Print Form

# Notice of Determination

**Appendix D**

**To:**

☒ Office of Planning and Research

*U.S. Mail:* P.O. Box 3044, Sacramento, CA 95812-3044

*Street Address:* 1400 Tenth St., Rm 113, Sacramento, CA 95814

☒ County Clerk
County of: San Bernardino
Address: 222 W. Hospitality Lane, 1st Floor
San Bernardino, CA 92415-0022

**From:**
Public Agency: San Bernardino County Transportation Authority
Address: 1170 W. 3rd Street, 2nd Floor
San Bernardino, CA 92410
Contact: Andres Ramirez
Phone: (909) 884-8276

Lead Agency (if different from above):
Address:
Contact:
Phone:

***SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.***

State Clearinghouse Number (if submitted to State Clearinghouse): 2012041012

Project Title: Redlands Passenger Rail Project (RPRP)

Project Applicant: San Bernardino County Transportation Authority (SBCTA)

Project Location (include county): City of Redlands, San Bernardino County, Mill Creek

Project Description:
RPRP is an approximately nine mile corridor extending east from the City of San Bernardino to the City of Redlands and includes local and express train service. SBCTA certified a Final EIR for the project in March of 2015. Following additional engineering during final design, SBCTA is proposing minor refinements to the project at Bridge 9.4 and University Street. These refinements include a revised design for Bridge 9.4, relocation of a drainage connection previously proposed at the Mill Creek Zanja, a new detention basin (east of I-10 and south of the railroad right-of-way), and expanded roadway improvements north of the at-grade crossing at University Street (and Park Avenue).

2018 JAN 10 AM 10:12
CLERK OF THE BOARD OF SUPERVISORS
COUNTY OF SAN BERNARDINO CALIFORNIA

This is to advise that the San Bernardino County Transportation Authority (☒ Lead Agency or ☐ Responsible Agency) has approved the above described project on 1-4-2018 (date) and has made the following determinations regarding the above described project.

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at:
1170 W. 3rd Street, 2nd Floor, San Bernardino, CA 92410

Signature (Public Agency): _____ Title: CHIEF OF TRANSIT AND RAIL

Date: 1-8-2018 Date Received for filing at OPR: ~~DATE FILED & POSTED~~
Posted On: 01/09/2018
Removed On: 02/21/2018

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2011
Receipt No: 36-01102018-016

State of California - Department of Fish and Wildlife

# 2018 ENVIRONMENTAL FILING FEE CASH RECEIPT

DFW 753.5a (Rev. 01/03/18) Previously DFG 753.5a

Print | StartOver | Finalize&Email

RECEIPT NUMBER:
36 — 01102018 — 016

STATE CLEARINGHOUSE NUMBER *(If applicable)*
2012041012

**SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY.**

| LEAD AGENCY | LEAD AGENCY EMAIL | DATE |
|---|---|---|
| San Bernardino County Transportation Authority | | 01102018 |

| COUNTY/STATE AGENCY OF FILING | DOCUMENT NUMBER |
|---|---|
| San Bernardino | |

PROJECT TITLE
Redlands Passenger Rail Project (RPRP)

| PROJECT APPLICANT NAME | PROJECT APPLICANT EMAIL | PHONE NUMBER |
|---|---|---|
| San Bernardino County Transportation Authority | | (909) 884-8276 |

| PROJECT APPLICANT ADDRESS | CITY | STATE | ZIP CODE |
|---|---|---|---|
| 1170 W. 3rd Street, 2nd Floor | San Bernardino | CA | 92410 |

**PROJECT APPLICANT** *(Check appropriate box)*

☑ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

**CHECK APPLICABLE FEES:**

| | | | |
|---|---|---|---|
| ☑ Environmental Impact Report (EIR) | $3,168.00 | $ | 3,168.00 |
| ☐ Mitigated/Negative Declaration (MND)(ND) | $2,280.75 | $ | 0.00 |
| ☐ Certified Regulatory Program document (CRP) | $1,077.00 | $ | 0.00 |
| ☐ Exempt from fee | | | |
| ☐ Notice of Exemption (attach) | | | |
| ☐ CDFW No Effect Determination (attach) | | | |
| ☐ Fee previously paid (attach previously issued cash receipt copy) | | | |
| ☐ Water Right Application or Petition Fee (State Water Resources Control Board only) | $850.00 | $ | 0.00 |
| ☑ County documentary handling fee | | $ | 50.00 |
| ☐ Other | | $ | |

**PAYMENT METHOD:** CK #625638

☐ Cash ☐ Credit ☑ Check ☐ Other **TOTAL RECEIVED** $ 3,218.00

| SIGNATURE | AGENCY OF FILING PRINTED NAME AND TITLE |
|---|---|
| X | Mariela Barrera, Deputy Clerk |

ORIGINAL - PROJECT APPLICANT | COPY - CDFW/ASB | COPY - LEAD AGENCY | COPY - COUNTY CLERK | DFW 753.5a (Rev. 20151215)

**SAN BERNARDINO COUNTY TRANSPORTATION AUTHORITY**

ACCOUNTS PAYABLE CHECK NO. 625638

| INVOICE NUMBER | DATE | P.O. NUMBER | DESCRIPTION | DISCOUNT | AMOUNT |
|---|---|---|---|---|---|
| Inv. 04 1/4/18 | 01/04/2018 | | APPLICATION FEE - CEQA ENVIRONMENTAI | 0.00 | 3,218.00 |
| | | | | | 3,218.00 |

CLERK OF THE
BOARD OF SUPERVISORS
2018 JAN 10 AM 10:12
COUNTY OF SAN BERNARDINO
CALIFORNIA

PLEASE DETACH BEFORE DEPOSITING

# Addendum No. 5 to the EIR

San Bernardino County Transportation Authority | Redlands Passenger Rail Project

*SCH No. 2012041012*

November 2017

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Attachment D. Hydrology and Hydraulics Report - Bridge 9.4
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# 1 Purpose and Background

On March 4, 2015, the San Bernardino Associated Governments (SANBAG) certified the Final Environmental Impact Report (EIR) for the Redlands Passenger Rail Project (RPRP) (State Clearinghouse No. 2012041012). The Project is proposed to encompass passenger rail operations along an approximately 9-mile corridor extending east from the City of San Bernardino to the City of Redlands. As approved, the Project would include local and express train service via five station stops; two in the City of San Bernardino; and three in the City of Redlands.

Effective January 1, 2017, Senate Bill 1305 consolidated several transportation-related functions into a statutory entity to be called the San Bernardino County Transportation Authority (SBCTA). The joint powers authority San Bernardino Associated Governments (SANBAG) will no longer perform transportation-related functions.

Following additional coordination with local stakeholders, including the City of Redlands and the Southern California Regional Rail Authority (SCRRA or Metrolink), and the completion of the Project's 90 percent design, SBCTA is proposing several design refinements. In general, these design refinements occur east of Church Street in the City of Redlands.

SBCTA has prepared this addendum to the EIR for the RPRP to address the potential environmental impacts associated with the proposed design refinements (refined Project). This addendum is prepared in accordance with the California Environmental Quality Act (CEQA) (Public Resources Code § 21000, et. seq.) and the CEQA Guidelines (California Administrative Code, Title 14, § 15000, et. seq.).

## 1.1 Applicability and Use of an Addendum

SBCTA's intent through preparation of this addendum is to demonstrate whether the previously adopted CEQA document (i.e., Final EIR), including mitigation measures, are still both adequate and valid for the refined Project. Pursuant to Public Resources Code Section 21166 and the CEQA Guidelines, Sections 15162 through 15164, SBCTA as the CEQA lead agency is required to conduct a fact-based evaluation of proposed changes to a Project to determine whether supplemental environmental documentation is required. CEQA Guidelines, Section 15162(a), states that when an EIR is certified for a Project, no Subsequent or Supplemental EIR shall be prepared for that Project unless the lead agency determines that one of the conditions described in Section 15162(a) has occurred.

Based on the analysis set forth in this addendum, SBCTA has concluded that the refined Project does not trigger any of these circumstances, and that an addendum is the appropriate form of documentation to comply with CEQA.

## 1.2 Format of This Addendum

The previously certified EIR serves as the initial environmental compliance document for the Project, and this addendum provides additional clarification and information about the

refined Project. This addendum should be read together with the full text of the previously certified EIR (2015). All mitigation measures applicable from the EIR would be applicable to the refined Project and, therefore, are incorporated by reference into this addendum.

This addendum relies on the use of an Environmental Checklist Form (Checklist), as suggested in Section 15063(d)(3) of the CEQA Guidelines.

## 1.3 Summary of Findings

Based upon the Checklist prepared for the refined Project and supporting responses (Section 3), implementation of the refined Project would not result in substantial changes requiring major revisions to the EIR. Further, the refined Project would not result in any environmental impacts that have not already been addressed in the EIR, and no new mitigation measures are required for the refined Project. Since only minor additions and clarifications are required to the EIR, and none of the conditions described in Public Resources Code Section 21166 or CEQA Guideline Section 15162 has occurred, SBCTA finds that the preparation of an addendum to the EIR is appropriate and consistent with Public Resources Code Section 21166 and CEQA Guideline Section 15162.

## 1.4 Lead Agency and Discretionary Approvals

This addendum and the previously certified EIR are intended to serve as the environmental documentation for the design changes being proposed under the refined Project. The SBCTA is the lead agency under CEQA and maintains authority to approve the addendum.

# 2 Description of Refined Project

## 2.1 Introduction

The approved Project proposes passenger rail operations along an approximately 9-mile corridor extending east from the City of San Bernardino to the City of Redlands. The approved Project would overlay local and express train service using a diesel multiple unit and standard Metrolink trainset, respectively. Local service would occur via five station stops: E Street and Tippecanoe Avenue[1] located in the City of San Bernardino; and New York Street, Orange Street (Downtown Redlands) and University Street (University of Redlands) located in the City of Redlands. Metrolink express service would be limited to downtown Redlands and E Street. Components approved as part of the Project include replacement of the existing railroad tracks and ties, reconstruction or rehabilitation of existing bridge structures, and construction of station platforms and a train layover facility. The EIR also considered auxiliary improvements such as parking, at-grade roadway crossings, pedestrian access, and new and relocated utilities, including water, sewer, storm drain, power, gas, fiber optic, and telephone lines.

SBCTA staff is currently negotiating operations and maintenance agreements with Omnitrans and Metrolink to operate and maintain the Project. Omnitrans, as the San Bernardino Valley transit provider, will operate and maintain the diesel multiple units and Metrolink, as the Southern California region commuter rail operator will provide maintenance-of-way and dispatching services of the Redlands Corridor. Revenue service is anticipated to begin in 2020.

## 2.2 Project Location

The refined Project encompasses the same general Study Area as described for the approved Project in Section 2.3, which extends along existing railroad right-of-way (ROW) owned by SBCTA between the cities of San Bernardino and Redlands, San Bernardino County, California (see Attachment A, Figure 1). Section 2.3 of the EIR provides a detailed description of the Project's location and Study Area.

## 2.3 Refined Project

Subsequent to Project approval in 2015, SBCTA has advanced the Project's design to 90 percent. As part of the Project's final design, SBCTA is proposing several minor design refinements to the approved Project, as was previously defined and analyzed in the Final EIR. The design refinements comprise of a series of physical improvements

[1] SBCTA has considered the environmental effects of relocating the station stop at Waterman Avenue, as proposed in the Final EIR, to Tippecanoe Avenue. Addendum #1 to the EIR provides an assessment of the station relocation to Tippecanoe Avenue, as considered as part of the Preferred Alternative in the EIR.

and are derived from value engineering, design coordination with Redlands, and other stakeholders (e.g., University of Redlands, Metrolink, etc.).

**Proposed Refinements addressed in Addendum 5:** SBCTA is proposing two design refinements to the approved Project. Table 1 provides a summary of these refinements in relation to the improvements originally contemplated in the approved Project (and EIR). These refinements include the following as described further below.

**Refinement No. 1 – Revised Structural and Drainage Design at Bridge 9.4 (Mill Creek Zanja)**: SBCTA approved the construction of a single-track bridge[2] structure at milepost (MP) 9.4 as previously considered in the approved Project and Final EIR. SBCTA has identified additional refinements to the design for Bridge 9.4 to optimize the hydraulics in up- and downstream segments of the Mill Creek Zanja. These refinements include a relocated outfall and a new detention basin to the southeast of Bridge 9.4.

a) *Design Refinements to Bridge 9.4*: Following additional hydrologic/hydraulic (H&H) modeling and geotechnical investigation as part of the approved Project's final design, SBCTA has refined the design for Bridge 9.4. These refinements include shifting the abutment angles such that they are positioned with the natural flow of the creek (Figure 2 of Attachment A). Riprap would line the channel slopes and bed (Figure 3 of Attachment A). The riprap would be approximately 2.7 feet thick along the bed of the creek (and buried at depth), sloping on either side of the banks at a ratio of 1.5 to 1. This bank protection would be required north and south of the bridge abutments.

b) *Relocation of Proposed Outfall (Mill Creek Zanja):* The approved Project and Final EIR analyzed multiple drainage improvements throughout the project, including the addition of drainage outfalls and associated outfall protection. Under the approved Project, an outfall was proposed to the north of Bridge 9.4. The refined Project simply relocates this outfall to the eastern bank of the Mill Creek Zanja, just south of Bridge 9.4 (Figures 2 and 3 in Attachment A).

c) *New Detention Basin*: Following additional drainage modeling as part of the approved Project's final design, SBCTA has identified a need for additional drainage capacity in areas east of Bridge 9.4. In response, a detention basin is proposed to the west of Bridge 9.4 on property owned by the City of Redlands (Figure 4 of Attachment A). The detention basin would be constructed on approximately 2.4 acres of land adjacent and to the south of SBCTA's railroad ROW (and east of I-10). Once constructed, the City of Redlands would own and maintain the detention basin.

**Refinement No. 2 – Refinements to University Street at Park Avenue:** Following additional engineering design and coordination with the California Public Utilities Commission, SBCTA has determined that the at-grade crossing improvements at the intersection of University Street and Park Avenue, north of SBCTA's ROW, will extend further north than previously contemplated.

[2] Addendum #2 to the EIR provides an assessment of the design refinement from a double to single track bridge structure at Bridge 9.4.

**Table 1. Comparison of Approved Project (2015 EIR) and Proposed Design Refinements (October 2017)**

| Design Basin for Refinement | Refinement No. | Approved Project (2015 EIR) | Proposed Refinements (90% Design Refinements–July 2017) | Milepost(s) | Figure No. |
|---|---|---|---|---|---|
| Revised Structural and Drainage Design at Bridge 9.4 (Mill Creek Zanja) | 1 | • Double tracking at Bridge 9.4<br>• Drainage Outfalls | a) *Design Refinements to Bridge 9.4* - Revised bridge design to improve hydraulics<br>b) *Relocation of Proposed Outfall (Mill Creek Zanja)* - relocate outfall to south of Bridge 9.4<br>c) *New Detention Basin* - Construct new detention basin on city owned property, south of SBCTA ROW and west of University Street | 9.4 | 2, 3, 4, 5 |
| Refinements to University Street at Park Avenue | 2 | • Approved Project contemplated roadway improvements | • Removal of seven parking spaces along University Street<br>• Park Avenue frontage improvements | 9.8 | 6 |

## 2.4 Status of Current Project

SBCTA has completed the 90 percent plans and specifications for the approved Project. Construction of the approved Project will be phased into three major construction contracts: (1) E Street Demolition; (2) Early Utilities Relocation; (3) and Mainline Track Construction. The E Street Demolition work commenced in September of 2017 and finished in October. Construction related to the Early Utilities Relocation is scheduled to start in the fourth quarter of 2017 and extend into early 2018. Construction of the mainline track improvements, including station platforms, is scheduled to start in 2018 and extend into 2020.

# 3 Environmental Analysis Checklist

The following Environmental Analysis Checklist (Checklist) (Table 2) was developed for projects with previously certified/approved environmental documents. This Checklist takes into consideration the preparation of an environmental document prepared at an earlier stage of a project (e.g., RPRP), evaluates the adequacy of the earlier document in assessing potential environmental impacts resulting from refinements proposed to the Project, and is consistent with Section 21166 of the Public Resources Code and Section 15162 of the CEQA Guidelines. The results of this evaluation are summarized below with the detailed analysis provided in subsequent sections.

**Table 2. Environmental Analysis Checklist Summary**

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| 1. Aesthetics (Table 3) | Yes | No | No | No |
| 2. Agriculture and Forestry Resources (Table 4) | Yes | No | No | No |
| 3. Air Quality (Table 5) | Yes | No | No | No |
| 4. Biological Resources (Table 6) | Yes | No | No | No |
| 5. Cultural Resources (Table 7) | Yes | No | No | No |
| 6. Geology/Soils (Table 8) | Yes | No | No | No |
| 7. Greenhouse Gas Emissions (Table 9) | Yes | No | No | No |
| 8. Hazards and Hazardous Materials (Table 10) | Yes | No | No | No |
| 9. Hydrology and Water Quality (Table 11) | Yes | No | No | No |
| 10. Land Use and Planning (Table 12) | Yes | No | No | No |
| 11. Mineral Resources Table 13 | Yes | No | No | No |
| 12. Noise (Table 14) | Yes | No | No | No |
| 13. Population and Housing (Table 15) | Yes | No | No | No |
| 14. Public Services (Table 16) | Yes | No | No | No |
| 15. Recreation (Table 17) | Yes | No | No | No |
| 16. Transportation/Traffic (Table 18) | Yes | No | No | No |

## Table 2. Environmental Analysis Checklist Summary

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| 17. Utilities and Service Systems (Table 19) | Yes | No | No | No |
| 18. Mandatory Findings(Table 20) | Yes | No | No | No |
| Note: See preceding checklist sections for detailed discussion of each environmental issue area. | | | | |

## Table 3. Aesthetics

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Have a substantial adverse effect on a scenic vista? | Yes | No | No | No |
| b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic building within a state scenic highway? | Yes | No | No | No |
| c) Substantially degrade the existing visual character or quality of the site and its surroundings? | Yes | No | No | No |
| d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? | Yes | No | No | No |

**Discussion:** Since the certification of the EIR, there have been no substantial changes to the existing aesthetic environment as described in Section 3.4, Visual Quality and Aesthetics, of the Final EIR. The refined Project features would generally be located at-or below grade, once constructed. The refined Project features are generally located within the previously described Study Area, which is urbanized, and does not contain any designated scenic vistas or scenic resources. Additionally, the refined Project features are not located within the viewshed of a State designated scenic highway. As a result, no substantial changes or major revisions to the previous EIR analysis are required.

The Final EIR concluded that with implementation of Mitigation Measures VQA-1, VQA-2, VQA-3, and VQA-5, the approved Project would not substantially degrade the existing visual character or quality of the site and its surroundings or create significant sources of light or glare. These same mitigation measures remain applicable the refined Project features. The refined Project would not result in new or substantially more severe impacts to aesthetics and no new mitigation measures would be required.

## Table 4. Agricultural Resources

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland.*** | | | | |
| ***Would the project:*** | | | | |
| a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? | Yes | No | No | No |
| b) Conflict with existing zoning for agricultural use, or a Williamson Act contract? | Yes | No | No | No |
| c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))? | Yes | No | No | No |
| d) Result in the loss of forest land or conversion of forest land to non-forest use? | Yes | No | No | No |
| e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use? | Yes | No | No | No |
| **Discussion:** Since the adoption of the Final EIR, there have been no substantial changes to the agricultural environment as described in Section 5.4, Less Than Significant Impacts of the Build Alternatives and Design Options, of the Final EIR. The refined Project features would be constructed on land identified as “Urban and Built-up” as previously identified in the Final EIR. Therefore, the refined Project features would not result in new or substantially more severe impacts to agricultural resources and no mitigation measures would be required. | | | | |

## Table 5. Air Quality

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.*** | | | | |
| ***Would the project:*** | | | | |
| a) Conflict with or obstruct implementation of the applicable air quality plan? | Yes | No | No | No |
| b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation? | Yes | No | No | No |
| c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)? | Yes | No | No | No |
| d) Expose sensitive receptors to substantial pollutant concentrations? | Yes | No | No | No |
| e) Create objectionable odors affecting a substantial number of people? | Yes | No | No | No |

**Discussion:** Since the adoption of the Final EIR, there have been no substantial changes to the existing air quality environment as described in Section 3.5, Air Quality and Climate Change, of the Final EIR. The EIR identified that the approved Project would generate short-term construction emissions due to construction activities that include demolition/reconstruction of the railroad corridor, construction employee and haul-related vehicle trips, and construction-related fugitive dust. These impacts were determined to be less than significant based on detailed air quality modeling completed in support of the EIR and included in Final EIR Appendix G. The refined Project features would require similar construction activities of comparable duration and intensity as described for the approved Project and analyzed in the EIR. The construction of the refined Project features would not result in a substantial increase in construction activities and related emissions as analyzed in the EIR because they refined Project features are similar in nature and scale, and would involve similar construction equipment operation and durations, as was analyzed in the Final EIR. The refined Project features would be constructed and operated consistent with the assumptions applied in the Final EIR. Therefore, the refined Project would not result in new or substantially more severe construction-related air quality impacts and no mitigation would be required.

Operations under the refined Project would remain similar to that of the approved project and as analyzed in the Final EIR; therefore, long-term operational emissions would be comparable. The refined Project would not result in new or substantially more severe operational air quality impacts and no mitigation would be required.

## Table 6. Biological Resources

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | Yes | No | No | No |
| b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | Yes | No | No | No |
| c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? | Yes | No | No | No |
| d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of wildlife nursery sites? | Yes | No | No | No |
| e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? | Yes | No | No | No |
| f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? | Yes | No | No | No |

## Table 6. Biological Resources

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|

**Discussion:** Since the adoption of the Final EIR, there have been no substantial changes to the existing environmental conditions as described in Section 3.7, Biological and Wetland Resources and Appendix I, of the Final EIR. The refined Project features are located adjacent to and within the previously described Study Area and analyzed Project footprint. Minor extensions of the approved Project's physical footprint would occur in the vicinity of Bridge 9.4, the nearby detention basin, and MP 9.8, near Sylvan Park. These additional areas support three vegetation communities: non-vegetated channel (NVC; Holland Code 64200), non-native grassland (NNG; Holland Code 42200) and urban developed (UD; Holland Code 12000) (see Attachment B).

Section 3.7.2 of the Final EIR identifies and describes the sensitive vegetation communities potentially affected by the construction and operation of the approved Project. Similar to the approved Project, the physical footprint at Bridge 9.4 under the refined Project would result in direct impacts to NVC and NNG. Based on the revised footprint for the refined Project, project construction would result in direct impacts to NNG (1.95 acre) and NVC (<0.01 acre). Similar to the conclusions provided in the Final EIR, these direct impacts could be significant and would require the implementation of Mitigation Measures BIO-1, BIO-2, BIO-3, BIO-4, BIO-5, and BIO-6.

As provided in Section 3.7 of the Final EIR, these sensitive communities provide suitable habitat for multiple special status species, including 10 special-status terrestrial wildlife species that were identified as having a moderate to high potential to occur. These species include the state designated species of concern western burrowing owl and loggerhead shrike, which have a low to moderate potential to occur. Similar to the approved Project, construction of the refined Project could result in direct or indirect impacts to the wildlife species listed in Table 3.7-4 of the Final EIR. Similar impacts to special status botanical species, including the smooth tarplant, could also result. As with the approved Project, previously-adopted Mitigation Measures BIO-1, BIO-2, BIO-3, BIO-4, and BIO-7, identified in the Final EIR, would reduce these potential direct effects to a level less than significant.

Similar to the approved Project, the refined Project would result in direct impacts to waters of the U.S. (WOUS) as result of the placement of fill materials or excavation within jurisdictional waters of the U.S. and state, including wetlands, within the railroad corridor. Additionally, construction of the refined Project would result in direct effects to waters of the State within California Department of Fish and Wildlife (CDFW)'s jurisdiction. Direct effects to USACE and CDFW jurisdictional areas were considered significant in the Final EIR. The revised Project would result in 0.002 acre of permanent impact and 0.084 acre of temporary impacts to waters of the U. S[3]. Up to 0.004 acre of CDFW jurisdiction would be permanently impacted and an additional 0.156 acre temporarily impacted[4] (Attachment B). Based on these combined construction-related impacts, the refined Project has the potential to result in significant, direct impacts to federal and state-protected wetlands through direct fill or excavation, and hydrological interruption. Similar to the approved Project, Mitigation Measure BIO-6 is proposed to mitigate this potential impact to a less than significant level. Mitigation Measure BIO-6 requires that SBCTA secure the required permit authorizations and implement all permit conditions to ensure no net loss of functions of wetlands, Other Waters of the U.S., and Waters of the State.

Based on the conclusions of the biological letter report contained in Attachment B, no new or more severe biological resources impacts would occur as a result of the refined Project features. All mitigation measures adopted as part of SBCTA's MMRP, including Mitigation Measures BIO-1, BIO-2, BIO-3, BIO-4, BIO-5, BIO-6, and BIO-7, would remain applicable to the refined Project features and potential impacts to biological resources would be mitigated to a less than significant level. There would not be a substantial increase in the severity of an impact and no new mitigation would be required.

[3] Previous impacts to WOUS at the Mill Creek Zanja included 0.091 acre of temporary impact and 0.022 acre of permanent impact.

[4] Previous impacts to CDFW jurisdiction at the Mill Creek Zanja included 0.19 acre of temporary impact and 0.12 acre of permanent impact.

## Table 7. Cultural Resources

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5? | Yes | No | No | No |
| b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5? | Yes | No | No | No |
| c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? | Yes | No | No | No |
| d) Disturb any human remains, including those interred outside of formal cemeteries? | Yes | No | No | No |

**Discussion:** Since the adoption of the Final EIR, there have been no substantial changes to the existing environmental conditions for historic architectural and archaeological resources as described in Section 3.12, Cultural and Historic Resources, and Appendix M of the Final EIR. The refined Project features are located within or adjacent to the previously analyzed area of potential effect (APE). Although the refined Project would result in minor extensions of the approved Project's physical footprint as previously evaluated in the Final EIR, these refinements would occur in or adjacent to the previously evaluated APE and in areas previously determined to not contain significant cultural resources (e.g., Sylvan Park, etc.). For areas outside the previously approved APE, an updated records search was performed to determine if other resources had been previously recorded. Based on this research in conjunction with additional cultural resource field survey of the expanded areas, no additional resources were documented with the revised APE (Attachment C).

Although no archaeological resources were identified within or adjacent to the areas proposed for minor design refinements, there is ground disturbing work associated with the proposed design refinement and the possibility exists for the discovery of unanticipated archaeological resources. Final EIR Mitigation Measure CUL-4, which addresses the potential for unanticipated discovery and adopted by SBCTA, would address this potential impact. The recommendation of Mitigation Measure CUL-4 to implement specific measures immediately following an unanticipated discovery remains unchanged and consistent with the Final EIR.

Similar to the approved Project, the refined Project would include a new drainage connection to the Mill Creek Zanja; approximately 200 feet west of the location identified in the Final EIR. This segment of the Mill Creek Zanja was previously determined to lack sufficient integrity to be considered part of the "Zanja." As a result, no new impacts would result.

Overall, the proposed refinements would not be considered to have a significant impact to historical resources under CEQA. The updated cultural resources analysis confirms that the proposed engineering refinements to the approved Project do not change the previous conclusions regarding cultural resources (Attachment C). No new or more severe cultural resources impacts would occur and Mitigation Measure CUL-4 as contained in the Final EIR for the approved Project would continue to apply the refined Project features. There would be no changes required to the prior *Cultural Resources Technical Memorandum* (Appendix M of the Final EIR). There would be no substantial increase in the severity of an impact and no new mitigation is required.

## Table 8. Geology and Soils

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving: | | | | |
| i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. | Yes | No | No | No |
| j) Strong seismic ground shaking? | Yes | No | No | No |
| k) Seismic-related ground failure, including liquefaction? | Yes | No | No | No |
| l) Landslides? | Yes | No | No | No |
| b) Result in substantial soil erosion or the loss of topsoil? | Yes | No | No | No |
| c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? | Yes | No | No | No |
| d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property? | Yes | No | No | No |
| e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater? | Yes | No | No | No |

## Table 8. Geology and Soils

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| **Discussion:** Since the certification of the Final EIR, there have been no substantial changes to the existing geological environment as described in Section 3.9, Geology, Soils and Seismicity, and Appendix K of the Final EIR. The refined Project features would be constructed in the same general vicinity with the same, or similar geology and soils characteristics as the approved Project and would not be located within 500 feet of a major active fault or fault zone. Similar to the approved Project, the refined Project does not include the construction of structures that would be used for human occupancy and, therefore, the Project would not expose people to potential substantial adverse effects, including the risk of loss, injury, or death as a result of significant ground shaking and related secondary hazards. Similar to the approved Project, the refined Project features would be required to be in conformance with applicable seismic standards in the Uniform Building Code and Final EIR Mitigation Measure GEO-1. No new or more severe geological impacts would occur and Final EIR Mitigation Measure GEO-1 is applicable to the refined Project. There would be no increase in the severity of an impact and no new mitigation would be required. | | | | |

## Table 9. Greenhouse Gas Emissions

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Generate greenhouse gas emissions, either directly or indirectly, that may have an adverse effect on the environment? | Yes | No | No | No |
| b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases? | Yes | No | No | No |
| **Discussion:** Since the adoption of the Final EIR, there have been no substantial changes to the existing environmental conditions as described in Section 3.5, Air Quality and Climate Change, and Appendix G of the Final EIR. The refined Project features would be constructed and operated consistent with the assumptions applied in the Final EIR. No increase in the emission of GHGs would result from the proposed refinements. As a result, no new or more severe impacts would occur with the refined Project and no mitigation is required. | | | | |

## Table 10. Hazards and Hazardous Materials

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? | Yes | No | No | No |
| b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the likely release of hazardous materials into the environment? | Yes | No | No | No |
| c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school? | Yes | No | No | No |
| d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment? | Yes | No | No | No |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area? | Yes | No | No | No |
| f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area? | Yes | No | No | No |
| g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? | Yes | No | No | No |

## Table 10. Hazards and Hazardous Materials

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands? | Yes | No | No | No |

**Discussion:** Since the certification of the Final EIR, there have been no substantial changes to the existing environmental conditions as described in Section 3.10, Hazardous Waste and Materials, and Appendix L of the Final EIR. Similar to the approved Project, a majority of the refined Project features would be located within the approved Project footprint as previously evaluated in the Final EIR. In instances where the refined Project features extend beyond the previously approved footprint, SBCTA would comply with Mitigation Measure HAZ-3, which requires an updated Phase 1 Environmental Site Assessment (ESA) and Phase 2 Investigation, if necessary. No additional demolition of existing structures would be required that would otherwise require the implementation of Mitigation Measure HAZ-2.

Similar to the approved Project, the transport, use, and storage of hazardous materials during construction would be conducted in accordance with all applicable State and Federal laws. For this reason, the refined Project features, as applicable, would be subject to the hazardous materials management requirements contained in Mitigation Measure HAZ-1.

Based on a review of the Department of Toxic Substance's Control EnviroStor Database, the refined Project features are not identified as being located on a hazardous materials site compiled pursuant to Government Code Section 65962.5. Mitigation Measure HAZ-4 would continue to apply to the refined Project in order to reduce the potential impacts associated with the discovery of hazardous materials and/or contaminants. Mitigation Measures HAZ-5 and HAZ-6 would also continue to be applicable to the refined Project features, where constructed within very high wildlife hazard areas.

Based on the above analysis, no new or more severe hazards and hazardous materials impacts would occur as a result of the refined Project features. All mitigation measures contained in the Final EIR would remain applicable to the refined Project. No new mitigation measures would be required.

## Table 11. Hydrology and Water Quality

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Violate any water quality standards or waste discharge requirements? | Yes | No | No | No |
| b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted? | Yes | No | No | No |
| c) Substantially alter the existing drainage pattern of area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site? | Yes | No | No | No |
| d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site? | Yes | No | No | No |
| e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff? | Yes | No | No | No |
| f) Otherwise substantially degrade water quality? | Yes | No | No | No |
| g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map? | Yes | No | No | No |

## Table 11. Hydrology and Water Quality

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| h) Place within a 100-year flood hazard area structures, which would impede or redirect flood flows? | Yes | No | No | No |
| i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? | Yes | No | No | No |
| j) Inundation by seiche, tsunami, or mudflow? | Yes | No | No | No |

**Discussion:** Since the certification of the Final EIR, there have been no substantial changes to the existing hydrological environment as described in Section 3.8, Floodplains, Hydrology, and Water Quality, and Appendix J of the Final EIR. Similar to the approved Project, the refined Project features would be located within or adjacent to the approved footprint as previously evaluated in the Final EIR. Where the refinements extend beyond the previously approved footprint, the improvements would be located within previously disturbed or paved areas (e.g., University Street). Similar to the approved Project, the refined Project features, as applicable, would be subject to Mitigation Measure HWQ-1, which requires the preparation of a site-specific drainage plan for all structural components associated with the Project. Refinement 1c, as currently proposed, is a component of implementing and complying with MM HWQ-1.

Similar to the approved Project, the refined Project features would include grading and land disturbance activities that would require compliance with Mitigation Measure HWQ-2, which requires compliance with the NPDES General Construction Permit. Construction of the refined Project would entail the same types of construction activities as analyzed in the Final EIR and, therefore, no greater or more severe water quality impacts are expected from the construction of the refined Project features. Similar to the Final EIR, the replacement of Bridge 9.4 as part of the proposed refinements would be located within waterways and, therefore, in-channel construction activities would be required to comply with Mitigation Measures HWQ-3. The treatment of project-related stormwater would be addressed through compliance with Mitigation Measure HWQ-6, such that long-term water quality impacts would be less than significant.

Similar to the approved Project, some of the proposed refinements would be constructed within areas subject to flooding during a 100-year storm event. SBCTA identified floodplain issues as significant in the Final EIR. Based on an H&H analysis of the revised design for Bridge 9.4 and related channel widening, the results indicate that revised design would satisfy FEMA requirements for a no-net-rise certification (Attachment D). Additionally, the revised design and related improvements would be subject to compliance with Mitigation Measures HWQ-4 and HWQ-5, as applicable, and would not exacerbate existing flooding conditions within the Project area.

Based on the above analysis, no new or more severe hydrology or water quality impacts would occur as a result of the proposed refinements. Mitigation Measures HWQ-1, HWQ-2, HWQ-3, HWQ-4, HWQ-5, and HWQ-6 in the Final EIR would remain applicable to the refined Project. No new mitigation is required.

## Table 12. Land Use and Planning

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Physically divide an established community? | Yes | No | No | No |
| b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect? | Yes | No | No | No |
| c) Conflict with any applicable habitat conservation plan or natural communities' conservation plan? | Yes | No | No | No |

**Discussion:** Since the adoption of the Final EIR, there have been no substantial changes to the existing environmental conditions as described in Section 3.2, Land Use, Planning and Communities, and Appendix D of the Final EIR. The refined Project features would be located within or in close proximity to the approved Project footprint as previously evaluated in the Final EIR. As proposed, the refined Project features would not introduce new land uses that were not otherwise previously considered as part of the Final EIR. For this reason, the no substantive changes to the previous analysis of plan consistency would result and the project refinements would not change the previous determination of a less than significant impact.

Similar to the approved Project, the refined Project features would not physically divide the community or conflict with any applicable habitat conservation plan or natural communities' conservation plan. Temporary and permanent encroachments into adjacent properties, as applicable to the refined Project features, would be required to comply with Mitigation Measure LU-1. The City of Redlands would retain ownership of the detention basin property following construction of the refined Project; similar to existing conditions. Similarly, no changes in ownership would occur at Sylvan Park following the improvements at University Street.

Based on the above evaluation, no new or more severe land use, planning and communities impacts would occur as a result of the refined Project features. Mitigation measures identified in the Final EIR would remain applicable to the refined Project. No new mitigation measures would be required.

