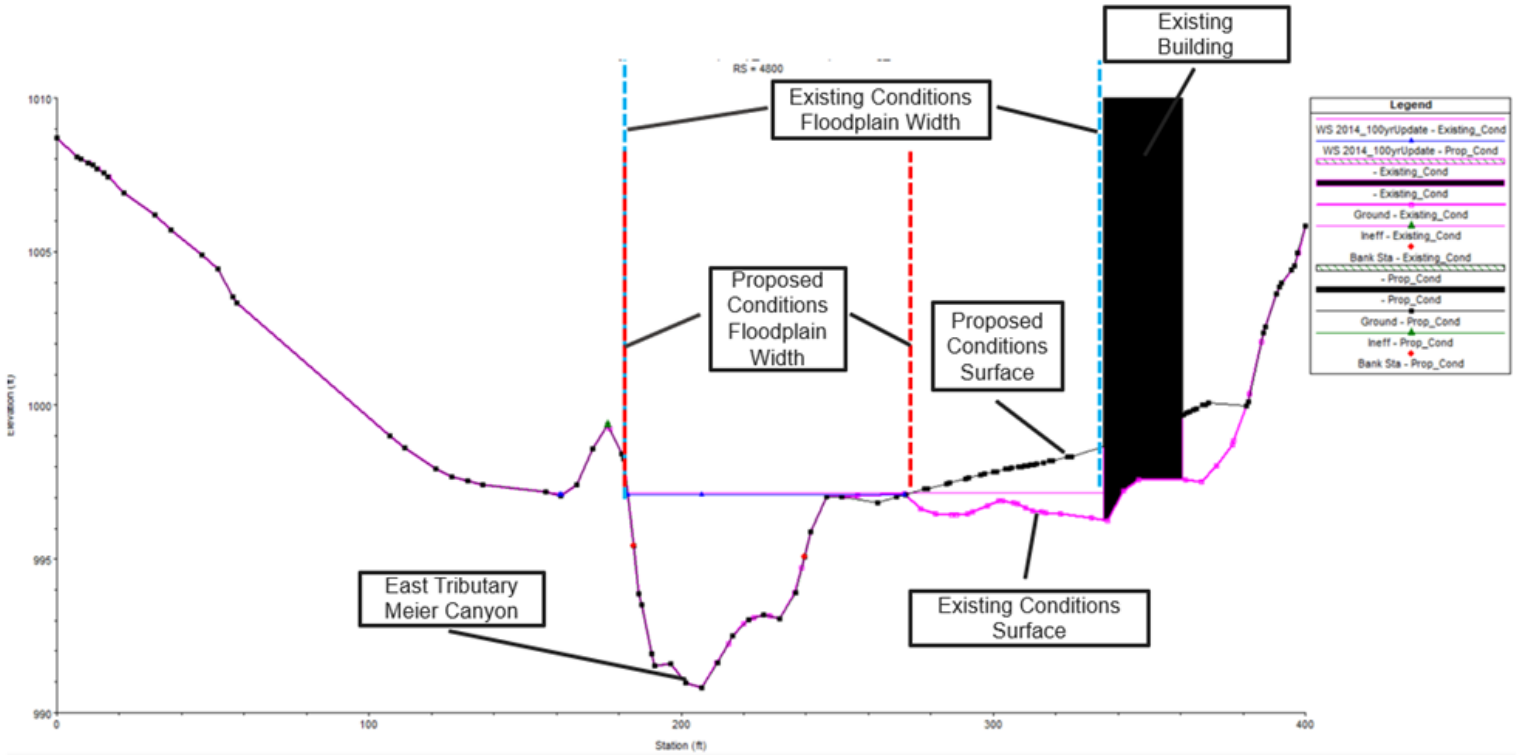

Figure 8. Cross-section 4800 – approximately 150 feet upstream of proposed visitor center

