BENEN

ARCADE-CRIPPLE CREEK TRAIL (SYLVAN TO STOCK RANCH) EXTENSION PROJECT

LOCATION HYDRAULIC STUDY AND SUMMARY ENCROACHMENT REPORT

June 11, 2026
Prepared for: **City of Citrus Heights**



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INTRODUCTION

The City of Citrus Heights proposes to construct a 0.5-mile addition to the planned 16-mile Creek Corridor Trail Project (CCTP) as part of the Arcade-Cripple Creek Trail (Sylvan to Stock Ranch) Extension Project (Project) (Figure 1. Project Location). The Project is funded through the federal Carbon Reduction Program and therefore requires compliance with both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The lead agency for CEQA compliance is the City of Citrus Heights and the federal lead agency for NEPA compliance is the California Department of Transportation (Caltrans).

As shown on Figure 1, tThe Project is located in the City of Citrus Heights and will extend east from the existing Stock Ranch Trail behind the Stock Ranch Commercial Center to Sylvan Road. The proposed alignment begins south of the Commercial property boundary and proceeds east through the Stock Ranch Nature Preserve, curving south around the Commercial Center's water quality detention basin. The alignment continues north, crossing a tributary of Arcade Creek, and traverses along the south side of the Huntington Square Apartments complex prior to connecting to Sylvan Road. The alignment terminates east of Sylvan Road at the location of a planned future trail extension segment from Sylvan Road to Mariposa Avenue. The Project has independent utility and would function as a stand-alone improvement.

Proposed facilities include a paved trail, a new prefabricated bridge across the unnamed creek tributary, solar lighting, bank protection along a segment of Arcade Creek, and an at-grade signalized pedestrian crossing at Sylvan Road. Construction activities will involve grading to achieve ADA-compliant slopes, installing the creek crossing, paving the trail, erecting the solar lighting, constructing bank protection, and adding pedestrian signal infrastructure with minor utility adjustments as needed.

To accommodate construction, right-of-way (ROW) acquisitions will be required from several parcels. These include a permanent easement and permit to enter (PTE) from the Sunrise Recreation & Park District and a TCE from Walmart. An existing trail easement exists across the Huntington Square Apartments property and there is potential for this permanent easement to be modified to best incorporate the trail alignment with the physical site features.

Construction access will be provided primarily through the Commercial Center's parking lot under a TCE, as well as a permit to enter for access from the Huntington Square Apartments parcel. These provisions will allow safe and efficient construction of the trail and its associated improvements.

The Project spans across one Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM): 06067C0083J (effective date 2/22/2024). As shown in Figure 2, the project is located within a regulated floodway. FIRM Panel 06067C0083J, included in Appendix A, also depicts an area of 1% annual chance flood (100-year flood). Consequently, the project must comply with the Code of Federal Regulations (CFR), specifically 44 CFR 60.3(c)(10), which prohibits increasing the Base Flood Elevations (BFE) established by FEMA by more than one foot within floodplain areas and no rise (0.00 ft) within the floodway.

This report presents the hydraulic analysis performed and evaluates how the proposed project may affect BFEs and floodplain boundaries defined by the 100-year flood event.

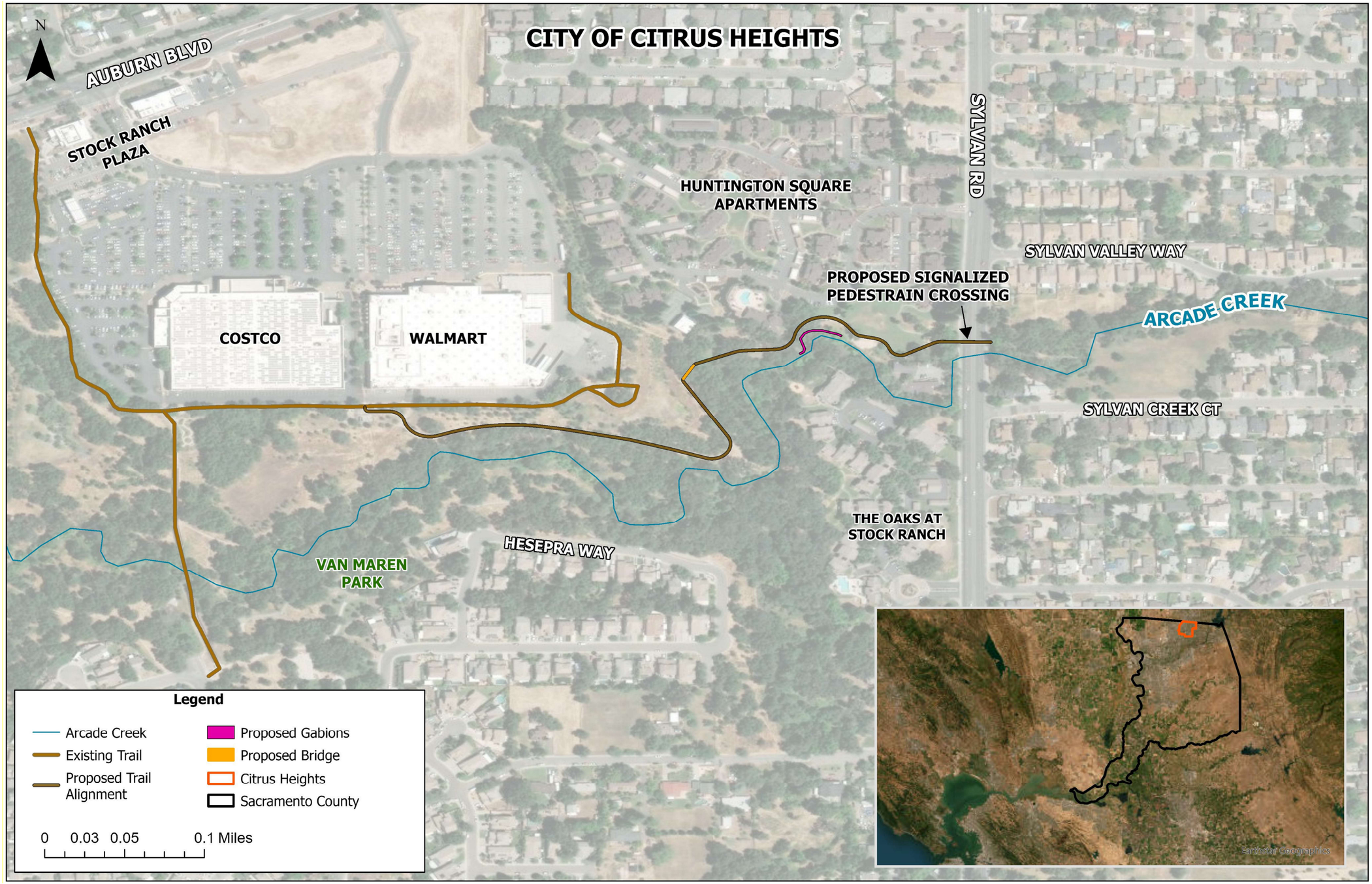


Figure 1. Project Location

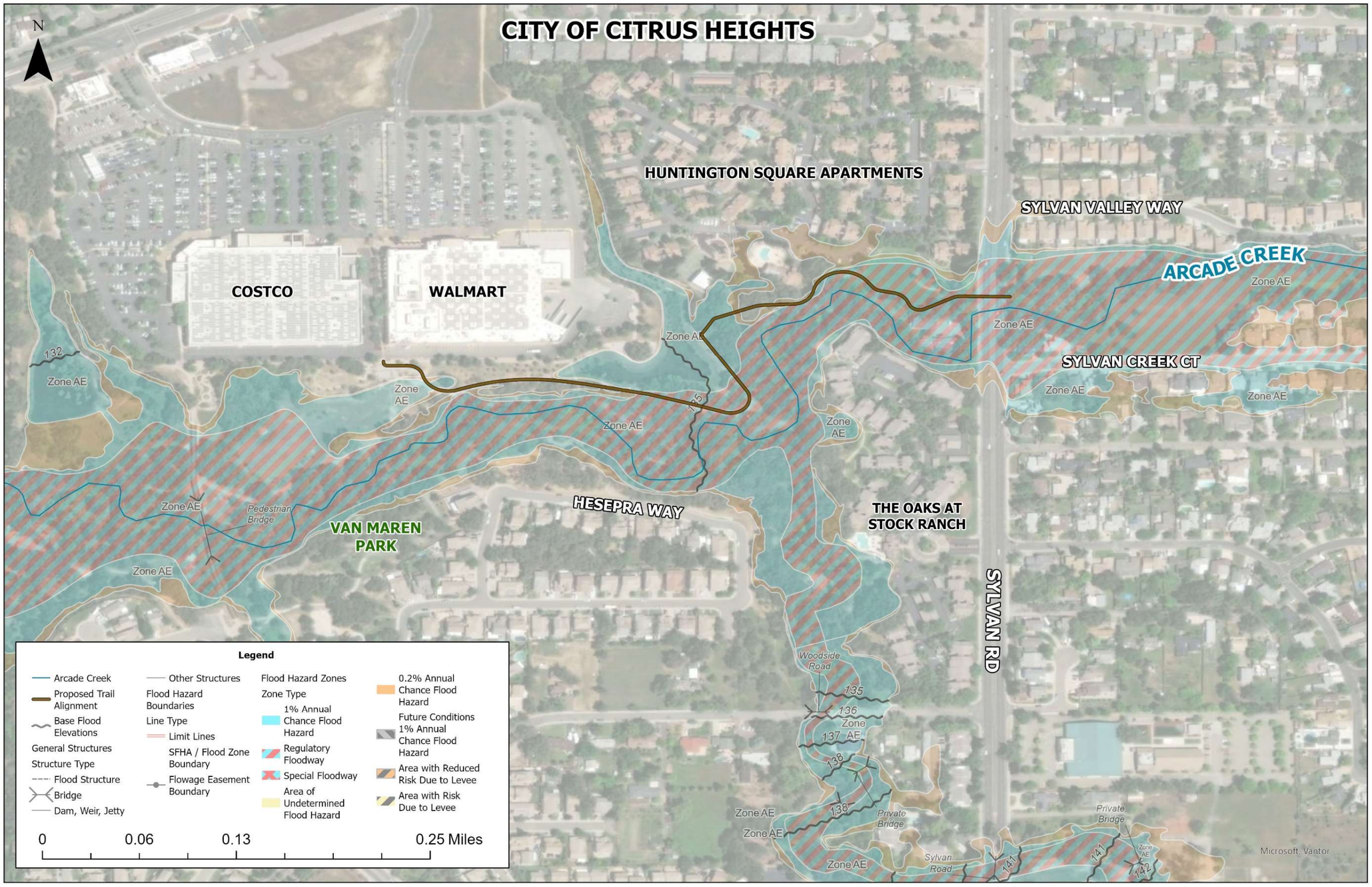


Figure 2. FEMA-Regulated Flood Zone and in Project Vicinity

HYDROLOGY

Given the project's location within a mapped FEMA floodplain, no independent hydrological analysis was conducted as part of this study. Instead, the hydrology from FEMA's Flood Insurance Study (FIS No. 06067CV001E Version No. 2.6.5.6) was used to inform the hydraulic modeling. The event flows sourced from the FIS are included in Table 1.