## Table 13. Mineral Resources

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? | Yes | No | No | No |
| b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan? | Yes | No | No | No |
| **Discussion:** Since the certification of the Final EIR, there have been no changes to the existing environmental conditions as described in Section 5.4, Less Than Significant Impacts of the Build Alternatives and Design Options, of the Final EIR. The refined Project features would be located within the same general vicinity of the approved Project as previously evaluated in the Final EIR and therefore would not result in the loss of the availability of a known mineral resource. As a result, implementation of the refined Project would not result in the loss of a known mineral resource and no new or more severe impacts would result from the refined Project. No new mitigation measures would be required. | | | | |

## Table 14. Noise

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project result in:*** | | | | |
| a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? | Yes | No | No | No |
| b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels? | Yes | No | No | No |
| c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? | Yes | No | No | No |
| d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project? | Yes | No | No | No |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? | Yes | No | No | No |
| f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? | Yes | No | No | No |

## Table 14. Noise

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| **Discussion:** Since the certification of the Final EIR, there have been no substantial changes to the noise environment as described in Section 3.6, Noise and Vibration, and Appendix H of the Final EIR. The refined Project would be located within the same general vicinity of the approved Project as previously evaluated in the Final EIR. Also, the refined Project features would be constructed and operated consistent with the assumptions applied in the Final EIR (hours of operation, equipment type). The refined Project features would result in significant construction noise levels similar to that evaluated in the Final EIR. Construction of the refined Project features would be subject to the requirements of Mitigation Measure NV-1 and NV-2.<br><br>Operational noise levels and related impacts to noise sensitive land uses associated within the refined Project would be similar to the approved Project. Under the refined Project, diesel multiple unit and Metrolink operations would generally function as described and analyzed in the Final EIR. Mitigation Measures NV-3, NV-5, NV-6, and NV-7 would be required to minimize operational noise impacts to a less than significant level.<br><br>Based on the evaluation above, no new or more severe noise impacts would occur as a result of the Refined Project. Final EIR Mitigation Measures NV-1, NV-2, NV-3, NV-5, NV-6, and NV-7 would remain applicable to the refined Project. No new mitigation measures would be required. | | | | |

## Table 15. Population and Housing

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)? | Yes | No | No | No |
| b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere? | Yes | No | No | No |
| c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere? | Yes | No | No | No |
| **Discussion:** No substantial changes to existing environmental conditions as it relates to population and housing have occurred since the certification of the Final EIR. Similar to the approved Project, the refined Project features would be limited to existing roadway and rail improvements in the vicinity of the approved Project. These improvements would not increase the relocation or displacement impacts from that associated with the approved Project. No new land uses are proposed as part of the refinements that would otherwise increase the population estimates identified in the Final EIR. No new or more severe population and housing impacts would occur and no new mitigation would be required. | | | | |

## Table 16. Public Services

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:*** | | | | |
| a) Fire Protection? | Yes | No | No | No |
| b) Police Protection? | Yes | No | No | No |
| c) Schools? | Yes | No | No | No |
| d) Parks? | Yes | No | No | No |
| e) Other public facilities? | Yes | No | No | No |

**Discussion:** Since the certification of the Final EIR, there have been no substantial changes to existing environmental conditions as described in Section 3.13, Parklands, Community Services, and Other Public Facilities, of the Final EIR. Similar to the approved Project, the refined Project features are limited to roadway, drainage, and rail improvements and would not generate population growth that would otherwise place new demands on local public service providers. Additionally, the refined Project does not include a residential component which would otherwise result in an incremental increase in demand on public services. No new or more severe public or community services and other facilities impacts would occur as a result of the refined Project. No new mitigation would be required.

## Table 17. Recreation

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated? | Yes | No | No | No |
| b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment? | Yes | No | No | No |

**Discussion:** Since the certification of the Final EIR, there have been no substantial changes to the existing environmental conditions as described in Section 3.13, Parklands, Community Services, and Other Public Facilities, of the Final EIR. Similar to the approved Project, the refined Project would not contribute to population growth that could result in an increased use of existing neighborhood and regional parks nor does it include or require construction or expansion of recreational facilities.

The refined Project does not propose substantial changes that require major revisions to the EIR's discussion of potential impacts to recreation. The temporary loss of parking along University Street would not restrict access to Sylvan Park and would be restored as part of the City's proposed improvements to University Street. No new or more severe impacts to parks and recreation would occur under the refined Project. Final EIR Mitigation Measure PCS-1 remain applicable to the refined Project.

## Table 18. Transportation/Traffic

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit? | Yes | No | No | No |
| b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways? | Yes | No | No | No |
| c) Result in a change in air traffic patterns, including either an increase in traffic levels or change in location that results in substantial safety risks? | Yes | No | No | No |
| d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? | Yes | No | No | No |
| e) Result in inadequate emergency access? | Yes | No | No | No |
| f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities? | Yes | No | No | No |

## Table 18. Transportation/Traffic

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| **Discussion:** The existing traffic and circulations conditions described in Section 3.3, Transportation and Circulation, and Appendix E of the Final EIR have not substantially changed since the EIR's certification. Similar to the approved Project, implementation of the refined Project would include various improvements at roadways and at-grade crossings to maintain existing traffic levels of service (LOS) and accommodate future traffic levels as forecasted under each City's General Plan. Construction of these improvements would require compliance with Mitigation Measures TR-1 to minimize impacts to existing roadway and intersection LOS, including emergency access, during construction of the refined Project.<br><br>Based on this evaluation, no new or more severe traffic impacts would occur as a result of the refined Project features. Final EIR Mitigation Measures TR-1, TR-2, TR-3, TR-4, and TR-5 would remain applicable to the refined Project. No new mitigation measures would be required. | | | | |

## Table 19. Utilities and Service Systems

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| ***Would the project:*** | | | | |
| a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board? | Yes | No | No | No |
| b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? | Yes | No | No | No |
| c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? | Yes | No | No | No |
| d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? | Yes | No | No | No |
| e) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments? | Yes | No | No | No |
| f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs? | Yes | No | No | No |
| g) Comply with federal, state, and local statutes and regulations related to solid waste? | Yes | No | No | No |

## Table 19. Utilities and Service Systems

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| **Discussion:** The Final EIR concluded that the approved Project would not result in significant environmental impacts as it relates to utilities and service systems (see Section 5.5 of the Final EIR). As provided in Chapter 2 of the EIR, the approved Project contemplated the placement of new or relocated utility infrastructure. The refined Project does not entail any substantial changes (or new improvements) that require major revisions to the EIR's discussion regarding utilities and service systems.<br><br>Similar to the approved Project, the refined Project would not introduce new land uses that would increase demand for potable water supply or wastewater treatment. Similar to the approved Project, new drainage infrastructure proposed in conjunction with the refined Project would be constructed in compliance with Mitigation Measure HWQ-1, which requires the attenuation of post-project runoff to pre-project levels. Similar to the approved Project, the refined Project would adhere to all applicable local, State, and Federal standards for the disposal of solid waste.<br><br>The refined Project does not entail any substantial changes that require major revisions to the EIR's discussion regarding utilities and service systems. No new or more severe utilities and service systems impacts would occur as a result of the refined Project. No new mitigation measures would be required. | | | | |

## Table 20. Mandatory Findings

| Environmental Issue Area: | Was Impact Analyzed in Prior Environmental Document(s)? | Do Project Refinements Involve New Significant Impacts or Substantially More Severe Impacts? | Any New Circumstances Involving New Significant Impacts or Substantially More Severe Impacts? | Any New Information Requiring New Analysis or Verification? |
|---|---|---|---|---|
| a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory? | Yes | No | No | No |
| b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.) | Yes | No | No | No |
| c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly? | Yes | No | No | No |

**Discussion:** As discussed in the Biological and Cultural Resources Sections, the refined Project features would not create new or more severe impacts when compared to the approved Project. With the implementation of Mitigation Measures BIO-1, BIO-2, BIO-3, BIO-4, BIO-5, BIO-6, and BIO-7, the refined Project would not substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal. Similar to the approved Project, the refined Project would not eliminate important examples of the major periods of California history or prehistory through compliance with Mitigation Measures CUL-1, CUL-3, and CUL-4.

Cumulative impacts were evaluated for each of the environmental issue areas in Chapter 3 of the Final EIR. Similar to the approved Project, the refined Project would be required to comply with mitigation requirements relating to traffic, noise, hydrology and water quality, and vibration. With mitigation, these impacts would be minimized to a less than significant level for the refined Project features and not cumulatively considerable.

Based on this evaluation, the proposed refinements to the approved Project would not result in any significant cumulative impacts or any new or substantially more severe cumulative impacts. Mitigation measures adopted by SBCTA for the approved Project would be effective in minimizing adverse environmental effects on human beings. Therefore, the refined Project would not result in substantially more severe cumulative impacts and no new mitigation measures would be required.

## Environmental Determination

Based upon the evidence in light of the whole record documented in the attached environmental checklist explanation, cited incorporations and attachments, I find that the Project:

☐ **Has previously been analyzed** as part of an earlier CEQA document (which either mitigated the project or adopted impacts pursuant to findings) adopted/certified pursuant to State and County CEQA Guidelines. The proposed project is a component of the whole action analyzed in the previously adopted/certified CEQA document.

☒ **Has previously been analyzed** as part of an earlier CEQA document (which either mitigated the project or adopted impacts pursuant to findings) adopted/certified pursuant to State and County CEQA Guidelines. **Minor additions and/or clarifications** are needed to make the previous documentation adequate to cover the project which are documented in this addendum to the earlier CEQA document (CEQA §15164).

☐ **Has previously been analyzed** as part of an earlier CEQA document (which either mitigated the project or adopted impacts pursuant to findings) adopted/certified pursuant to State and County CEQA Guidelines. However, there is important new information and/or **substantial changes have occurred** requiring the preparation of an additional CEQA document (ND or EIR) pursuant to CEQA Guidelines Sections 15162 through 15163.

Signed: _____

# 4 Mitigation Measures

A listing of applicable mitigation measures from the Redlands Passenger Rail Project's EIR is provided as Attachment E of this EIR Addendum. All mitigation measures adopted as part of SBCTA's MMRP for the Project would continue to apply following the approval of the refined Project. SBCTA, as the CEQA lead agency, is responsible for adopting and implementing the approved mitigation.

# Attachment A. Figures

# Attachment B. Biology Letter Report

# Attachment C. Cultural Resources Letter Report

# Attachment D. Hydrology and Hydraulics Report - Bridge 9.4

# Attachment E. Mitigation Monitoring and Reporting Program

## Attachment A: Figures

Figure 1: Regional Location

Figure 2: Foundation Design at Bridge 9.4 (Vertical)

Figure 3: Bank Protection for Mill Creek Zanja

Figure 4: Proposed Detention Basin

Figure 5: Refinements at University Street

**Figure 1: Regional Location**

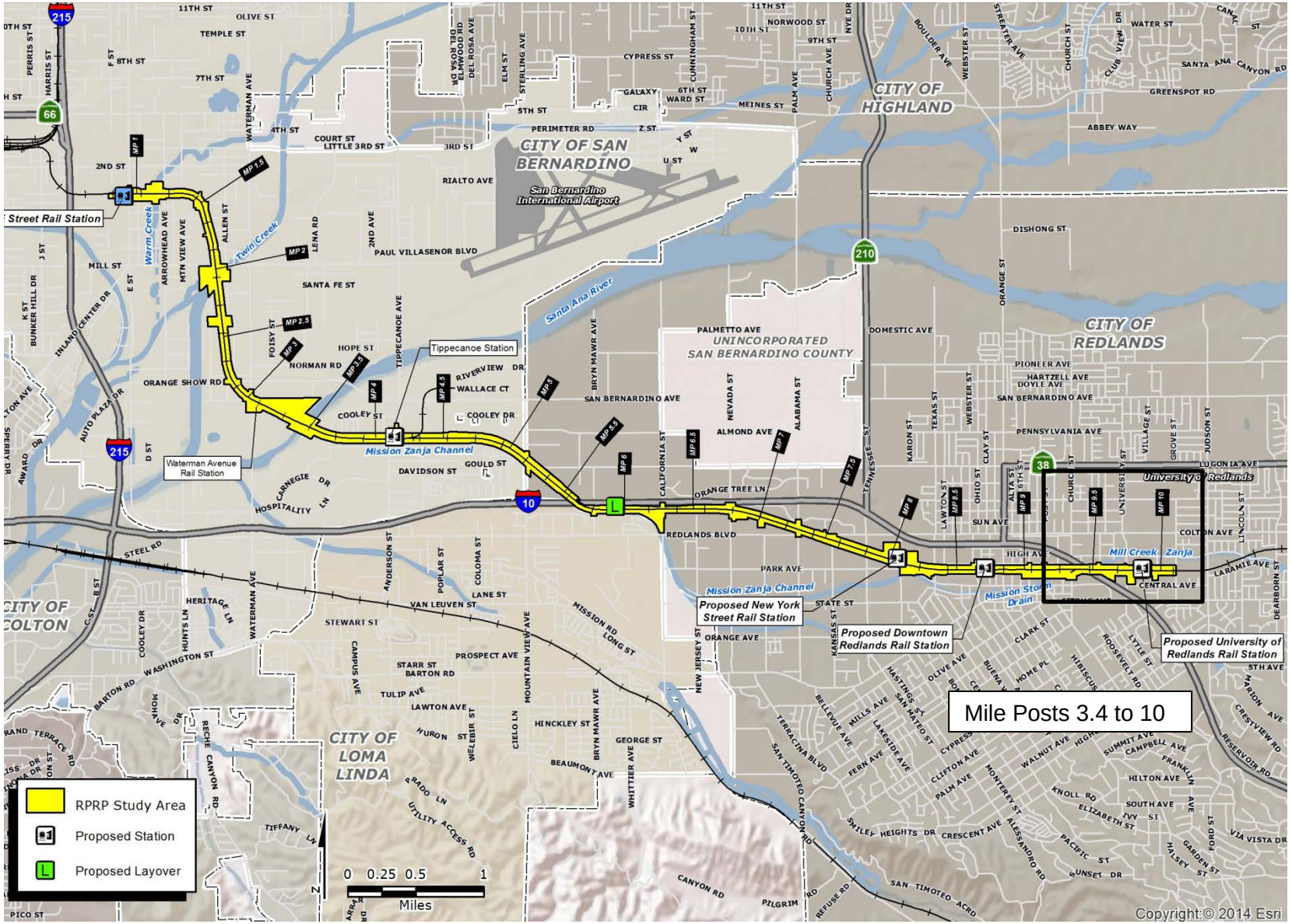


**Figure 2: Foundation Design at Bridge 9.4 (Vertical)**

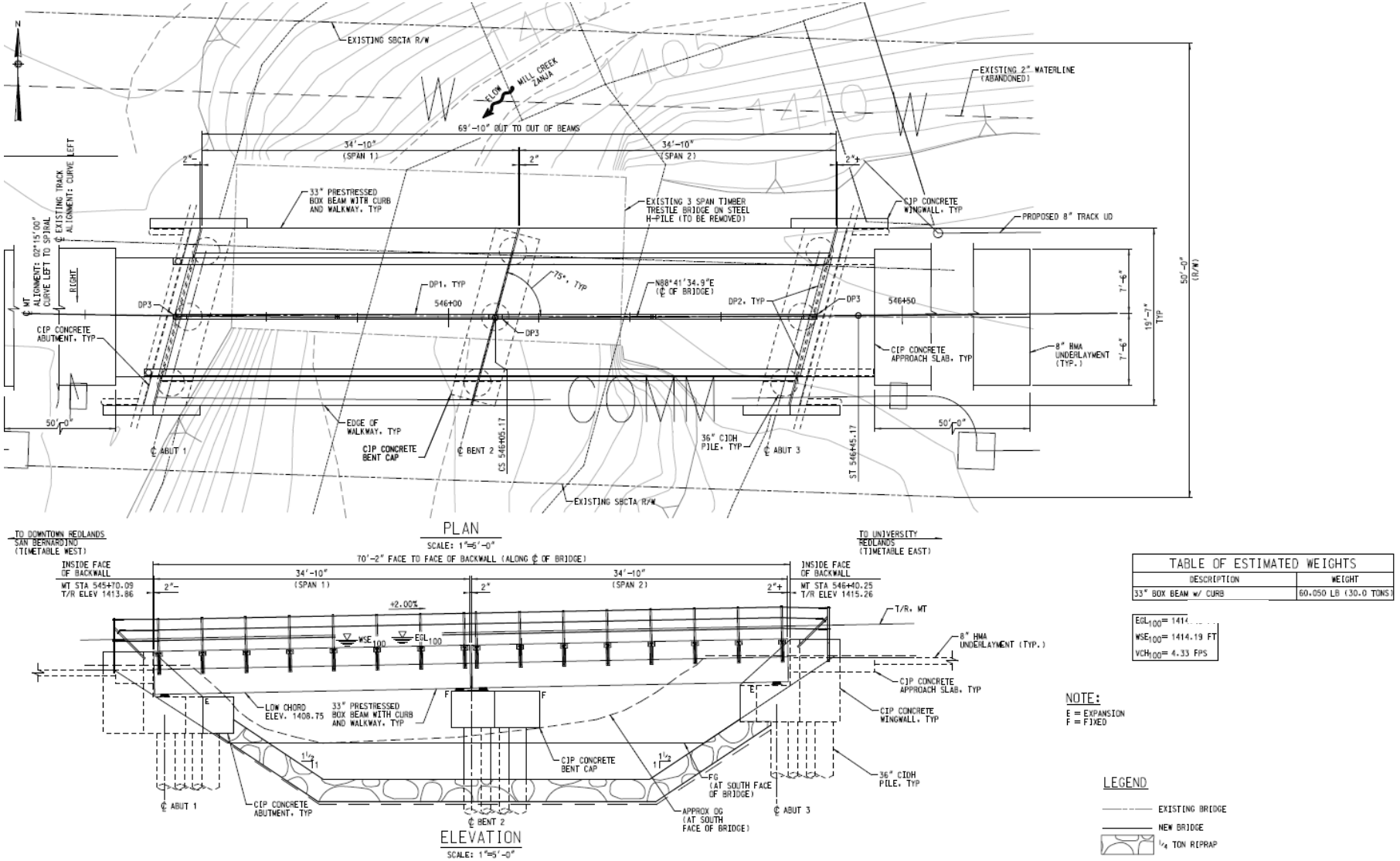
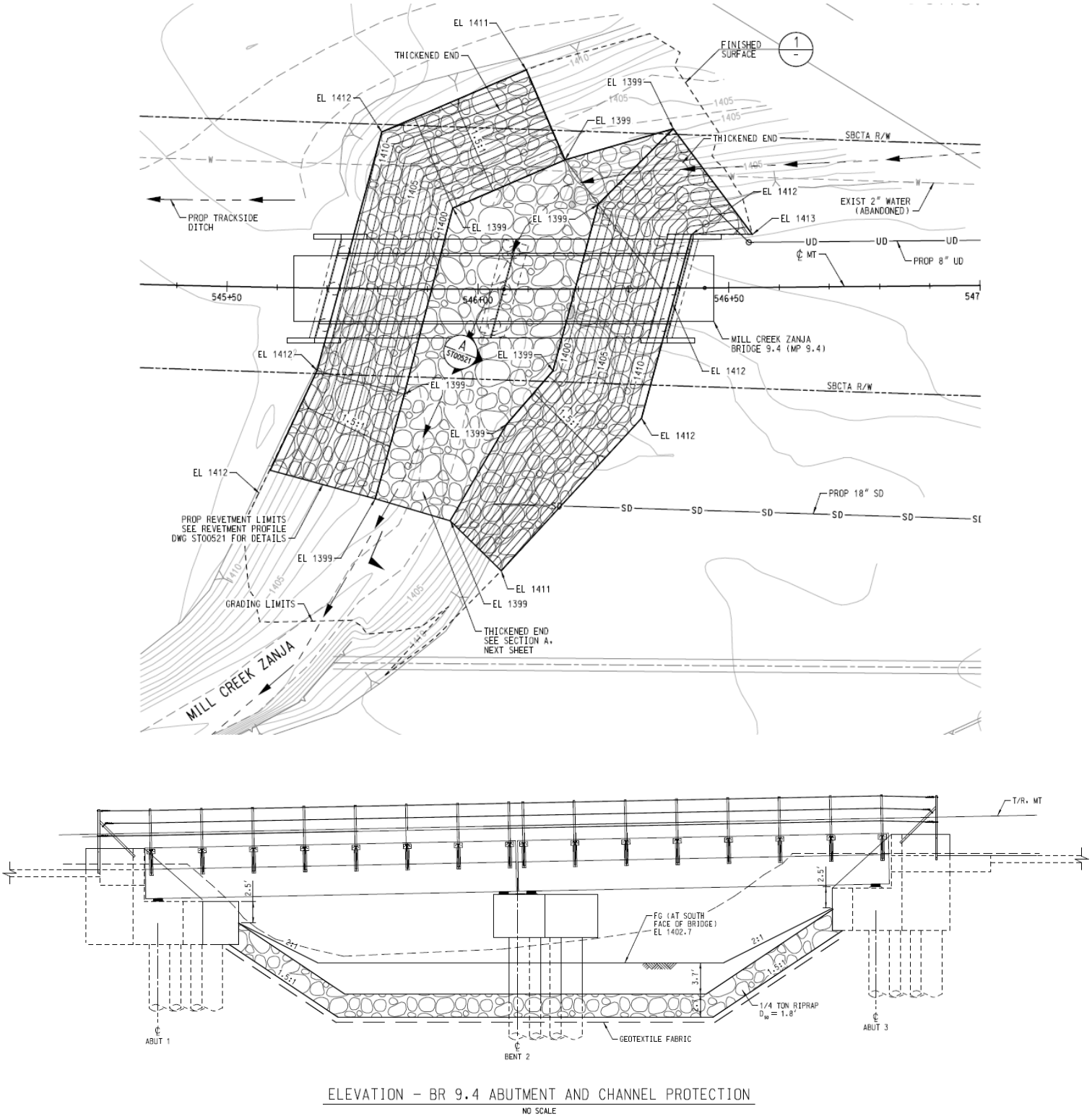


**Figure 3: Bank Protection for Mill Creek Zanja**




ELEVATION – BR 9.4 ABUTMENT AND CHANNEL PROTECTION

NO SCALE

**Figure 4: Proposed Detention Basin**

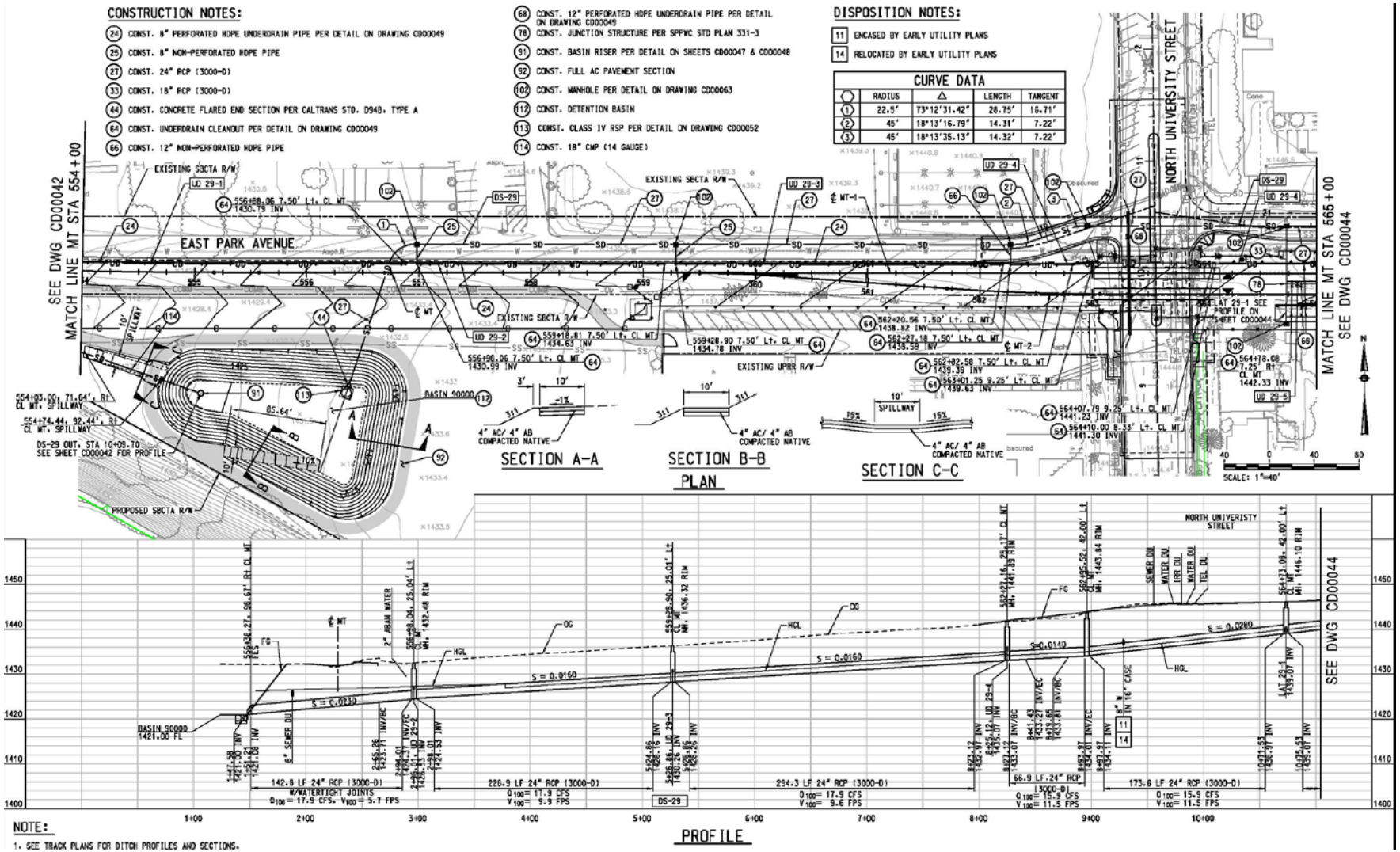
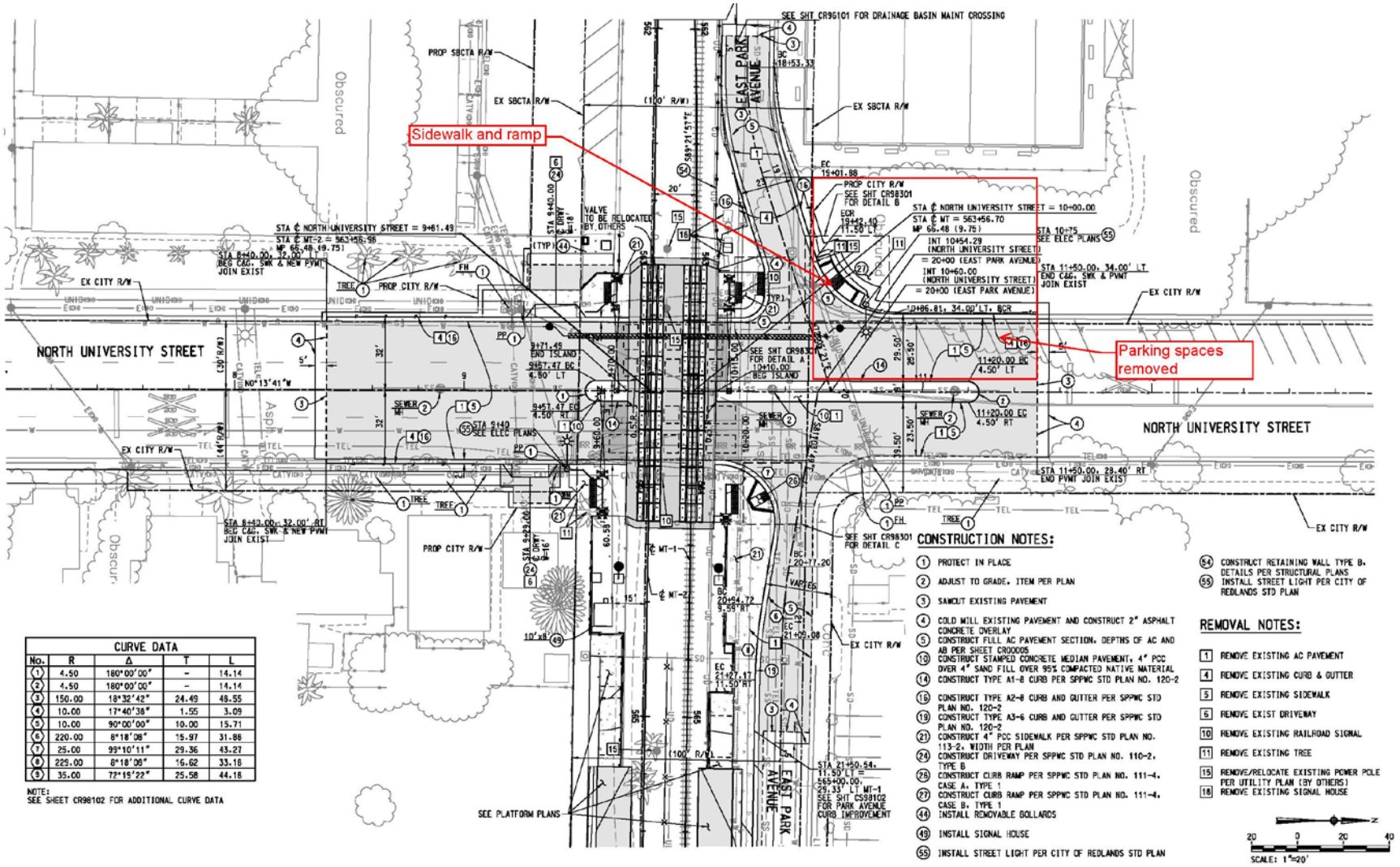


**Figure 5: Southeast Corner of Sylvan Park Changes**



# Memo

| | |
|---|---|
| Date: | Wednesday, November 08, 2017 |
| Project: | Redlands Passenger Rail Project |
| To: | Carrie Schindler, Director of Transit and Rail |
| From: | Ingrid Eich, HDR Engineering, Inc. |
| Subject: | **Biological Letter Supporting Addendum No. 5** |

# 1 Introduction

This biological memo addresses a refinement to the Redlands Passenger Rail Project (RPRP or approved Project) that has occurred since the certification of the Final Environmental Impact Report (EIR) on March 4, 2015. Specifically, SBCTA is proposing two design refinements to the approved Project. Table 1 provides a summary of these refinements in relation to the improvements originally contemplated in the approved Project (and EIR).

The proposed refinements occur within the original survey area covered in the Biological Technical Report (BTR) that was prepared in conjunction with the approved Project and included in Appendix of the Final EIR. The BTR included a review of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) Rarefind program and California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants of California for special-status species with potential to occur in the vicinity of the approved Project. The CNDDB and CNPS record search results are found in the RPRP BTR (HDR 2015) and is incorporated by reference for the purposes of the memo.

## 1.1 Project Location

The refined Project improvements encompass the same general Study Area as described for the approved Project, which extends along existing railroad right-of-way (ROW) owned by SBCTA between the cities of San Bernardino and Redlands, San Bernardino County, California (Figure 1).The proposed refinements to the approved Project would be constructed in the City of Redlands at Bridge 9.4 (Mill Creek Zanja) and in Sylvan Park.

### Refined Project

**Refinement No. 1 – Bridge 9.4 (Mill Creek Zanja)**: SBCTA is proposing the construction of a single-track bridge[1] structure at MP 9.4, as previously considered in the approved Project and Final EIR. SBCTA has identified multiple refinements to the design for Bridge 9.4 to optimize

[1] Addendum #2 to the EIR provides an assessment of the design refinement from a double to single track bridge structure.

constructability: expand channel improvements to the Mill Creek Zanja, outfall relocation, and construction of a new detention basin.

- Channel Improvements to Mill Creek Zanja: Following additional hydrologic/hydraulic modeling and geotechnical investigation as a part of the approved Project's final design, SBCTA has decided to make refinements to the design of Bridge 9.4, including abutment and bank protection improvements. Abutment angles are positioned with the natural flow of the creek and a fourth ton of riprap would line the slopes and be buried beneath the bed of the creek (Figure 2). The riprap would be approximately 2.7 feet thick along the bed of the creek, sloping on either side of the banks at a ratio of 1.5 to 1. This bank protection would be required well north and south past bridge construction.

- Relocation of Outfall: The approved Project and Final EIR considered multiple drainage improvements throughout the project, including the protection or addition of drainage outfalls. Based on the approved Project, an outfall was proposed north of Bridge 9.4. The refined Project simply proposes that this outfall be relocated south.

- Detention Basin: A detention basin is proposed west of Bridge 9.4 on property owned by the City of Redlands (Figure 4 of Attachment A). The basin would take up approximately 2.5 acres of land previously analyzed footprint of the Final EIR.

**Refinement No 2. – Refinements at University Street:** Following additional engineering design, SBCTA has determined that minor changes to the project's physical footprint would be required north of the railroad at University Street to facilitate the northern extension of a center median and pedestrian walkway at the southeastern corner of Sylvan Park. These refinements include the removal of up to seven parking spaces along University Avenue and minor physical encroachment into Sylvan Park.