Reference: Meier Canyon Floodplain Study Update

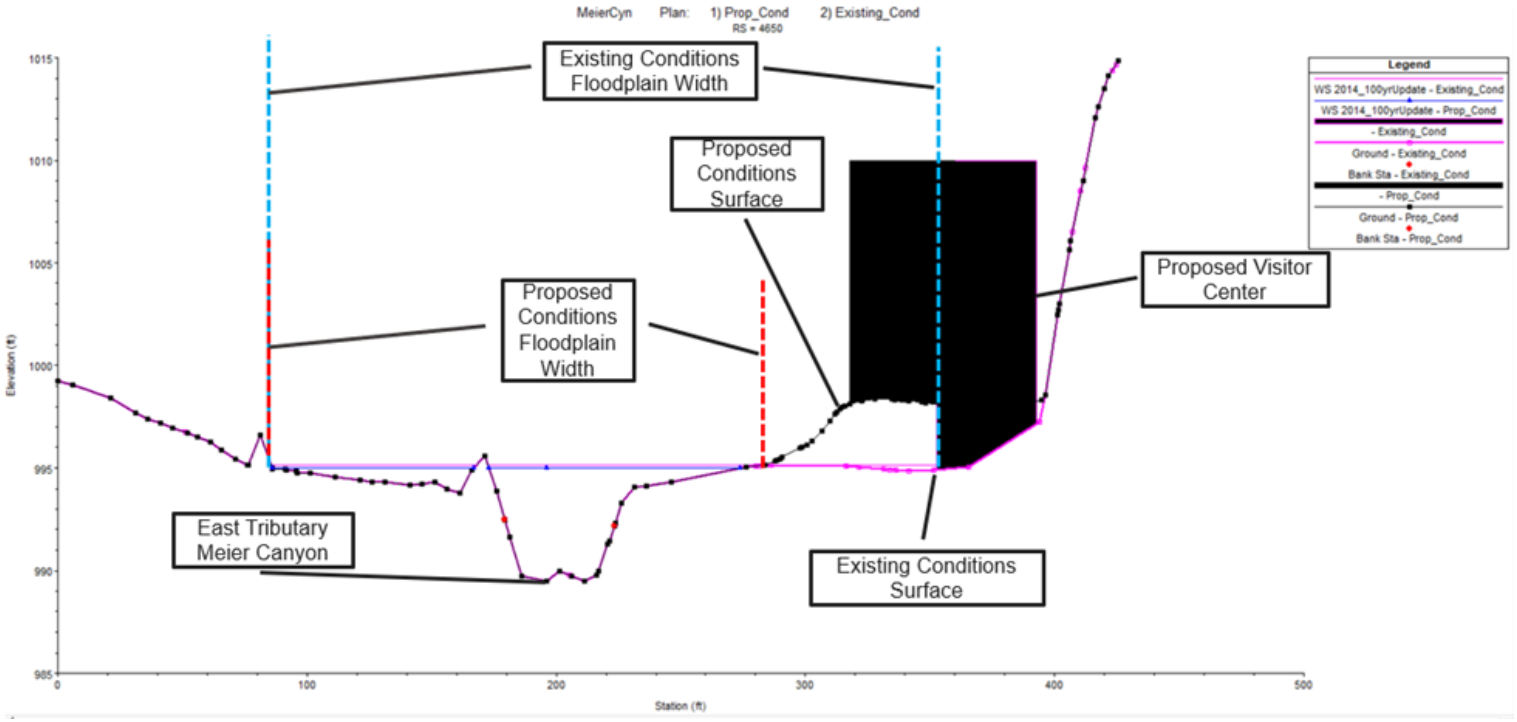

Figure 9. Cross-section 4650 – approximately 230-ft upstream of pedestrian bridge