Table 1. Peak Discharges Provided by the FIS

Storm Event	FIS Discharge (cubic feet per second, cfs)
10-year (10% Annual Chance)	1,260
50-year (2% Annual Chance)	1,700
100-year (1% Annual Chance)	1,840
500-year (0.2% Annual Chance)	2,230

HYDRAULICS

MODELING APPROACH

Multiple hydraulic models were developed to accommodate FEMA-required model types. FEMA's standard sequence for floodplain analysis modeling is as outlined below (FEMA 2020):

1. **Effective Model:** The FEMA Effective Model should be obtained and reviewed to establish baseline floodplain conditions and flood elevations based on the most recently published FIS.
2. **Duplicate Effective Model:** The Duplicate Effective Model is developed as a copy of the Effective Model to confirm that the model inputs are consistent. This step ensures that the resulting water surface elevations match the published values, thereby verifying the accuracy and consistency of the replicated model, as the BFEs of the Duplicate Effective Model must "agree with those of other contiguous studies of the same flooding source within 0.5 ft," per FEMA's General Hydraulic Considerations Guidance Document No. 52, Section 9.2.
3. **Corrected Effective Model:** The Duplicate Effective Model was modified to create the Corrected Effective Model. The Corrected Effective Model examines and corrects any discrepancies in the Duplicate Effective Model with more detailed topographic data used to reflect any naturally occurring changes in the area during the date of the FIRM incorporated

with effective modeling. Additional cross sections may be added to specific areas for further analysis.

4. **Existing Conditions (pre-project):** The Corrected Effective Model is modified to represent the current, as-built conditions within the project area. This includes updates to topography to capture physical changes made to the floodplain since the Effective Model was produced.
5. **Proposed Conditions (post-project):** The Existing Conditions model is modified to reflect post-project conditions. This model incorporates physical changes to the floodplain since the Effective Model was produced and includes proposed design elements such as grading changes and proposed structures.

As per FEMA guidance, the modeled results of the 10-, 50-, 100-, and 500-year storm events were evaluated using the peak discharge values from the FIS as inputs for this reach.

MODEL DEVELOPMENT

The hydraulic models were developed using the 2024 topographic data provided in the Effective Model since the most recent U.S. Geological Survey (USGS) does not have topographic data with high quality resolution. The surveyed topography received on February 11, 2026, was incorporated in the Corrected Effective, Existing Conditions, and Proposed Conditions models. All elevation data presented in this analysis reflect the North American Vertical Datum of 1988 (NAVD88).

Concerns regarding bank erosion close to the trail prompted the inclusion of proposed bank repair, as shown in Figure 3. An additional proposed conditions model was created to simulate the impact of the trail in combination with the bank repair.

To ensure consistency during data analysis, all models were developed as 1D), unsteady-state hydraulic models with identical geometry. The models do not account for infiltration, consistent with the Effective Model. FEMA's original effective model was truncated to the project extent at upstream and downstream tie-in locations, which serve as boundary conditions where the updated model reconnects to unchanged conditions. For this analysis, the tie-in locations were established approximately 500 feet upstream and 274 feet downstream of the project area. The selected upstream and downstream tie-in points are depicted in Figure 4.