**Table 1. Comparison of Approved Project (2015 EIR) and Proposed Design Refinements (June 2017)**

| Design Basin for Refinement | Refinement Tracking No. | Approved Project (2015 EIR) | Proposed Refinements (90% Design Refinements–June 2017) | Milepost(s) | Figure No. |
|---|---|---|---|---|---|
| Bridge 9.4 (Mill Creek Zanja) | 11 | • Approved Project contemplated drainage improvements, including the construction of new outfalls | • Revised bridge design<br>• Expanded channel improvements to Mill Creek Zanja<br>• Relocate Outfall to south of Bridge 9.4<br>• Construct new detention basin on city owned property, south ROW and west of University | 9.4 | Figure 3 |
| University Street | 15 | • Approved Project contemplated roadway improvements | • Removal of seven parking spaces along western edge of the University Avenue ROW<br>• Pedestrian and ramp improvements | 9.8 | Figure 3 |

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**Figure 1. Regional Location**

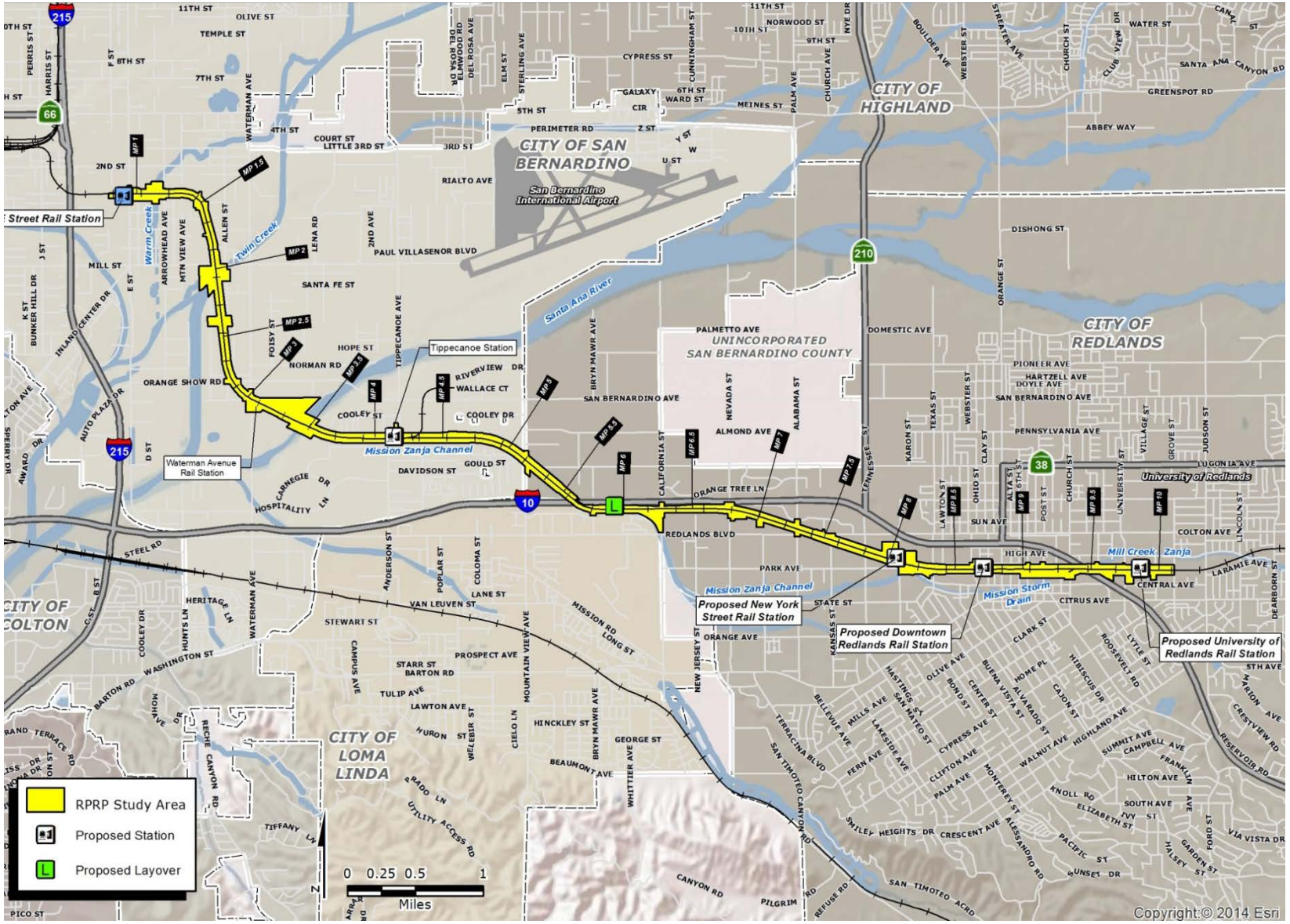

**Figure 2. Foundation Design at Bridge 9.4 (Vertical)**

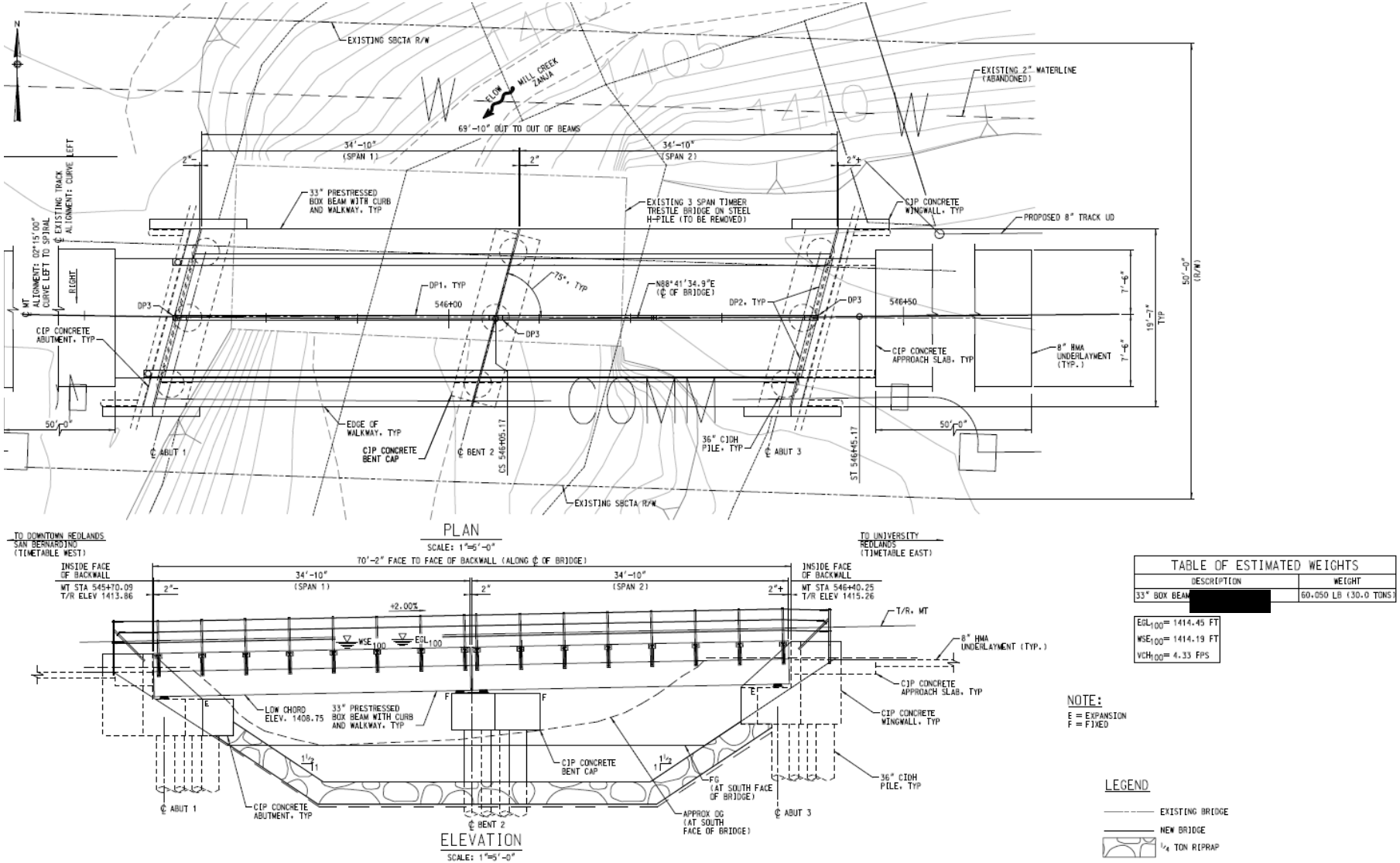

**Figure 3. Proposed Refinements Overlaid on Existing Biological Resources**

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# 2 Evaluation – Area of Potential Effect

Vegetation was classified using the R.F. Holland system of natural communities as described in *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland R.F. 1986). Detailed descriptions of vegetation communities found within the refined Project area can be found in the 2015 BTR (HDR 2015), which is provided as Appendix I of the Final EIR. The refined Project area supports three vegetation communities: non-vegetated channel (NVC; Holland Code 64200), non-native grassland (NNG; Holland Code 42200) and urban developed (UD; Holland Code 12000) (see Figure 2). In reviewing the CDFW Natural Communities List (CDFW 2010), no sensitive vegetation communities occur within the refined Project area.

Several sensitive botanical and zoological species are known to occur within the vicinity of the RPRP (HDR 2015). Based on the updated survey, the proposed detention basin supports suitable habitat for the following sensitive species:

- Smooth tarplant (*Centromadia pungens* ssp. *laevis*; CNPS list 1B.1) - low/moderate potential to occur
- Western burrowing owl (*Athene cunicularis hypugaea*; state species of concern [SSC]) - low/moderate potential to occur
- Loggerhead shrike (*Lanius ludovicianus*; SSC) - low/moderate potential to occur
- Migratory Bird Treaty Act protected avian species

Mill Creek Zanja has low to moderate potential to support western burrowing owl.

Additional information on these species can be found in the RPRP BTR (HDR 2015).

## 2.1 USACE and CDFW Jurisdictional Areas

Mill Creek Zanja is mapped as NWI riverine (USFWS 2017). Based on the project BTR (HDR 2015), potential U.S. Army Corps of Engineers (USACE) regulated waters of the U.S. (WOUS) occur along the centerline of the 14- to 28-foot-wide channel for Mill Creek Zanja. Potential WOUS consist of an ephemeral, unvegetated, low-flow channel supporting a sandy substrate (Photograph 1 and Photograph 2). Mill Creek Zanja channel is covered with grouted rip rap as it conveys flow under I-10 (east crossing). The creek supports sparse non-native vegetation, sandy substrate, riprap banks, and substantial urban trash and debris. Within the survey area, Mill Creek Zanja is ephemeral and supports WOUS and CDFW unvegetated streambed.

CDFW unvegetated streambed is mapped to the top of the bank associated with Mill Creek Zanja. Within this section of Mill Creek Zanja, the creek banks are unvegetated, moderately to steeply sloped, and consist of soil and rock riprap (Photograph 1 and Photograph 2).

There are no aquatic features subject to USACE or CDFW jurisdiction associated with the proposed detention basin or refinements at Sylvan Park.

**Photograph 1. Mill Creek Zanja. View facing south with Bridge 9.4 in foreground.**

**Photograph 2. Mill Creek Zanja. View facing southwest towards Church Street.**

## 2.2 Direct Impacts

### Sensitive Botanical and Zoological Species

#### CONSTRUCTION

Channel improvements, relocation of the outfall structure, and creation of the detention basin have the potential to directly impact suitable burrowing and/or foraging habitat for western burrowing owl (NVC [riprap in channel] and NNG) (Photograph 1 through Photograph 4). Creation of the detention basin has the potential to directly impact foraging habitat for loggerhead shrike, suitable habitat for smooth tarplant (NNG) and nesting migratory birds (NNG) (Table 2; Photograph 3 and Photograph 4).

**Table 2. Summary of Impacts to Vegetation/Land Cover Types**

| Vegetation/ Land Cover Types | Permanent Impacts (acre) | Temporary Impacts (acre) |
|---|---|---|
| Non-Native Grassland | 1.95 | -- |
| Non-Vegetated Channel | <0.01 | 0.08 |
| Urban Developed | 0.57 | -- |
| Total | 2.52 | 0.08 |

Potential impacts to smooth tarplant, burrowing owl, loggerhead shrike and nesting migratory birds are consistent with impacts identified in the EIR for the approved Project and would be less than significant after application of Mitigation Measures **BIO-1, BIO3, BIO-4 and BIO-5**, as identified in SBCTA's adopted Mitigation Monitoring and Reporting Program (MMRP) and included as Attachment A.

**Photograph 3. Proposed basin site is located left of the tracks. View facing west toward I-10 overpass and Bridge 9.4.**

**Photograph 4. Proposed basin site is located right of the tracks. View facing east. Sylvan Park is located left of photo.**

#### OPERATION

No direct impacts would result following construction of the channel improvements, outfall structure, and detention basin. Similar to existing conditions, future operation and maintenance activities would be conducted by Metrolink and County Flood Control District, including mowing. Long-term impacts would be less than significant.

### USACE and CDFW Jurisdictional Areas

Construction of the channel improvements, specifically placement of a 0.25 ton of riprap along the channel bed and slopes and construction of the outfall structure, would result in a permanent discharge to USACE non-wetland WOUS (Figure 2 and Figure 3). However, permanent loss of WOUS is limited to 0.002 acre net loss of non-wetland WOUS because the majority of the rock either replaces existing rock or will be buried and the channel will continue to provide the same aquatic function, including surface flows, as before project implementation. Therefore, the remaining 0.084 acre of non-wetland WOUS impacts are being treated as temporary. Similarly, only 0.004 acre of CDFW jurisdictional unvegetated streambed would be permanently lost during channel improvements and construction of the proposed outfall structure and the remaining 0.156 acre of CDFW unvegetated streambed impacts are being treated as temporary. Construction of the detention basin would not result in direct or indirect impacts to USACE or CDFW jurisdictional features. These direct impacts are reduced from those identified in the EIR for the approved Project and would continue to be less than significant after application of Mitigation Measure BIO-6, as identified in SBCTA's adopted MMRP as provided in Attachment A.

## 2.3 Indirect Impacts

### Sensitive Botanical and Zoological Species

#### CONSTRUCTION

Should sensitive botanical or zoological species occur adjacent to the refined Project area, there is the potential to indirectly impact these species during construction. Indirect impacts to sensitive botanical and zoological species and migratory birds would generally be attributed to temporary construction-related dust and water quality effects. For example, hazardous materials leaks, such as fuel, hydraulic fluid, and/or lubricants, from equipment working in or around occupied habitat. In addition, construction-related noise levels have the potential to indirectly impact sensitive zoological species, particularly nesting avian species. These impacts are consistent with impacts identified in the EIR for the approved Project and would be less than significant after application of Mitigation Measures **BIO-1, BIO-4, BIO-3, BIO-5, HWQ-2** and **HWQ-3** (see Attachment A).

#### OPERATION

Similar to existing conditions, Mill Creek Zanja would continue to be maintained by the County Flood Control District. No indirect impacts to special-status botanical or zoological species are expected once operational.

### USACE and CDFW Jurisdictional Areas

#### CONSTRUCTION

Similar to the approved Project, the proposed improvements could indirectly impact USACE WOUS and CDFW unvegetated streambed. Indirect impacts would mainly come in the form of indirect water quality impacts resulting from construction activities. Pollutants of concern for jurisdictional areas include erosion of soil materials and corresponding increases in sedimentation and the discharge of hazardous materials or debris from construction equipment. These impacts are consistent with impacts identified in the EIR for the approved Project and would be less than significant after application of Mitigation Measures BIO-6, HWQ-2, and HWQ-3 as identified in the MMRP (see Attachment A).

#### OPERATION

Similar to the approved Project, once constructed the Project facilities would be subject to routine maintenance, which would be subject to standardized operations and maintenance practices in compliance with Mitigation Measures HWQ-6 (see Attachment A). The proposed channel improvements would be permeable (rock-lined) allowing for infiltration of stormwater flows and settling of sediment and other contaminants. Similarly the proposed detention basin would provide for retention of storm flows, settling of sediment and other contaminants, and increased infiltration. Therefore, no indirect impacts to biological resources from adverse water quality discharges would be less than significant.

# 3 References

CDFW 2010. List of Vegetation Alliances and Associations. Vegetation Classification and Mapping Program, California Department of Fish and Game. Sacramento, CA. September 2010.

HDR 2015. HDR Engineering. Revised Biological Technical Report for the Redlands Passenger Rail Project. Prepared January 2015.

Holland, R.F.1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, Nongame-Heritage Program. 156p (amended).

USFWS 2017. U. S. Fish and Wildlife Service. Website last updated August 22, 2017. National Wetlands Inventory mapper. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. https://www.fws.gov/wetlands/data/Mapper.html. Viewed online September 2017.

# Memo

| | |
|---|---|
| Date: | Wednesday, November 15, 2017 |
| Project: | SBCTA Redlands Passenger Rail Project Addendum 5 |
| To: | Andres Ramirez, Chief of Transit and Rail Programs, San Bernardino County Transportation Authority |
| From: | Nina Delu, Environmental Planner & Registered Professional Archaeologist, HDR |
| Subject: | **Cultural Resources Technical Memo** |

San Bernardino County Transportation Authority (SBCTA) has recently advanced engineering on the Redlands Passenger Rail Project (Project) to 90 percent and HDR has performed a supplemental cultural resources technical analysis in response to these advancements. The Federal Transit Administration (FTA), Region IX, approved a Locally Preferred Alternative (LPA), in a Record of Decision, dated February 17, 2015, pursuant to the National Environmental Policy Act (NEPA). The approval of the Project was based on the findings of the Final Environmental Impact Statement (February 2015). SBCTA, the Lead Agency under the California Environmental Quality Act (CEQA), certified the Final Environmental Impact Record (EIR) (State Clearinghouse #2012041012) in March 2015. ICF International prepared a *Cultural Resources Technical Memorandum* in June 2014 that determined the Project would have no adverse effect on historic properties. The California Office of Historic Preservation (OHP) concurred with the findings of the report on August 14, 2014 (OHP reference number FTA120830A).

The purpose of this cultural resources technical analysis is to identify whether any of the proposed design refinements to the LPA would affect the previous findings regarding cultural resources (both historic built environment and archaeological) within the previously-approved area of potential effects (APE), and to note any revisions to the APE needed to reflect these proposed design refinements.

# Project Background

The approved LPA proposes passenger rail operations along an approximately 9-mile corridor extending east form the City of San Bernardino to the City of Redlands. The approved Project also proposed local and express train service. Local service would occur via five station stops: E Street and Waterman Avenue located in the City of San Bernardino; and New York Street, Orange Street (Downtown Redlands) and University Street (University of Redlands) located in the City of Redlands. Metrolink express service would be limited to downtown Redlands and E Street. Components approved as part of the Project included replacement of the existing railroad tracks and ties, reconstruction or rehabilitation of existing bridge structures, construction of station platforms and train layover facility, and auxiliary improvements, such as parking, at-grade roadway crossings, and pedestrian access.

The 2015 approved Project was not expected to have an adverse effect on historic properties, inclusive of historic architecture and archaeological resources, under NEPA and Section 106 of the

National Historic Preservation Act. Under CEQA, the proposed Project was not expected to have an impact on historic architecture or archaeological resources.

The Project has since advanced with the completion of the 90 percent design. SBCTA is proposing physical design refinements to the LPA as defined in the Final EIS (Environmental Impact Statement)/Final EIR as approved by FTA and adopted by SBCTA. The refinements considered in relation to impacts to cultural resources are comprised of the relocation of the drainage outfall on Mill Creek Zanja and a new detention basin, plus additional encroachment into Sylvan Park via easement (no property acquisition). Figure 1 highlights the general location of the proposed Project refinements within the red box, at the eastern terminus of the Project.

# Physical Design Refinements

The following provides a description of the proposed physical design refinements considered herein that SBCTA is proposing in response to advancements in the Project's engineering design since the approval of the Final EIS/EIR in 2015 (see Table 1). The design refinements would result in the following physical refinements that have the potential to impact cultural resources:

- **Relocation of Proposed Outfall (Mill Creek Zanja**): The approved Project and Final EIR considered multiple drainage improvements throughout the project, including the addition of drainage outfalls and associated outfall protection. Based on the approved Project, an outfall was proposed to the north of Bridge 9.4. The refined Project simply relocates this outfall to the eastern bank of Mill Creek Zanja, just south of Bridge 9.4 (Figure 2).

- **New Detention Basin:** Following additional drainage modeling as part of the approved Project's final design, SBCTA has identified a need for additional drainage capacity in areas east of Bridge 9.4. In response, a detention basin is proposed to the west of Bridge 9.4 on property owned by the City of Redlands (Figure 3). The detention basin would be constructed on approximately 2.5 acres of land adjacent and to the south of SBCTA's railroad right-of-way (and east of I-10). Once constructed, the City of Redlands would own and maintain the detention basin.

- **Refinements to University Street:** Following additional engineering design and coordination with the California Public Utilities Commission (CPUC), SBCTA has determined that the at-grade crossing improvements at University Avenue, north of SBCTA's right-of-way, will extend further north than previously contemplated. As a result, SBCTA has identified up to seven on-street parking spaces that will need to be relocated to satisfy CPUC safety requirements (Figure 4). These parking spaces will be replaced as part of Redland's planned street improvements to the larger University Avenue corridor.

**Table 1. Comparison of 2015 Approved Project and Proposed 2017 Physical Design Refinements**

| LPA in Certified EIS/EIR – 2015 | 90 Percent Design – 2017 | Figure Reference |
|---|---|---|
| • Bridge 9.4 (Mill Creek Zanja)<br>• Drainage Outfalls | • Relocation of Proposed Outfall (Mill Creek) -relocate outfall to south of Bridge 9.4<br>• New Detention Basin - Construct new detention basin on City owned property, south ROW and west of University. | Figure 2 and Figure 3 |
| • Refinements to University Street at Sylvan Park: approved Project contemplated roadway improvements.<br>• Identified 740 sq. ft. of encroachment into Sylvan Park | • Removal of 10 parking spaces along University Ave.<br>• Park Avenue frontage improvements<br>• Refinement increases encroachment into Sylvan Park to 794 sq. ft | Figure 4 |

**Figure 1. Regional Location with Project Refinements Located within Red Area**

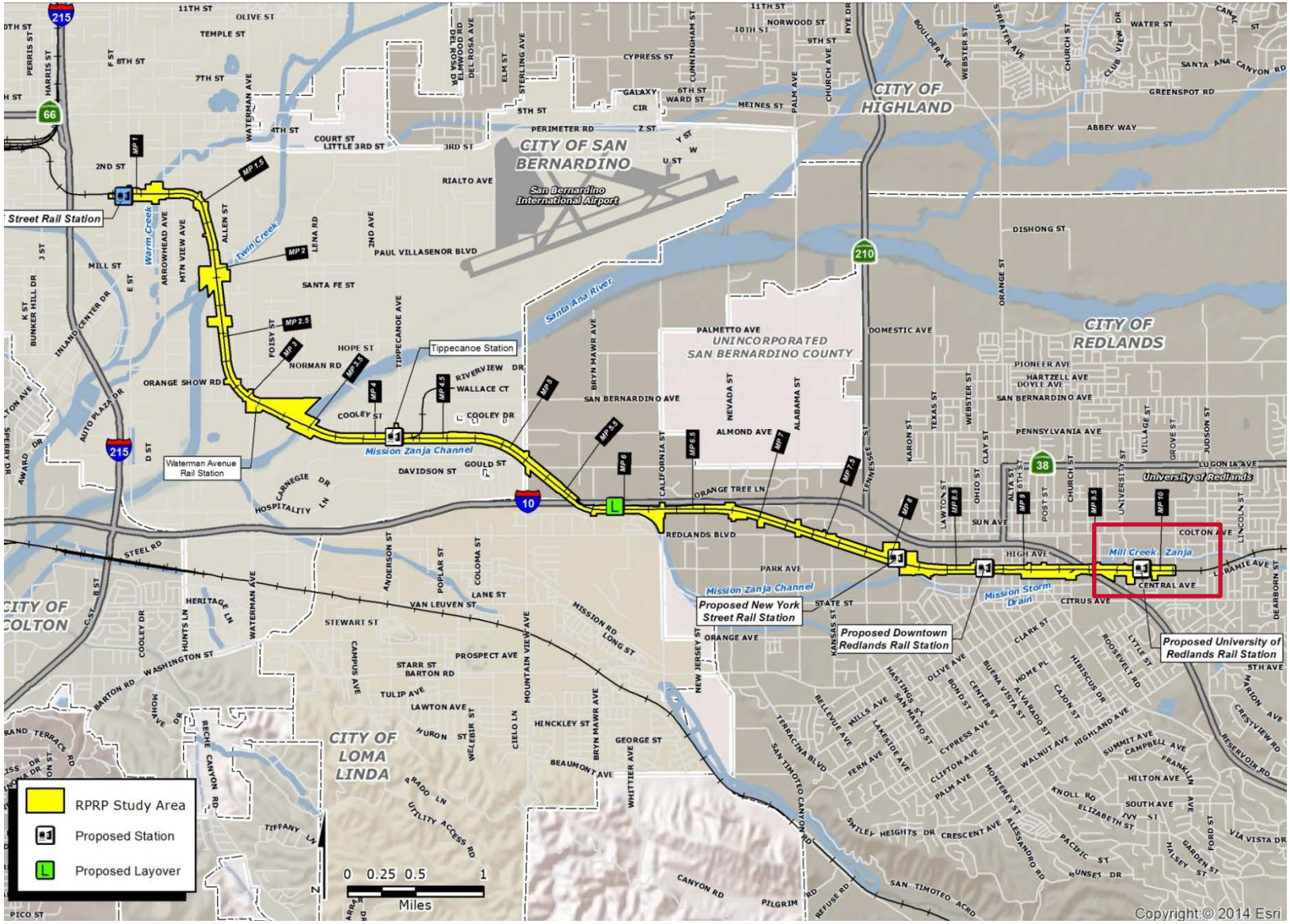
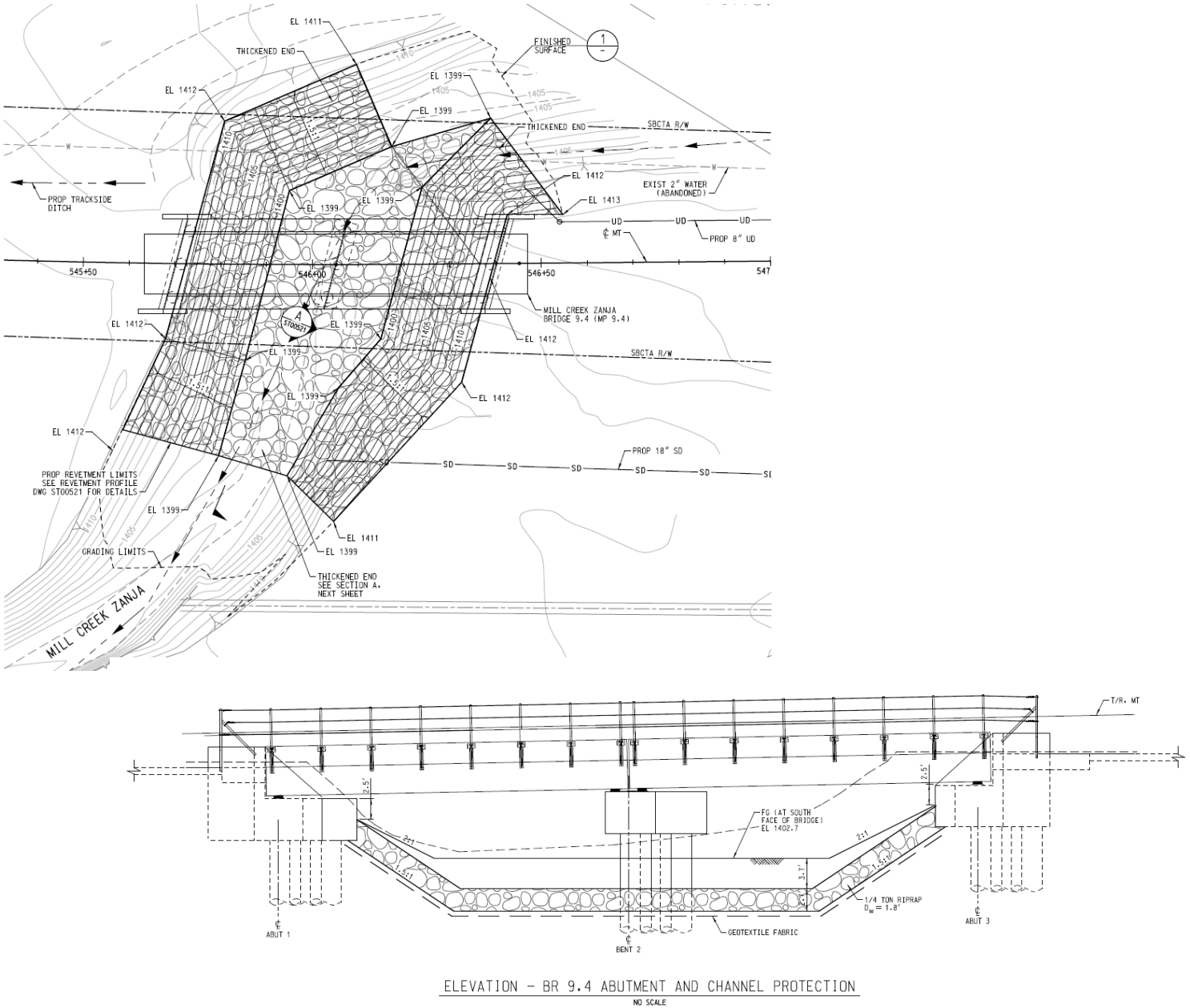


**Figure 2. Bank Protection for Mill Creek Zanja/ Relocation of Proposed Outfall**




ELEVATION – BR 9.4 ABUTMENT AND CHANNEL PROTECTION
NO SCALE

**Figure 3. Proposed Detention Basin**

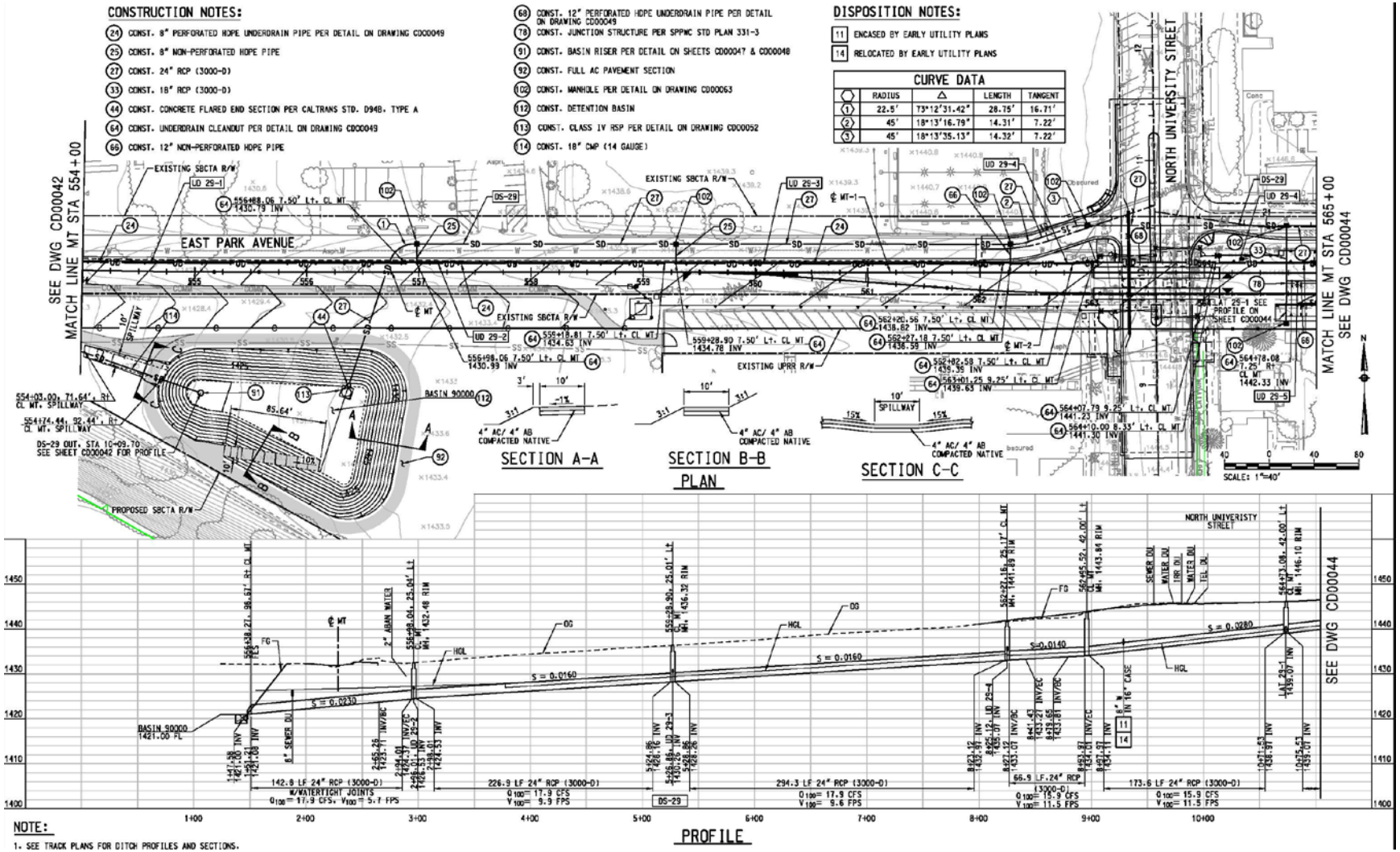
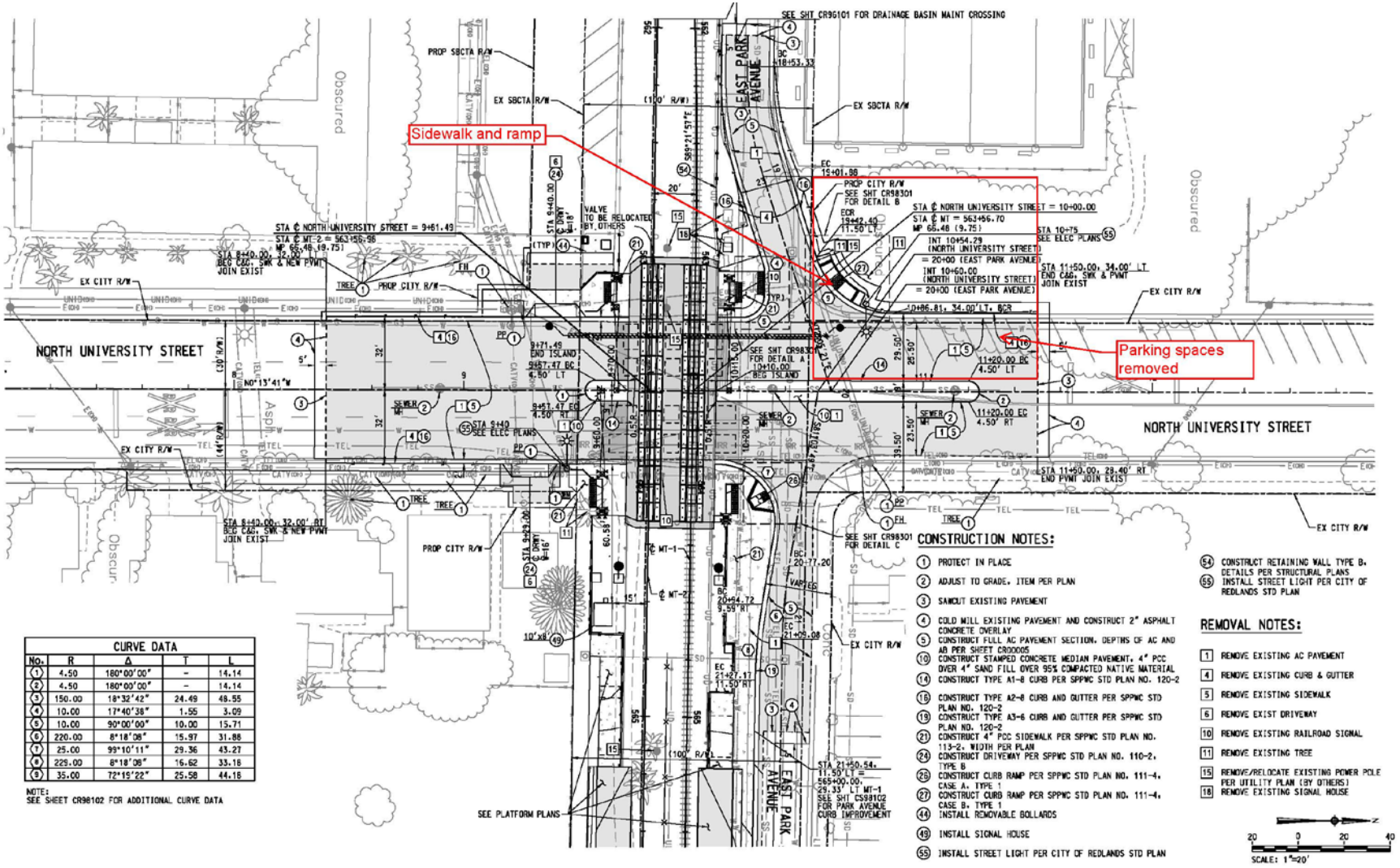


**Figure 4. Refinements at the Southeast Corner of Sylvan Park**



# Area of Potential Effects

The approved 2014 APE was originally created to take into consideration both archaeology and architectural resources, encompassing the maximum footprint for construction, ground-disturbance and grading, and generally extended one parcel past the limits of the above-ground Project improvements, and/or direct impacts for the gated crossings, tree removal areas, maintenance facilities, transit structures, raised medians, staging areas, property acquisitions, and ROW impacts. The APE also included previously recorded cultural resources located adjacent to the above-ground Project improvements and direct impact areas. In addition, the APE included parcels adjacent to the proposed Project footprint as part of the architectural history field surveys for properties that may be potentially indirectly affected by visual, audible, or atmospheric intrusions; shadow effects; vibrations from construction activities; or change in access or use. These areas of the APE would not be physically demolished, destroyed, relocated/removed, materially altered, or impacted from neglect or deterioration as a result of this Project.

In keeping with the previous methodology, both direct and indirect effects were taken into account while deciding whether to revise the APE, including areas where new project components are proposed.

The Project APE has been compared to the proposed physical design refinements to the adopted LPA, and an expansion is necessary of the approved 2014 APE to encompass the parcel where the proposed detention basin is located, and the relocation of the proposed outfall at Mill Creek Zanja (Figure 5). The remaining physical design refinements proposed herein would be contained within the approved Project APE.