Reference: Meier Canyon Floodplain Study Update

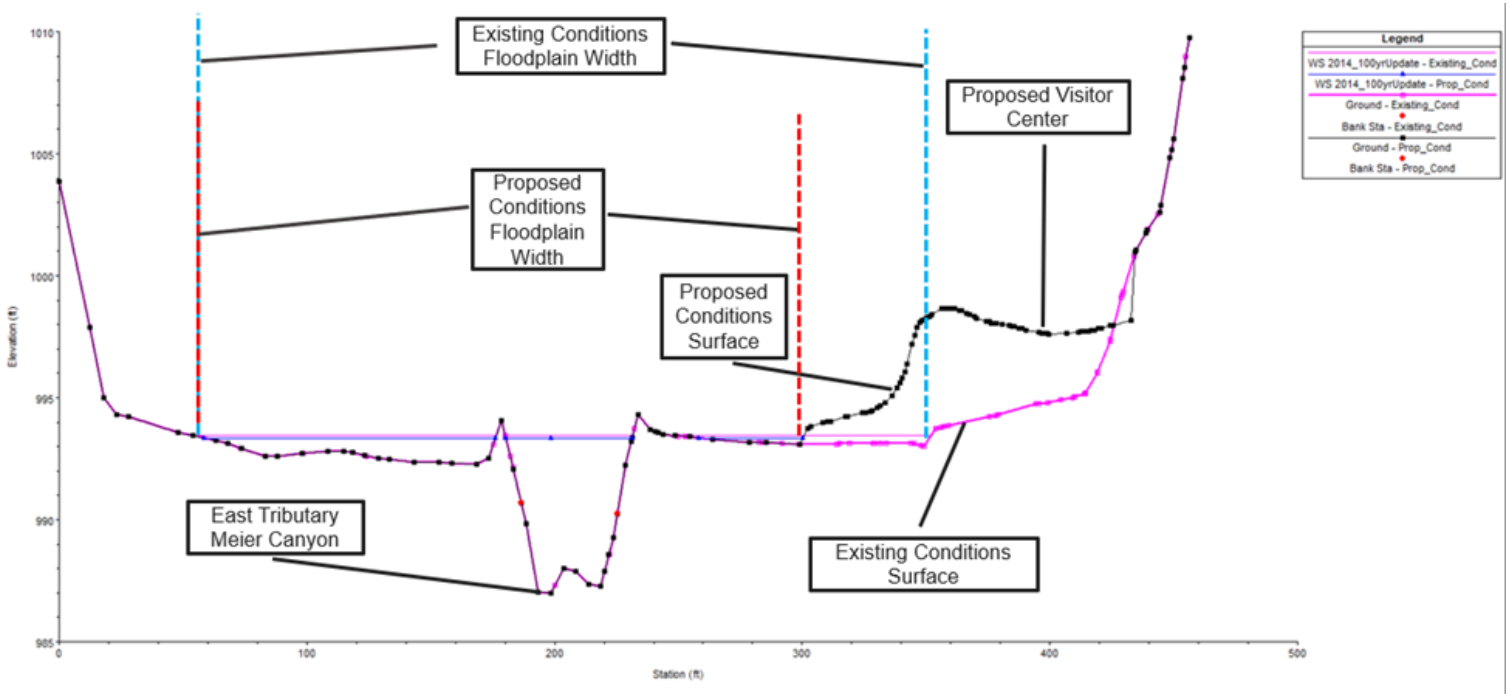

Figure 10. Cross-section 4538 – downstream end of proposed visitor center

Reference: Meier Canyon Floodplain Study Update

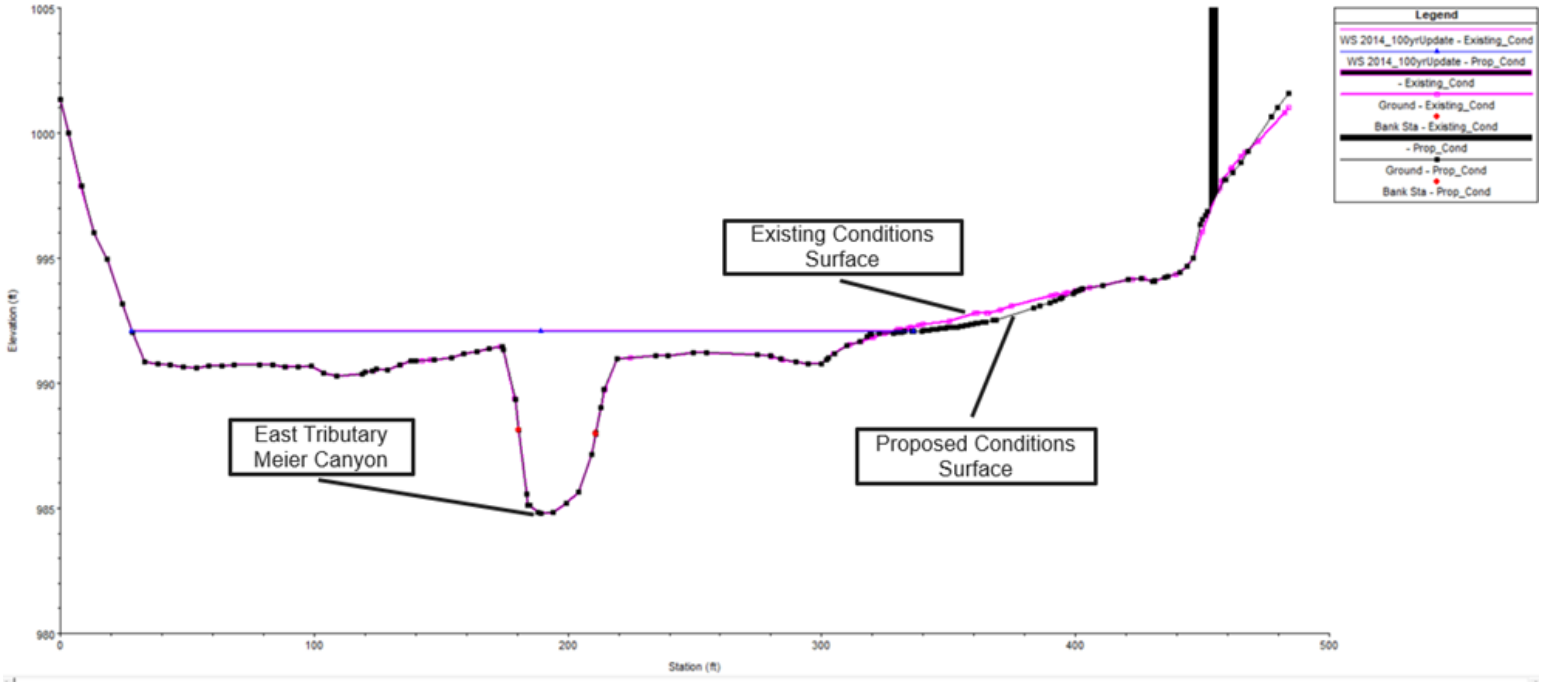

Figure 11. Cross-section 4411 – approximately 30-ft downstream of bridge, downstream end of proposed development area

Reference: Meier Canyon Floodplain Study Update

Tabular 1D hydraulic results for maximum water surface elevation (WSE), flow depth, and average flow velocity for the existing vs. proposed conditions at selected cross-sections adjacent to the proposed visitor center structure location are contained in **Table 2**.

Table 2. Summary of HEC-RAS model results for existing vs. proposed conditions (East Tributary of Meier Canyon Creek, adjacent to proposed visitor center structure location)