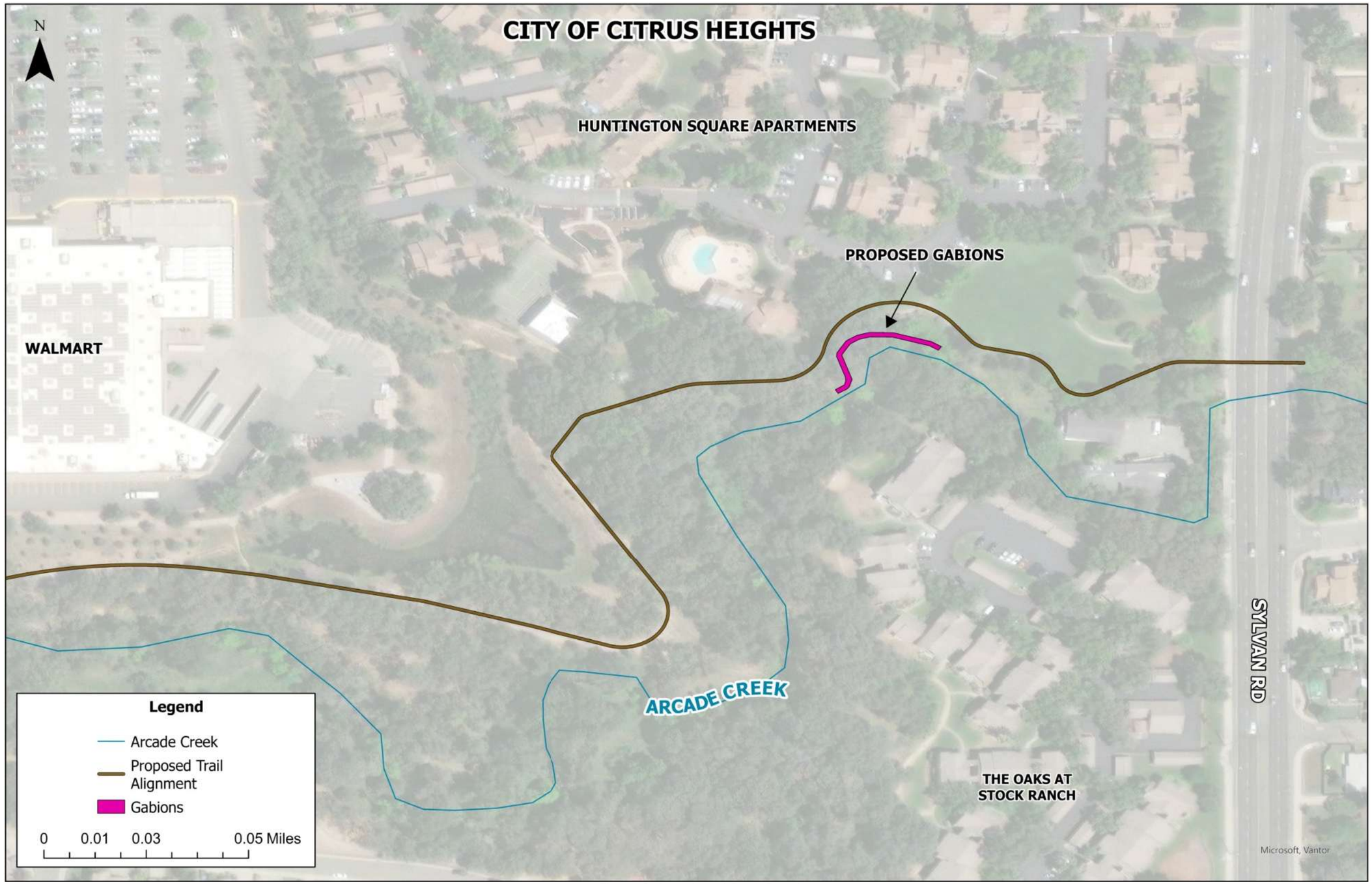


Figure 3. Location of Bank Repair

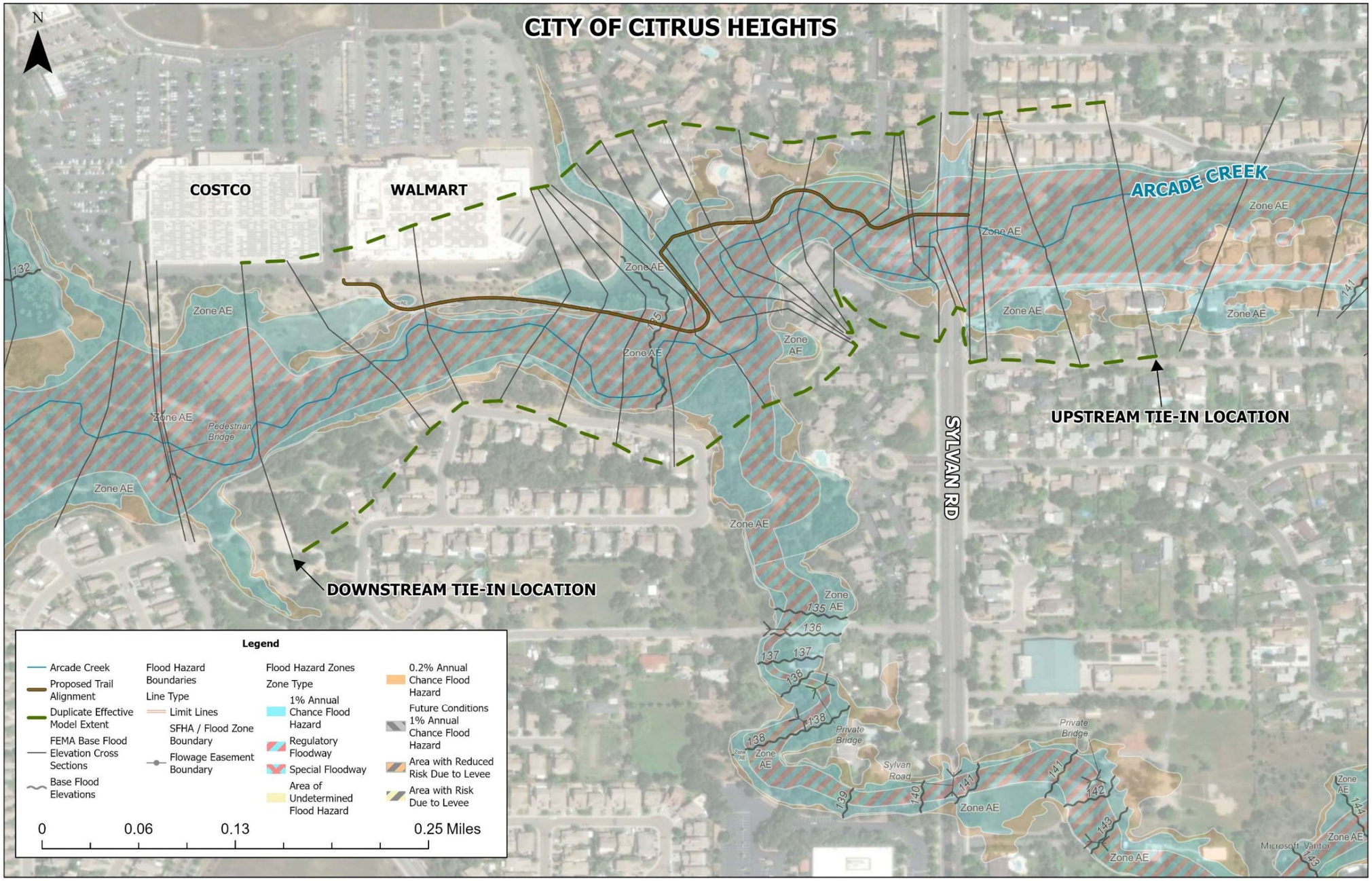


Figure 4. Duplicate Effective Model Tie-in Locations

EFFECTIVE MODEL

The Effective Model in HEC-RAS v5.0.7 was provided by FEMA and received on December 18, 2025. The Effective Model contained infrastructure of creek crossings along Cripple Creek and Arcade Creek and ineffective flow areas at some river stations, which determine areas of ponding water or infrastructure at creek crossings. The Effective Model was copied into HEC-RAS v6.7 Beta5 for improved software compatibility and functionality. Hydraulic results from the two versions were compared to ensure there are no differences and to confirm that the Effective Model performs consistently in the updated software.

DUPLICATE EFFECTIVE MODEL

The Duplicate Effective Model was developed within HEC-RAS v6.7 Beta 5 from the Effective Model to replicate the results and the currently effective FIRM. Elevations and Manning's roughness values were retained from the Effective Model to ensure consistency and minimize the introduction of additional variables that could influence results.

Upstream and downstream boundary conditions were represented using unsteady-state stage-flow hydrographs from the time-series flow data of the Effective Model at the matching cross sections. Stage and flow data inputs for the Duplicate Effective Model were obtained from HEC-RAS Data Storage System (DSS) file included with the Effective Model. During the replication process, it was determined that the published FIS flow values did not reproduce the 100-year floodplain boundary shown in the effective FIRM without utilizing a stage-flow hydrograph as the downstream boundary condition. The stage-flow hydrograph was applied to constrain the model's downstream tie-in location to match the effective BFE within 0.5 foot, as the flow of 1,840 cfs alone did not produce similar results to the effective model with normal depth at this tie-in location. Figure 5 compares the 100-year inundation extents generated using stage hydrograph and normal depth downstream boundary conditions.

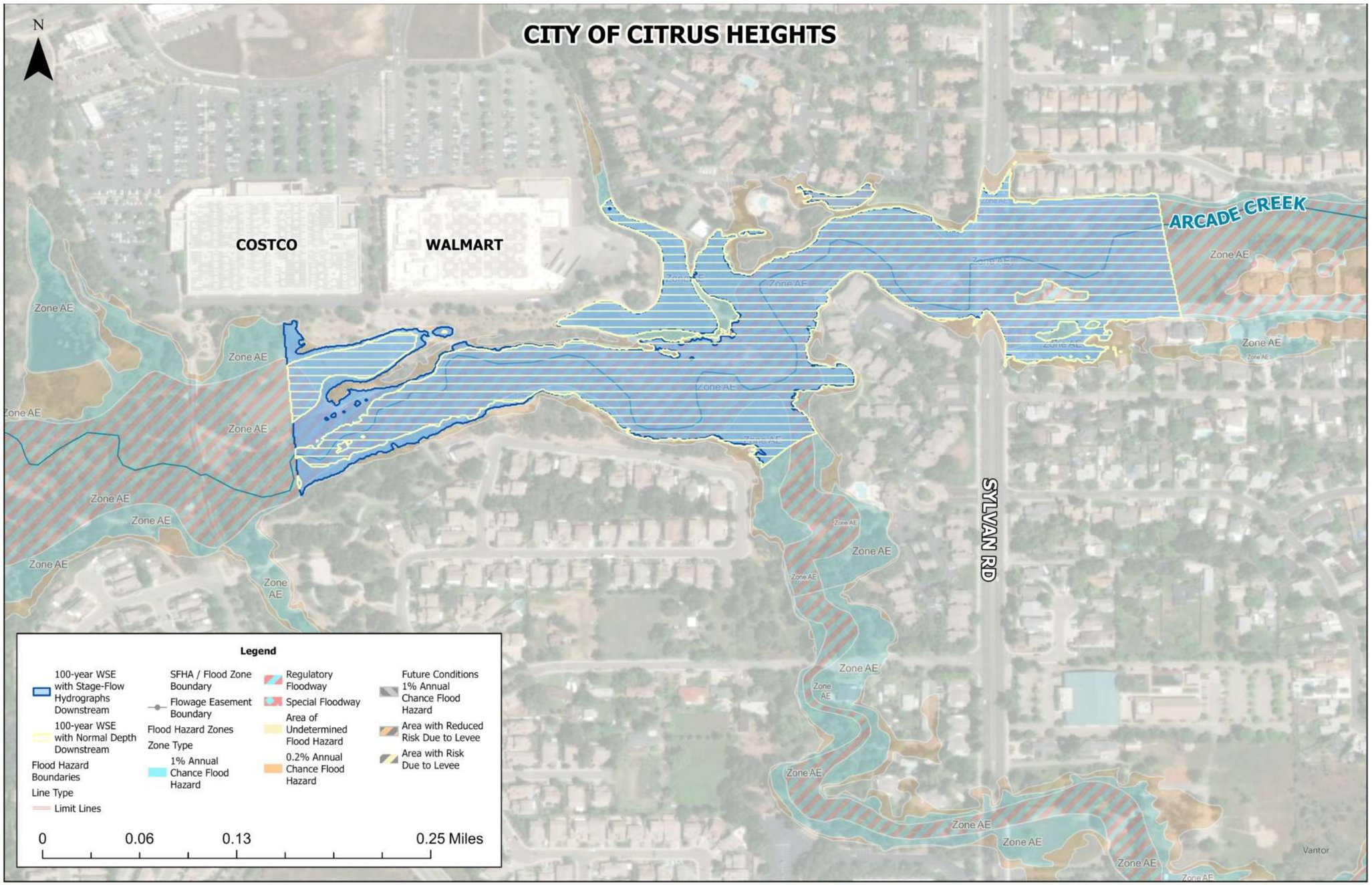


Figure 5. Comparison of Duplicate Effective Model Inundation Extents with Varying Downstream Boundary Conditions

CORRECTED EFFECTIVE MODEL

The Duplicate Effective Model was modified to create the Corrected Effective Model. Additional cross sections with approximated ineffective flow areas, based on ineffective flow areas existing within the model, were added in locations of river bends that did not contain cross sections from the Effective Model and in areas that reflect the cut and fill locations along the proposed trail. Manning's roughness coefficient remained consistent with the Effective Model to minimize discrepancies in results.

EXISTING CONDITIONS MODEL

The Corrected Effective Model was modified to create the Existing Conditions Model by incorporating the surveyed topography into the Corrected Model geometry. The Existing Conditions Model includes survey data received on February 11, 2026, integrated with the terrain used in the Effective Model Manning's roughness coefficient remained consistent with the Effective Model to minimize discrepancies in results.

PROPOSED CONDITIONS MODEL

The Proposed Conditions Model was developed by modifying the Existing Conditions Model to reflect changes in site topography associated with the proposed project, as well as reflecting the proposed creek crossing. The terrain surface for this model combines the proposed finished grade with the underlying USGS and surveyed topographic data used in the Existing Conditions Model.

Additionally, a second Proposed Conditions Model was developed to include the proposed bank protection. To simulate the bank protection within the Proposed Conditions with Gabions Model, the horizontal variation of roughness values was modified in two cross sections to include a Manning's n-value of 0.05 to represent the gabions at the bank repair locations.

MODEL RESULTS

The water surface elevations of the Duplicate Effective Model results fall within ±0.5 feet of the Effective Model at the tie-in locations, meeting FEMA's requirements for duplicate effective modeling. The maximum water surface elevations of the models are compared at FEMA's Base Flood Elevation (BFE) markers since these locations represent the regulatory flood elevations used for floodplain management and mapping. Comparing results at BFE markers ensures that the Duplicate Effective Model accurately reproduces the flood risk depicted on the effective FIRMs and

confirms consistency at key control points along Arcade Creek. BFE Identification #138 and #129 represent the upstream and downstream tie-in locations, respectively.

Table 2 summarizes the computed water surface elevations within the project area, comparing the BFEs from the Effective FIRM to the Duplicate Effective Model. The results indicate that the Duplicate Effective Model produces lower water surface elevations than the Effective Model. Similarly, Table 3 summarizes the differences between the Duplicate Effective Model and the Corrected Effective Model, showing that the Corrected Effective Model yields higher water surface elevations than the Duplicate Effective Model.

Table 2. Comparison of Water Surface Elevations in the Effective FIRM and Duplicate Effective Model

100-year Storm Event Maximum Water Surface Elevation Comparisons			
BFE Identification	**Effective Model WSE (ft)**	**Duplicate Effective WSE (ft)**	**WSE Difference (ft)**
138	138.77	138.75	0.02
136	137.59	137.51	0.08
135	135.77	135.48	0.29
134	134.78	134.25	0.53
133	134.32	133.77	0.55
132	133.75	133.30	0.45
130	132.56	132.41	0.15
129	132.32	132.25	0.07

Table 3. Comparison of Water Surface Elevation in the Duplicate Effective Model and Corrected Effective Model

100-year Storm Event Maximum Water Surface Elevation Comparisons			
BFE Identification	**Duplicate Effective WSE (ft)**	**Corrected Effective WSE (ft)**	**WSE Difference (ft)**
138	138.75	138.83	-0.08
136	137.51	137.58	-0.07
135	135.48	135.46	0.02
134	134.25	134.55	-0.30
133	133.77	134.07	-0.30
132	133.30	133.70	-0.40
130	132.41	132.62	-0.21
129	132.25	132.27	-0.02

The Duplicate Effective Model simulates flood extents that resemble the mapped effective 100-year floodplain extents in the project area, as shown in Figure 6. The inundation extents for the 100-year event for the Corrected Effective Model and Existing Conditions Model are illustrated in Figure 7 and Figure 8, respectively.