**Figure 5. 2014 Approved APE and 2017 Expanded APE, Areas Surveyed**

# Identification of Historic Properties

In November 2017, an updated records search was conducted with the South Central Coastal Information Center (SCCIC) for the area in which Project refinements are proposed. All previously identified historic properties within the APE were included in the *Cultural Resources Technical Memorandum*, prepared June 2014 and approved by OHP on August 14, 2014 (OHP reference number FTA120830A). In the vicinity of the design refinements, no newly identified cultural resources are currently on file with the SCCIC within the APE or within the newly expanded APE boundary areas (see confidential Appendix A for records search results map).

# Assessment of Project Effects

The assessment of Project effects is limited to the design refinements located within the 2014 approved APE, and also includes the proposed detention basin in the newly expanded APE. The Final EIS/EIR previously determined there would be no adverse effect on historic properties under NEPA, as well as no impact to historical resources under CEQA. The OHP concurred with the findings of the report on August 14, 2014 (OHP reference number FTA120830A).

## Archaeological Resources

On November 6, 2017, HDR archaeologist Nina Delu visited the site and conducted an archaeological pedestrian survey of the area of the expanded APE. The expanded APE includes an approximately 2.5 acres parcel and consists of a roughly triangular-shaped vacant lot on the south side of East Park Avenue, as well as two small, high-disturbed areas flanking the Mill Creek Zanja, south of the I-10 freeway (Photograph 1).

**Photograph 1. Expanded APE, taken from the westernmost edge of the parcel where detention basin is proposed, facing east**

The topography of the revised APE in the proposed detention basin parcel is flat (the area has most likely been graded in the past) and is currently disked for weed abatement (with only dried non-native grass present on the property). Soils in the detention basin parcelare yellowish brown silty-sand with inclusions of gravel and construction debris. A large push pile of dirt is present in the southeast corner of the parcel and modern trash is strewn across the parcel. Additionally, the areas that flank the Mill Creek Zanja are highly disturbed and without vegetation. Soils in these areas consist of silty-sand with large gravel and cobble inclusions.

The 2014 RPRP archaeological survey reported that two archaeological resources have been previously identified within or adjacent to the areas currently proposed for minor design refinements:

**Redway House, CA-SBR-5313H:** This resource is on record at the SCCIC; however, the site was not detected in the APE as a result of the 2014 RPRP survey. The Redway House resource within the APE was also not visible within the APE during the current pedestrian survey.

**Mill Creek Zanja, CA-SBR-8092H (6Z eligibility):** The segment of Mill Creek Zanja within APE was found not eligible for CRHR or NRHP based on a lack of integrity and setting as a result of the 2014 RPRP survey; SHPO concurred with eligibility determinations on August 14, 2014. The Mill Creek Zanja segment was revisited during the field survey, and there are no changes to the reported condition.

During the pedestrian survey no artifacts, ecofacts, features, historic structures, midden soils, or other evidence of new cultural resources were identified. The refined Project would include a new drainage connection to Mill Creek Zanja that results in an expansion to the 2014 approved APE since the drainage connection is now approximately 200 feet west of the previously identified location. Considering that this segment of the Mill Creek Zanja was previously determined to lack sufficient integrity and was found ineligible for the CRHR or NRHP, and no other resources have been identified in the area where the new drainage connection is proposed, no new impacts would result of the relocation of this drainage connection.

In consideration to the excavation that will be required for the newly proposed detention basin, the potential for encountering buried cultural resources is determined to be very low based on the highly disturbed nature of the expanded APE, the lack of previously recorded resources, and the absence of cultural material based on the current pedestrian survey. However, given there is ground disturbing work associated with the proposed design refinement, the possibility exists for the discovery of unanticipated archaeological resources. The recommendation of Mitigation Measures CUL-4 to implement specific measures immediately following an unanticipated discovery remains unchanged and consistent with the 2015 EIS/EIR.

## Architectural Resources

A single architectural resource is located in the vicinity where project refinements are proposed (Table 2). The Redlands Lawn Bowling Club (Primary Number 36-028901; 411 N. University Street, Redlands, California), built in 1926, is located in the southeast corner of Sylvan Park. The resource boundary is the historic parcel boundary (see confidential Appendix A for resource boundary). The Redlands Lawn Bowling Club was found eligible for the NRHP under Criteria A (Eligibility Code 3S) based on the 2014 RPRP survey and SHPO concurred with eligibility determinations on August 14, 2014.

**Table 2. Redlands Lawn Bowling Club**

| Address | Type/Name | Eligibility | Previous Effect/ Impact | Updated Effect/ Impact |
|---|---|---|---|---|
| 411 N. University St. Redlands, CA | The Redlands Lawn Bowling Club | **3S:** Eligible for the NRHP based on the 2014 RPRP survey (Criteria A); SHPO concurred with eligibility determinations on August 14, 2014 | No Adverse Effect | No Adverse Effect |

Based on the expanded improvements to University Street, the refined Project would encroach slightly further into Sylvan Park (see Figure 4). Similar to the approved Project, this encroachment would not directly affect the Redlands Lawn Bowling Alley resource. The seven parking spaces removed as part of the University Street improvements would be compensated by the existing parking spaces within the park. Once constructed, the improvements would be at-grade (e.g. sidewalk) and would not indirectly affect this historic resource.

# Conclusions

This cultural resource analysis, reviewed the 2014 approved Project APE in contrast to proposed physical design refinements to the adopted LPA, and the APE was expanded to encompass the parcel where the proposed detention basin is located, as well as two small areas flanking the Mill Creek Zanja immediately south of the I-10 freeway (Figure 5). The remaining physical design refinements proposed are contained within the approved Project APE.

A review of current record search data from the SCCIC and a pedestrian survey where Project refinements are proposed do not change the previous conclusions regarding archaeological resources. Considering there is ground disturbing work associated with the proposed design refinement, the possibility exists for the discovery of unanticipated archaeological resources. The recommendation of Mitigation Measures CUL-4 to implement specific measures immediately following an unanticipated discovery remains unchanged and consistent with the 2015 EIS/EIR.

There are no additional historic properties as defined by Section 106 of the National Historic Preservation Act [16 U.S.C. § 470w(5)] or historical resources as defined by CEQA (CCR, Title 14(3) § 15064.5[a] [2]) within the APE for the Project refinements including the relocation of the proposed outfall for Mill Creek Zanja and the newly proposed detention basin Project refinements, and therefore it is recommended that there is No Historic Properties Affected/ No Impact for these project refinement.

Considering the expanded improvements to University Street, the refined Project would encroach slightly further into Sylvan Park but this encroachment would not directly affect the gated Redlands Lawn Bowling Alley resource. The seven parking spaces removed as part of the University Street improvements would be compensated by the existing parking spaces within the park. Once constructed, the improvements would be at-grade (e.g. sidewalk) and would not indirectly affect this historic property.

Overall, the proposed refinements/engineering refinements to the adopted LPA would not be considered to have an adverse effect to historic properties under NEPA, Section 106 of the National Historic Preservation Act, or an impact to historical resources under CEQA.

# Appendix A:

## CONFIDENTIAL RECORDS SEARCH RESULTS MAP

## **CONFIDENTIAL:** RECORDS SEARCH RESULTS MAP

# Draft Bridge 9.4 - Hydrologic and Hydraulic Analysis (60% Design)

## Redlands Passenger Rail Project

*Prepared for:*
*SBCTA*

**March 2017**

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Exhibit 2: Mill Creek Zanja Reach Limits
Exhibit 3: Modeling Overview–Cross-Sections
Exhibit 4: FEMA FIRM 06071C Panel 8716H
Exhibit 5: Proposed Bridge Alternative Plans

## Attachments

Attachment 1 – HEC-RAS Modeling Exhibits
Attachment 2 – Hydraulic Analysis Results
Attachment 3 – Engineering “No-Rise” Certificate
Attachment 4 – Scour Analysis
Attachment 5 – Digital Information (CD)
HEC-RAS Model

# 1.Purpose

The rail from historic Warm Creek (that portion of Warm Creek that was not combined with East Twin Creek and Warm Creek Improvements) to Mill Creek Zanja is proposed to be improved as part of the Redlands Passenger Rail Project (RPRP) (see Exhibit 1). This report covers the hydraulic impacts for the Atchison, Topeka, and Santa Fe (AT&SF) Railway Bridge 9.4 (Bridge 9.4), which is a railroad crossing over the Mill Creek Zanja ditch. The improvements are proposed to reconstruct the bridge from its existing freight-only operation to current standards required for regular passenger rail operations. As part of this project, recommendations, including hydraulic analysis, are being provided to assist in this process.

The purpose of the hydraulic modeling is to: (1) analyze the existing hydraulic condition of the Mill Creek Zanja to serve as a baseline; (2) evaluate the hydraulic impact to the rail and the proposed passenger rail from proposed Bridge 9.4; and (3) evaluate various proposed bridge alternatives which shall result in a No-Rise condition upstream of the bridge.

# 2.Background

The RPRP will design a track alignment for passenger and freight service from the proposed San Bernardino Transit Center east to the University of Redlands. The Redlands Corridor Strategic Plan (RCSP) was developed by San Bernardino County Transit Authority (SBCTA) to address the transportation needs of the Redlands Corridor, assess the capability of transit service and multimodal improvements to meet mobility needs, and describe a course of action to implement transit service in the Redlands Corridor in a cost-effective manner. The first phase of the RCSP calls for the development of a passenger rail service operating between the San Bernardino Transit Center and the University of Redlands, a distance of approximately nine miles. Exhibit 1 shows the overall project.

Existing Bridge 9.4 is a 3-span, steel beam bridge with steel piles. The total length of the bridge is approximately 43 feet. The existing bridge is located at a sharp bend in the Mill Creek Zanja, and the flow approaches the upstream face at a skew. Neither the bents nor abutments are aligned with the flow in the channel.

Existing Bridge 9.4 does not meet standard railroad requirements, including the 50-year soffit criteria and the 100-year subgrade criteria. Due to vertical clearance requirements at the adjacent Interstate 10 crossing, as well as limited capacity within the existing channel, it was concluded that bridge design hydraulic criteria at this location cannot reasonably be achieved. Given this information, SBCTA made the decision that the proposed bridge shall meet or exceed the hydraulic capacity of the existing bridge, resulting in a No-Rise condition upstream of the bridge. Hydraulic analyses are therefore required to evaluate the proposed bridge alternatives to ensure that the proposed structure does not have a negative impact on upstream water surface elevation and adjacent landowners.

The Mill Creek Zanja is designated as a Federal Emergency Management Agency (FEMA) Zone A floodplain, where base flood elevations have not been determined. The floodplain overbank

areas are designated as Zone AO, with flood depths of one to three feet. The creek does not have a regulated floodway.

FEMA completed an extensive search in 2012 for available hydrologic and hydraulic data on the Mill Creek Zanja; however were unable to locate the requested data. The general hydraulic modeling approach for this bridge is to evaluate the existing conditions model, which will serve as the baseline for which to compare the proposed alternatives. The recommended bridge shall be designed such that it does not increase the water surface elevation when compared to existing conditions, resulting in a No-Rise condition upstream of the bridge. The proposed bridge will be designed per structure, constructability, and geotechnical and hydraulic issues.

The Mill Creek Zanja reach modeled in this study is located from approximately 395 feet upstream of Interstate 10 to approximately 295 feet downstream of Church Street (see Exhibit 2). The total reach length is approximately 1,200 feet. The existing channel has a soft-bottom with riprap side slopes. Multiple bank armoring techniques (riprap, grouted riprap) were visible from site photographs as well as aerial imagery, indicating that the area may be susceptible to erosion and scour. Figure 1 shows Bridge 9.4 downstream face in the Mill Creek Zanja. A total of two structures are modeled within the study reach, as shown in Table 1.

**Table 1: Structures in the Mill Creek Zanja Reach**

| Structure | Structure Type |
|---|---|
| AT&SF Railroad Bridge 9.4 | 3-span bridge |
| Church Street | Concrete arch |

A draft FEMA “no rise” certificate is included with this report as Attachment 3. Although, Bridge 9.4 does not have a designated FEMA floodway and base flood elevations have not been determined, a No-Rise certificate was completed to document that no changes to the 100-year water surface elevation will occur due to bridge replacement.

**Figure 1: Bridge 9.4 Downstream Face**

# 3.Hydrology

Discharges along the Mill Creek Zanja in the vicinity of Bridge 9.4 are tabulated in the San Bernardino County Flood Insurance Study (FIS), revised 28 August 2008. The 10-, 50-, 100-, and 500-year flowrates are provided at Interstate Highway 10, located just upstream from Bridge 9.4, with a drainage area of 9.59 square miles. The FIS discharges are provided in Table 2. The 100-year discharge at Bridge 9.4 is 3,200 cfs and was used for this evaluation. The 200-year flow rate was determined using the Discharge versus Exceedance probability chart with interpolating between 100-year and 500-year flow rates. The 200-year flowrate is also shown in Table 2.

**Table 2: Hydrology - Flowrates**

| 10-Year Flood Discharge (cfs) | 50-Year Flood Discharge (cfs) | 100-Year Flood Discharge (cfs) | 200-Year Flood Discharge (cfs) | 500-Year Flood Discharge (cfs) |
|---|---|---|---|---|
| 620 | 2,000 | 3,200 | 5,000 | 8,600 |
| **Note:** Flowrates are in cubic feet per second (cfs) | | | | |

# 4.Hydraulic Modeling

## 4.1 Modeling Overview

Hydraulic modeling of the Mill Creek Zanja and Bridge 9.4 was conducted using Hydrologic Engineering Center River Analysis System (HEC-RAS) program, version 5.0.3, as developed by the United States Army Corps of Engineers (USACE). All reference topography is based on the North American Vertical Datum of 1988 (NAVD 1988) datum.

As previously stated, the standard hydraulic design criteria for bridges does not apply to Bridge 9.4, due to site constraints. For this project, the proposed bridge shall result in a No-Rise condition, in which there is no increase in water surface elevation upstream of the bridge.

## 4.2 Model Inputs

### 4.2.1 Existing Conditions Model (HEC-RAS)

The existing conditions model will serve as a baseline in which the proposed alternatives will be compared. There is no FEMA effective model for this reach from which to use as a bse condition. The existing conditions model was developed using project topographic data that was derived from flown topographic and ground survey, collected throughout of the course of the project. HEC-GeoRAS was utilized as a graphical interface allow for the development of the geometric information in ArcGIS to be imported into HEC-RAS. Specific modeling inputs and assumptions for the existing conditions model are summarized below:

- Existing bridge geometry and dimensions were derived from bridge measurements and survey, to include existing top of rail survey.
- A 10 degree skew was applied to bounding bridge cross-sections, the bridge deck and opening, as well as the two bents to account for the bridge, abutments and bents being located at a sharp bend in the channel and not aligned to flow.
- Flow data was derived from the 2008 San Bernardino County FIS published by FEMA
- No debris was applied to the bridge bents.
- Ineffective flow areas were added to cross-sections as needed using engineering judgment.

- The existing bridge was modeled using the highest energy answer for Energy, Momentum, and Yarnell for low flow and the pressure and/or weir option for high flow.
- One dimensional hydraulic model was performed under subcritical conditions.
- The boundary condition at the downstream end of the reach was calculated using normal depth, with an approximate bed slope of 0.15%.

### 4.2.2 Proposed Condition Bridge Model (HEC-RAS)

The proposed alternatives hydraulic model used the existing conditions model as a base. Channel modifications and proposed track profile changes required to accommodate the bridge construction were incorporated into the model, as well as the bridge geometries unique to each alternative. Several bridge alternatives were hydraulically analyzed as part of this study. Many of these alternatives either did not perform well hydraulically, or were deemed too expensive, and therefore were not progressed into conceptual design. Four bridge alternatives were analyzed in detail, and are summarized below.

Alternative 1: 3-Span 20" Concrete Slab

This alternative utilizes a pre-stressed, pre-cast concrete slab, 20 inches thick, across three spans. Each span is 20 feet. The abutments will include vertical faces in order to maximize available flow area through the bridge. Wing walls will serve to return vertical features back to the sloped channel banks. The sub-structure consists of 30" CIDH piles with bent caps measuring 4'x4'. Bents and abutment faces will be skewed 15 degrees to better align with approach flows. Channel modifications will be required in order to accommodate the increase in bridge length over the existing structure.

Alternative 2: 2-Span 33" Pre-Cast Concrete Box Girder

This alternative utilizes a pre-stressed, pre-cast concrete box, 33 inches deep, across two spans. Each span is 33 feet and includes 1.5:1 sloping abutment faces. The sub-structure consists of 30" CIDH piles with bent cap measures 5.5' wide by 4' deep. The bent will be skewed 25 degree toward flows, enabled by offset and angled placement of the box girders. Channel modifications will be required in order to accommodate the increase in bridge length over the existing structure.

Alternative 3: 2-Span Steel Girder

This alternative utilizes 20.875 inch deep steel girders over two bridge spans. Each span is 27 feet and includes vertical abutment faces. The sub-structure consists of 30" CIDH piles with bent cap measures 4' wide by 4' deep. The bent will be skewed 25 degree toward flows. Channel modifications will be required in order to accommodate the increase in bridge length over the existing structure.

Alternative 4: (4) 10Hx12W Box Culverts, Partially Buried

This alternative includes four, cast-in-place, 10' high by 12' wide standard UPRR concrete box culverts. In order to meet cover requirements, the boxes will be sunk four feet below the channel invert, reducing available flow capacity through the structure. This alternative includes wing walls and a downstream apron constructed at the box invert elevation.

Alternative 2 was selected as the recommended alternative. The proposed bridge design plans are provided in Exhibit 5. The proposed condition model for the recommended bridge was modeled as described below:

- A 10 degree skew was applied to bounding bridge cross-sections, the bridge deck and opening, and the pier to account for the bridge, abutments and pier being located at a sharp bend in the channel and not aligned to flow.
- The highest energy answer for the Energy, Momentum and Yarnell was used for the Low Flow calculations. The shape coefficient was used the average of the pier, bent and pile cap. The pressure and/or weir method was used for High Flow calculations.
- The proposed condition survey was based on NAVD 88 vertical datum. The Corpscon program was used to convert elevations in NAVD 88 to NGVD 29. The conversion relationship of NAVD 88 – NGVD 29 = 2.5 feet was used based on the proposed bridge location (N34.07515, W117.2721).

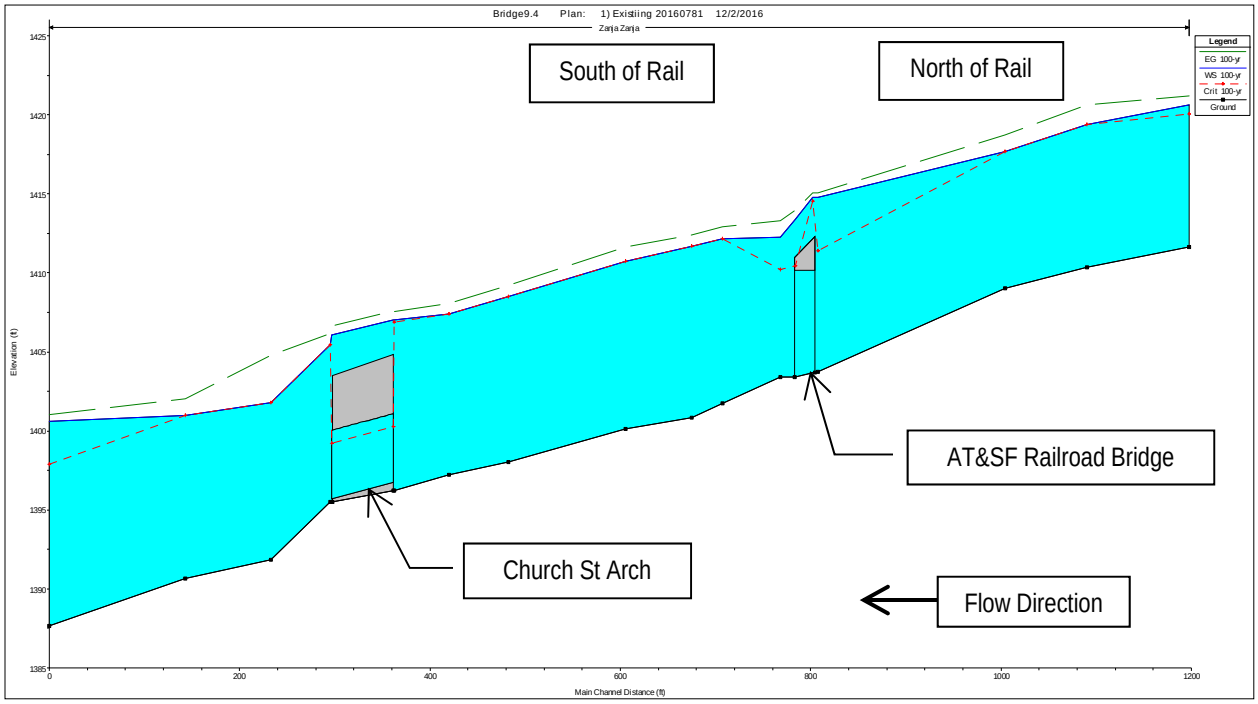
## 4.3 Model Results

The existing and proposed conditions model hydraulic results for the 100-year event at HEC-RAS cross-section 836, upstream of Bridge 9.4 are summarized in Table 3. The full hydraulic model results are provided in Attachment 2. Figure 3 and Figure 4 provide graphical representations of the existing and proposed profiles, respectively, in the vicinity of Bridge 9.4. Figure 5 and Figure 6 show the cross section views of the existing and proposed bridges, respectively. The model exhibits for the existing and proposed condition profile and cross sections can be found in Attachment 1.

**Table 3: AT&SF Bridge 9.4 (HEC-RAS Sta. 836) Hydraulic Results**

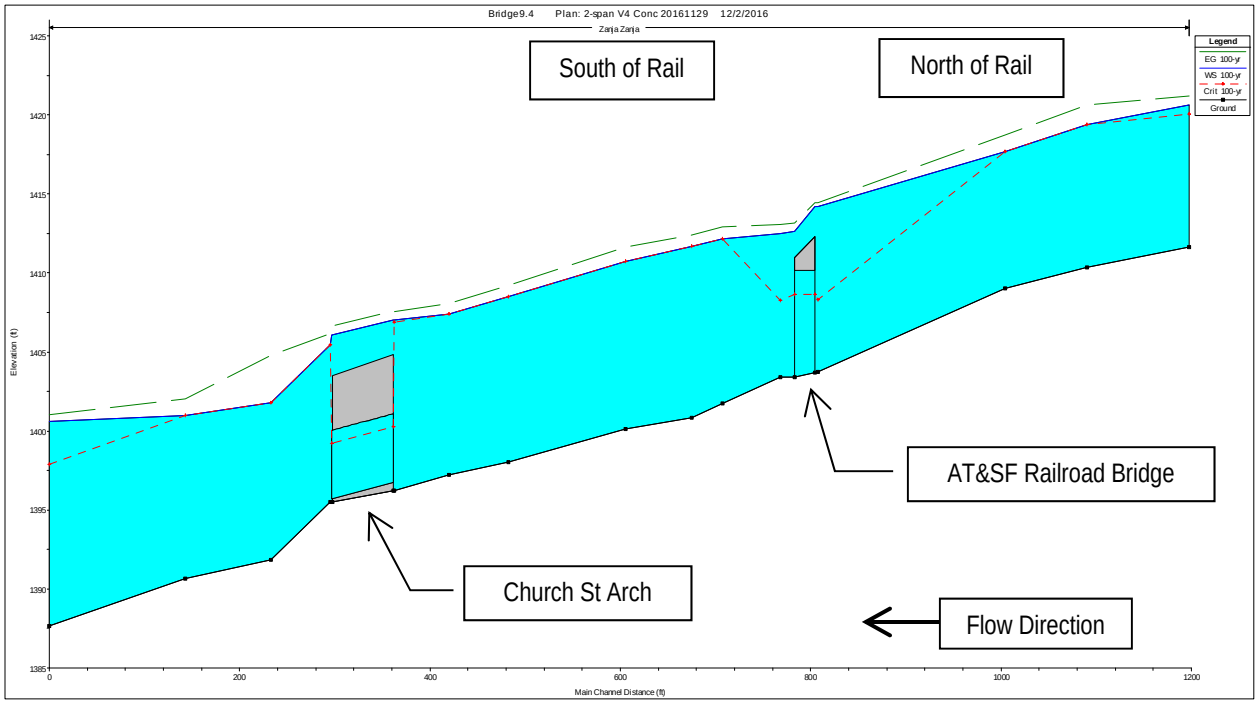
| | | Existing Conditions | Proposed Conditions |
|---|---|---|---|
| 100-Yr event | WSE | 1414.77 ft | 1414.19 ft |
| | EGL | 1415.04 ft | 1414.45 ft |
| | VCH | 4.60 ft/s | 4.33 ft/s |
| | Froude # | 0.37 | 0.24 |

WSE = water surface elevation; EGL = energy grade line elevation; VCH = main channel average velocity; All elevations are NGVD 1929.



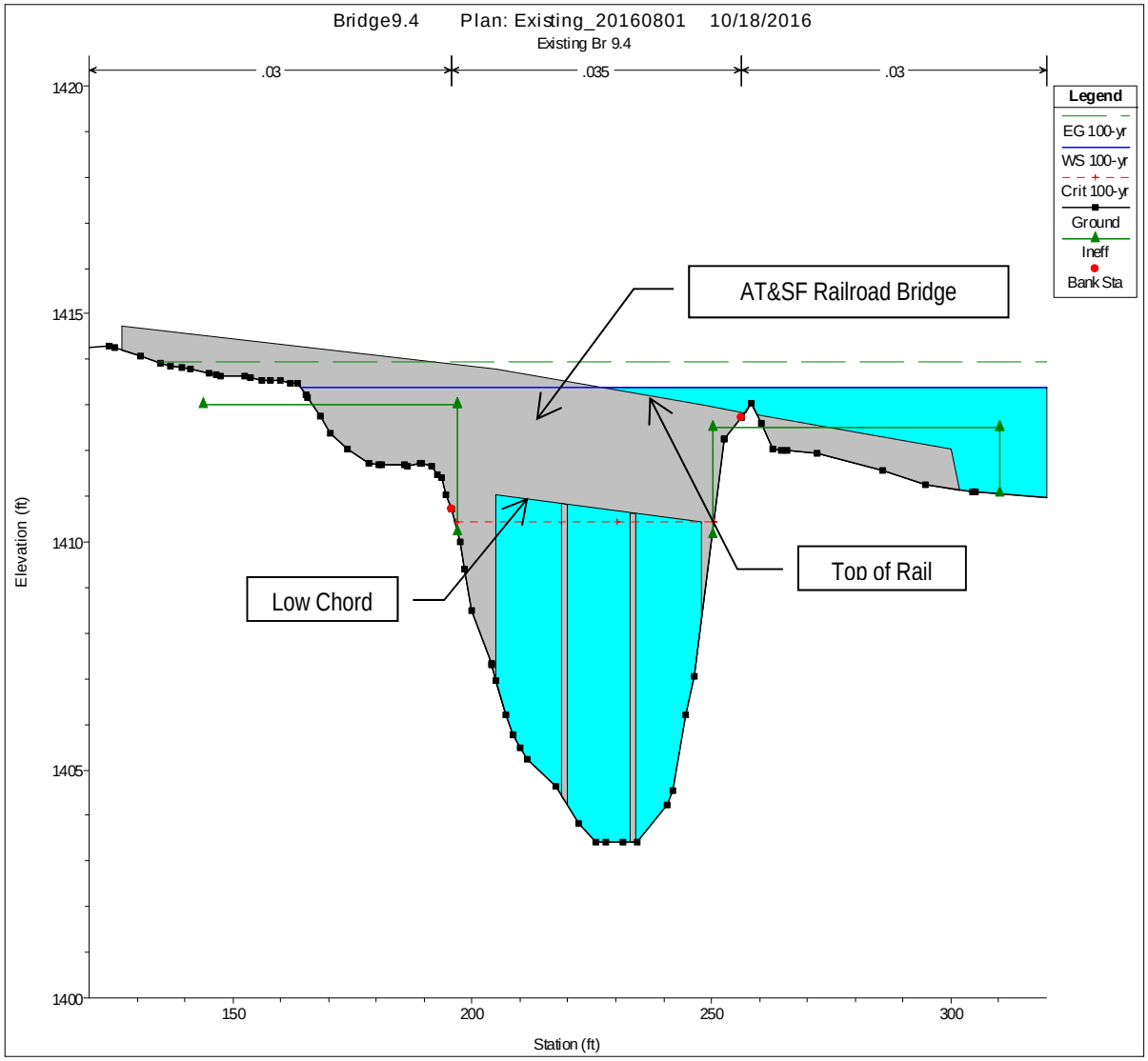

EG = energy grade line (ft), WS = water surface (ft), Crit = Critical Depth Elevation (ft), yr = year

**Figure 2: Profile of Existing Condition**



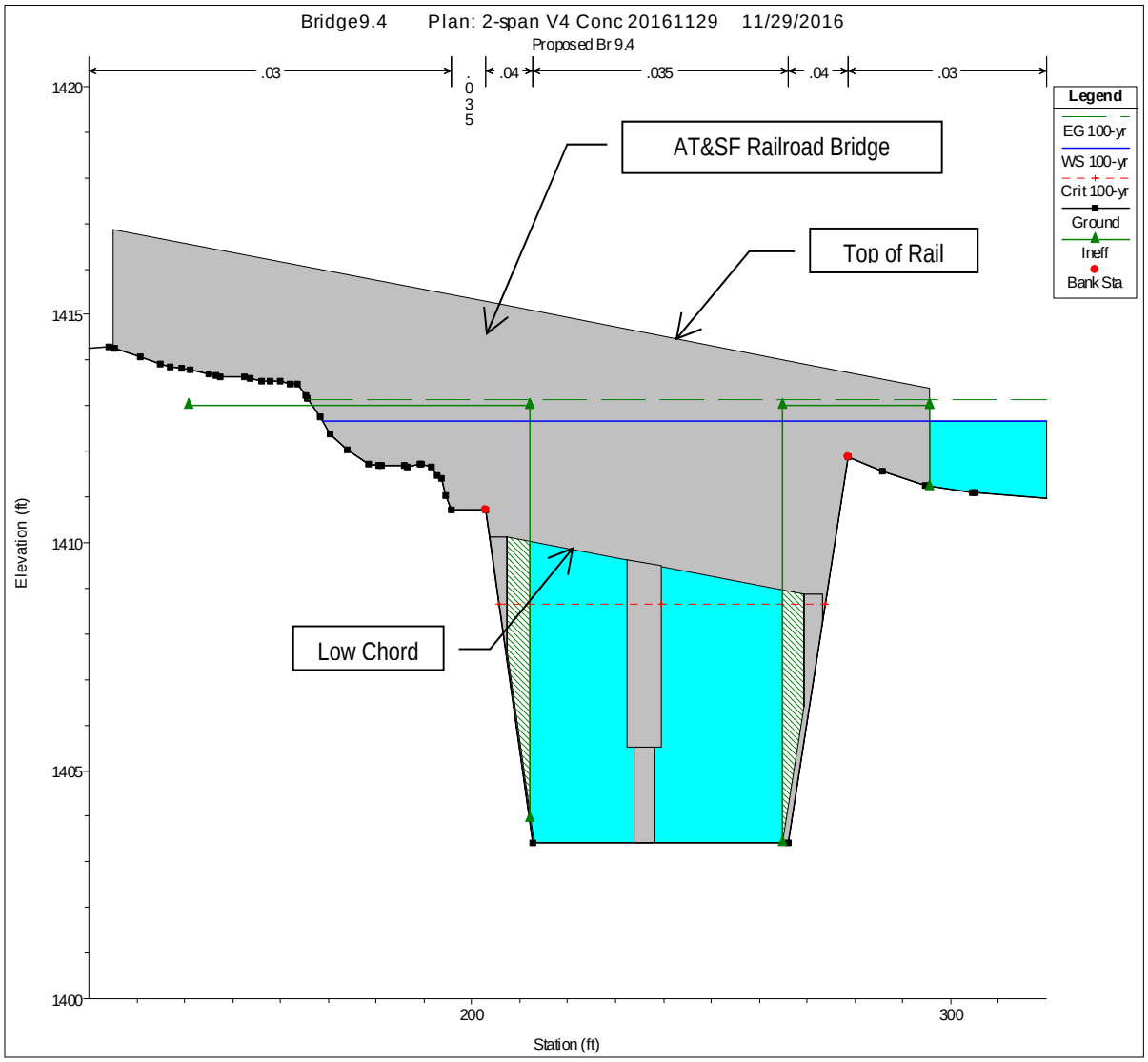

EG = energy grade line (ft), WS = water surface (ft), Crit = Critical Depth Elevation (ft), yr = year

**Figure 3: Profile of Proposed Condition**




EG = energy grade line (ft), WS = water surface (ft), Crit = Critical Depth Elevation (ft), yr = year, Ineff = Ineffective Flow Area, Sta. = Station

**Figure 4: Cross-Section of Existing Bridge 9.4**




EG = energy grade line (ft), WS = water surface (ft), Crit = Critical Depth Elevation (ft), yr = year, Ineff = Ineffective Flow Area, Sta. = Station

**Figure 5: Cross-Section of Proposed Bridge 9.4**

The results of the hydraulic analysis upstream and downstream of the Bridge 9.4 are shown in Table 4. The results indicate a slight decrease (0.58 feet) in water surface elevation immediately upstream of Bridge 9.4 for the proposed condition and a slight increase (0.22 feet) immediately downstream of the bridge. The proposed condition geometry results in a slight widening of the existing channel, resulting in a reduced velocity, and slight increase in water surface elevation at one section. This is further complicated by the varying flow distribution in the overbanks and multiple flow paths over the tracks and around the bridge. The rise is a localized result of the model limitations and primarily contained within the ROW at the bridge. It should be noted that the capacity of the bridge increases from 1,700 cfs through the existing opening to almost 2,600 cfs with the proposed structure. This means that more flow should remain in the channel and not forced out into the overbank. The remainder of the channel results in a no-rise condition.

**Table 4: Hydraulic Analysis Results (ft, NGVD29)**

| *River Station* | *Existing* | *Proposed* | *Proposed-Existing* |
|---|---|---|---|
| 1227 | 1420.63 | 1420.63 | 0 |
| 1119 | 1419.40 | 1419.40 | 0 |
| 1033 | 1417.65 | 1417.65 | 0 |
| 836 | 1414.77 | 1414.19 | -0.58 |
| 814 | Bridge 9.4 | | |
| 797 | 1412.26 | 1412.48 | 0.22 |
| 736 | 1412.16 | 1412.16 | 0 |
| 704 | 1411.69 | 1411.69 | 0 |
| 634 | 1410.73 | 1410.73 | 0 |
| 512 | 1408.52 | 1408.52 | 0 |
| 449 | 1407.39 | 1407.39 | 0 |
| 391 | 1407.04 | 1407.04 | 0 |
| 357 | Church St. Arch | | |
| 324 | 1405.46 | 1405.46 | 0 |
| 262 | 1401.78 | 1401.78 | 0 |
| 172 | 1400.99 | 1400.99 | 0 |
| 29 | 1400.61 | 1400.61 | 0 |

# 5.Scour Analysis

Bridge scour analysis was conducted according to Federal Highway Administration (FHWA) Hydraulic Engineering Circular 18, Evaluating Scour at Bridges (HEC-18) methodology (FHWA 2012). The bridge substructure for the proposed bridge shall be designed to withstand the effects of scour caused by hydraulic conditions from floods larger than the hydraulic design flood. However, due to the site constraints, there was not a specific design flow for this structure. Therefore, contraction, abutment, and pier scour were calculated for the 100-year event as the 100-year event is a standard level for protection design.