Station	Existing Conditions			Proposed Conditions			Change in WSE (ft)
	WSE (ft)	Max. Depth (ft)	Channel Velocity (ft/sec)	WSE (ft)	Max. Depth (ft)	Channel Velocity (ft/sec)	
5700	1,011.6	4.7	9.7	1,011.6	4.7	9.7	0.0
5550	1,011.0	5.8	6.5	1,011.0	5.8	6.5	0.0
5400	1,007.1	5.1	8.9	1,007.1	5.1	8.9	0.0
5250	1,003.6	4.5	7.9	1,003.6	4.5	7.9	0.0
5100	1,001.5	4.8	9.6	1,001.5	4.8	9.6	0.0
5032	1,000.2	4.9	10.4	1,000.2	4.9	10.4	0.0
4993	**999.5**	**5.5**	**10.3**	**999.5**	**5.5**	**10.3**	**0.0**
4950	998.1	5.5	11.8	998.1	5.5	11.8	0.0
4909	998.0	5.6	10.4	998.0	5.7	10.3	0.0
4893	997.9	5.2	9.9	997.9	5.3	9.8	0.0
4877	997.9	5.8	8.9	998.0	5.8	8.8	0.0
4840	997.7	6.1	8.7	997.7	6.1	8.6	0.0
4820	997.2	6.1	9.6	997.2	6.1	9.6	0.0
4800	**997.1**	**6.3**	**9.1**	**997.1**	**6.3**	**9.4**	**0.0**
4783	996.5	5.9	10.3	996.9	6.3	9.6	0.4
4766	996.5	6.1	9.7	996.2	5.7	11.0	-0.3
4749	996.0	5.5	10.6	996.0	5.5	10.6	0.0
4700	996.1	5.3	8.8	995.7	5.0	10.0	-0.4
4675	995.3	5.2	10.5	995.3	5.2	10.3	0.0
4650	**995.2**	**5.7**	**10.0**	**995.0**	**5.5**	**10.4**	**-0.2**
4633	994.8	5.7	10.3	994.8	5.7	10.4	0.0
4616	994.7	6.0	10.3	994.7	6.0	10.3	0.0
4597	993.9	5.5	11.6	993.9	5.5	11.7	0.0
4578	993.0	5.1	12.9	993.0	5.1	12.9	0.0
4558	993.6	6.1	10.0	993.5	6.0	10.3	-0.1
4538	**993.5**	**6.5**	**10.1**	**993.4**	**6.4**	**10.5**	**-0.1**
4519	993.0	6.5	10.8	992.9	6.4	11.2	-0.1
4500	992.9	6.6	10.8	992.7	6.4	11.3	-0.2
4477	992.6	6.7	11.0	992.5	6.5	11.6	-0.1
4454	993.0	7.5	9.2	993.0	7.5	8.8	0.0
Bridge							
4411	**992.1**	**7.3**	**8.8**	**992.1**	**7.29**	**9.0**	**0.0**
4350	990.1	7.3	12.1	990.1	7.31	12.2	0.0

Summary and Conclusions

This analysis developed a comparison of the 100-year floodplains in the vicinity of the proposed visitor center building and adjacent infrastructure (parking lot and roads) between the existing and proposed conditions. As summarized in **Table 2** above, there is expected to be a difference in maximum water surface elevation for the 100-year flood discharge of less than +/- 0.5 foot or less along the East Tributary of Meier Canyon Creek adjacent to the proposed Camp visitor center compared to the existing condition (without visitor center).

At the locations where there are changes in water surface elevation, the is an expected change of average flow velocity (within the channel) of approximately +/- 1 foot/second, with a maximum value of an increase of 1.3 feet/second just upstream of the proposed visitor center. In general, where there was a reduction in flow depth for the proposed conditions, the average flow velocity increased. And where there was an increase in water surface elevation, a reduction in average flow velocity.

Based on the 1D hydraulic model results developed for this analysis, minimal changes in water surface elevation and mean flow velocity for the 100-year flood are expected to occur within the AJU Camp property limits (see **Figure 6**). The estimated changes in flow depth and average velocity are between a distance of approximately 250 upstream of the proposed visitor center to about 300 feet downstream of the visitor center along the East Tributary of Meier Canyon Creek.

The maximum 100-year flood water surface elevation at the location of the proposed visitor center building is estimated to be approximately 995.0 feet (at the upstream, southeast corner of the building footprint). The maximum 100-year flood water surface elevation at the downstream, southwest corner of the building footprint is estimated to be about 992.7 feet. These estimates can be used to select the finished floor elevation for the proposed visitor center structure.

References

Chow, V.T. *Open-Channel Hydraulics*. McGraw-Hill Book Company, 1959.

Cooper Aerial Surveys Co, 2018. *Topographic Mapping for Brandeis Bardin Campus Site*. One-foot contour intervals, July 19.

Ventura County Watershed Protection District (VCWPD), 2014. *Simi Valley MPD 2014 100-year Flood Study*. File: SimiValley_MPD_2014_ComparisonTables.pdf, 1/28/2014.

Sincerely,

STANTEC CONSULTING SERVICES INC.