The calculated water surface elevations for existing and proposed conditions were extracted from the hydraulic models at the BFE markers and averaged across each marker line.

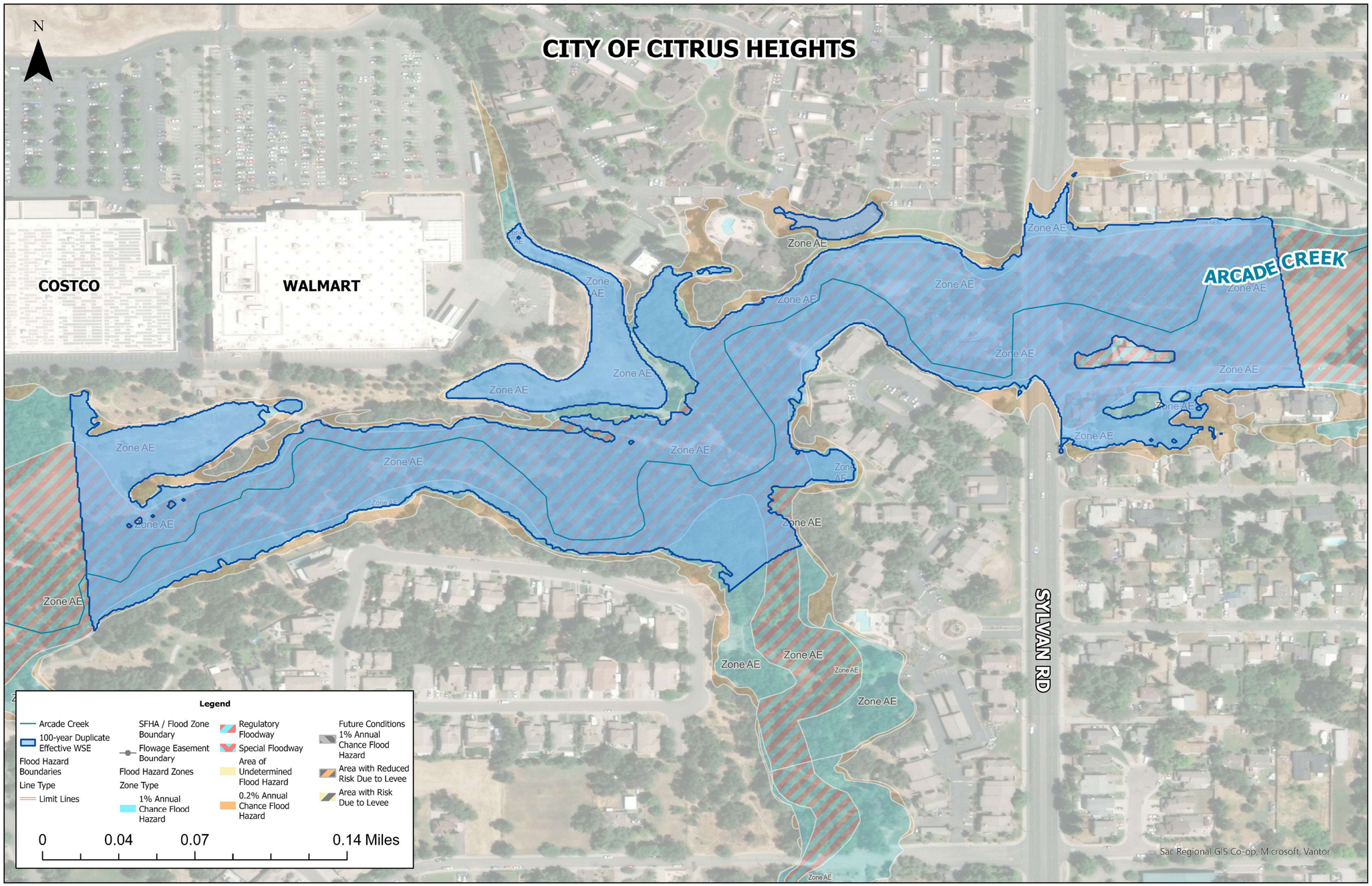


Figure 6. 100-Year Floodplain Boundaries Comparison: Effective FIRM vs. Duplicate Effective Model

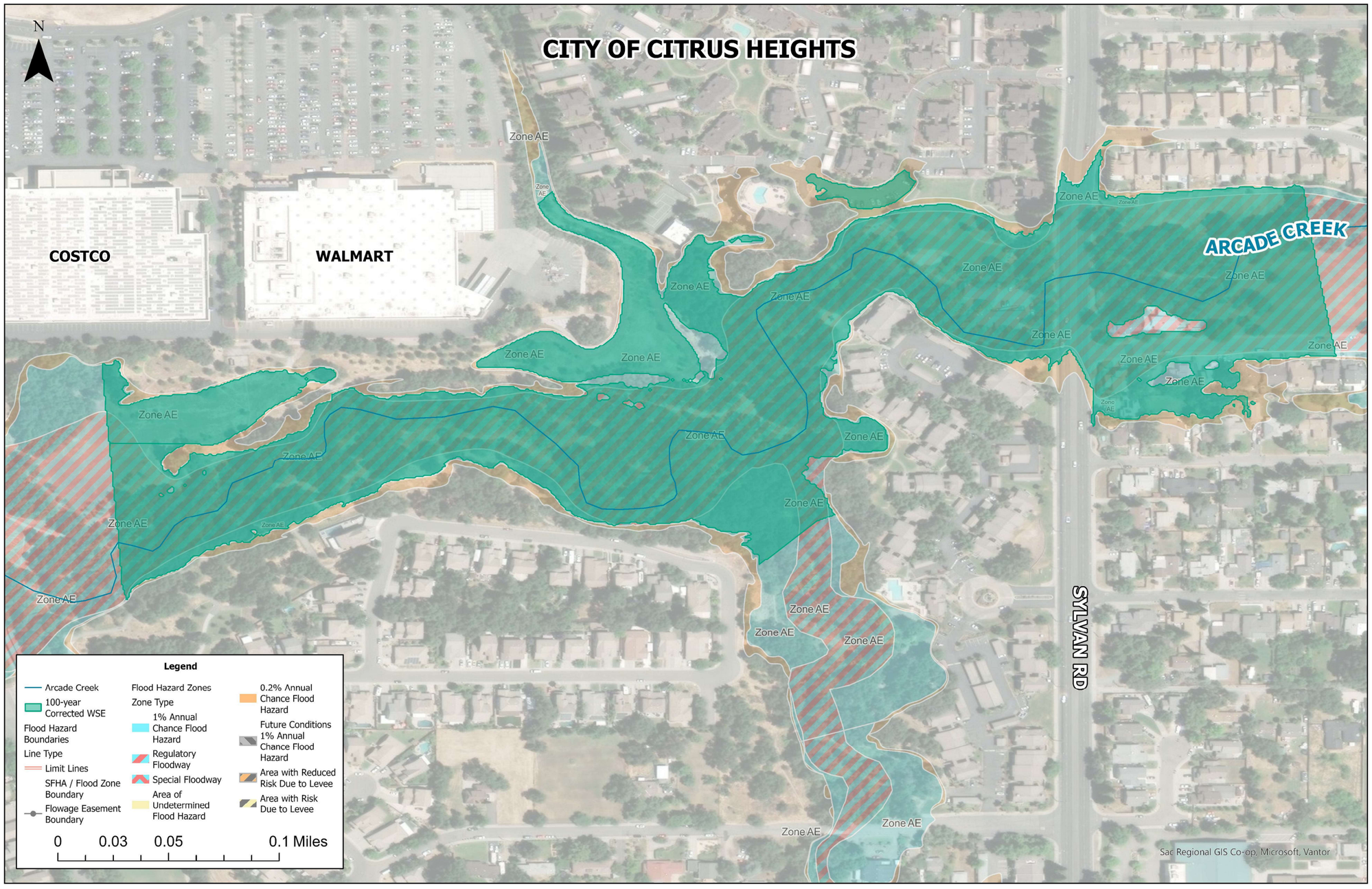


Figure 7. 100-Year Floodplain Boundaries Comparison: Effective FIRM vs. Corrected Effective Model