General scour through the bridge opening as a result of horizontal and vertical contraction was computed. Horizontal contraction was assessed, but with the revised vertical contraction methodology in the current HEC-18 edition, the vertical contraction accounts for both mechanisms. For the proposed structure, the 100-year event pressurizes the opening and overtops the structure between the bank stations. As such, the resulting vertical contraction value is to be used.

Pier scour was computed assuming a 10 degree skew and a weighted average of pier stem and pile cap width. Results are given below in Table 7. No debris was assumed. Abutment scour was computed using the NCHRP method described in HEC-18. The abutments are intended to be protected using riprap, articulated concrete block system (ACB), or other type revetments which will mitigate scour conditions at the abutment and the approach embankment, but if these revetments were to be negated for purposes of structural design, abutment scour (10.1 feet), plus long term degradation and bendway scour (west end) should be considered. Unsupported pile length at the bridge piers should account for pier scour, vertical contraction scour, and long term degradation.

Long term degradation was estimated using an equilibrium slope methodology. Using the Church St culvert downstream as a fixed point, an equilibrium slope was computed based on a D50 of 0.9 mm. This method assumes channel degradation as a result of a reduced sediment supply upstream due to development. The stable slope is projected upstream from the fixed elevation of the Church St invert and the difference between existing conditions and this project slope at Bridge 9.4 is the maximum potential degradation depth.

Table 7 shows the scour depths for 60% Design.

**Table 5: Scour Depths (ft)**

| Flow | Horizontal Contraction Scour (ft) | Pier Scour (ft) | Vertical Contraction Scour[1] (ft) | Long Term Scour[2] (ft) | Bendway Scour (ft) | Total Scour (ft) | Total Abutment Scour (ft) |
|---|---|---|---|---|---|---|---|
| 100 Year | 5.7 | 9.0 | 7.8 | 4.0 | 3.1 | 20.9 | 14.1 (east) 17.2 (west) |

1: Horizontal contraction scour included in pressure scour
2: Long term scour based upon equilibrium slope

# 6.Conclusions

Using the data and resources available, the hydraulic conditions for both existing and proposed conditions were modeled for Bridge 9.4. The results of the modeling indicate that the proposed bridge improvements result in a slightly lower water surface and velocity directly upstream from the bridge. Model results indicate a slightly higher water surface elevation directly downstream from the bridge as result of a slight widening of the existing channel in the proposed geometry,

resulting in a lower velocity. The scour analysis was conducted per HEC-18. The bridge scour depth shall be considered in the structural design. A FEMA “No-Rise” Certificate was completed for the proposed bridge and is included in Attachment 3.

# 7.References

Federal Emergency Management Agency. 2008. Flood Insurance Study, San Bernardino County, California.

HDR, Inc. 2016. SBCTA Redlands Passenger Rail Project Plans.

U.S. Army Corps of Engineers. 2016. HEC-RAS v.5.0 User’s Manual and Technical

Reference Manual

Federal Highway Administration (FHWA), Hydraulic Engineering Circular 18, Evaluating Scour at Bridges (HEC-18) Methodology (FHWA 2012).

# Exhibit 1: RPRP Project Overview

Transit Center
Bridge 1.1
Bridge 2.2
Twin Creek Map Extent
Santa Ana River Map Extent
Lower Mission Zanja Creek Map Extent
Bridge 3.4
Gage Canal
University of Redlands
Bridge 9.4
Project Location
SP Railroad
At and SF Railroad
Warm Creek
Twin Creek
Mill Creek Zanja
Mission Zanja
Storm Drain
Santa Ana River
PACIFIC OCEAN
LOS ANGELES
SAN BERNARDINO
RIVERSIDE
ORANGE
SAN DIEGO
Copyright © 2014 Esri

N
0 0.25 0.5 1
Miles

Drainage Crossing
Mill Creek Zanja
Twin Creek
Mission Zanja Creek Lower Reach
Mission Zanja Creek Upper Reach

FEMA Flood Hazards
Zone X (0.2% Annual Chance Flood)
Zone A
Zone AE
Zone AH
Zone AO

# PROJECT OVERVIEW

## EXHIBIT 1

SANBAG | REDLANDS PASSENGER RAIL PROJECT

HYDRAULIC IMPACT REPORT

PATH: G:\GIS_PRODUCTION\PROJECTS\SANBAG_351426\RPRP_FINAL_DESIGN_2683397\2_WORK_IN_PROGRESS\MAP_DOCS\MXD\DRAINAGE\PROJECT_OVERVIEW.MXD - USER: MLEFFERT - DATE: 12/2/2016

# Exhibit 2: Mill Creek Zanja Reach Limits


**BRIDGE 9.4**

**EXHIBIT 2**

**SANBAG | REDLANDS PASSENGER RAIL PROJECT**

PATH: G:\GIS_PRODUCTION\PROJECTS\SANBAG_351426\RPRP_FINAL_DESIGN_268339\7.2_WORK_IN_PROGRESS\MAP_DOCS\MXD\DRAINAGE\BR9_4_REACHLIMITS.MXD - USER: MLEFFERT - DATE: 12/2/2016

# Exhibit 3: Modeling Overview – Cross Sections


**BRIDGE 9.4**

**EXHIBIT 3**

**SANBAG | REDLANDS PASSENGER RAIL PROJECT**

PATH: G:\GIS_PRODUCTION\PROJECTS\SANBAG_351426\RPRP_FINAL_DESIGN_268339\7.2_WORK_IN_PROGRESS\MAP_DOCS\MXD\DRAINAGE\BR9_4_XSECTIONOVERVIEW.MXD - USER: MLEFFERT - DATE: 12/7/2016

# Exhibit 4: FEMA FIRM 06071C Panel 8716H

# NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11 North. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

**Base map** information shown on this FIRM was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency. This imagery was flown in 2005 and was produced with a 1-meter ground sample distance.

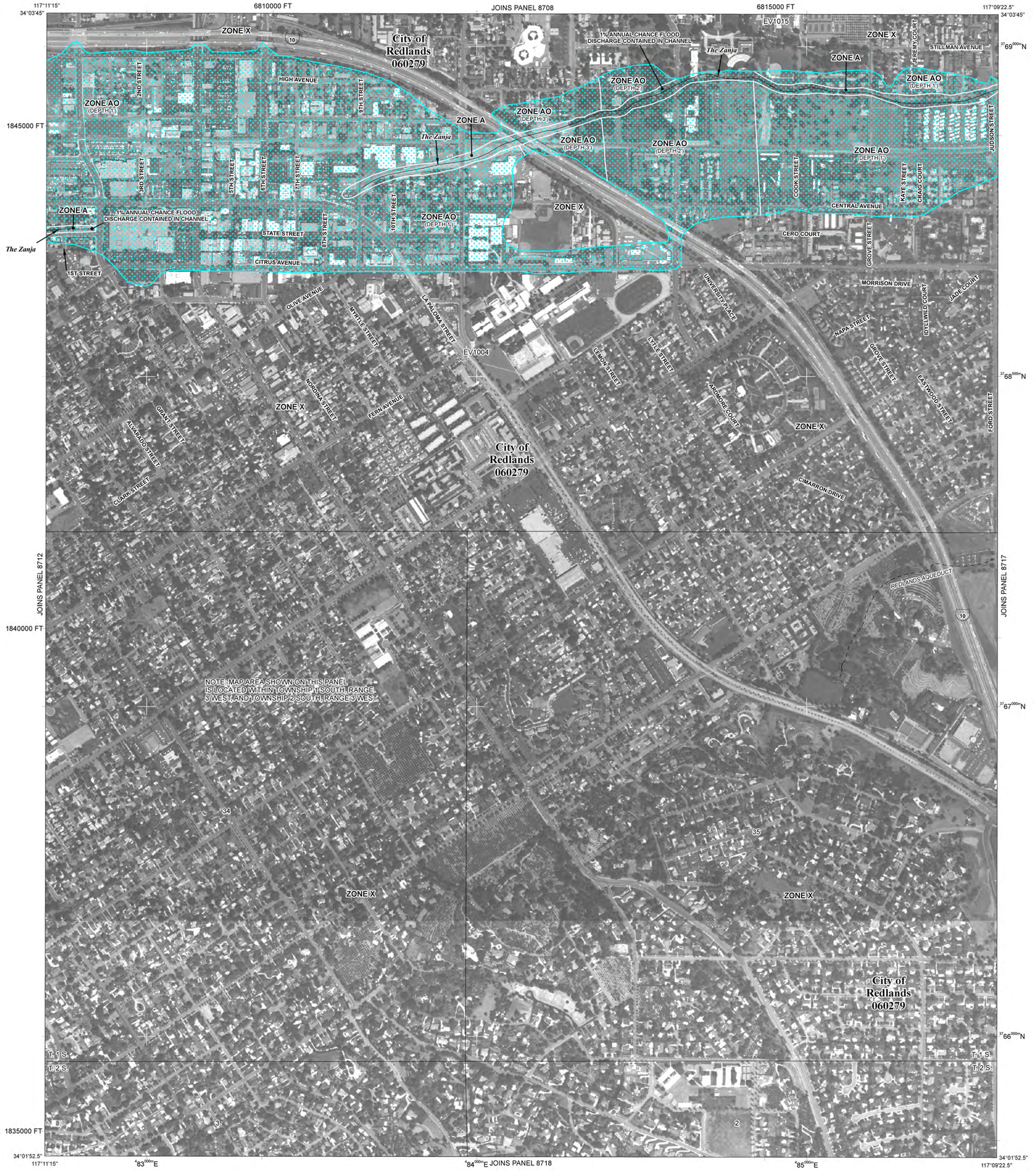
This map may reflect more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to confirm to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.




# LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

| | |
|---|---|
| **ZONE A** | No Base Flood Elevations determined. |
| **ZONE AE** | Base Flood Elevations determined. |
| **ZONE AH** | Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined. |
| **ZONE AO** | Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined. |
| **ZONE AR** | Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood. |
| **ZONE A99** | Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined. |
| **ZONE V** | Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined. |
| **ZONE VE** | Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined. |

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

| | |
|---|---|
| **ZONE X** | Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. |

OTHER AREAS

| | |
|---|---|
| **ZONE X** | Areas determined to be outside the 0.2% annual chance floodplain. |
| **ZONE D** | Areas in which flood hazards are undetermined, but possible. |

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

| | |
|---|---|
| | 1% annual chance floodplain boundary |
| | 0.2% annual chance floodplain boundary |
| | Floodway boundary |
| | Zone D boundary |
| | CBRS and OPA boundary |
| | Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities. |
| 513 | Base Flood Elevation line and value; elevation in feet* |
| (EL 987) | Base Flood Elevation value where uniform within zone; elevation in feet* |

* Referenced to the North American Vertical Datum of 1988

| | |
|---|---|
| A — A | Cross section line |
| 23 — 23 | Transect line |
| 87°07'45", 32°22'30" | Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere |
| 4276000mN | 1000-meter Universal Transverse Mercator grid values, zone 11N |
| 600000 FT | 5000-foot grid ticks: California State Plane coordinate system, zone V (FIPSZONE 0405), Lambert Conformal Conic projection |
| DX5510 × | Bench mark (see explanation in Notes to Users section of this FIRM panel) |
| ●M1.5 | River Mile |

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
March 18, 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 28, 2008 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in 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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 8716H