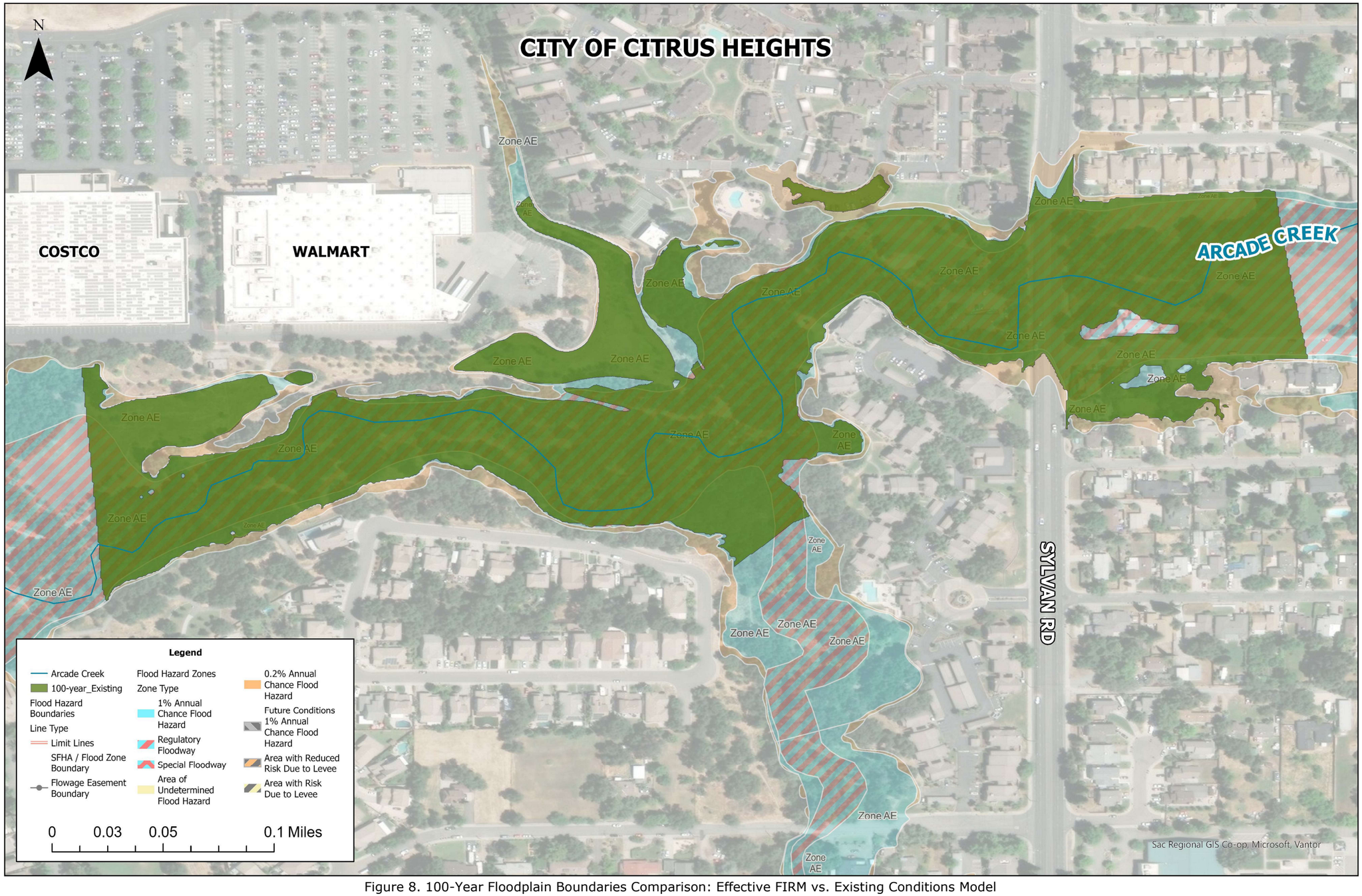


Figure 8. 100-Year Floodplain Boundaries Comparison: Effective FIRM vs. Existing Conditions Model

While the BFEs are consistent between scenarios, the floodplain extents differ. These variations between the Effective and Existing Conditions models result from varying terrains and additional computations points at cross sections carried over from the Corrected Model. Although the elevation data used in the Effective, Duplicate Effective, and Corrected Effective models were originally derived from Digital Elevation Models (DEMs) with a 1-meter resolution, recent survey produced an updated surface along the proposed trail and adjacent creek, extending from where the proposed and existing trails meet to Sylvan Rd. The new surface was then stitched on top of the existing terrain provided in the Effective model to produce the surface in the Existing Conditions.

The simulated inundation differences between existing and proposed conditions are attributed to revised grading. Terrain for the Proposed Conditions reflects the grading of the proposed pedestrian trail on top of the underlying terrain used for the Existing Conditions Model. This variation in floodplain extent is illustrated in Figure 9, where the inundation limits of the Proposed Conditions Model are superimposed on those of the Existing Conditions Model. Similar results are shown in Figure 10, where the inundation limits of the Proposed Conditions with Gabions Model are superimposed on those of the Existing Conditions Model. Additionally, Figure 11 illustrates the inundation differences between the Proposed Conditions and Proposed Conditions with Gabions models superimposed on the Existing Conditions Model, as well as circled areas showing the locations of the differences between the models.

Table 4 presents the impacts of the maximum water surface elevation when bank repair is not implemented (pre-project), and when bank repair is implemented (post-project). Both scenarios include the proposed trail.

Table 4. Water Surface Elevation Comparisons between the Existing Conditions Model and both Proposed Conditions Model

100-year Storm Event Maximum Water Surface Elevation Comparisons					
BFE Identification	Existing Conditions	Proposed Conditions	Proposed Conditions with Gabions	WSE Difference between Existing and Proposed Conditions (ft)	WSE Difference between Existing and Proposed Conditions with Gabions (ft)
	WSE	WSE	W.S. Elev		
	(ft)	(ft)	(ft)		
138	138.83	138.83	138.83	0.00	0.00
136	137.58	137.58	137.58	0.00	0.00
135	135.46	135.46	135.46	0.00	0.00

100-year Storm Event Maximum Water Surface Elevation Comparisons					
BFE Identification	Existing Conditions	Proposed Conditions	Proposed Conditions with Gabions	WSE Difference between Existing and Proposed Conditions (ft)	WSE Difference between Existing and Proposed Conditions with Gabions (ft)
	WSE	WSE	W.S. Elev		
	(ft)	(ft)	(ft)		
134	134.55	134.55	134.55	0.00	0.00
133	134.07	134.07	134.07	0.00	0.00
132	133.70	133.70	133.70	0.00	0.00
130	132.62	132.62	132.62	0.00	0.00
129	132.27	132.27	132.27	0.00	0.00

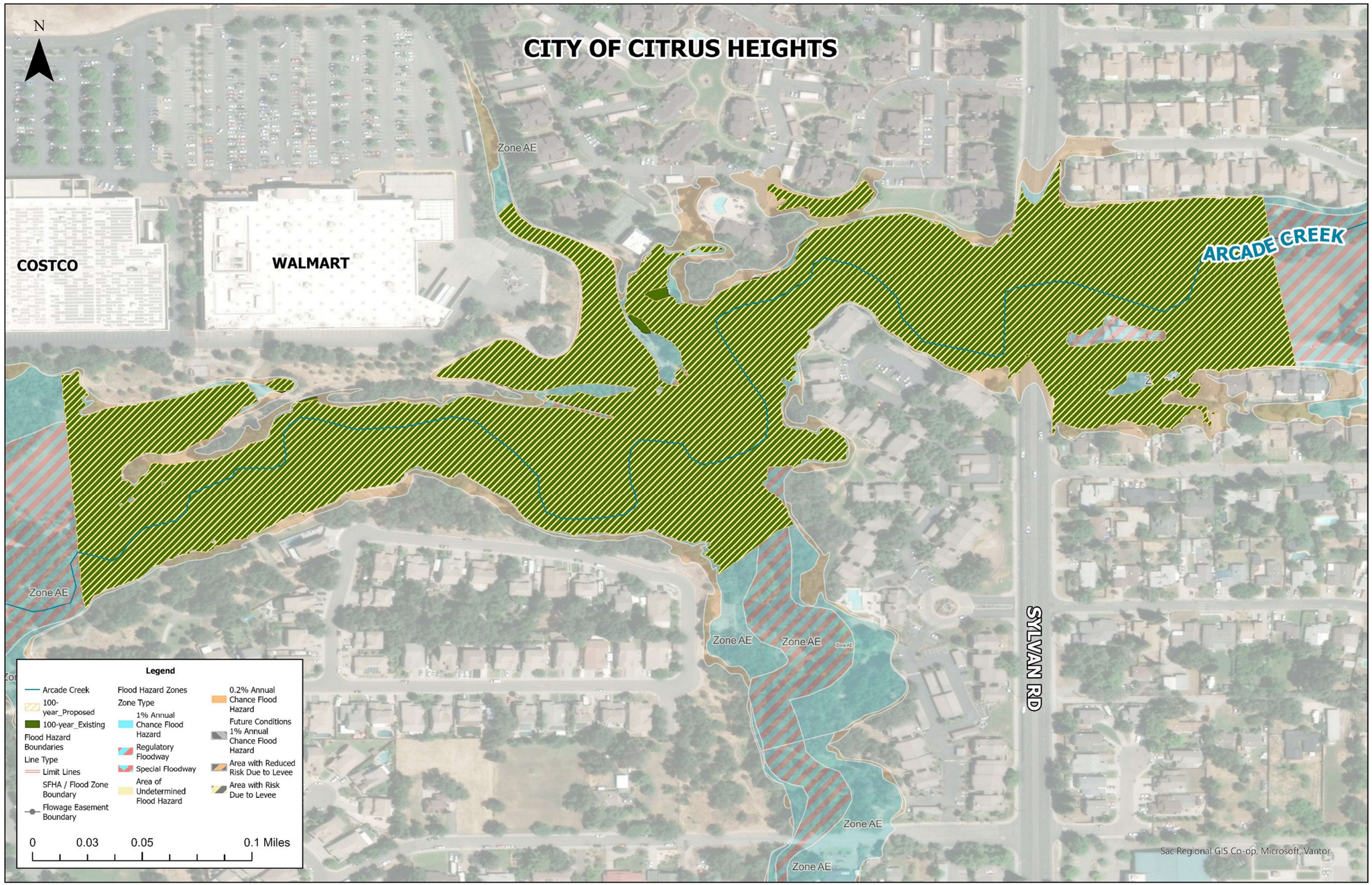


Figure 9. 100-Year Floodplain Boundaries Comparison: Existing Conditions vs. Proposed Conditions



Figure 10. 100-Year Floodplain Boundaries Comparison: Existing Conditions vs. Proposed Conditions with Gabions