# FIRM

## FLOOD INSURANCE RATE MAP

## SAN BERNARDINO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

## PANEL 8716 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| REDLANDS, CITY OF | 060279 | 8716 | H |

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

**MAP NUMBER**
**06071C8716H**

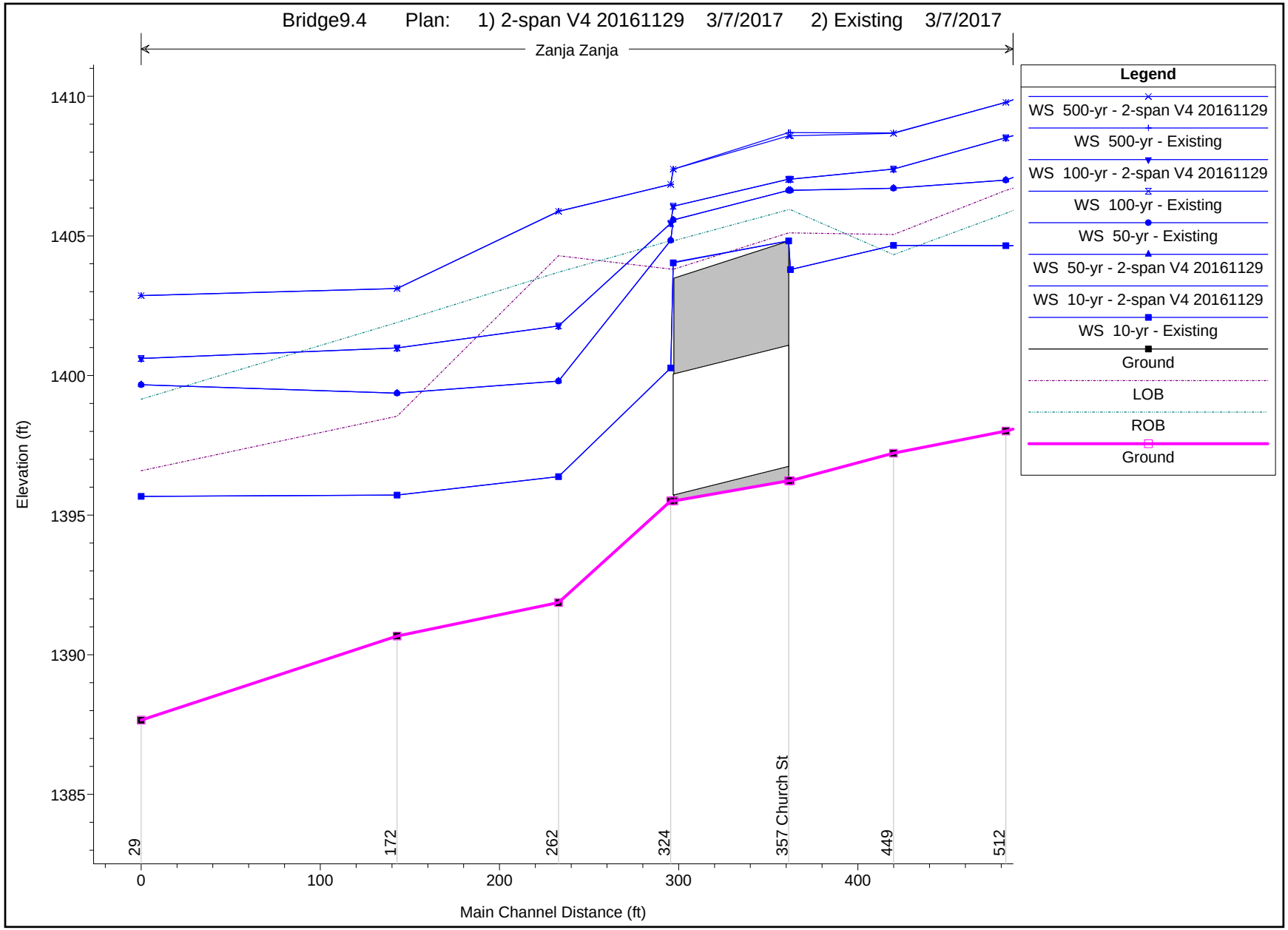
**MAP REVISED**
**AUGUST 28, 2008**

Federal Emergency Management Agency

# Exhibit 5: Proposed Bridge Plan

# Attachment 1

# HEC-RAS Modeling Exhibits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Zanja Zanja
Legend
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WS 500-yr - Existing
WS 100-yr - 2-span V4 20161129
WS 100-yr - Existing
WS 50-yr - Existing
WS 50-yr - 2-span V4 20161129
WS 10-yr - 2-span V4 20161129
WS 10-yr - Existing
Ground
LOB
ROB
Ground
Elevation (ft)
1410
1405
1400
1395
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172
262
324
357 Church St
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512
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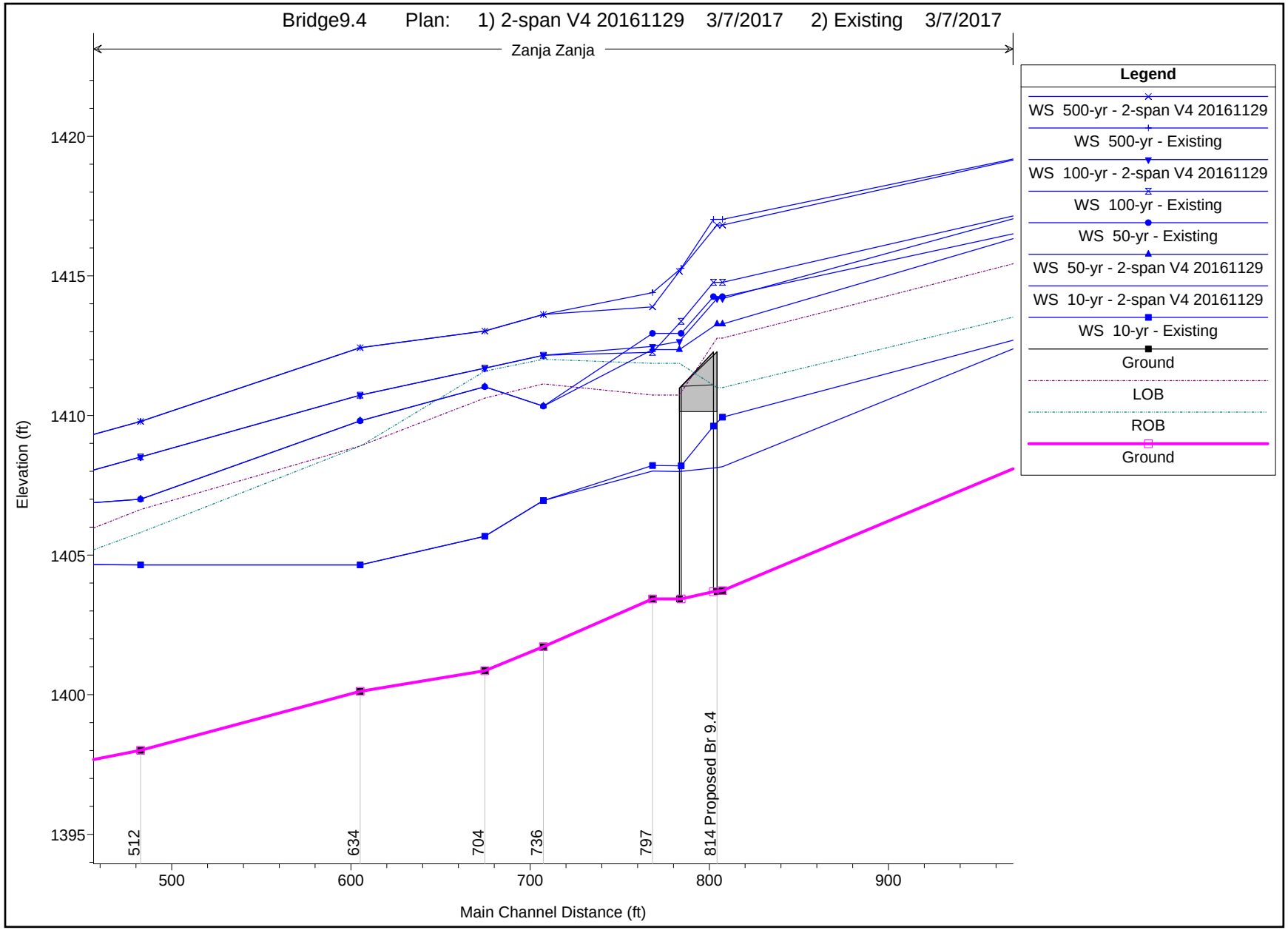
100
200
300
400
Main Channel Distance (ft)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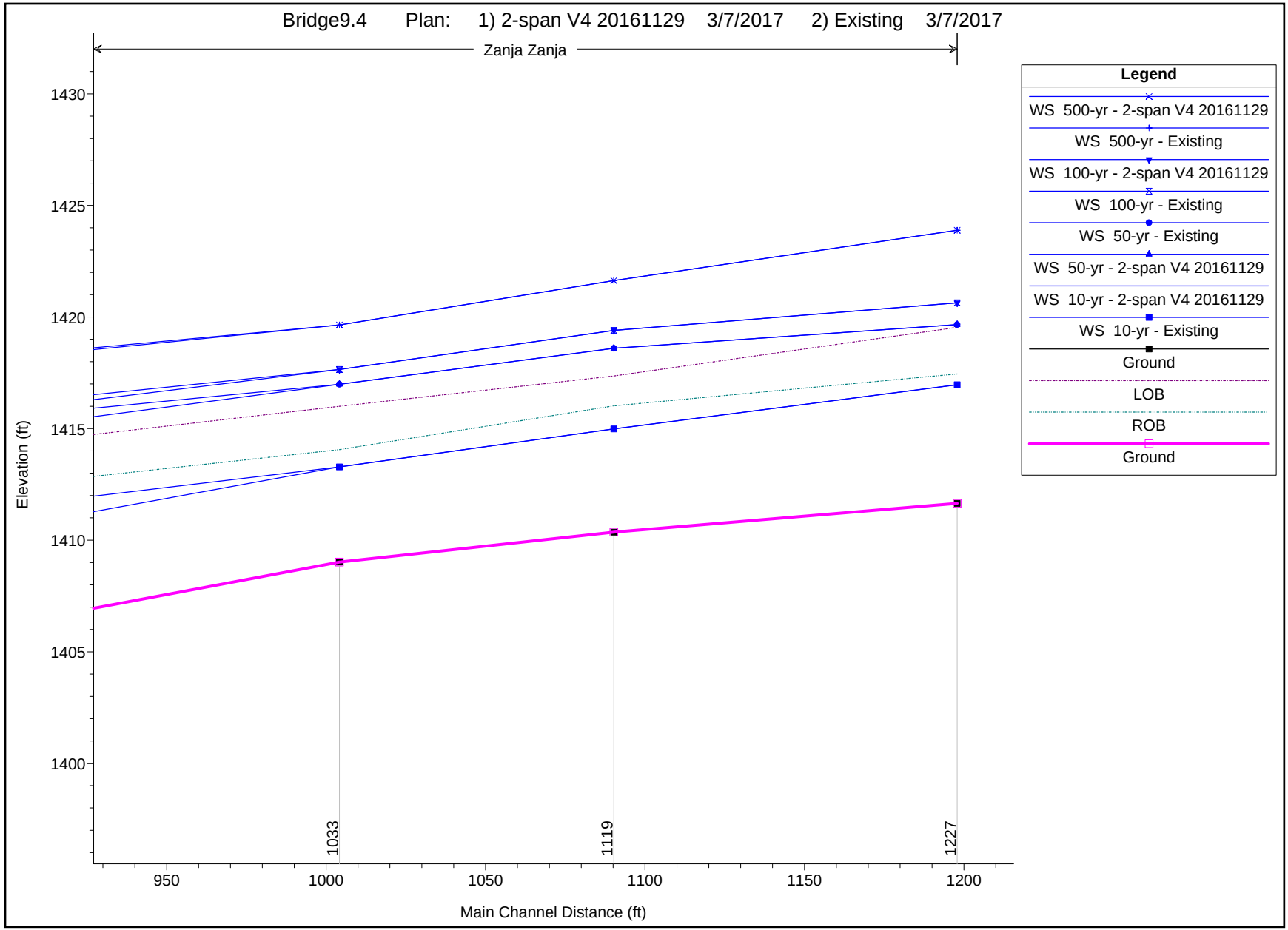
WS 500-yr - Existing
WS 100-yr - 2-span V4 20161129
WS 100-yr - Existing
WS 50-yr - Existing
WS 50-yr - 2-span V4 20161129
WS 10-yr - 2-span V4 20161129
WS 10-yr - Existing
Ground
LOB
ROB
Ground
Elevation (ft)
1420
1415
1410
1405
1400
1395
512
634
704
736
797
814 Proposed Br 9.4
500
600
700
800
900
Main Channel Distance (ft)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Zanja Zanja
Legend
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WS 500-yr - Existing
WS 100-yr - 2-span V4 20161129
WS 100-yr - Existing
WS 50-yr - Existing
WS 50-yr - 2-span V4 20161129
WS 10-yr - 2-span V4 20161129
WS 10-yr - Existing
Ground
LOB
ROB
Ground
Elevation (ft)
1430
1425
1420
1415
1410
1405
1400
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1119
1227
950
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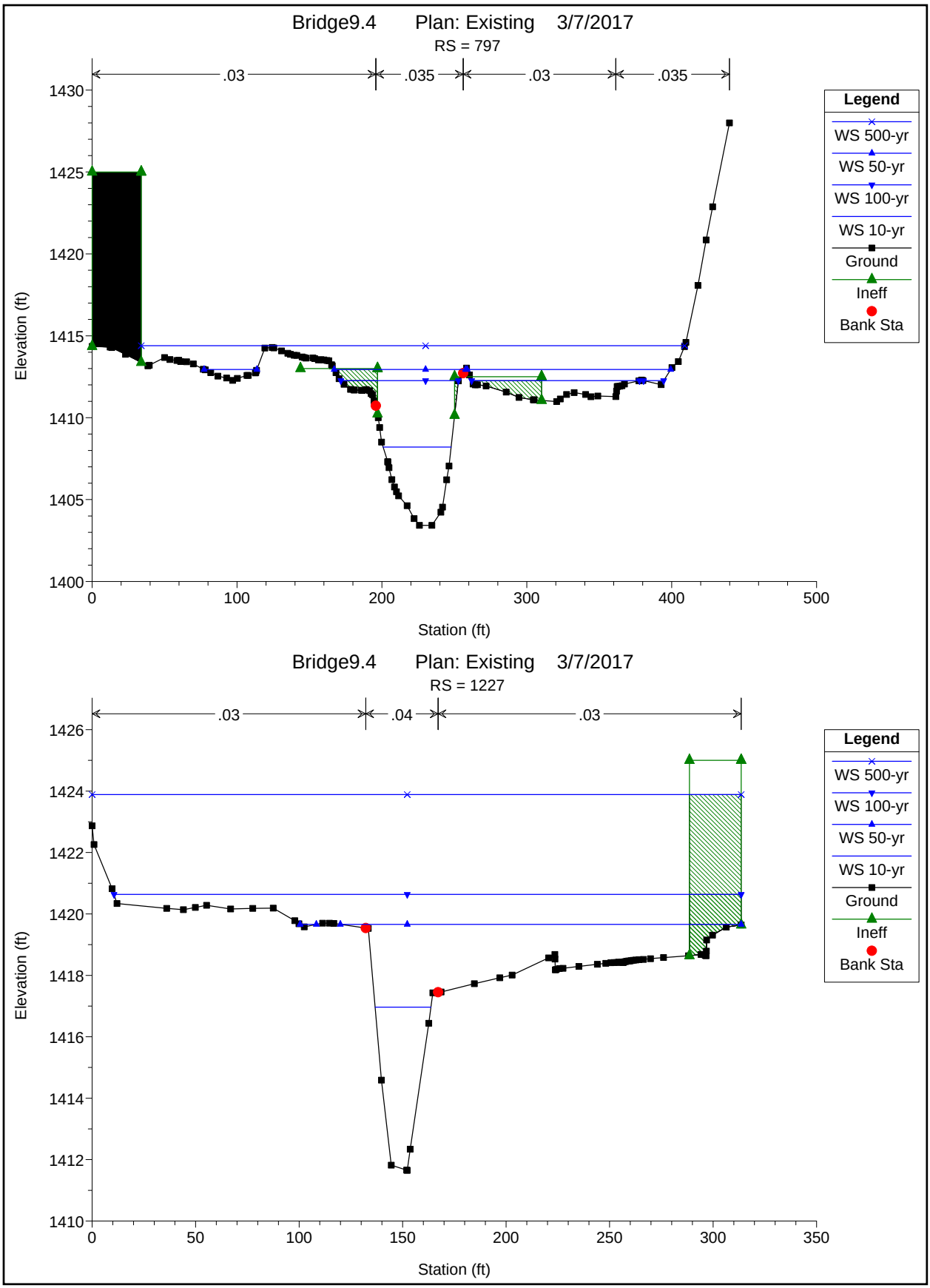
1100
1150
1200
Main Channel Distance (ft)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Elevation (ft)
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Station (ft)
Legend
WS 500-yr
WS 50-yr
WS 100-yr
WS 10-yr
Ground
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Bank Sta
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1412
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Elevation (ft)
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Station (ft)
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Ground
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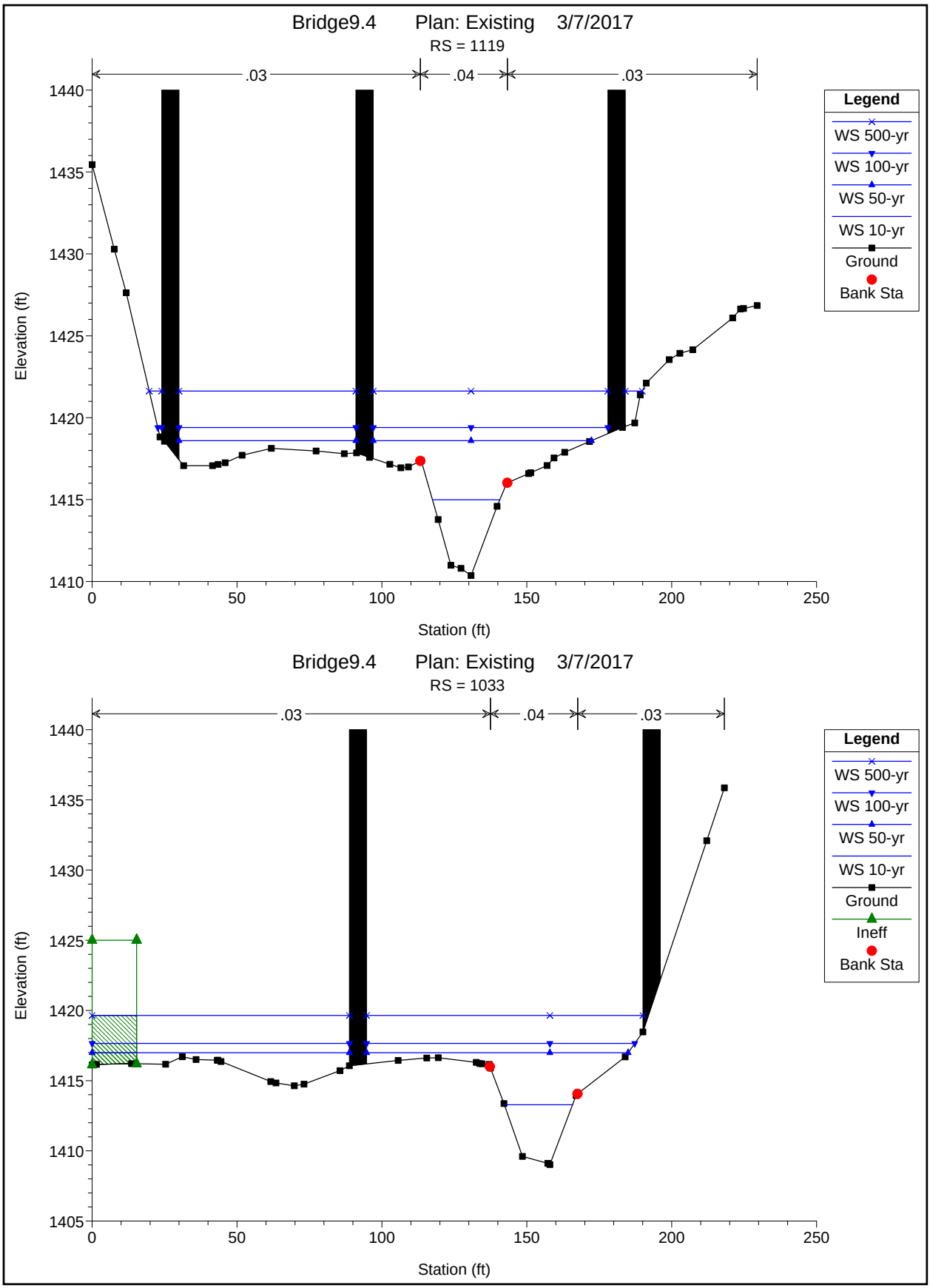
Bank Sta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200
250
Bridge9.4 Plan: Existing 3/7/2017
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Legend
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WS 100-yr
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WS 10-yr
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Elevation (ft)
Station (ft)
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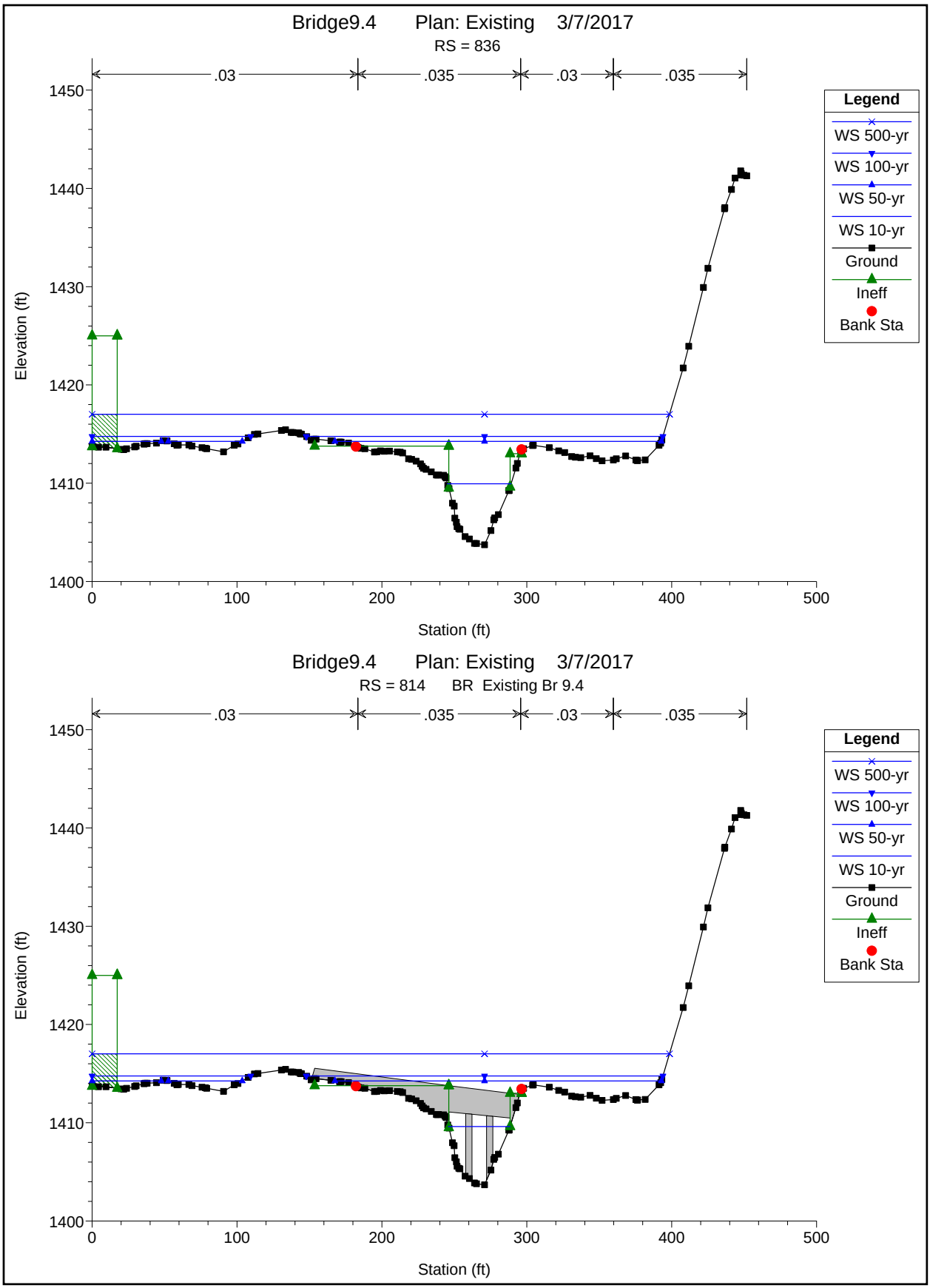
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Elevation (ft)
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Station (ft)
Bridge9.4 Plan: Existing 3/7/2017
RS = 814 BR Existing Br 9.4
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Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
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Elevation (ft)
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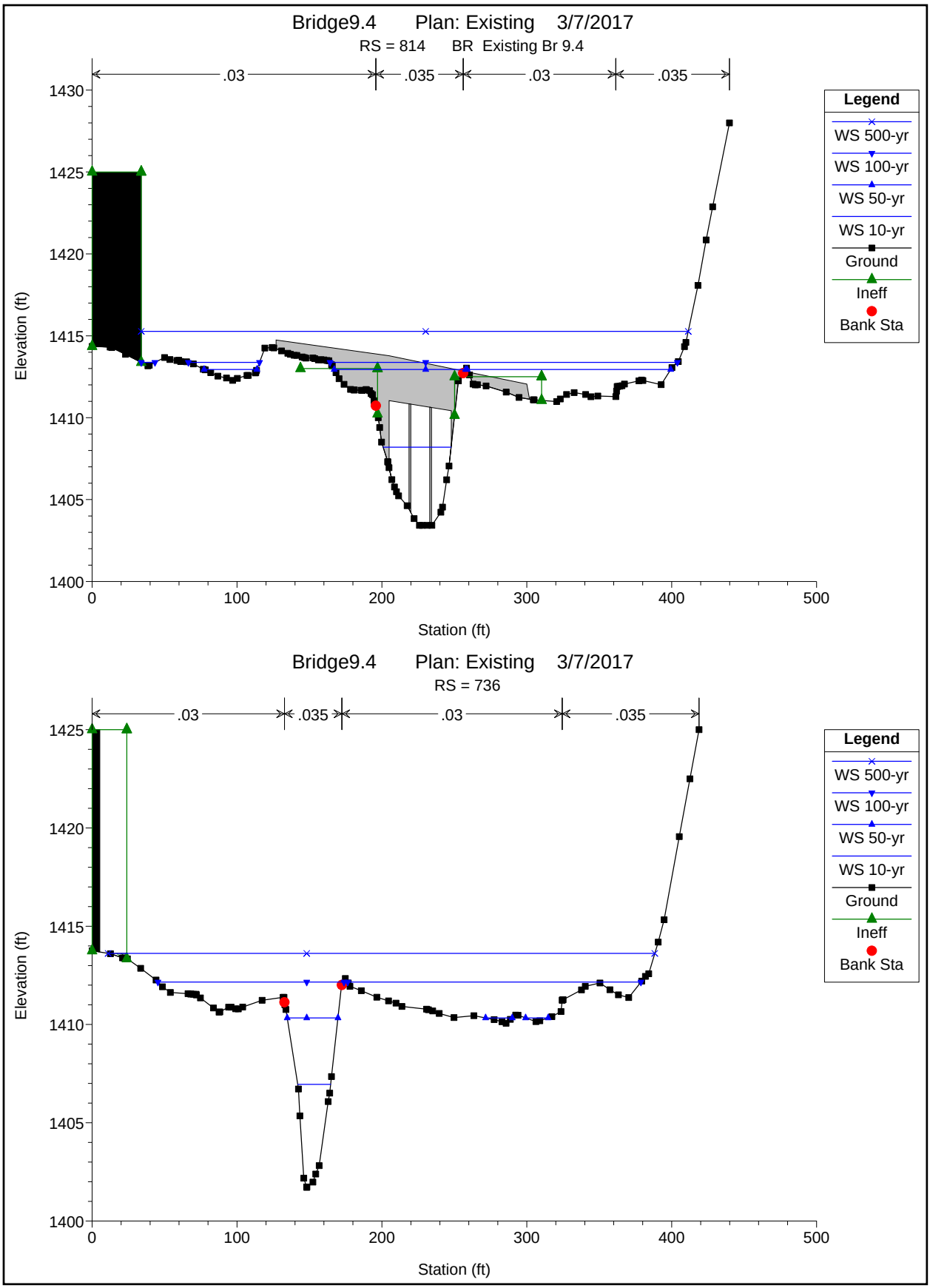
Station (ft)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Legend
WS 500-yr
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WS 10-yr
Ground
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Elevation (ft)
Station (ft)
1430
1425
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1400
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400
500
Bridge9.4 Plan: Existing 3/7/2017
RS = 736
.03
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Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
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Station (ft)
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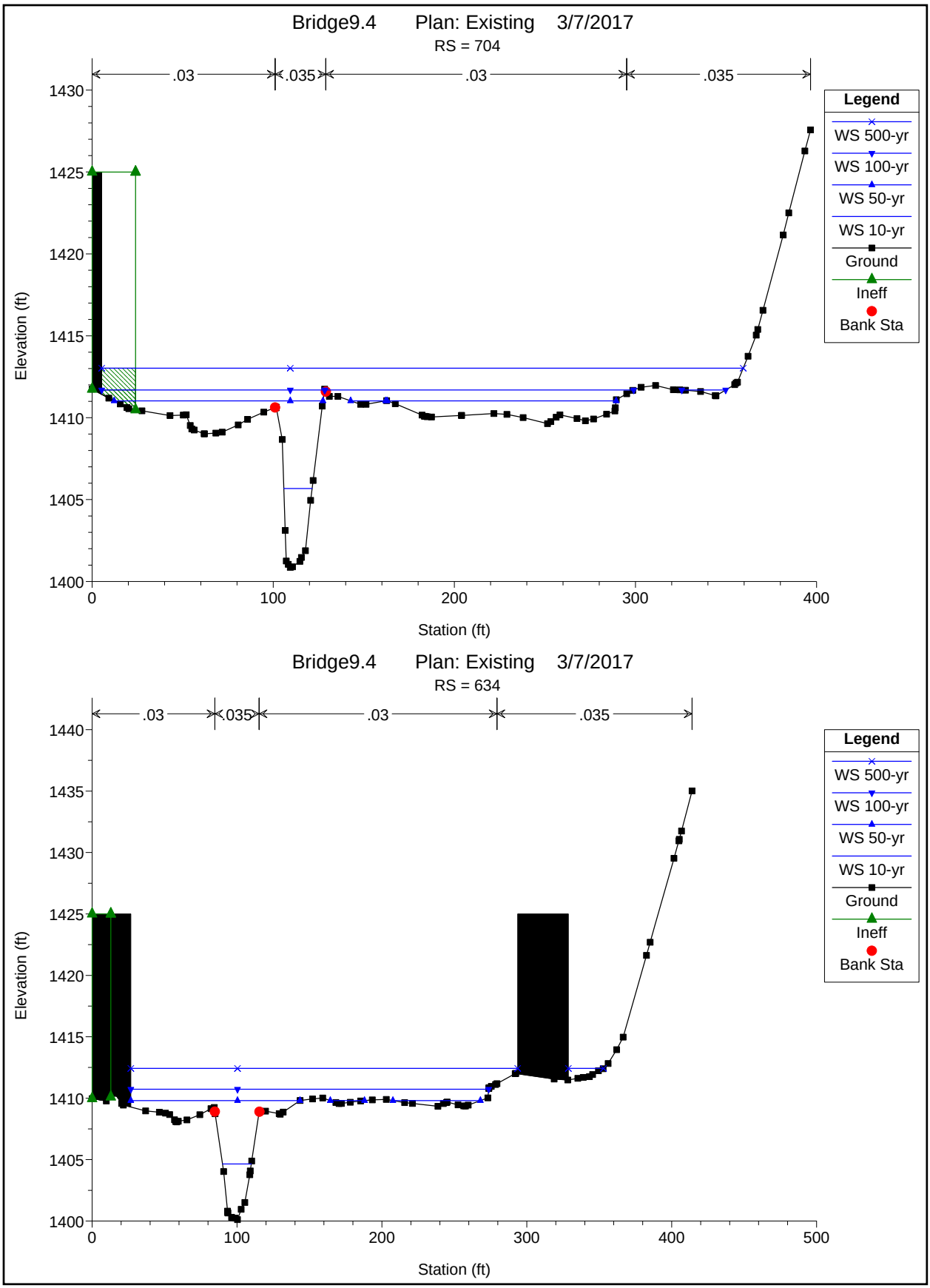
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Legend
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WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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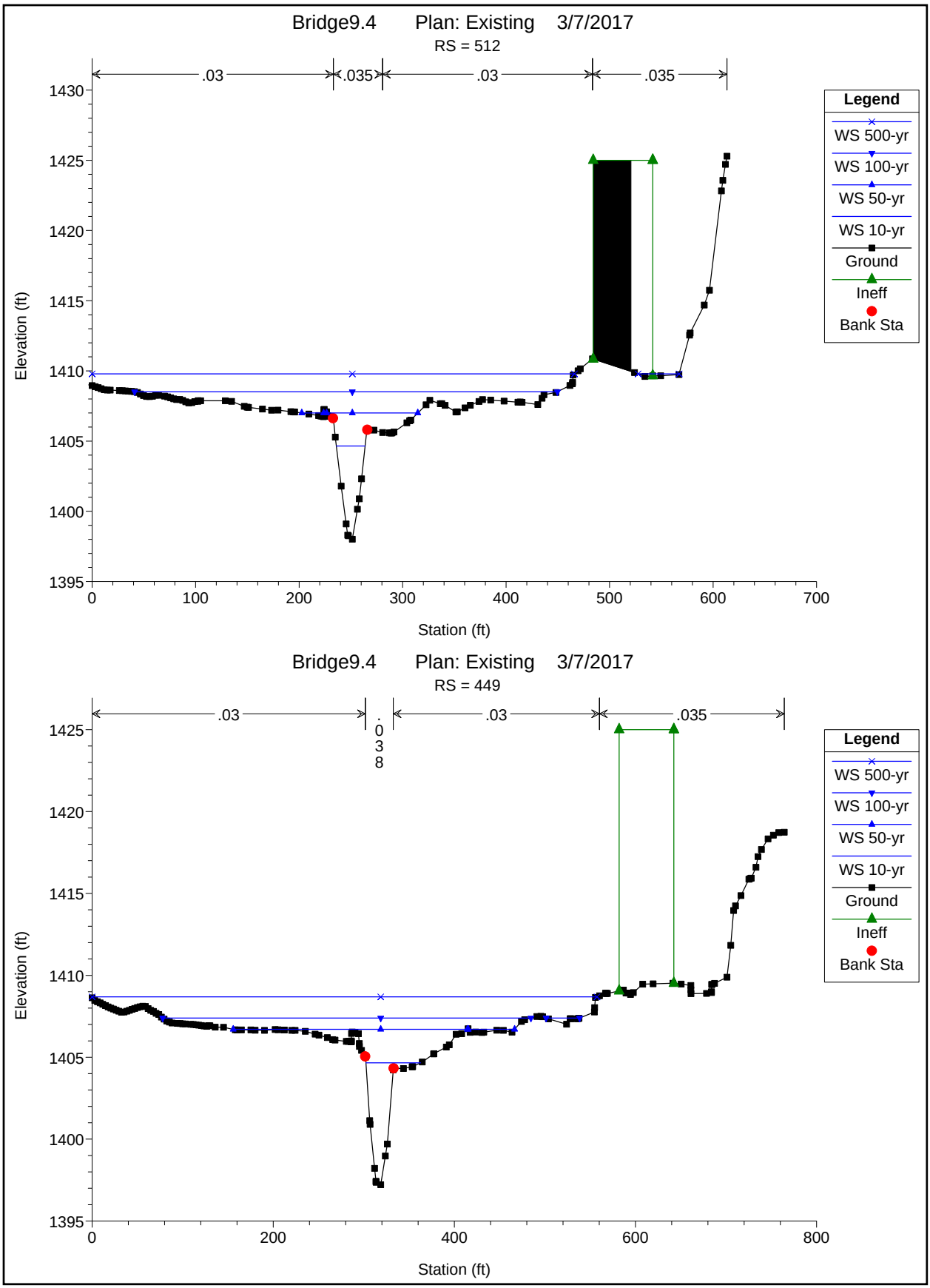
Station (ft)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500
600
700
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Bridge9.4 Plan: Existing 3/7/2017
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.035
Elevation (ft)
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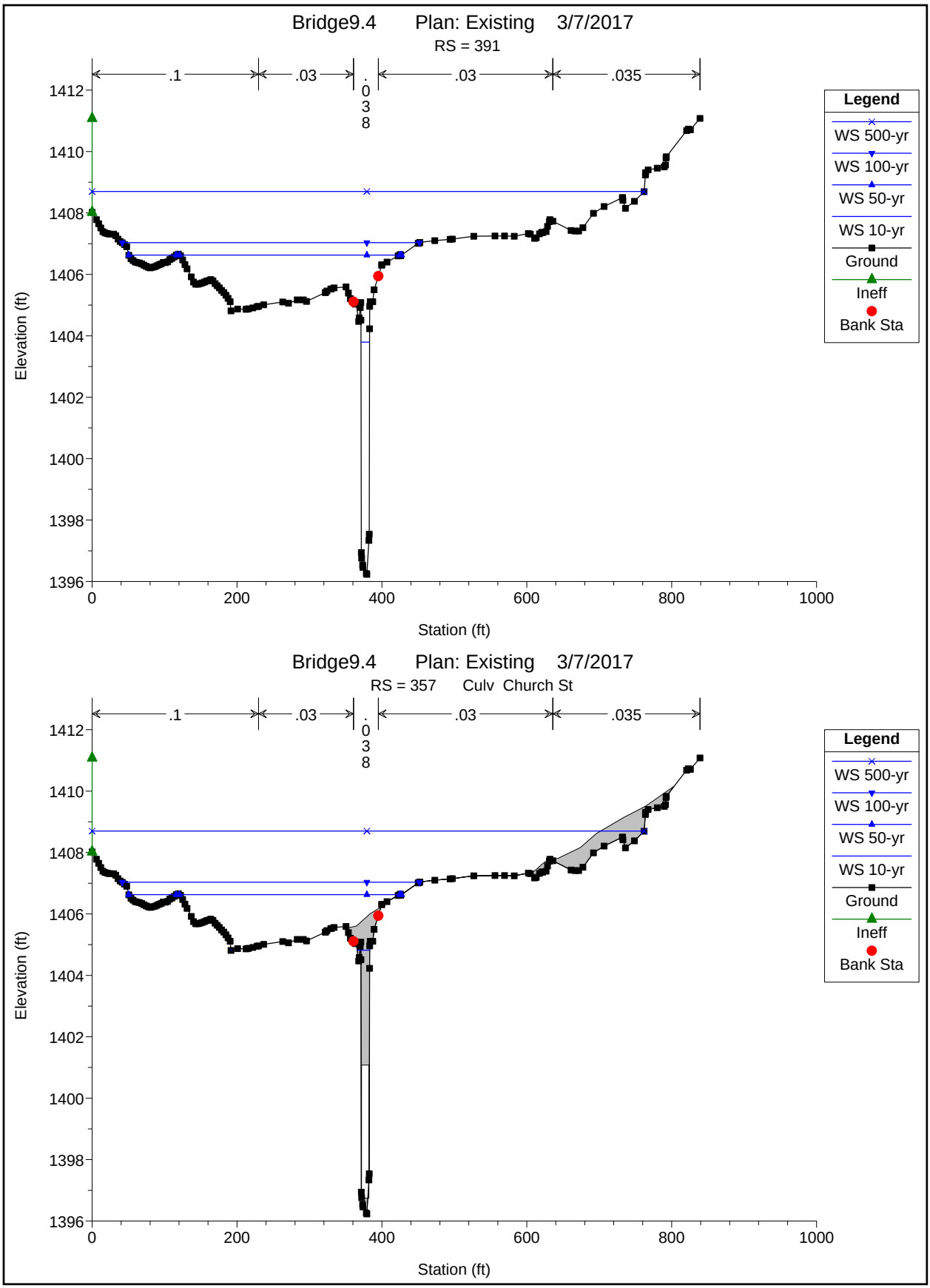
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta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Elevation (ft)
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WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Bridge9.4 Plan: Existing 3/7/2017
RS = 357 Culv Church St
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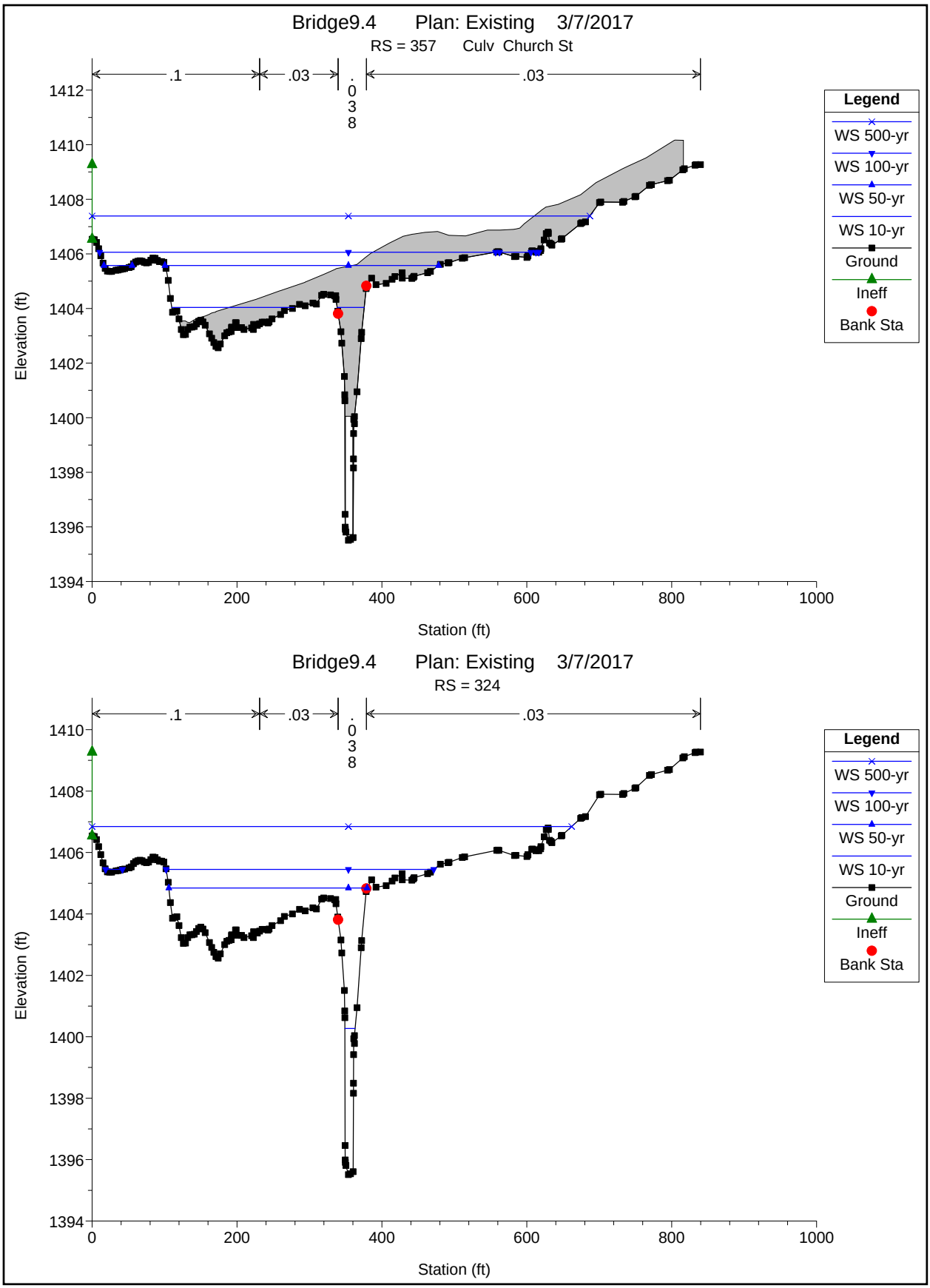
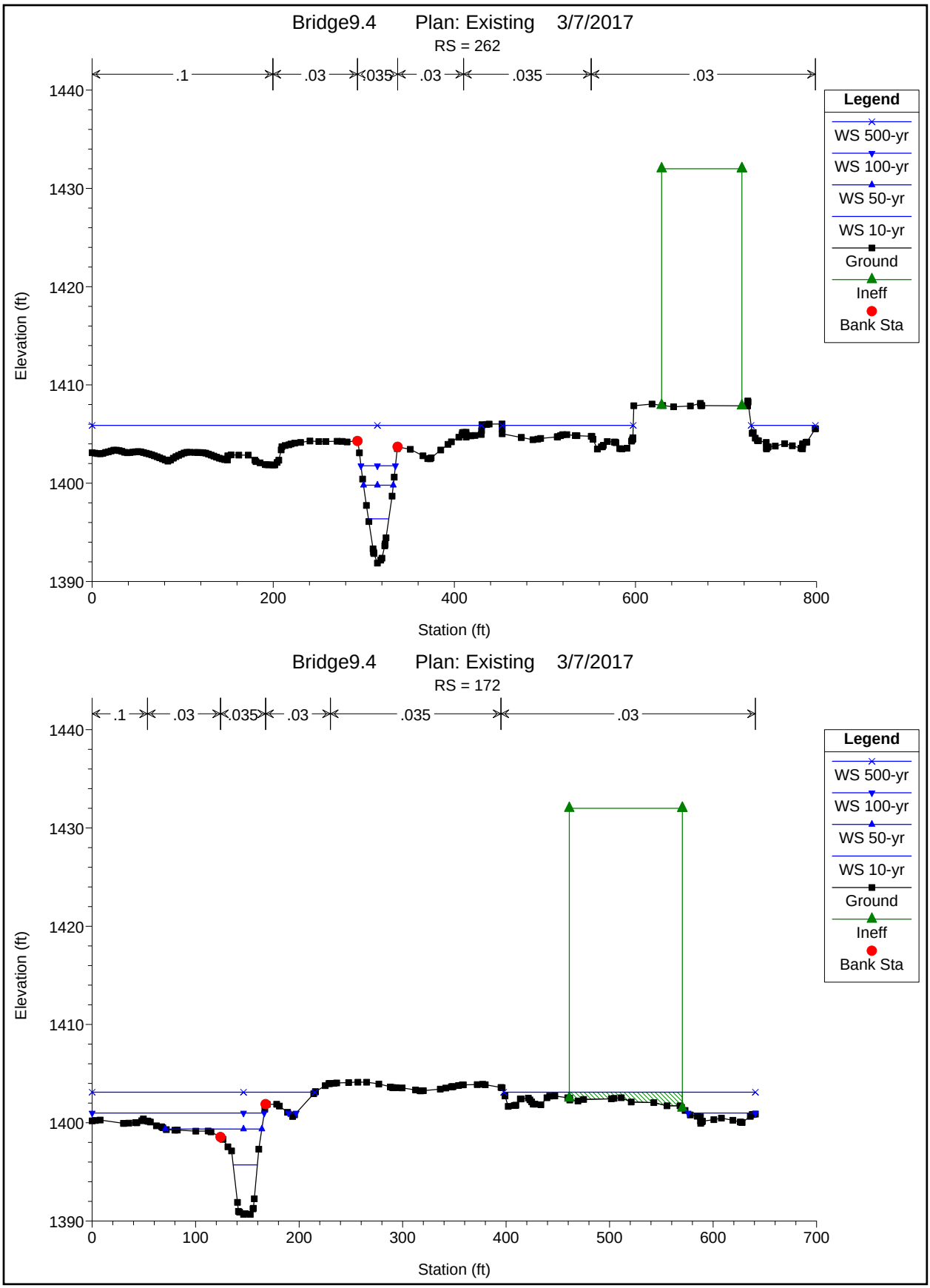
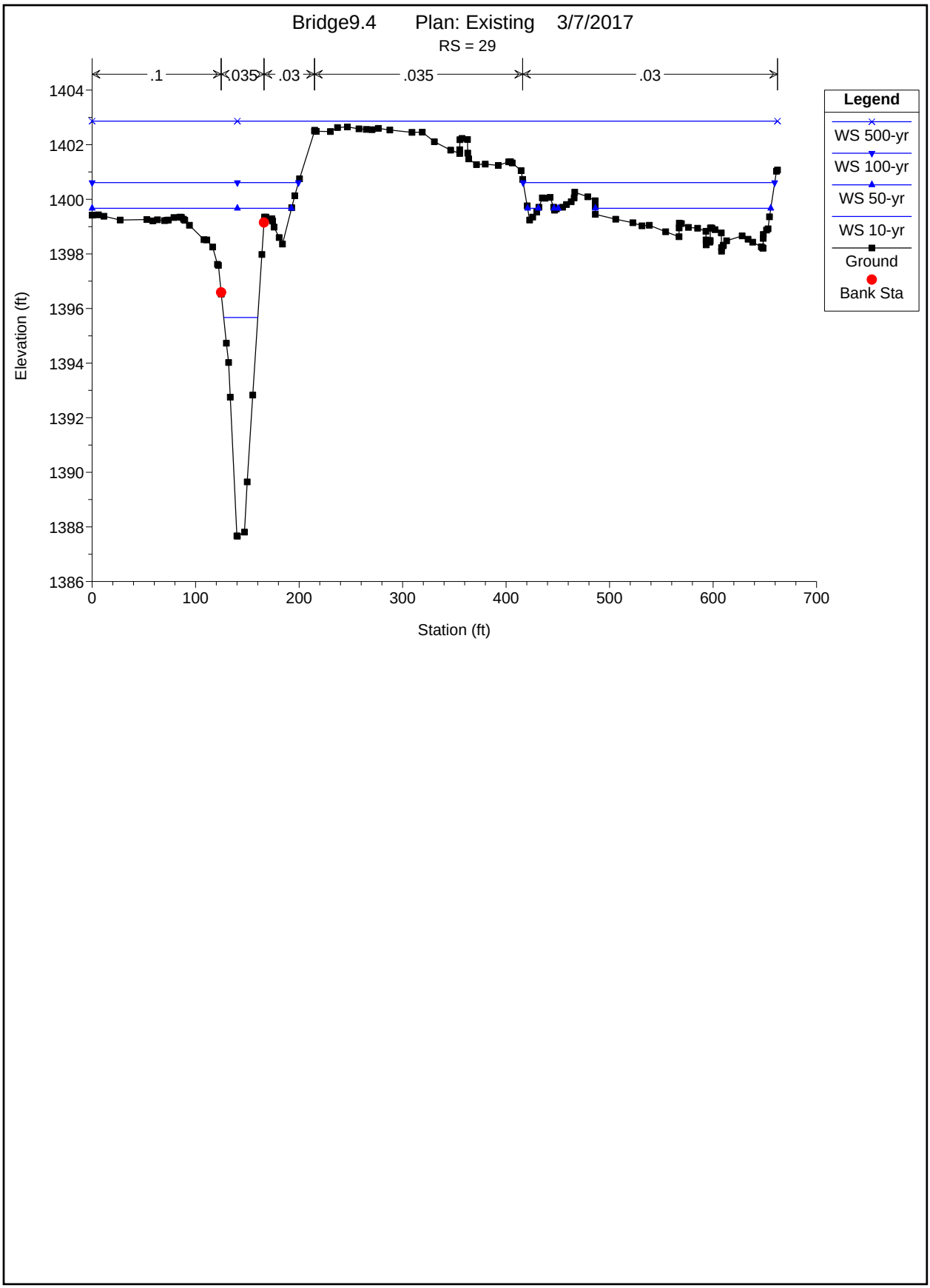
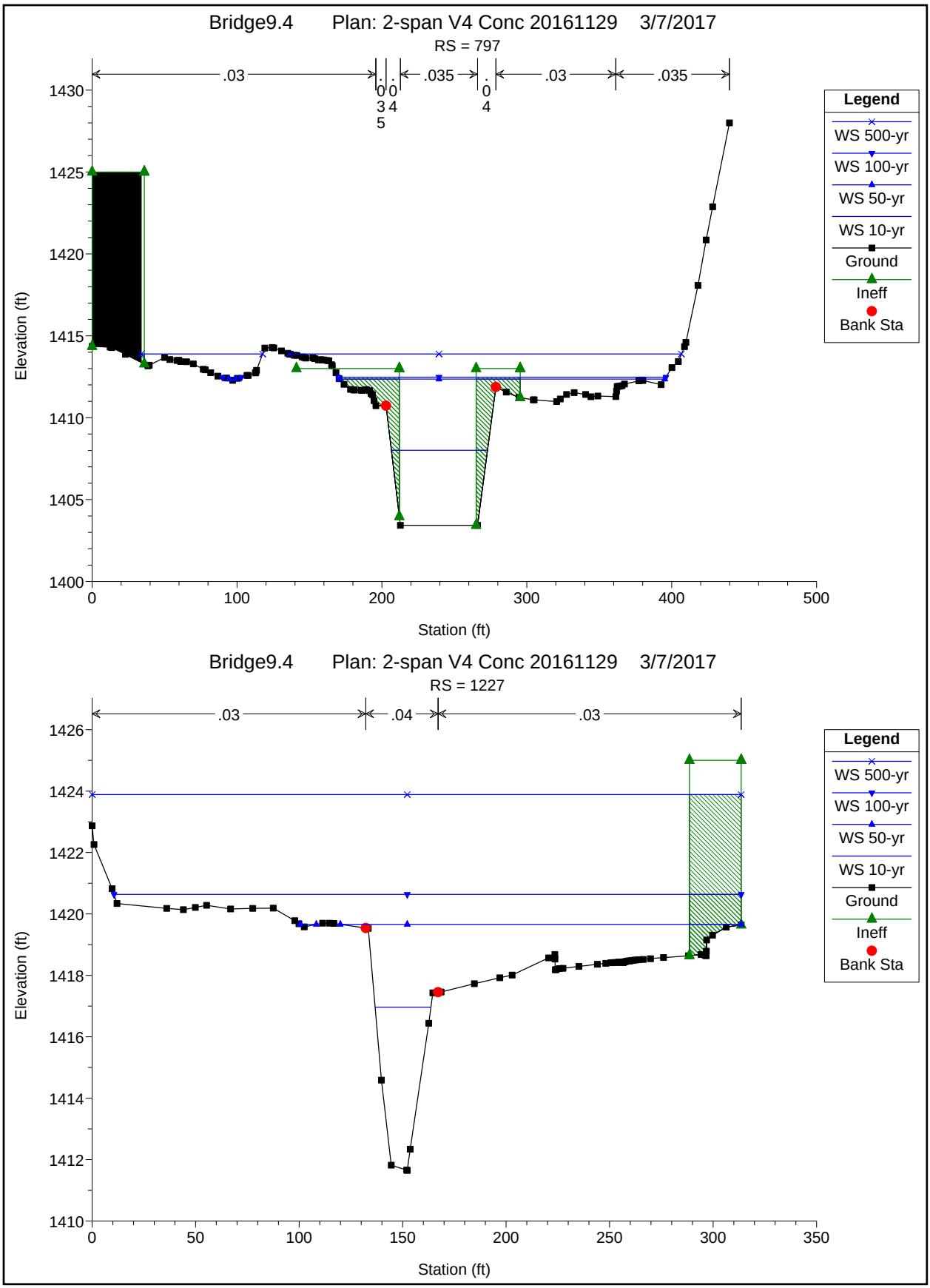
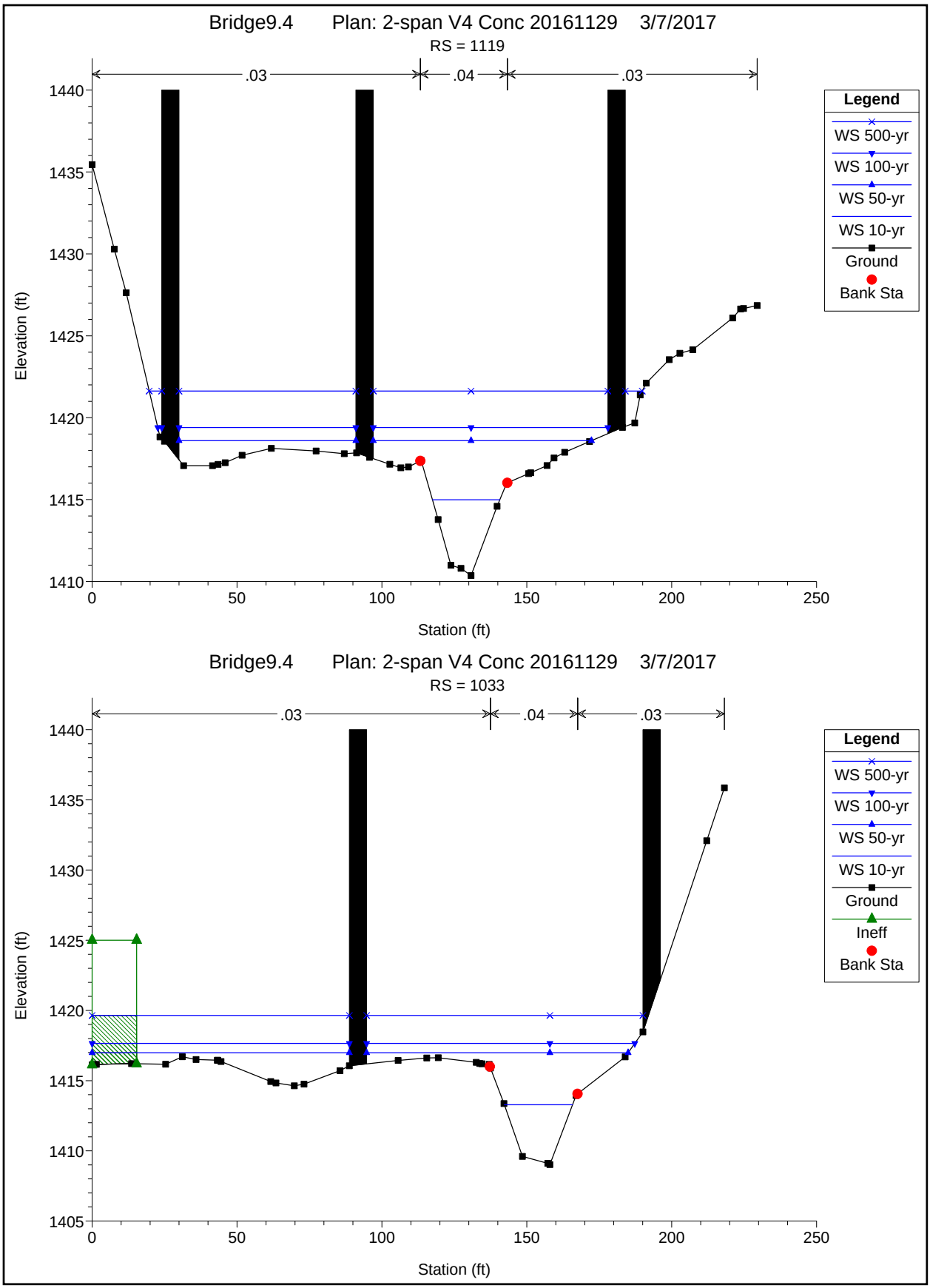
.035
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta

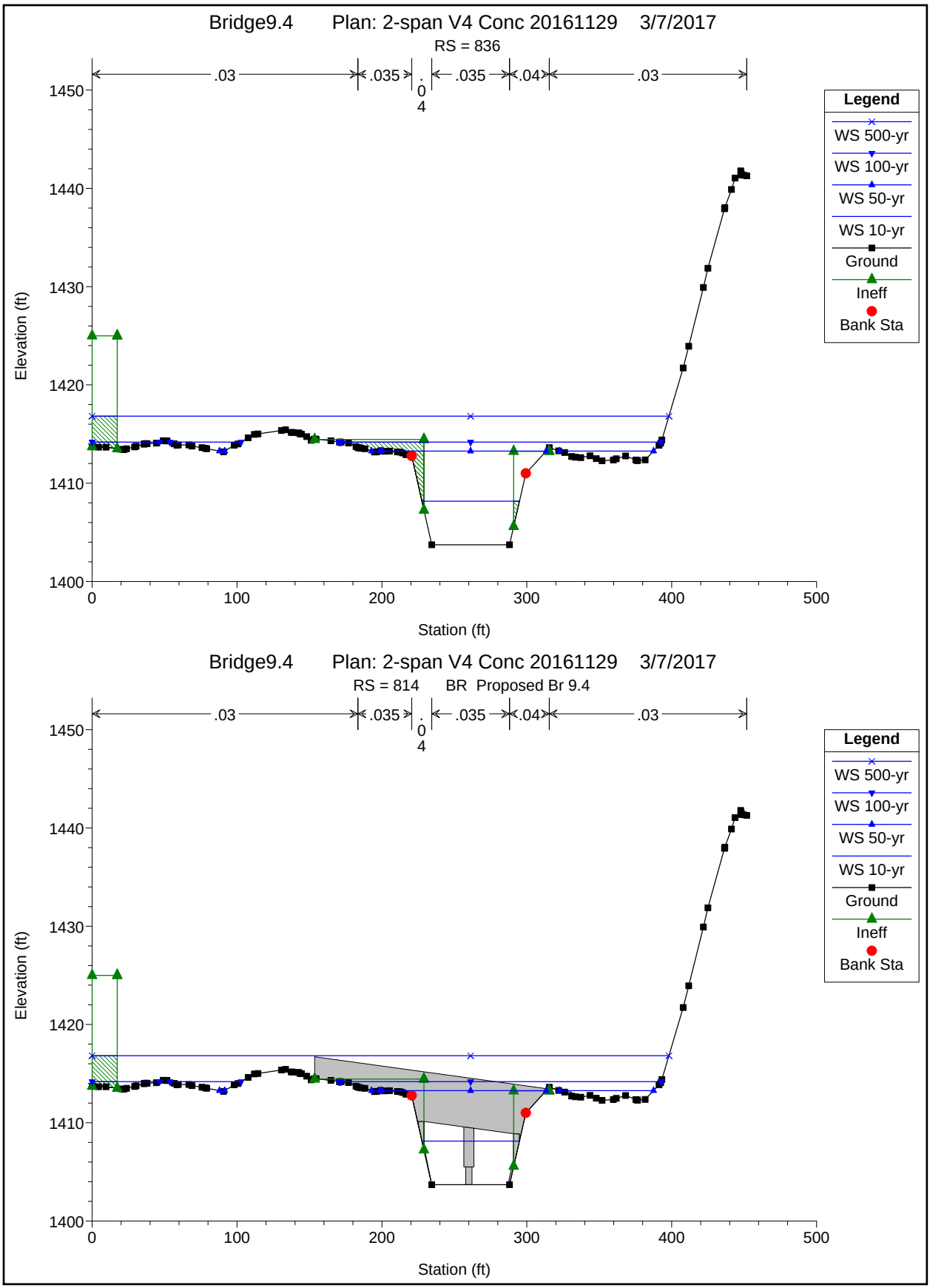

Bridge9.4 Plan: Existing 3/7/2017
RS = 357 Culv Church St
.1
.03
.038
.03
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Bridge9.4 Plan: Existing 3/7/2017
RS = 324
.1
.03
.038
.03
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta

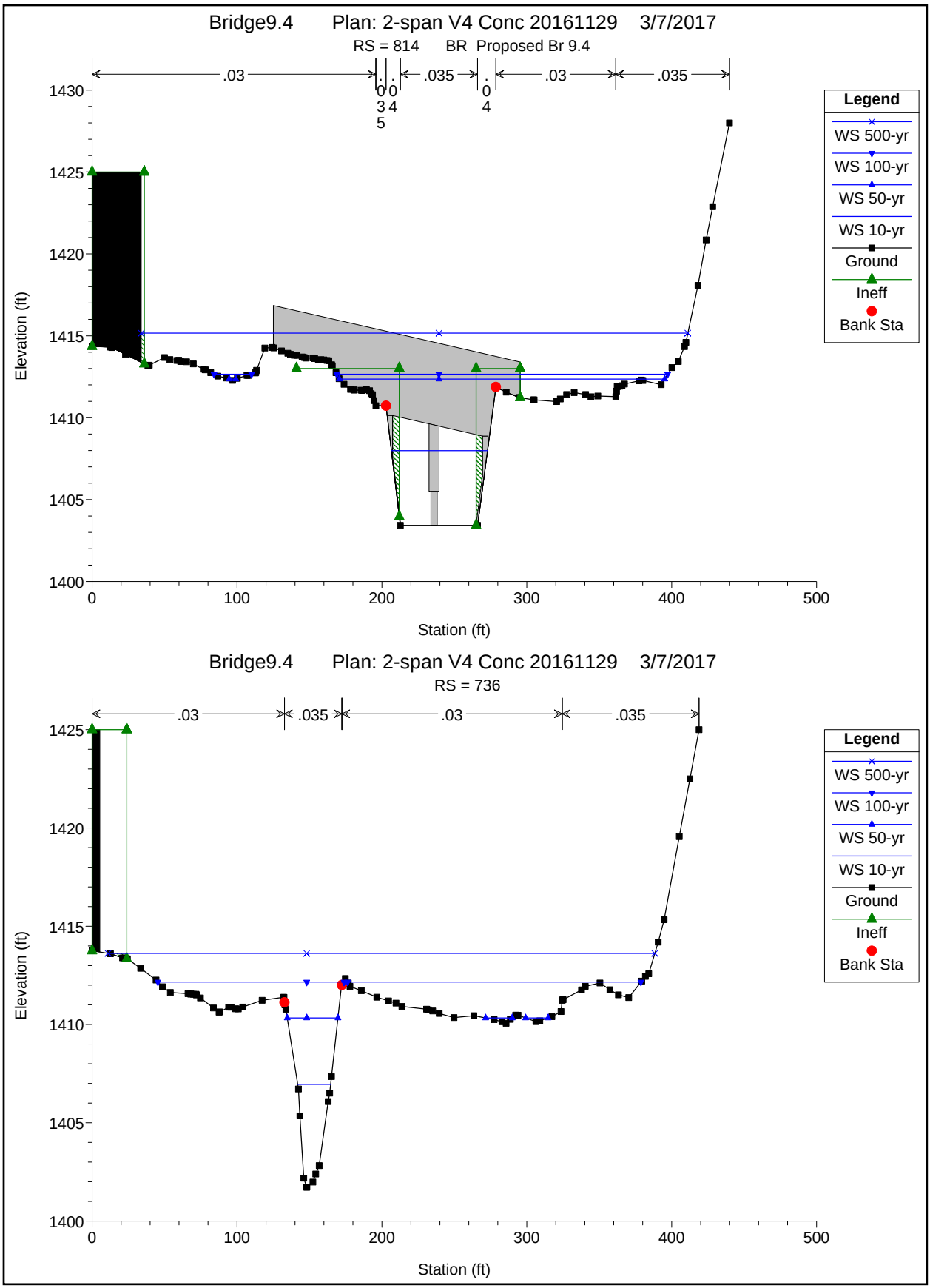

Bridge9.4 Plan: Existing 3/7/2017
RS = 262
.1
.03
.035
.03
.035
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
1440
1430
1420
1410
1400
1390
0
200
400
600
800
Station (ft)
Bridge9.4 Plan: Existing 3/7/2017
RS = 172
.1
.03
.035
.03
.035
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
1440
1430
1420
1410
1400
1390
0
100
200
300
400
500
600
700
Station (ft)

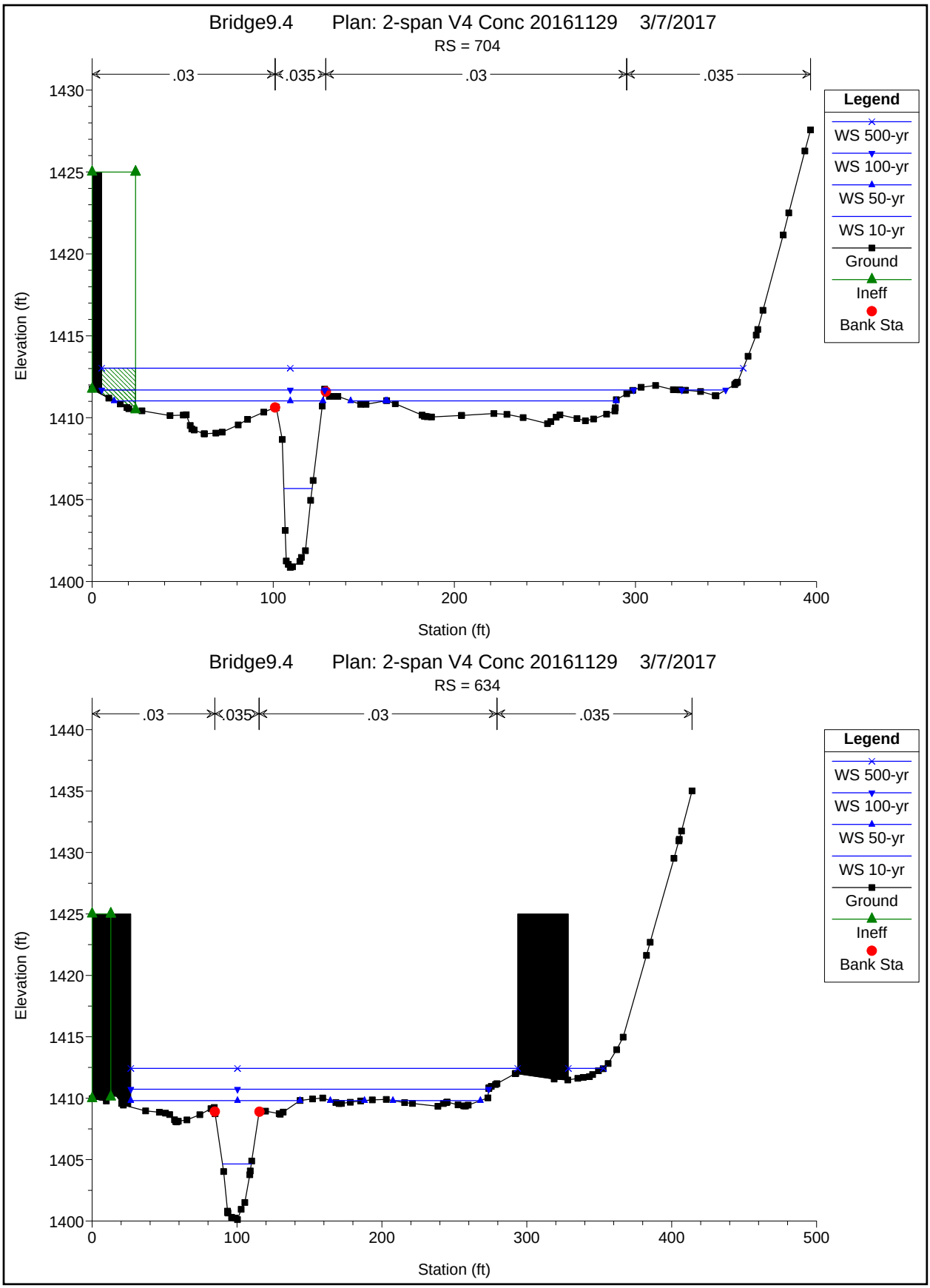

Bridge9.4 Plan: Existing 3/7/2017
RS = 29
.1
.035
.03
.035
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1404
1402
1400
1398
1396
1394
1392
1390
1388
1386
0
100
200
300
400
500
600
700

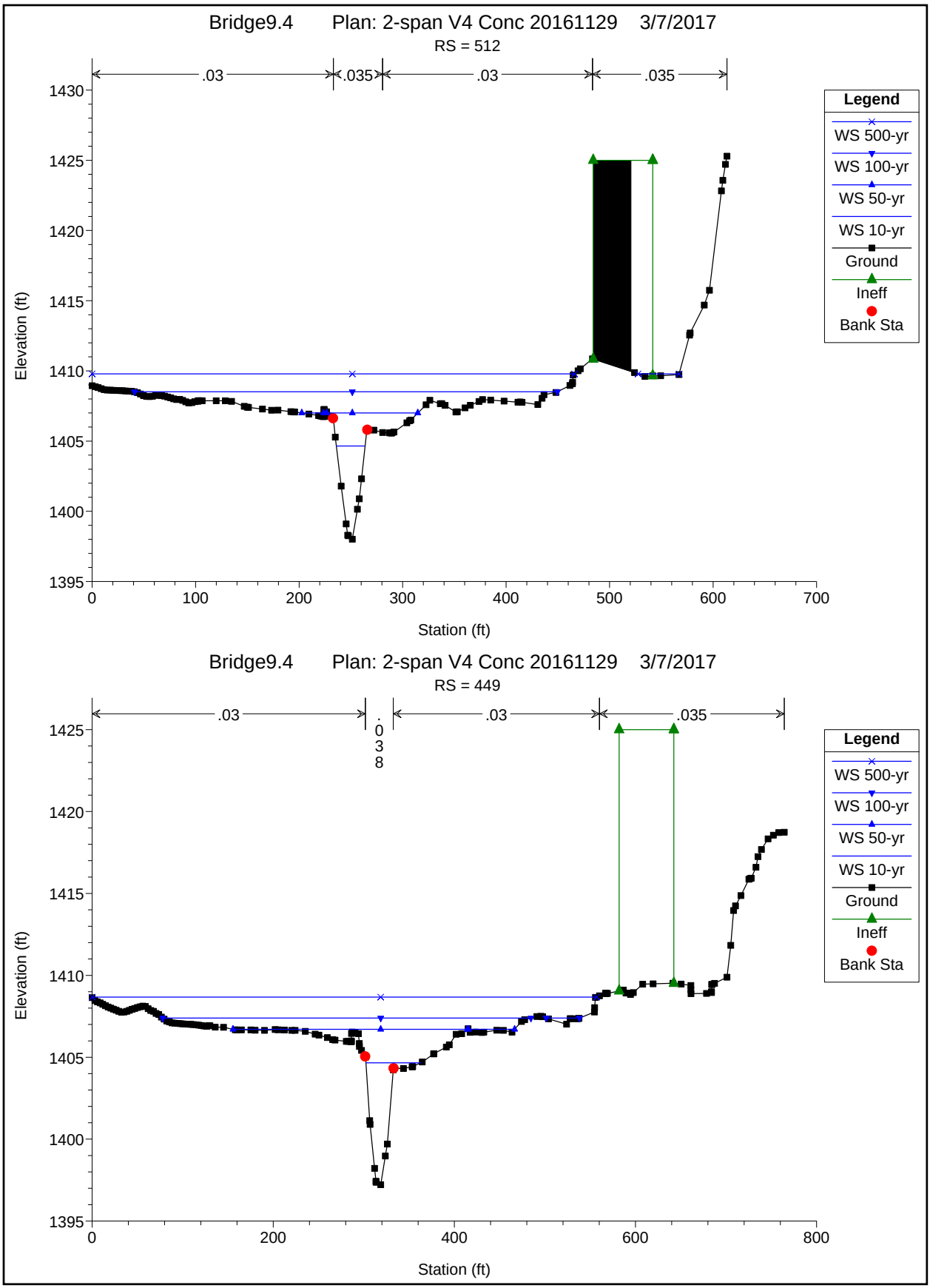

Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 797
.03
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 1227
.03
.04
.03
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta

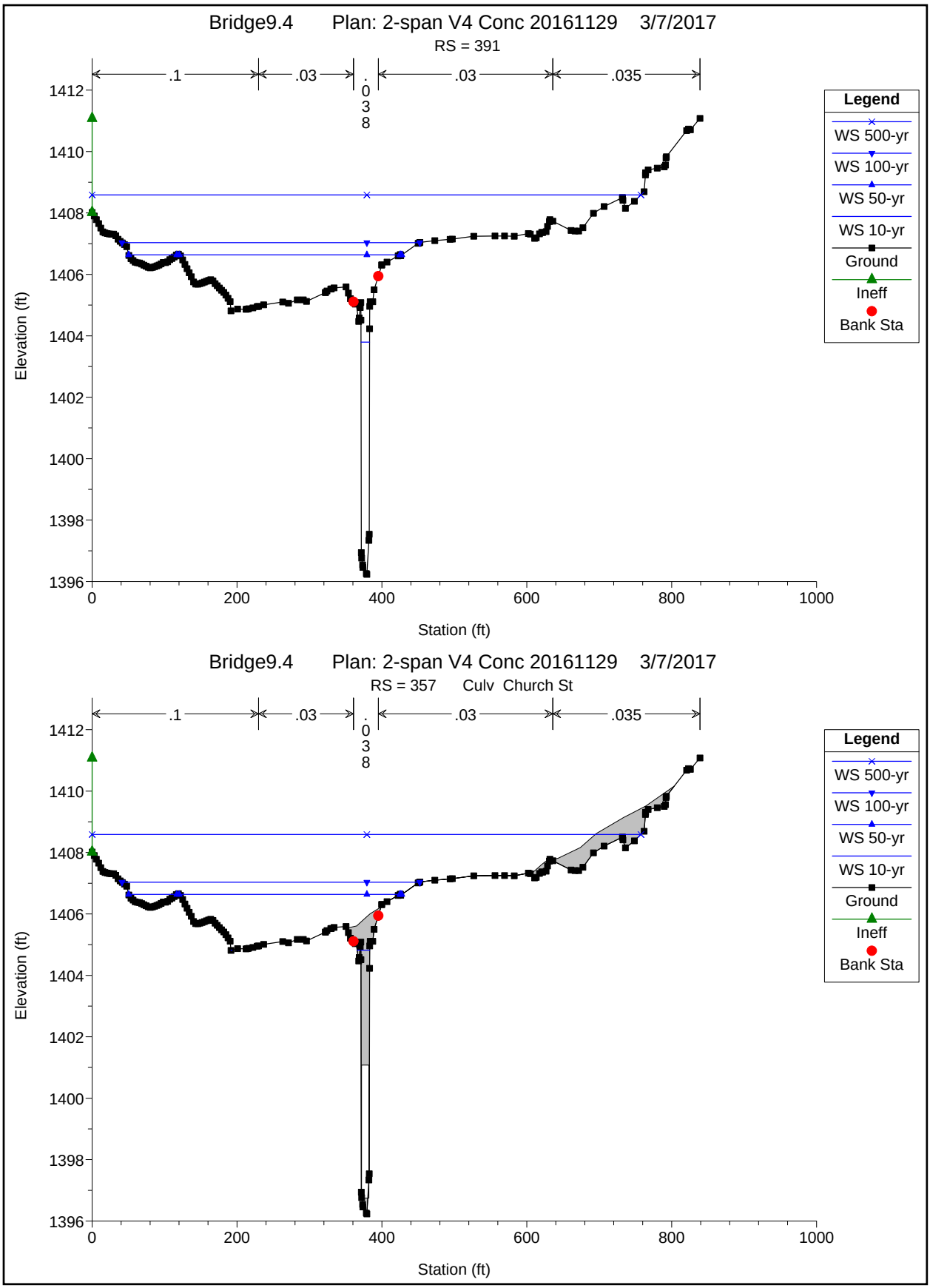

Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 1119
.03
.04
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 1033
.03
.04
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

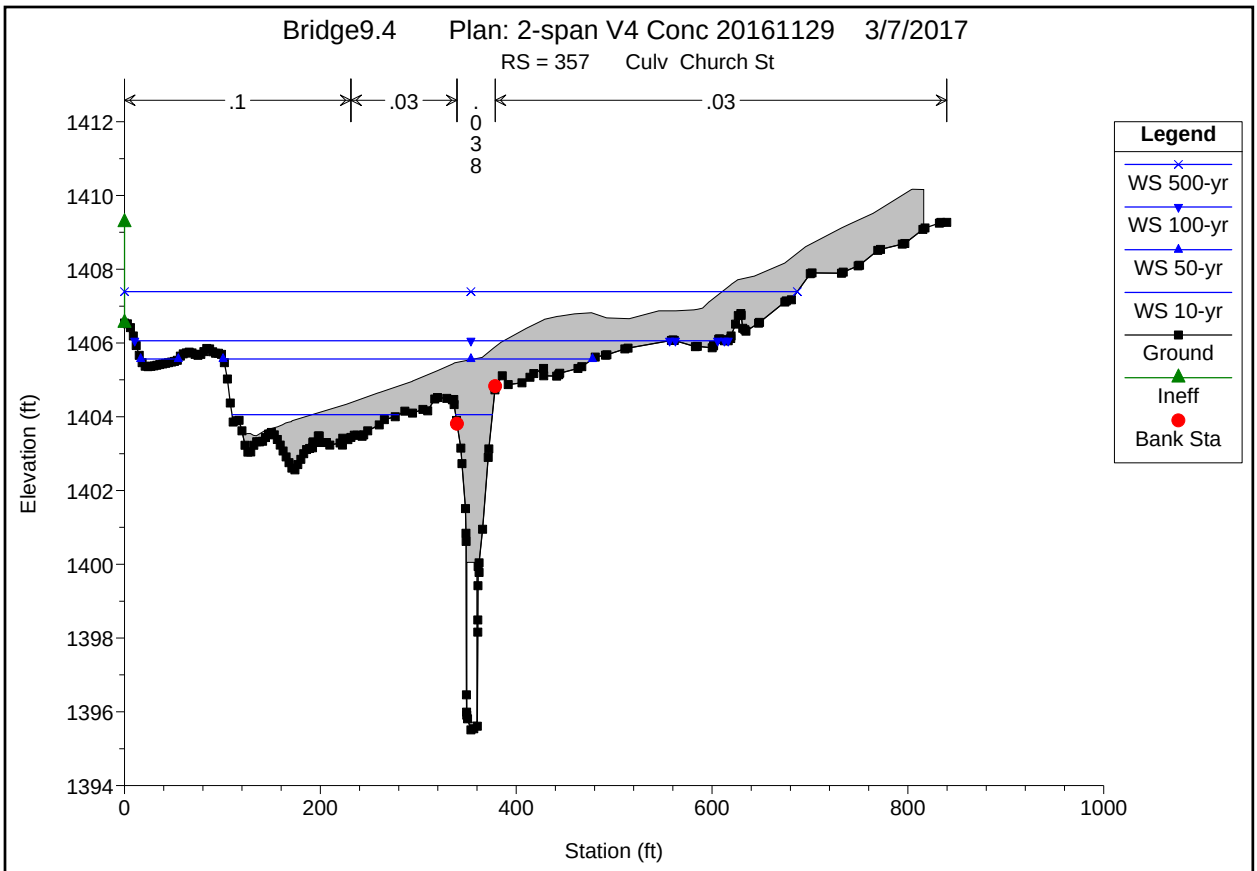

Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 836
.03
.035
.04
.035
.04
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1450
1440
1430
1420
1410
1400
0
100
200
300
400
500
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 814 BR Proposed Br 9.4
.03
.035
.04
.035
.04
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1450
1440
1430
1420
1410
1400
0
100
200
300
400
500

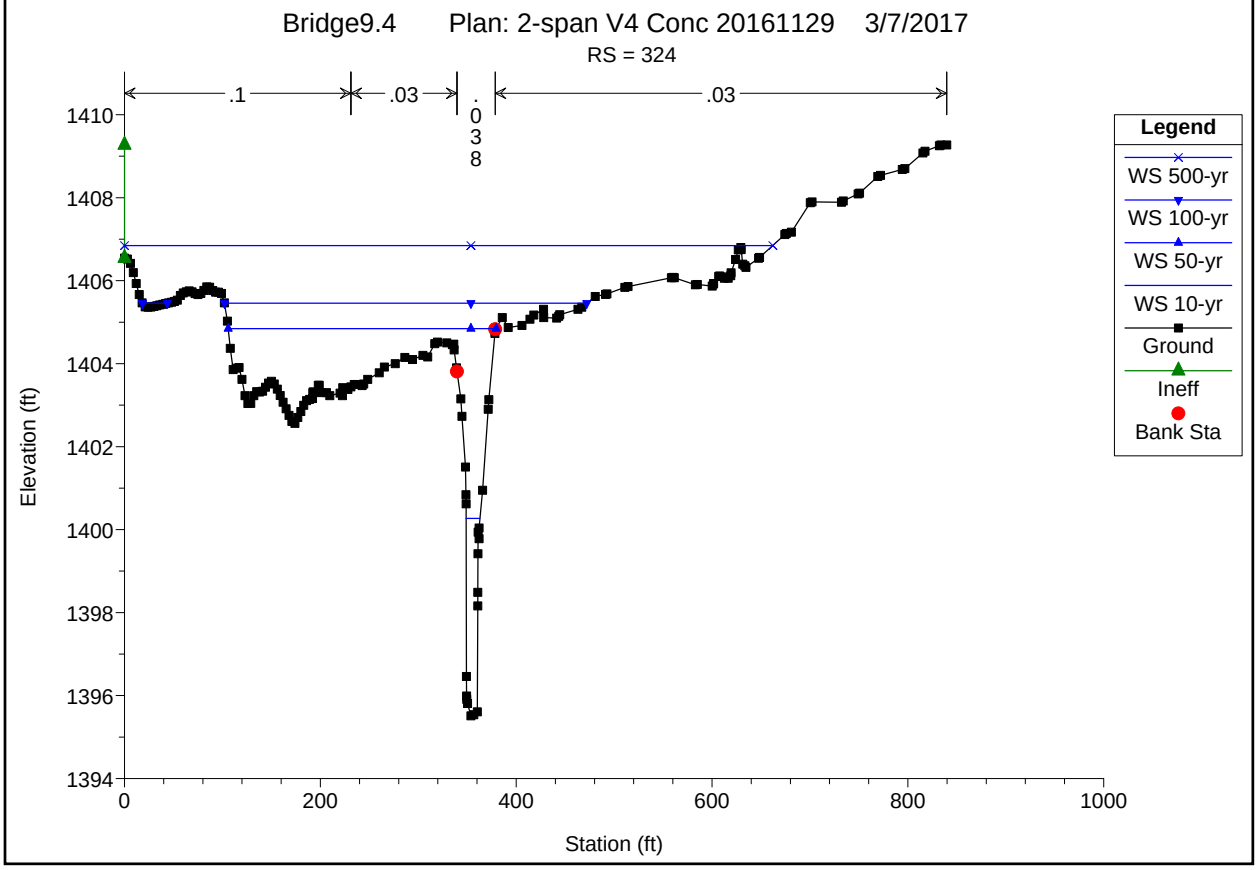

Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 814 BR Proposed Br 9.4
.03
.035
.03
.035
.035
.04
.04
.045
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1400
1405
1410
1415
1420
1425
1430
0
100
200
300
400
500
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 736
.03
.035
.03
.035
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1400
1405
1410
1415
1420
1425
0
100
200
300
400
500

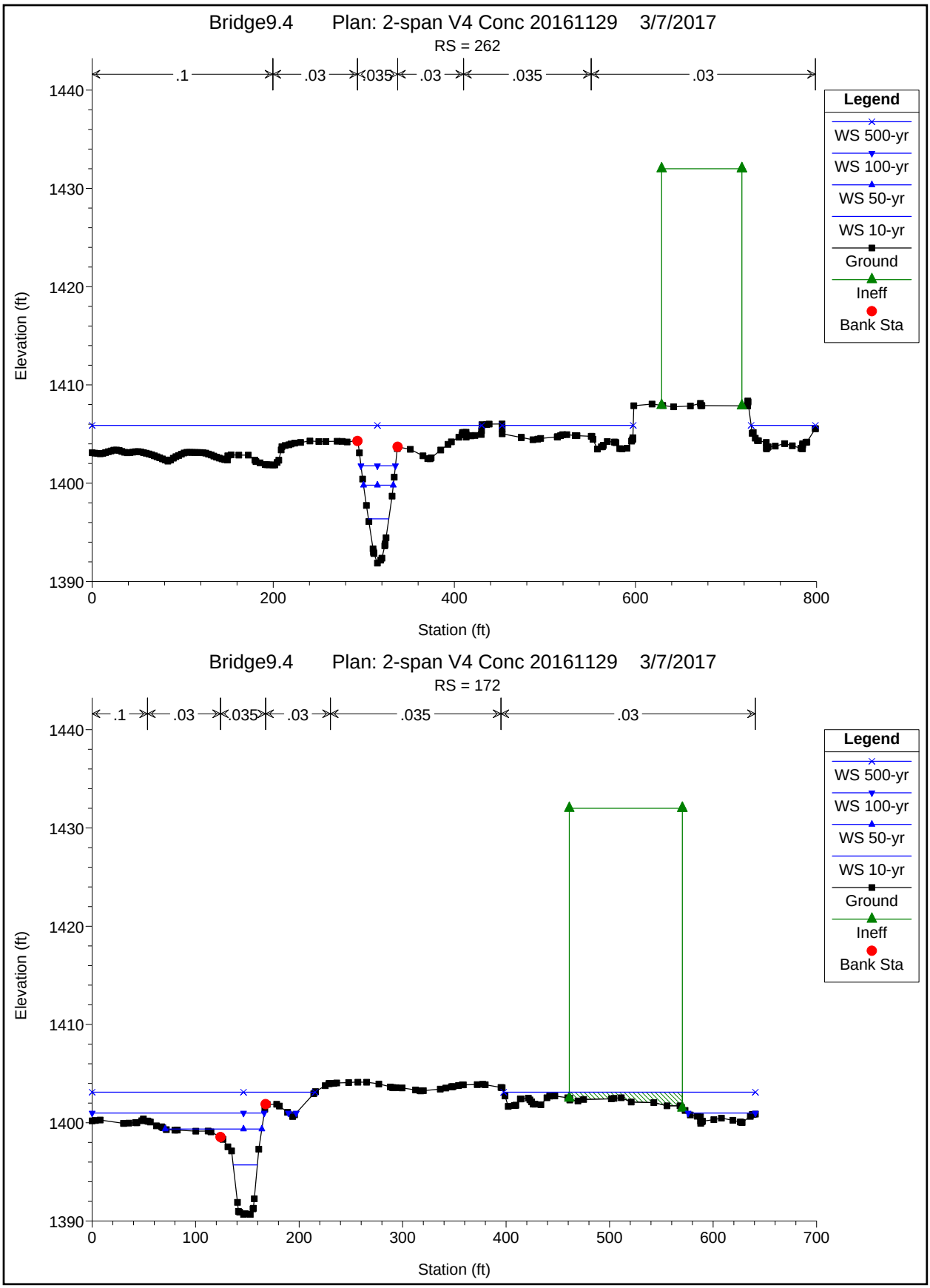

Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 704
.03
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 634
.03
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta

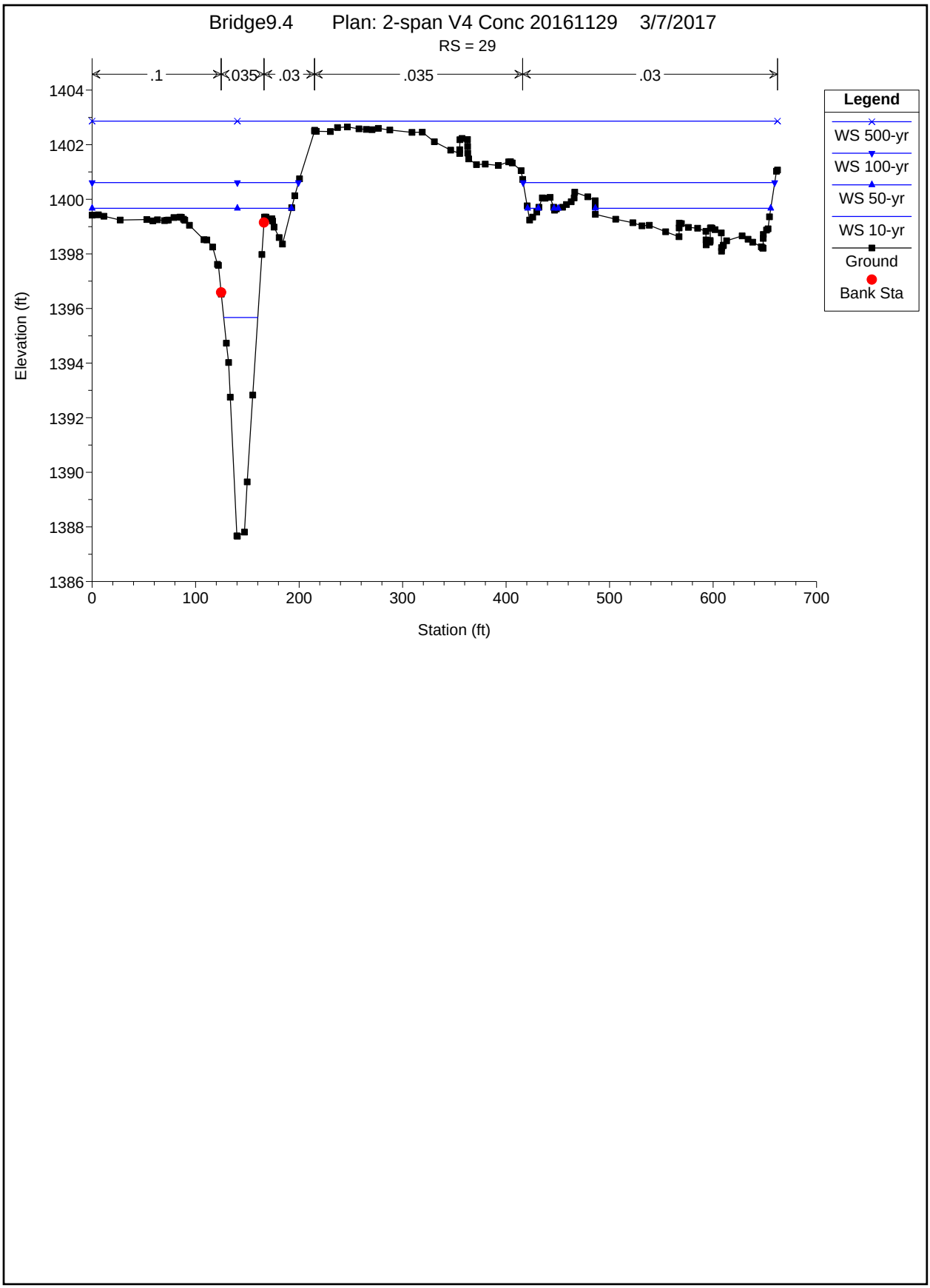

Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 512
.03
.035
.03
.035
Elevation (ft)
1430
1425
1420
1415
1410
1405
1400
1395
0
100
200
300
400
500
600
700
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 449
.03
.038
.03
.035
Elevation (ft)
1425
1420
1415
1410
1405
1400
1395
0
200
400
600
800
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta


Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 391
.1
.03
.038
.03
.035
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
1000
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 357 Culv Church St
.1
.03
.038
.03
.035
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1412
1410
1408
1406
1404
1402
1400
1398
1396
0
200
400
600
800
1000


Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 357 Culv Church St
.1
.03
.038
.03
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta


Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 324
.1
.03
.038
.03
Elevation (ft)
Station (ft)
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta


Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 262
.1
.03
.035
.03
.035
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
1440
1430
1420
1410
1400
1390
0
200
400
600
800
Station (ft)
Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 172
.1
.03
.035
.03
.035
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Ineff
Bank Sta
Elevation (ft)
1440
1430
1420
1410
1400
1390
0
100
200
300
400
500
600
700
Station (ft)


Bridge9.4 Plan: 2-span V4 Conc 20161129 3/7/2017
RS = 29
.1
.035
.03
.035
.03
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1404
1402
1400
1398
1396
1394
1392
1390
1388
1386
0
100
200
300
400
500
600
700