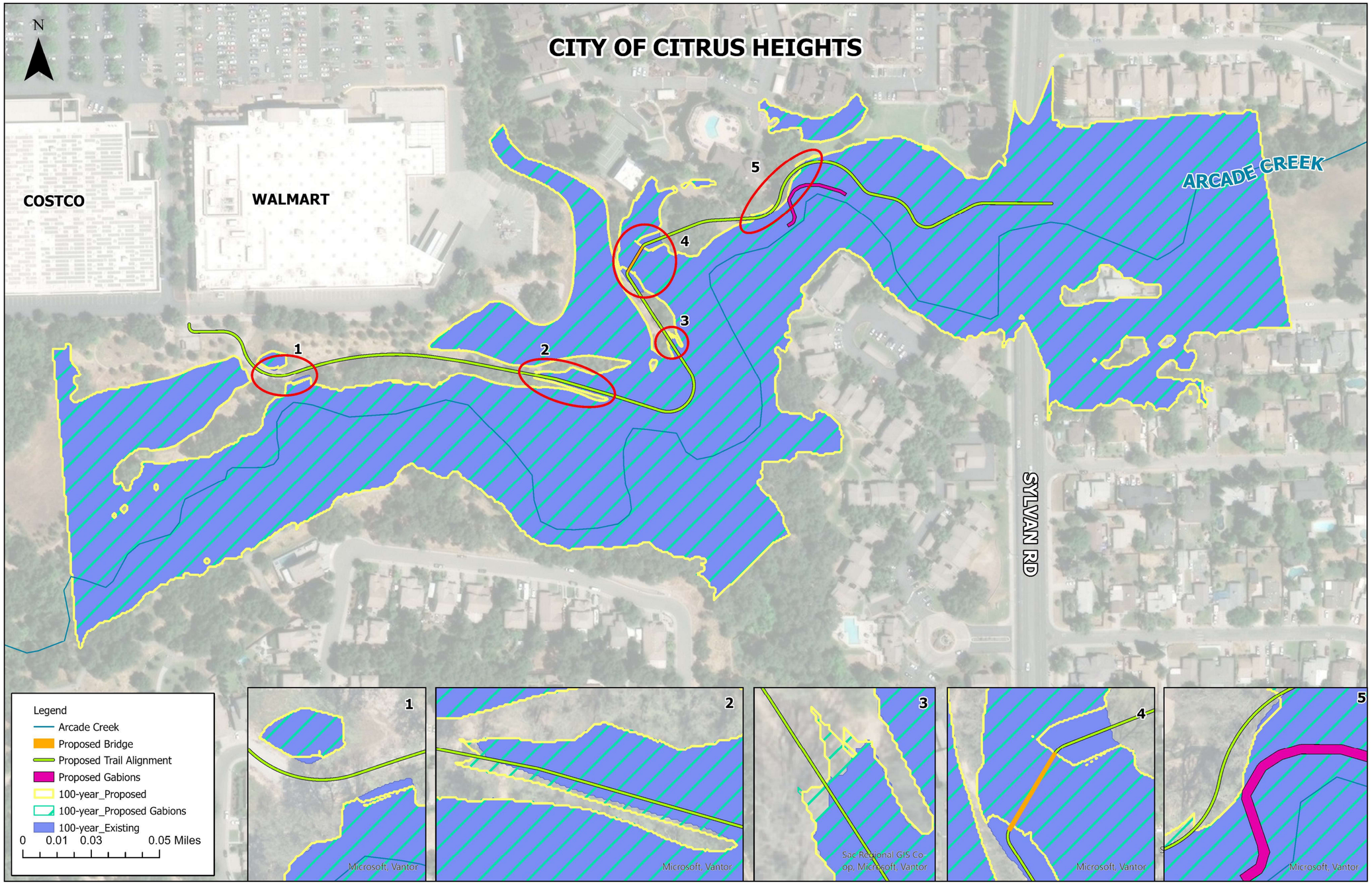


Figure 11. 100-Year Water Surface Elevation Inundation Comparisons of Existing Conditions vs, Proposed Conditions vs. Proposed Conditions with Gabions

In addition to the results tables comparing models at FEMA's BFEs, Appendix E provides a detailed comparison of the maximum water surface elevation at each cross section for the 10-, 50-, 100-, and 500-year storm events. The results show that neither proposed condition nor proposed conditions with gabions models are expected to increase water surface elevations in Arcade Creek during the 10-, 50-, 100-, or 500-year events.

DISCUSSION

The analysis determined that the discharge values provided in the FIS did not reproduce the inundation extents shown on the currently effective FIRM, without the application of a downstream stage hydrograph. The differences in inundation extent are attributed to the variations in cross-section interpolation methods and differing computational accuracy and stability in the 1D solver between the two software versions (HEC-RAS v5.0.7 and HEC-RAS v6.7 Beta 5).

The differences in inundation extents, floodplain boundaries, and water surface elevations of the 100-year event between the Effective Model and Existing Conditions Model suggest that a future map revision may be appropriate to update the BFEs. Such a revision would necessitate modifications to the roughness values and incorporate recent surveyed topography. These updates would help ensure that floodplain delineations more accurately reflect current watershed characteristics and flow dynamics under present-day conditions.

Within the scope of this evaluation, such revisions were not performed, as the objective of this study was limited to determining whether the proposed project would increase the currently effective BFEs.

Although differences in inundation extents are observed between the pre-project and post-project conditions, there is no change in water surface elevation differences (0.00 ft) during the 100-year storm event. This indicates that the proposed trail alignment and bank protection are hydraulically compliant and result in no adverse impact to flood elevations.

In support of coordination with Caltrans, Appendix B and Appendix C include the Location Hydraulic Study Form and Summary Floodplain Encroachment Report, respectively.

RISK ASSESSMENT

RISK ASSOCIATED WITH IMPLEMENTATION

The project area has a known history of localized flooding affecting the property located south of Huntington Square Apartments, near the proposed trail connection to Sylvan Road. Historical records indicate that this property was previously elevated due to flooding associated with Arcade Creek.

The hydraulic modeling results indicate that there is no increase in water surface elevation between the pre-project and post-project conditions for the modeled storm events. Therefore, the proposed project would not increase flood risk to adjacent properties, including the previously impacted area.

IMPACTS ON FLOODPLAIN VALUES

As defined by FEMA, natural floodplains provide important functions, including floodwater storage, attenuation of peak flows, groundwater recharge, water quality improvement, and habitat for fish/wildlife.

The proposed project consists of a recreational trail that enhances connectivity and mobility for Citrus Heights residents and is considered a compatible floodplain use. Project implementation will require temporary vegetation removal and minor grading within the floodplain. These activities may result in short-term minor impacts to biological resources and ecological systems; however, no substantial or permanent loss of floodplain storage, habitat, or ecological function is anticipated. Therefore, the Project would not result in significant impacts to natural and beneficial floodplain values.

SUPPORT OF INCOMPATIBLE DEVELOPMENT

The proposed trail alignment would not induce or support incompatible floodplain development. The trail alignment does not alter base flood elevations, as demonstrated by the hydraulic analysis showing no change in BFEs between existing and proposed conditions.

Although limited ROW acquisitions and temporary construction access will be required in developed areas of Walmart and Huntington Square Apartments, the Project does not facilitate new structural development within the floodplain. Additionally, the Project will not adversely affect emergency

access or evacuation routes. Therefore, the Project does not induce incompatible floodplain development.

MINIMIZATION OF FLOODPLAIN IMPACT

The Project has been designed to minimize both short-term and long-term impacts to the floodplain. Temporary construction disturbances will be minimized through the implementation of best management practices (BMPs), including erosion and sediment control measures.

Permanent improvements, including minor grading, bank protection, and installation of a prefabricated bridge, have been designed to avoid adverse hydraulic impacts. While fill is proposed to support the bridge structure, hydraulic modeling confirms that there are no increases in BFEs between the existing and proposed conditions.

Accordingly, the Project has minimized impacts to the floodplain to the maximum extent practicable.

RESTORATION AND PRESERVATION OF FLOODPLAIN VALUES

The Project is not expected to impact floodplain values. See "Impacts on Floodplain Values" section above.

ALTERNATIVES TO SIGNIFICANT ENCROACHMENT

Caltrans defines a significant encroachment as one that results in any of the following:

- A significant potential interruption or termination of emergency vehicle access or community evacuation routes,
- A significant risk to life or property, or
- Significant adverse impacts on natural and beneficial floodplain values.

The Project will not result in a significant interruption of emergency vehicle access or community evacuation routes, as it consists of a pedestrian trail and does not alter roadway operations.

Hydraulic modeling demonstrates that there is no increase in BFEs; therefore, the Project would not increase flood risk or result in significant potential for loss of property or life.

As discussed in the "Impacts on Floodplain Values" section, the Project will not result in significant adverse impacts to natural and beneficial floodplain values. Therefore, the Project does not constitute a significant floodplain encroachment.

ALTERNATIVES TO LONGITUDINAL ENCROACHMENT

According to Caltrans, longitudinal encroachment occurs when a project is oriented parallel to the direction of flood flow. Although portions of the proposed pedestrian trail are generally parallel to Arcade Creek, it does not qualify as a significant longitudinal encroachment. The Project's localized improvements, including minor grading, bank protection, and a prefabricated bridge, do not substantially obstruct or restrict lateral flow within the floodplain. Hydraulic modeling results demonstrate no increase in BFEs between the existing and proposed conditions, indicating that impacts to floodplain conveyance are negligible.

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APPENDIX A

FEMA Flood Insurance Rate Map Panel 06067C0083J

121°18'0"W

38° 43'7.52" N,
121° 18'45.05" W

38° 43'7.52" N,
121° 16'52.55" W

38° 41'15.02" N,
121° 18'45.05" W

38° 41'15.02" N,
121° 16'52.55" W

38°42'0"N

121°18'0"W

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available effective flood hazard information for your community, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Mapping and Insurance Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be downloaded from the website. Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be acquired directly from the Flood Map Service Center at the website listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

Note: Some Special Flood Hazard Areas with elevations may not appear with elevation labels if the Base Flood Elevation or Cross-section line which communicates the elevation for the location appears on the adjacent panel. Please see the Panel Locator Diagram on this map panel to determine the adjacent panel and find the elevation feature there, or alternatively use the Flood Insurance Study report for detailed elevations by flood source.

SCALE

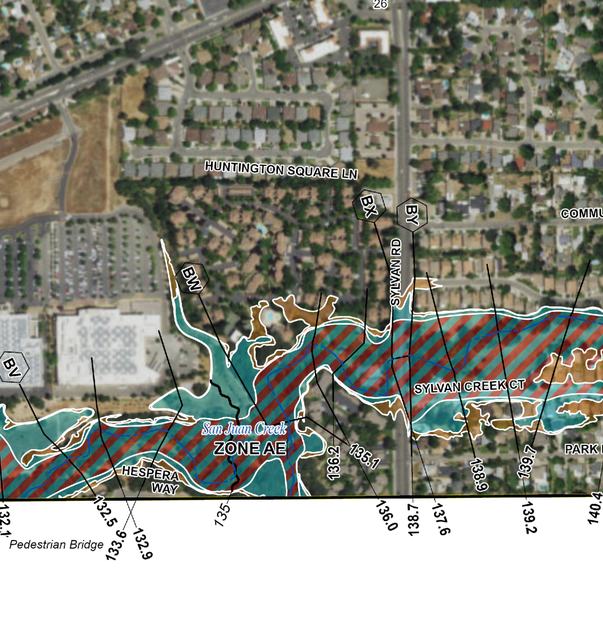
1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 feet

0 50 100 200 300 400 meters

Map Projection:
NAD 1983 StatePlane California II FIPS 0402 Feet
Vertical Datum: NAVD88

PANEL LOCATOR



*PANEL NOT PRINTED

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

SACRAMENTO COUNTY CALIFORNIA AND INCORPORATED AREAS

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
CITY OF CITRUS HEIGHTS	060765	0083	J

MAP NUMBER
06067C0083J
EFFECTIVE DATE
February 22, 2024

APPENDIX B

Location Hydraulic Study Form

LOCATION HYDRAULIC STUDY FORM

Dist. 2 Co. SAC Rte. _____ Project ID _____
Federal-Aid Project Number: _____

Floodplain Description:
The FEMA FIRM indicates the Project is within a high-risk flood area Zone AE. Zone AE represents areas subject to inundation by the 1% annual chance flood (100-year flood) with established Base Flood Elevations.

1. Description of Proposal *(include any physical barriers i.e. concrete barriers, sound walls, etc. and design elements to minimize floodplain impacts)*
The Project includes a new pedestrian signal with pedestrian refuge on Sylvan Road and a new pedestrian bridge crossing Arcade Creek.

2. ADT: Current 26,330 Projected N/A

3. Hydraulic Data: Base Flood Q100= 1,840 CFS
WSE100= 138.77 *The flood of record, if greater than Q100:* 500-year flood
Q= 2,230 CFS WSE= 139.37
Overtopping flood Q= _____ CFS WSE= _____

Are NFIP maps and studies available? NO _____ YES X

4. Is the highway location alternative within a regulatory floodway?
NO _____ YES X

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

Potential Q100 backwater damages:

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

"Natural and beneficial flood-plain values" shall include but are not limited to fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge.

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 _____	YES X
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 Q100 flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B	Property	$ 240,000
	Total	$ 240,000

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.

LOCATION HYDRAULIC STUDY FORM cont.

Dist. 2 Co. SAC Rte. _____ P.M. _____
Federal-Aid Project Number: _____
Project ID _____ Bridge No. _____

PREPARED BY:

Signature:
I certify that I have conducted a Location Hydraulic Study consistent with 23 CFR 650 and that the information summarized in items numbers 3, 4, 5, 7, and 9 of this form is accurate.

_____ *Date* _____
District Hydraulic Engineer *(capital and 'on' system projects)*

_____ *Date* 6/11/26
Local Agency/Consulting Hydraulic Engineer *(local assistance projects)*

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development? NO X YES _____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

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

I certify that item numbers 1, 2, 6 and 8 of this Location Hydraulic Study Form are accurate and will ensure that Final PS&E reflects the information and recommendations of said report:

_____ *Date* _____
District Project Engineer *(capital and 'on' system projects)*

_____ *Date* 6/18/26
Local Agency Project Engineer *(local assistance projects)*

CONCURRED BY:
I have reviewed the quality and adequacy of the floodplain submittal consistent with the attached checklist, and concur that the submittal is adequate to meet the mandates of 23 CFR 650.

_____ *Date* _____
District Project Manager *(capital and 'on' system projects)*

_____ *Date* 6/18/26
Local Agency Project Manager *(Local Assistance projects)*

_____ *Date* _____
District Local Assistance Engineer *(or District Hydraulic Branch for very complex projects or when required expertise is unavailable. Note: District Hydraulic Branch review of local assistance projects shall be based on reasonableness and concurrence with the information provided).*

I concur that the natural and beneficial floodplain values are consistent with the results of other studies prepared pursuant to 23 CFR 771, and that the NEPA document or determination includes environmental mitigation consistent with the Floodplain analysis.

_____ *Date* _____
District Senior Environmental Planner *(or Designee)*

Note: If a significant floodplain encroachment is identified as a result of floodplains studies, FHWA will need to approve the encroachment and concur in the Only Practicable Alternative Finding.

APPENDIX C

Summary Floodplain Encroachment Report

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 2 Co. SAC Rte. ____ PM __
Federal-Aid Project Number *(Local Assistance)*____
Project No.: _____ Bridge No._____
Limits: _____
_____

Floodplain Description: The FEMA FIRM indicates the Project is within a high-risk flood area Zone AE. Zone AE represents areas subject to inundation by the 1% annual chance flood (100-year flood) with established Base Flood Elevations.

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
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	
6.	Does the proposed action constitute a significant floodplain encroachment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

_____ *Date* _____
District Project Engineer *(capital and 'on' system projects)*

_____ *Date* _____
Local Agency Project Engineer *(local assistance projects)*

CONCURRED BY:

_____ *Date* _____
District Project Manager *(capital and 'on' system projects)*

_____ *Date* _____
District Local Assistance Engineer *(Local Assistance projects)*

I concur that impacts to natural and beneficial floodplain values are consistent with the results of other studies prepared pursuant to 23 CFR 771, and that the NEPA document or determination includes environmental mitigation consistent with the Floodplain analysis.

_____ *Date* _____
District Senior Environmental Planner *(or Designee)*

Note: If a significant floodplain encroachment is identified as a result of floodplains studies, FHWA will need to approve the encroachment and concur in the Only Practicable Alternative Finding.

APPENDIX D

Results for 10-year, 50-year, 500-year Flood Events at BFE

50-year Storm Event Maximum Water Surface Elevation Comparisons						
BFE Elevation Identification	FEMA Model	Duplicate Effective	Corrected Effective	Existing Conditions	Proposed Conditions	Proposed Conditions with Gabions
	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
138	138.46	138.45	138.53	138.53	138.53	138.53
136	137.22	137.14	137.24	137.24	137.24	137.24
135	135.39	135.12	135.05	135.05	135.05	135.05
134	134.33	133.78	134.06	134.06	134.06	134.06
133	133.86	133.30	133.56	133.56	133.56	133.56
132	133.25	132.78	133.16	133.16	133.16	133.16
130	131.97	131.82	132.04	132.04	132.04	132.04
129	131.72	131.65	131.68	131.68	131.68	131.68

500-year Storm Event Maximum Water Surface Elevation Comparisons						
BFE Elevation Identification	FEMA Model	Duplicate Effective	Corrected Effective	Existing Conditions	Proposed Conditions	Proposed Conditions with Gabions
	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
138	139.37	139.36	139.43	139.43	139.43	139.43
136	138.37	138.28	138.39	138.39	138.39	138.39
135	136.50	136.21	136.26	136.26	136.26	136.26
134	135.55	134.97	135.39	135.39	135.39	135.39
133	135.16	134.55	134.93	134.93	134.93	134.93
132	134.62	134.07	134.55	134.55	134.55	134.55
130	133.46	133.21	133.37	133.37	133.37	133.37
129	133.21	133.10	133.10	133.10	133.10	133.10

APPENDIX E

Results for 10-year, 50-year, 100-year, and 500-year Flood Events at Cross Sections

10-year Maximum Water Surface Elevation Comparisons						
River Station	FEMA's Effective	Duplicate Effective	Corrected Effective	Existing Conditions	Proposed Conditions	Proposed Condition with Gabions
	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)
41267.82[1]	137.76	137.75	137.75	137.75	137.75	137.75
41083	—	—	137.64	137.64	137.64	137.64
40959.08	137.3	137.28	137.45	137.45	137.45	137.45
40772.13	137.01	136.98	137.16	137.16	137.16	137.16
40739.35	136.57	136.52	136.69	136.69	136.69	136.69
40700.76	Sylvan Rd - Culvert					
40658.06	136.16	136.09	136.26	136.26	136.26	136.25
40649	—	—	136.38	136.38	136.38	136.38
40620	—	—	136.1	136.1	136.1	136.09
40590.11	135.68	135.58	135.83	135.83	135.83	135.82
40483.52	135.45	135.34	135.6	135.6	135.6	135.6
40401	—	—	135.45	135.45	135.45	135.44
40292	—	—	134.99	134.99	134.99	134.98
40195.44	134.85	134.67	134.75	134.75	134.75	134.74
40126	—	—	134.57	134.57	134.57	134.56
40022.97	134.55	134.34	134.34	134.34	134.34	134.33
40012	—	—	134.32	134.32	134.32	134.32
39984	—	—	134.27	134.27	134.27	134.27
39936	—	—	134.07	134.07	134.07	134.07
39894.7*	134.37	134.13	133.98	133.98	133.98	133.99
39827	—	—	133.85	133.85	133.85	133.86
39766.45	134.23	133.97	133.78	133.78	133.78	133.78
39745	—	—	133.81	133.81	133.81	133.81
39640.8*	133.96	133.67	133.43	133.43	133.43	133.43
39596	—	—	133.48	133.48	133.48	133.48
39515.2	133.71	133.34	133.32	133.32	133.32	133.32
39413	—	—	133.14	133.14	133.14	133.14
39339.4*	133.3	132.77	132.9	132.9	132.9	132.91
39276	—	—	132.88	132.88	132.88	132.88
39163.66	133.15	132.54	132.79	132.79	132.79	132.79
39139	—	—	132.7	132.7	132.7	132.7
39013	—	—	132.5	132.5	132.5	132.5
38944.4*	132.77	132.16	132.32	132.32	132.32	132.32
38855	—	—	132.22	132.22	132.22	132.22
38725.1*	132.32	131.76	132.03	132.03	132.03	132.04
38505.93	131.92	131.42	131.73	131.73	131.73	131.73
38471	—	—	131.58	131.58	131.58	131.59
38433	—	—	131.42	131.42	131.42	131.42
38349	—	—	131.4	131.4	131.4	131.41
38318	—	—	131.37	131.37	131.37	131.37
38228	—	—	131.16	131.16	131.16	131.16
38184.33	131.08	130.77	131.09	131.09	131.09	131.09
38139	—	—	130.94	130.94	130.94	130.94
38120	—	—	130.91	130.91	130.91	130.91
38094	—	—	130.8	130.8	130.8	130.8
38011	—	—	130.79	130.79	130.79	130.79
37931.65	130.6	130.44	130.7	130.7	130.7	130.7
37867	—	—	130.64	130.64	130.64	130.64
37796	—	—	130.59	130.59	130.59	130.59
37731	—	—	130.45	130.45	130.45	130.45
37675	—	—	130.24	130.24	130.24	130.24
37621	—	—	130.16	130.16	130.16	130.16
37557	—	—	130.14	130.14	130.14	130.14
37512.67[2]	130.12	130.12	130.12	130.12	130.12	130.12

[1] Upstream tie-in location
[2] Downstream tie-in location

50-year Maximum Water Surface Elevation Comparisons						
River Station	FEMA's Effective	Duplicate Effective	Corrected Effective	Existing Conditions	Proposed Conditions	Proposed Condition with Gabions
	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)
41267.82[3]	138.93	138.93	138.93	138.93	138.93	138.93
41083	—	—	138.83	138.83	138.83	138.83
40959.08	138.63	138.62	138.71	138.71	138.71	138.71
40772.13	138.44	138.42	138.5	138.5	138.5	138.5
40739.35	138.34	138.32	138.41	138.41	138.41	138.41
40700.76	Sylvan Rd - Culvert					
40658.06	137.24	137.17	137.21	137.21	137.21	137.2
40649	—	—	137.32	137.32	137.32	137.31
40620	—	—	137.13	137.13	137.13	137.13
40590.11	136.71	136.59	136.81	136.81	136.81	136.81
40483.52	136.48	136.34	136.57	136.57	136.57	136.56
40401	—	—	136.47	136.47	136.47	136.47
40292	—	—	135.95	135.95	135.95	135.94
40195.44	135.87	135.67	135.76	135.76	135.76	135.75
40126	—	—	135.61	135.61	135.61	135.6
40022.97	135.57	135.33	135.39	135.39	135.39	135.38
40012	—	—	135.38	135.38	135.38	135.38
39984	—	—	135.33	135.33	135.33	135.33
39936	—	—	135.13	135.13	135.13	135.13
39894.7*	135.39	135.13	135.06	135.06	135.06	135.06
39827	—	—	134.95	134.95	134.95	134.96
39766.45	135.23	134.95	134.87	134.87	134.87	134.87
39745	—	—	134.91	134.91	134.91	134.91
39640.8*	134.97	134.62	134.51	134.51	134.51	134.51
39596	—	—	134.56	134.56	134.56	134.57
39515.2	134.72	134.32	134.43	134.43	134.43	134.43
39413	—	—	134.25	134.25	134.25	134.25
39339.4*	134.35	133.82	134.07	134.07	134.07	134.07
39276	—	—	134.04	134.04	134.04	134.04
39163.66	134.22	133.61	133.98	133.98	133.98	133.98
39139	—	—	133.88	133.88	133.88	133.88
39013	—	—	133.7	133.7	133.7	133.7
38944.4*	133.86	133.3	133.55	133.55	133.55	133.56
38855	—	—	133.47	133.47	133.47	133.47
38725.1*	133.46	132.95	133.3	133.3	133.3	133.3
38505.93	133.09	132.65	133.04	133.04	133.04	133.04
38471	—	—	132.88	132.88	132.88	132.89
38433	—	—	132.7	132.7	132.7	132.7
38349	—	—	132.71	132.71	132.71	132.71
38318	—	—	132.67	132.67	132.67	132.67
38228	—	—	132.45	132.45	132.45	132.45
38184.33	132.36	132.09	132.42	132.42	132.42	132.42
38139	—	—	132.22	132.22	132.22	132.22
38120	—	—	132.22	132.22	132.22	132.22
38094	—	—	132.1	132.1	132.1	132.1
38011	—	—	132.12	132.12	132.12	132.12
37931.65	131.95	131.8	132.02	132.02	132.02	132.02
37867	—	—	131.97	131.97	131.97	131.97
37796	—	—	131.91	131.91	131.91	131.91
37731	—	—	131.77	131.77	131.77	131.77
37675	—	—	131.6	131.6	131.6	131.6
37621	—	—	131.52	131.52	131.52	131.52
37557	—	—	131.51	131.51	131.51	131.51
37512.67[4]	131.5	131.5	131.5	131.5	131.5	131.5

[3] Upstream tie-in location
[4] Downstream tie-in location

100-year Maximum Water Surface Elevation Comparisons						
River Station	FEMA's Effective	Duplicate Effective	Corrected Effective	Existing Conditions	Proposed Conditions	Proposed Condition with Gabions
	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)	W.S. Elev (ft)
41267.82[5]	139.23	139.23	139.23	139.23	139.23	139.23
41083	—	—	139.13	139.13	139.13	139.13
40959.08	138.93	138.92	139.01	139.01	139.01	139.01
40772.13	138.74	138.72	138.8	138.8	138.8	138.8
40739.35	138.65	138.64	138.71	138.71	138.71	138.71
40700.76	Sylvan Rd - Culvert					
40658.06	137.61	137.53	137.56	137.56	137.56	137.55
40649	—	—	137.67	137.67	137.67	137.67
40620	—	—	137.51	137.51	137.51	137.51
40590.11	137.09	136.96	137.18	137.18	137.18	137.17
40483.52	136.85	136.7	136.93	136.93	136.93	136.92
40401	—	—	136.86	136.86	136.86	136.85
40292	—	—	136.31	136.31	136.31	136.3
40195.44	136.25	136.03	136.14	136.14	136.14	136.13
40126	—	—	136.01	136.01	136.01	135.99
40022.97	135.95	135.7	135.79	135.79	135.79	135.78
40012	—	—	135.78	135.78	135.78	135.78
39984	—	—	135.73	135.73	135.73	135.73
39936	—	—	135.53	135.53	135.53	135.53
39894.7*	135.78	135.49	135.47	135.47	135.47	135.47
39827	—	—	135.37	135.37	135.37	135.37
39766.45	135.61	135.31	135.28	135.28	135.28	135.28
39745	—	—	135.32	135.32	135.32	135.32
39640.8*	135.37	135.01	134.96	134.96	134.96	134.96
39596	—	—	135.01	135.01	135.01	135.01
39515.2	135.13	134.72	134.88	134.88	134.88	134.89
39413	—	—	134.7	134.7	134.7	134.71
39339.4*	134.78	134.25	134.55	134.55	134.55	134.55
39276	—	—	134.53	134.53	134.53	134.53
39163.66	134.65	134.06	134.47	134.47	134.47	134.47
39139	—	—	134.37	134.37	134.37	134.37
39013	—	—	134.2	134.2	134.2	134.2
38944.4*	134.32	133.77	134.07	134.07	134.07	134.07
38855	—	—	133.99	133.99	133.99	133.99
38725.1*	133.94	133.45	133.83	133.83	133.83	133.83
38505.93	133.6	133.17	133.59	133.59	133.59	133.59
38471	—	—	133.43	133.43	133.43	133.43
38433	—	—	133.24	133.24	133.24	133.24
38349	—	—	133.26	133.26	133.26	133.26
38318	—	—	133.23	133.23	133.23	133.23
38228	—	—	133.01	133.01	133.01	133.01
38184.33	132.92	132.66	132.99	132.99	132.99	132.99
38139	—	—	132.78	132.78	132.78	132.78
38120	—	—	132.79	132.79	132.79	132.79
38094	—	—	132.67	132.67	132.67	132.67
38011	—	—	132.69	132.69	132.69	132.69
37931.65	132.54	132.39	132.6	132.6	132.6	132.6
37867	—	—	132.55	132.55	132.55	132.55
37796	—	—	132.49	132.49	132.49	132.49
37731	—	—	132.36	132.36	132.36	132.36
37675	—	—	132.2	132.2	132.2	132.2
37621	—	—	132.11	132.11	132.11	132.11
37557	—	—	132.11	132.11	132.11	132.11
37512.67[6]	132.11	132.11	132.11	132.11	132.11	132.11

[5] Upstream tie-in location
[6] Downstream tie-in location

500-year Maximum Water Surface Elevation Comparisons						
River Station	FEMA's Effective	Duplicate Effective	Corrected Effective	Existing Conditions	Proposed Conditions	Proposed Condition with Gabions
	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev	W.S. Elev
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
41267.82[7]	139.85	139.85	139.85	139.85	139.85	139.85
41083	—	—	139.74	139.74	139.74	139.74
40959.08	139.55	139.54	139.62	139.62	139.62	139.62
40772.13	139.34	139.33	139.4	139.4	139.4	139.4
40739.35	139.25	139.24	139.3	139.3	139.3	139.3
40700.76	Sylvan Rd - Culvert					
40658.06	138.4	138.31	138.31	138.31	138.31	138.31
40649	—	—	138.48	138.48	138.48	138.47
40620	—	—	138.33	138.33	138.33	138.33
40590.11	137.87	137.74	137.97	137.97	137.97	137.96
40483.52	137.62	137.46	137.7	137.7	137.7	137.69
40401	—	—	137.65	137.65	137.65	137.65
40292	—	—	137.05	137.05	137.05	137.04
40195.44	137	136.77	136.92	136.92	136.92	136.91
40126	—	—	136.8	136.8	136.8	136.79
40022.97	136.69	136.43	136.58	136.58	136.58	136.57
40012	—	—	136.57	136.57	136.57	136.57
39984	—	—	136.52	136.52	136.52	136.52
39936	—	—	136.31	136.31	136.31	136.31
39894.7*	136.51	136.22	136.27	136.27	136.27	136.27
39827	—	—	136.17	136.17	136.17	136.17
39766.45	136.33	136.02	136.07	136.07	136.07	136.07
39745	—	—	136.12	136.12	136.12	136.12
39640.8*	136.11	135.75	135.8	135.8	135.8	135.8
39596	—	—	135.85	135.85	135.85	135.85
39515.2	135.87	135.45	135.72	135.72	135.72	135.72
39413	—	—	135.53	135.53	135.53	135.53
39339.4*	135.58	135.01	135.41	135.41	135.41	135.41
39276	—	—	135.38	135.38	135.38	135.38
39163.66	135.48	134.84	135.32	135.32	135.32	135.33
39139	—	—	135.22	135.22	135.22	135.22
39013	—	—	135.06	135.06	135.06	135.06
38944.4*	135.16	134.55	134.93	134.93	134.93	134.93
38855	—	—	134.84	134.84	134.84	134.85
38725.1*	134.81	134.23	134.69	134.69	134.69	134.69
38505.93	134.48	133.94	134.45	134.45	134.45	134.45
38471	—	—	134.27	134.27	134.27	134.27
38433	—	133.41	134.04	134.04	134.04	134.04
38349	—	—	134.08	134.08	134.08	134.08
38318	—	—	134.04	134.04	134.04	134.04
38228	—	—	133.79	133.79	133.79	133.79
38184.33	133.82	—	133.79	133.79	133.79	133.79
38139	—	—	133.52	133.52	133.52	133.52
38120	—	—	133.55	133.55	133.55	133.55
38094	—	—	133.41	133.41	133.41	133.41
38011	—	—	133.46	133.46	133.46	133.46
37931.65	133.44	133.2	133.35	133.35	133.35	133.35
37867	—	—	133.29	133.29	133.29	133.29
37796	—	—	133.25	133.25	133.25	133.25
37731	—	—	133.15	133.15	133.15	133.15
37675	—	—	133.05	133.05	133.05	133.05
37621	—	—	132.98	132.98	132.98	132.98
37557	—	—	132.98	132.98	132.98	132.98
37512.67[8]	132.99	132.99	132.99	132.99	132.99	132.99

[7] Upstream tie-in location
[8] Downstream tie-in location