# Attachment 2

# Hydraulic Analysis Results

HEC-RAS Plan: Existing River: Zanja Reach: Zanja

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| Zanja | 1227 | 10-yr | 620.00 | 1411.65 | 1416.97 | 1415.90 | 1417.66 | 0.007181 | 6.71 | 92.40 | 26.95 | 0.64 |
| Zanja | 1227 | 50-yr | 2000.00 | 1411.65 | 1419.66 | 1419.38 | 1420.24 | 0.004639 | 6.99 | 354.43 | 201.49 | 0.55 |
| Zanja | 1227 | 100-yr | 3200.00 | 1411.65 | 1420.63 | 1420.04 | 1421.20 | 0.003616 | 6.94 | 578.63 | 303.03 | 0.50 |
| Zanja | 1227 | 500-yr | 8600.00 | 1411.65 | 1423.89 | 1421.86 | 1424.42 | 0.001574 | 6.10 | 1507.92 | 313.59 | 0.35 |
| | | | | | | | | | | | | |
| Zanja | 1119 | 10-yr | 620.00 | 1410.36 | 1414.99 | 1414.99 | 1416.41 | 0.018984 | 9.56 | 64.87 | 23.21 | 1.01 |
| Zanja | 1119 | 50-yr | 2000.00 | 1410.36 | 1418.60 | 1418.60 | 1419.61 | 0.006780 | 8.97 | 283.02 | 136.31 | 0.67 |
| Zanja | 1119 | 100-yr | 3200.00 | 1410.36 | 1419.40 | 1419.40 | 1420.61 | 0.007308 | 10.19 | 395.92 | 143.33 | 0.71 |
| Zanja | 1119 | 500-yr | 8600.00 | 1410.36 | 1421.63 | 1421.63 | 1423.90 | 0.008922 | 13.77 | 727.93 | 152.12 | 0.83 |
| | | | | | | | | | | | | |
| Zanja | 1033 | 10-yr | 620.00 | 1409.02 | 1413.28 | 1413.28 | 1414.68 | 0.018575 | 9.46 | 65.52 | 23.53 | 1.00 |
| Zanja | 1033 | 50-yr | 2000.00 | 1409.02 | 1416.99 | 1416.99 | 1417.83 | 0.005716 | 8.35 | 311.54 | 178.95 | 0.62 |
| Zanja | 1033 | 100-yr | 3200.00 | 1409.02 | 1417.65 | 1417.65 | 1418.73 | 0.006725 | 9.76 | 421.31 | 181.26 | 0.69 |
| Zanja | 1033 | 500-yr | 8600.00 | 1409.02 | 1419.65 | 1419.65 | 1421.73 | 0.008525 | 13.20 | 756.52 | 184.09 | 0.81 |
| | | | | | | | | | | | | |
| Zanja | 836 | 10-yr | 620.00 | 1403.73 | 1409.94 | 1407.18 | 1410.13 | 0.001115 | 3.52 | 176.09 | 43.98 | 0.30 |
| Zanja | 836 | 50-yr | 2000.00 | 1403.73 | 1414.26 | 1409.90 | 1414.42 | 0.000988 | 3.50 | 666.66 | 324.10 | 0.30 |
| Zanja | 836 | 100-yr | 3200.00 | 1403.73 | 1414.77 | 1411.42 | 1415.04 | 0.001482 | 4.60 | 834.06 | 355.68 | 0.37 |
| Zanja | 836 | 500-yr | 8600.00 | 1403.73 | 1417.02 | 1415.29 | 1417.48 | 0.001573 | 6.10 | 1674.40 | 398.49 | 0.40 |
| | | | | | | | | | | | | |
| Zanja | 814 | | Bridge | | | | | | | | | |
| | | | | | | | | | | | | |
| Zanja | 797 | 10-yr | 620.00 | 1403.43 | 1408.21 | 1406.35 | 1408.45 | 0.001832 | 3.96 | 156.51 | 46.91 | 0.38 |
| Zanja | 797 | 50-yr | 2000.00 | 1403.43 | 1412.94 | 1408.76 | 1413.17 | 0.000776 | 4.12 | 605.78 | 267.56 | 0.28 |
| Zanja | 797 | 100-yr | 3200.00 | 1403.43 | 1412.26 | 1410.21 | 1413.30 | 0.003168 | 8.35 | 421.66 | 210.89 | 0.56 |
| Zanja | 797 | 500-yr | 8600.00 | 1403.43 | 1414.40 | 1414.40 | 1415.69 | 0.004150 | 10.74 | 1117.42 | 375.08 | 0.66 |
| | | | | | | | | | | | | |
| Zanja | 736 | 10-yr | 620.00 | 1401.72 | 1406.96 | 1406.28 | 1407.95 | 0.008266 | 7.98 | 77.69 | 22.75 | 0.76 |
| Zanja | 736 | 50-yr | 2000.00 | 1401.72 | 1410.34 | 1409.93 | 1412.35 | 0.010090 | 11.39 | 179.03 | 69.01 | 0.90 |
| Zanja | 736 | 100-yr | 3200.00 | 1401.72 | 1412.16 | 1412.16 | 1412.93 | 0.004144 | 8.38 | 562.82 | 330.85 | 0.60 |
| Zanja | 736 | 500-yr | 8600.00 | 1401.72 | 1413.62 | 1413.62 | 1414.83 | 0.005689 | 11.32 | 1076.37 | 377.27 | 0.72 |
| | | | | | | | | | | | | |
| Zanja | 704 | 10-yr | 620.00 | 1400.86 | 1405.67 | 1405.67 | 1407.49 | 0.016639 | 10.82 | 57.30 | 15.63 | 1.00 |
| Zanja | 704 | 50-yr | 2000.00 | 1400.86 | 1411.03 | 1411.03 | 1411.73 | 0.004620 | 7.93 | 370.44 | 261.14 | 0.56 |
| Zanja | 704 | 100-yr | 3200.00 | 1400.86 | 1411.69 | 1411.69 | 1412.40 | 0.004849 | 8.46 | 548.72 | 317.70 | 0.58 |
| Zanja | 704 | 500-yr | 8600.00 | 1400.86 | 1413.02 | 1413.02 | 1414.34 | 0.007095 | 11.51 | 987.26 | 354.17 | 0.72 |
| | | | | | | | | | | | | |
| Zanja | 634 | 10-yr | 620.00 | 1400.12 | 1404.65 | 1404.64 | 1406.20 | 0.014571 | 9.98 | 62.13 | 19.83 | 0.99 |
| Zanja | 634 | 50-yr | 2000.00 | 1400.12 | 1409.81 | 1409.81 | 1410.82 | 0.004412 | 8.66 | 298.96 | 200.68 | 0.60 |
| Zanja | 634 | 100-yr | 3200.00 | 1400.12 | 1410.73 | 1410.73 | 1411.62 | 0.003973 | 8.98 | 521.71 | 247.00 | 0.59 |
| Zanja | 634 | 500-yr | 8600.00 | 1400.12 | 1412.43 | 1412.43 | 1413.87 | 0.005535 | 12.18 | 975.74 | 291.20 | 0.71 |
| | | | | | | | | | | | | |
| Zanja | 512 | 10-yr | 620.00 | 1398.01 | 1404.65 | 1402.78 | 1405.14 | 0.003263 | 5.62 | 110.26 | 27.78 | 0.50 |
| Zanja | 512 | 50-yr | 2000.00 | 1398.01 | 1407.00 | 1407.00 | 1408.37 | 0.006403 | 9.82 | 237.89 | 109.31 | 0.74 |
| Zanja | 512 | 100-yr | 3200.00 | 1398.01 | 1408.52 | 1408.52 | 1409.22 | 0.003312 | 8.28 | 642.80 | 408.58 | 0.55 |
| Zanja | 512 | 500-yr | 8600.00 | 1398.01 | 1409.79 | 1409.79 | 1410.82 | 0.004865 | 11.20 | 1225.75 | 505.80 | 0.69 |
| | | | | | | | | | | | | |
| Zanja | 449 | 10-yr | 620.00 | 1397.22 | 1404.66 | 1401.62 | 1404.93 | 0.001674 | 4.19 | 154.13 | 60.34 | 0.34 |
| Zanja | 449 | 50-yr | 2000.00 | 1397.22 | 1406.71 | 1405.85 | 1407.34 | 0.003102 | 7.14 | 380.19 | 309.50 | 0.49 |
| Zanja | 449 | 100-yr | 3200.00 | 1397.22 | 1407.39 | 1407.39 | 1408.08 | 0.003558 | 8.16 | 637.14 | 443.73 | 0.53 |
| Zanja | 449 | 500-yr | 8600.00 | 1397.22 | 1408.69 | 1408.69 | 1409.61 | 0.004929 | 10.69 | 1305.10 | 557.47 | 0.64 |
| | | | | | | | | | | | | |
| Zanja | 391 | 10-yr | 620.00 | 1396.23 | 1403.79 | 1401.21 | 1404.69 | 0.007519 | 7.60 | 81.60 | 11.79 | 0.51 |
| Zanja | 391 | 50-yr | 2000.00 | 1396.23 | 1406.63 | 1406.37 | 1407.01 | 0.006065 | 6.35 | 481.57 | 370.84 | 0.54 |
| Zanja | 391 | 100-yr | 3200.00 | 1396.23 | 1407.03 | 1406.88 | 1407.56 | 0.008151 | 7.81 | 638.69 | 410.43 | 0.63 |
| Zanja | 391 | 500-yr | 8600.00 | 1396.23 | 1408.70 | 1408.15 | 1409.14 | 0.005104 | 7.57 | 1736.32 | 762.01 | 0.53 |
| | | | | | | | | | | | | |
| Zanja | 357 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| Zanja | 324 | 10-yr | 620.00 | 1395.51 | 1400.27 | 1400.27 | 1402.26 | 0.024655 | 11.31 | 54.81 | 14.10 | 1.01 |
| Zanja | 324 | 50-yr | 2000.00 | 1395.51 | 1404.84 | 1404.84 | 1405.50 | 0.007202 | 7.76 | 456.19 | 273.69 | 0.65 |
| Zanja | 324 | 100-yr | 3200.00 | 1395.51 | 1405.45 | 1405.45 | 1406.16 | 0.007631 | 8.70 | 654.87 | 392.71 | 0.68 |
| Zanja | 324 | 500-yr | 8600.00 | 1395.51 | 1406.85 | 1406.85 | 1407.70 | 0.008776 | 10.97 | 1442.00 | 661.96 | 0.76 |
| | | | | | | | | | | | | |
| Zanja | 262 | 10-yr | 620.00 | 1391.87 | 1396.38 | 1396.38 | 1397.80 | 0.013989 | 9.57 | 64.81 | 22.49 | 0.99 |
| Zanja | 262 | 50-yr | 2000.00 | 1391.87 | 1399.80 | 1399.80 | 1402.23 | 0.012329 | 12.49 | 160.09 | 32.89 | 1.00 |
| Zanja | 262 | 100-yr | 3200.00 | 1391.87 | 1401.78 | 1401.78 | 1404.78 | 0.011660 | 13.90 | 230.18 | 38.02 | 1.00 |
| Zanja | 262 | 500-yr | 8600.00 | 1391.87 | 1405.88 | 1405.88 | 1406.84 | 0.003931 | 10.52 | 1712.58 | 646.09 | 0.61 |
| | | | | | | | | | | | | |
| Zanja | 172 | 10-yr | 620.00 | 1390.67 | 1395.72 | 1394.44 | 1396.43 | 0.005121 | 6.79 | 91.29 | 23.38 | 0.61 |
| Zanja | 172 | 50-yr | 2000.00 | 1390.67 | 1399.37 | 1398.43 | 1400.81 | 0.007089 | 9.68 | 217.08 | 93.48 | 0.75 |
| Zanja | 172 | 100-yr | 3200.00 | 1390.67 | 1400.99 | 1400.99 | 1402.05 | 0.004719 | 9.16 | 477.35 | 238.85 | 0.64 |
| Zanja | 172 | 500-yr | 8600.00 | 1390.67 | 1403.12 | 1403.12 | 1404.45 | 0.005451 | 11.70 | 1101.10 | 458.63 | 0.71 |
| | | | | | | | | | | | | |
| Zanja | 29 | 10-yr | 620.00 | 1387.66 | 1395.67 | 1392.27 | 1395.94 | 0.001502 | 4.13 | 149.96 | 32.90 | 0.34 |
| Zanja | 29 | 50-yr | 2000.00 | 1387.66 | 1399.67 | 1396.04 | 1400.11 | 0.001501 | 5.68 | 532.69 | 376.73 | 0.37 |
| Zanja | 29 | 100-yr | 3200.00 | 1387.66 | 1400.61 | 1397.91 | 1401.03 | 0.001503 | 6.17 | 926.81 | 442.37 | 0.38 |
| Zanja | 29 | 500-yr | 8600.00 | 1387.66 | 1402.86 | 1401.53 | 1403.30 | 0.001500 | 7.23 | 2103.34 | 662.21 | 0.39 |

HEC-RAS Plan: 2-span V4 20161129 River: Zanja Reach: Zanja

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| Zanja | 1227 | 10-yr | 620.00 | 1411.65 | 1416.97 | 1415.90 | 1417.66 | 0.007181 | 6.71 | 92.40 | 26.95 | 0.64 |
| Zanja | 1227 | 50-yr | 2000.00 | 1411.65 | 1419.66 | 1419.38 | 1420.24 | 0.004639 | 6.99 | 354.43 | 201.49 | 0.55 |
| Zanja | 1227 | 100-yr | 3200.00 | 1411.65 | 1420.63 | 1420.04 | 1421.20 | 0.003616 | 6.94 | 578.63 | 303.03 | 0.50 |
| Zanja | 1227 | 500-yr | 8600.00 | 1411.65 | 1423.89 | 1421.86 | 1424.42 | 0.001574 | 6.10 | 1507.92 | 313.59 | 0.35 |
| | | | | | | | | | | | | |
| Zanja | 1119 | 10-yr | 620.00 | 1410.36 | 1414.99 | 1414.99 | 1416.41 | 0.018984 | 9.56 | 64.87 | 23.21 | 1.01 |
| Zanja | 1119 | 50-yr | 2000.00 | 1410.36 | 1418.60 | 1418.60 | 1419.61 | 0.006780 | 8.97 | 283.02 | 136.31 | 0.67 |
| Zanja | 1119 | 100-yr | 3200.00 | 1410.36 | 1419.40 | 1419.40 | 1420.61 | 0.007308 | 10.19 | 395.92 | 143.33 | 0.71 |
| Zanja | 1119 | 500-yr | 8600.00 | 1410.36 | 1421.63 | 1421.63 | 1423.90 | 0.008922 | 13.77 | 727.93 | 152.12 | 0.83 |
| | | | | | | | | | | | | |
| Zanja | 1033 | 10-yr | 620.00 | 1409.02 | 1413.28 | 1413.28 | 1414.68 | 0.018575 | 9.46 | 65.52 | 23.53 | 1.00 |
| Zanja | 1033 | 50-yr | 2000.00 | 1409.02 | 1416.99 | 1416.99 | 1417.83 | 0.005716 | 8.35 | 311.54 | 178.95 | 0.62 |
| Zanja | 1033 | 100-yr | 3200.00 | 1409.02 | 1417.65 | 1417.65 | 1418.73 | 0.006725 | 9.76 | 421.31 | 181.26 | 0.69 |
| Zanja | 1033 | 500-yr | 8600.00 | 1409.02 | 1419.65 | 1419.65 | 1421.73 | 0.008525 | 13.20 | 756.52 | 184.09 | 0.81 |
| | | | | | | | | | | | | |
| Zanja | 836 | 10-yr | 620.00 | 1403.73 | 1408.17 | 1405.32 | 1408.25 | 0.000488 | 2.36 | 262.67 | 67.35 | 0.20 |
| Zanja | 836 | 50-yr | 2000.00 | 1403.73 | 1413.27 | 1407.11 | 1413.42 | 0.000347 | 3.15 | 679.74 | 187.92 | 0.19 |
| Zanja | 836 | 100-yr | 3200.00 | 1403.73 | 1414.19 | 1408.30 | 1414.45 | 0.000574 | 4.33 | 861.92 | 316.88 | 0.24 |
| Zanja | 836 | 500-yr | 8600.00 | 1403.73 | 1416.82 | 1414.45 | 1417.25 | 0.000902 | 6.03 | 1886.99 | 398.09 | 0.31 |
| | | | | | | | | | | | | |
| Zanja | 814 | | Bridge | | | | | | | | | |
| | | | | | | | | | | | | |
| Zanja | 797 | 10-yr | 620.00 | 1403.43 | 1408.01 | 1405.06 | 1408.11 | 0.000482 | 2.56 | 242.52 | 66.37 | 0.21 |
| Zanja | 797 | 50-yr | 2000.00 | 1403.43 | 1412.36 | 1406.97 | 1412.60 | 0.000493 | 4.04 | 555.09 | 229.09 | 0.24 |
| Zanja | 797 | 100-yr | 3200.00 | 1403.43 | 1412.48 | 1408.27 | 1413.07 | 0.001190 | 6.33 | 573.78 | 239.14 | 0.37 |
| Zanja | 797 | 500-yr | 8600.00 | 1403.43 | 1413.89 | 1413.15 | 1415.08 | 0.003141 | 9.60 | 1149.75 | 354.30 | 0.56 |
| | | | | | | | | | | | | |
| Zanja | 736 | 10-yr | 620.00 | 1401.72 | 1406.96 | 1406.28 | 1407.95 | 0.008266 | 7.98 | 77.69 | 22.75 | 0.76 |
| Zanja | 736 | 50-yr | 2000.00 | 1401.72 | 1410.34 | 1409.93 | 1412.35 | 0.010090 | 11.39 | 179.03 | 69.01 | 0.90 |
| Zanja | 736 | 100-yr | 3200.00 | 1401.72 | 1412.16 | 1412.16 | 1412.93 | 0.004144 | 8.38 | 562.82 | 330.85 | 0.60 |
| Zanja | 736 | 500-yr | 8600.00 | 1401.72 | 1413.62 | 1413.62 | 1414.83 | 0.005689 | 11.32 | 1076.37 | 377.27 | 0.72 |
| | | | | | | | | | | | | |
| Zanja | 704 | 10-yr | 620.00 | 1400.86 | 1405.67 | 1405.67 | 1407.49 | 0.016639 | 10.82 | 57.30 | 15.63 | 1.00 |
| Zanja | 704 | 50-yr | 2000.00 | 1400.86 | 1411.03 | 1411.03 | 1411.73 | 0.004620 | 7.93 | 370.44 | 261.14 | 0.56 |
| Zanja | 704 | 100-yr | 3200.00 | 1400.86 | 1411.69 | 1411.69 | 1412.40 | 0.004849 | 8.46 | 548.72 | 317.70 | 0.58 |
| Zanja | 704 | 500-yr | 8600.00 | 1400.86 | 1413.02 | 1413.02 | 1414.34 | 0.007095 | 11.51 | 987.26 | 354.17 | 0.72 |
| | | | | | | | | | | | | |
| Zanja | 634 | 10-yr | 620.00 | 1400.12 | 1404.65 | 1404.64 | 1406.20 | 0.014571 | 9.98 | 62.13 | 19.83 | 0.99 |
| Zanja | 634 | 50-yr | 2000.00 | 1400.12 | 1409.81 | 1409.81 | 1410.82 | 0.004412 | 8.66 | 298.96 | 200.68 | 0.60 |
| Zanja | 634 | 100-yr | 3200.00 | 1400.12 | 1410.73 | 1410.73 | 1411.62 | 0.003973 | 8.98 | 521.71 | 247.00 | 0.59 |
| Zanja | 634 | 500-yr | 8600.00 | 1400.12 | 1412.43 | 1412.43 | 1413.87 | 0.005535 | 12.18 | 975.74 | 291.20 | 0.71 |
| | | | | | | | | | | | | |
| Zanja | 512 | 10-yr | 620.00 | 1398.01 | 1404.65 | 1402.78 | 1405.14 | 0.003263 | 5.62 | 110.26 | 27.78 | 0.50 |
| Zanja | 512 | 50-yr | 2000.00 | 1398.01 | 1407.00 | 1407.00 | 1408.37 | 0.006403 | 9.82 | 237.89 | 109.31 | 0.74 |
| Zanja | 512 | 100-yr | 3200.00 | 1398.01 | 1408.52 | 1408.52 | 1409.22 | 0.003315 | 8.28 | 642.58 | 408.68 | 0.55 |
| Zanja | 512 | 500-yr | 8600.00 | 1398.01 | 1409.79 | 1409.79 | 1410.82 | 0.004865 | 11.20 | 1225.71 | 505.80 | 0.69 |
| | | | | | | | | | | | | |
| Zanja | 449 | 10-yr | 620.00 | 1397.22 | 1404.66 | 1401.62 | 1404.93 | 0.001674 | 4.19 | 154.13 | 60.34 | 0.34 |
| Zanja | 449 | 50-yr | 2000.00 | 1397.22 | 1406.71 | 1405.85 | 1407.34 | 0.003091 | 7.13 | 381.17 | 309.93 | 0.49 |
| Zanja | 449 | 100-yr | 3200.00 | 1397.22 | 1407.39 | 1407.39 | 1408.08 | 0.003557 | 8.16 | 637.20 | 443.77 | 0.53 |
| Zanja | 449 | 500-yr | 8600.00 | 1397.22 | 1408.68 | 1408.68 | 1409.61 | 0.004986 | 10.75 | 1299.41 | 557.01 | 0.64 |
| | | | | | | | | | | | | |
| Zanja | 391 | 10-yr | 620.00 | 1396.23 | 1403.79 | 1401.21 | 1404.69 | 0.007519 | 7.60 | 81.60 | 11.79 | 0.51 |
| Zanja | 391 | 50-yr | 2000.00 | 1396.23 | 1406.64 | 1406.37 | 1407.01 | 0.006011 | 6.33 | 483.55 | 372.65 | 0.54 |
| Zanja | 391 | 100-yr | 3200.00 | 1396.23 | 1407.04 | 1406.89 | 1407.57 | 0.008106 | 7.80 | 640.24 | 411.11 | 0.63 |
| Zanja | 391 | 500-yr | 8600.00 | 1396.23 | 1408.59 | 1408.14 | 1409.07 | 0.005904 | 8.04 | 1649.28 | 757.45 | 0.57 |
| | | | | | | | | | | | | |
| Zanja | 357 | | Culvert | | | | | | | | | |
| | | | | | | | | | | | | |
| Zanja | 324 | 10-yr | 620.00 | 1395.51 | 1400.27 | 1400.27 | 1402.26 | 0.024655 | 11.31 | 54.81 | 14.10 | 1.01 |
| Zanja | 324 | 50-yr | 2000.00 | 1395.51 | 1404.84 | 1404.84 | 1405.50 | 0.007196 | 7.76 | 456.35 | 273.72 | 0.65 |
| Zanja | 324 | 100-yr | 3200.00 | 1395.51 | 1405.46 | 1405.46 | 1406.16 | 0.007544 | 8.66 | 658.09 | 395.31 | 0.68 |
| Zanja | 324 | 500-yr | 8600.00 | 1395.51 | 1406.85 | 1406.85 | 1407.70 | 0.008760 | 10.96 | 1442.94 | 662.03 | 0.76 |
| | | | | | | | | | | | | |
| Zanja | 262 | 10-yr | 620.00 | 1391.87 | 1396.38 | 1396.38 | 1397.80 | 0.013989 | 9.57 | 64.81 | 22.49 | 0.99 |
| Zanja | 262 | 50-yr | 2000.00 | 1391.87 | 1399.80 | 1399.80 | 1402.23 | 0.012329 | 12.49 | 160.09 | 32.89 | 1.00 |
| Zanja | 262 | 100-yr | 3200.00 | 1391.87 | 1401.78 | 1401.78 | 1404.78 | 0.011660 | 13.90 | 230.18 | 38.02 | 1.00 |
| Zanja | 262 | 500-yr | 8600.00 | 1391.87 | 1405.88 | 1405.88 | 1406.84 | 0.003954 | 10.55 | 1708.60 | 646.08 | 0.62 |
| | | | | | | | | | | | | |
| Zanja | 172 | 10-yr | 620.00 | 1390.67 | 1395.72 | 1394.44 | 1396.43 | 0.005121 | 6.79 | 91.29 | 23.38 | 0.61 |
| Zanja | 172 | 50-yr | 2000.00 | 1390.67 | 1399.37 | 1398.43 | 1400.81 | 0.007089 | 9.68 | 217.08 | 93.48 | 0.75 |
| Zanja | 172 | 100-yr | 3200.00 | 1390.67 | 1400.99 | 1400.99 | 1402.05 | 0.004719 | 9.16 | 477.35 | 238.85 | 0.64 |
| Zanja | 172 | 500-yr | 8600.00 | 1390.67 | 1403.12 | 1403.12 | 1404.45 | 0.005451 | 11.70 | 1101.10 | 458.63 | 0.71 |
| | | | | | | | | | | | | |
| Zanja | 29 | 10-yr | 620.00 | 1387.66 | 1395.67 | 1392.27 | 1395.94 | 0.001502 | 4.13 | 149.96 | 32.90 | 0.34 |
| Zanja | 29 | 50-yr | 2000.00 | 1387.66 | 1399.67 | 1396.04 | 1400.11 | 0.001501 | 5.68 | 532.69 | 376.73 | 0.37 |
| Zanja | 29 | 100-yr | 3200.00 | 1387.66 | 1400.61 | 1397.91 | 1401.03 | 0.001503 | 6.17 | 926.81 | 442.37 | 0.38 |
| Zanja | 29 | 500-yr | 8600.00 | 1387.66 | 1402.86 | 1401.53 | 1403.30 | 0.001500 | 7.23 | 2103.34 | 662.21 | 0.39 |

# Attachment 3

# Engineering “No Rise” Certificate

NATIONAL FLOOD INSURANCE PROGRAM
ENGINEERING "NO-RISE" CERTIFICATE

## SITE INFORMATION

| | | | |
|---|---|---|---|
| Community | Redlands | County | San Bernardino County |
| Applicant | SBCTA | Date | 11/18/2016 |
| Address | 1170 W. 3rd St, San Bernardino, CA 92410 | Engineer | Jacob Hyles, P.E., HDR Engineering, Inc. |
| | | Address | 8690 Balboa Ave, Suite 200, San Diego, CA 92123 |
| Telephone | 909-884-8276 | Telephone | 858-712-8297 |
| Site Address/ Location | The Zanja Bridge 9.4<br>34° 3'32.34"N and 117°10'21.53"W | Township<br>Section | |

## PROJECT INFORMATION

| | |
|---|---|
| Description of Development: | New bridge development with ties, subgrade and rails. |
| Type of Development: | Filling ___ Grading _X_ Excavation _X__ Minor Improv ___<br>Substantial Improv _X_ New Construction ___ Other ___ |

## FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

| | |
|---|---|
| NFIP map(s) and panel(s) affected: | FIRM Map Number- 06071C8716H |
| Effective date of map: | August 28, 2008 |
| Base Flood Elevation (feet): | Existing N/A; Proposed N/A |
| Name of flooding source: | The Zanja |

## CERTIFICATION

This is to certify that I am a duly qualified Professional Engineer licensed to practice in the State of California. I further certify that the attached engineering data supports the fact the proposed development in the floodway described above will not create any increase in the base flood elevations (100-year flood), floodway elevations and the floodway widths on The Zanja at published cross sections listed in the Flood Insurance Study for the above community dated August 28, 2008 and will not create any increase to the base flood elevations (100-year flood), floodway elevations and the floodway widths at unpublished cross-section in the vicinity of the proposed development.

Jacob Hyles, P.E.
CERTIFIER'S NAME

HDR Engineering, Inc.
COMPANY NAME

SIGNATURE

REGISTERED PROFESSIONAL ENGINEER
JACOB E. HYLES
No. 81767
Exp. 3-31-18
CIVIL
STATE OF CALIFORNIA

CA 81767
LICENSE NUMBER

January 27, 2017
DATE

# Attachment 4

# Scour Analysis

| | | | | | |
|---|---|---|---|---|---|
| Project: | RPRP | Prepared: NA | Date: | 9/1/2016 |
| Subject: | **Br 9.4Scour** | Checked: | Date: | |
| Task: | **Summary 100-Year Contraction Scour** | | | |
| Job#: | **268339** | | | |

Reference: FHWA - HEC-18 Evaluating Scour at Bridges 2012, Chapter 6

US XS: 836 Due to over-topping and slope, XS 1033 does not fit requirements for overtopping pressure scrou comps.

**Contraction Scour, Chapter 6.2**

EQ 6.1

$$V_c = K_u y^{1/6} D^{1/3}$$

Proposed

| | | |
|---|---|---|
| $K_u$ | 11.17 | English Units |
| y | 9.74 | Average depth of flow upstream of the contraction, ft (hydraulic depth at approach cross section) |
| $D_{50}$ | 0.9 | Particle size for Vc, mm |
| $D_{50}$ | 0.00295272 | Particle size for Vc, ft |
| $V_c$ | 2.34 | Critical velocity above which bed material of size D and smaller will be transported, ft/s |

Velocity in Channel 4.33 ft/s Average velocity at approach cross section

Live-Bed Contraction Scour

Contraction Scour **5.7** ft

**Live-bed Contraction Scour, Chapter 6.3**

EQ 6-2

$$\frac{y_2}{y_1} = \left(\frac{Q_2}{Q_1}\right)^{6/7} \left(\frac{W_1}{W_2}\right)^{K_1}$$

| | | |
|---|---|---|
| $y_2$ | 10.8 | Average depth in the contracted section, ft |
| $y_1$ | 9.74 | Average depth in the upstream main channel section, ft |
| $y_0$ | 5.17 | Existing depth in the contracted section before scour, ft |
| $Q_2$ | 2571.45 | Flow in the contracted channel ft3/s |
| $Q_1$ | 2968.48 | Flow in the upstream channel transporting sediment, ft3/s |
| $W_1$ | 78.78 | Top width of the upstream main channel that is transporting bed material, ft |
| $W_2$ | 54.96 | Top width of the main channel in the contracted section less pier widths, ft — See top width from 10-year |
| $k_1$ | 0.64 | Exponent |
| $V_*$ | 0.42 | Shear velocity in the upstream section, ft/s |
| $\omega$ | 0.4264 | Fall velocity of bed material based on the D50, ft/s |
| g | 32.2 | Acceleration of gravity, 32.3 ft/s2 |
| $S_1$ | 0.000574 | Slope of energy grade line of main channel, ft/ft |
| $V_*/\omega$ | 1.00 | |
| $y_s$ | **5.7** | Average contraction scour depth, ft |

**Clear-water Contraction Scour, Chapter 6.4**

EQ 6.4

$$y_2 = \left[\frac{K_u Q^2}{D_m^{2/3} W^2}\right]^{3/7}$$

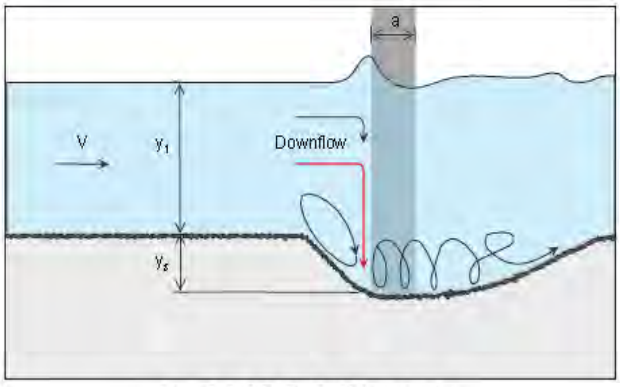
| | | |
|---|---|---|
| $y_2$ | 16.62863267 | Average equilibirium depth in the contracted section after contraction scour, ft |
| $K_u$ | 0.0077 | English Units |
| Q | 2571.45 | Discharge through the contracted section or on the set-back overbank area at the section associated with the width W, ft3/s |
| $D_m$ | 0.0036909 | Diameter of the smallest nontransportable particle in the bed material (1.25*D50) in the contracted section, ft |
| $D_{50}$ | 0.00295272 | Median diameter of the bed material, ft |
| W | 54.96 | Top width of the contracted section less pier widths |
| $y_0$ | 5.174308588 | Average existing depth in the contracted section, ft |
| $y_s$ | **11.45** | Average contraction scour depth, ft |

| | | | | | |
|---|---|---|---|---|---|
| Project: | **RPRP** | Prepared: | NA | Date: | 9/1/2016 |
| Subject: | **Br 9.4Scour** | Checked: | | Date: | |
| Task: | **100-Year Pier Scour** | | | | |
| Job#: | **268339** | No: | | | |

**Equations taken from US Department of Transportation Federal Highway Administration HEC-18 (2012)**

**With Debris Accumulation**

| Proposed | | | |
|---|---|---|---|
| 1 | K1 | Shape factor (= 1.0 for approach angle > 5 degrees or with debris) | Table 7.1 |
| 1 | K2 | Skew factor (= 1.0 when using aproj or with debris) | Table 7.2 |
| 1.1 | K3 | Bed forms factor | Table 7.3 |
| 0 | H | Height of debris (ft) | |
| 0 | W | Width of debris (ft) | |
| 10.46 | y | Depth of approach flow (ft) (used max channel depth) | |
| 6.16 | a | Pier width perpendicular to flow (ft) | |
| 6.16 | a*d | Projected pier width (ft) | |
| 4.64 | V | Approach velocity (ft/s) (from flow distribution just upstream of pier) | |
| 0.25 | Fr | Froude number = V/(gy)^1/2 | |
| **9.0** | $y_s$ | Pier scour (ft) = 2.0 $a^*_d$ K1 K2 K3 (y/a)^0.35 Fr^0.43 | EQ 7.3 |




ɔur.

$$\frac{y_s}{a^*_d} = 2.0\, K_1\, K_2\, K_3 \left(\frac{y_1}{a^*_d}\right)^{0.35} Fr_1^{0.43}$$

$y_s$ = Scour depth, ft (m)
$y_1$ = Flow depth directly upstream of the pier, ft (m)
$K_1$ = Correction factor for pier nose shape from Figure 7.3 and Table 7.1
$K_2$ = Correction factor for angle of attack of flow from Table 7.2 or Equation 7.4
$K_3$ = Correction factor for bed condition from Table 7.3
a = Pier width, ft (m)
L = Length of pier, ft (m)
$Fr_1$ = Froude Number directly upstream of the pier = $V_1/(gy_1)^{1/2}$
$V_1$ = Mean velocity of flow directly upstream of the pier, ft/s (m/s)
g = Acceleration of gravity (32.2 ft/s²) (9.81 m/s²)

$$a^*_d = \frac{K_1(HW) + (y - K_1 H)a}{y} \qquad (7.32)$$

where:

$a^*_d$ = Effective width of pier when debris is present, ft (m)
a = Width of pier perpendicular to flow, ft (m)
$K_1$ = 0.79 for rectangular debris, 0.21 for triangular debris
H = Height (thickness) of the debris, ft (m)
W = Width of debris perpendicular to the flow direction, ft (m)
y = Depth of approach flow, ft (m)

| | | | | | |
|---|---|---|---|---|---|
| | Project: | **RPRP** | Prepared: NA | Date: | 9/1/2016 |
| | Subject: | **Br 9.4Scour** | Checked: | Date: | |
| | Task: | **100-Year Pressure Scour** | | | |
| | Job#: | **268339** | | | |

**Equations taken from US Department of Transportation Federal Highway Administration HEC-18 (2012)**

## Pressure Flow Scour - Overtopping Flow

| | Existing | |
|---|---|---|
| Q1 | 2968 | Upstream channel discharge as defined for horizonatal contraction scour (ft3/s) |
| Q2 | 2571 | Discharge through bridge (ft3/s) |
| $h_{ue}$ | 9.48 | Effective upstream channel flow depth for live-bed conditions and bridge overtopping (ft) |
| $h_u$ | 9.74 | Upstream channel flow depth as defined for horizontal contraction scour (ft) |
| $Q_{ue}$ | 2878 | Effective channel discharge for live-bed conditions and bridge overtopping flow (ft3/s) |
| $h_b$ | 5.22 | Vertical size of the bridge opening prior to scour (ft) |
| $h_t$ | 5.31 | Distance from the water surface to the lower face of the bridge girders equals hu-hb (ft) |
| $h_w$ | 0.26 | Weir flow height equals ht-T for ht>T, hw=0 for ht<T |
| t | 2.05 | flow seperation thickness (ft) |
| T | 5.05 | height of the obstruction (ft) |

Live-Bed Contraction Scour

$y_s = y_2 + t - h_b$

| | | |
|---|---|---|
| $y_s$ | **7.8** | Average contraction scour depth, ft |

## Live-bed Contraction Scour, Chapter 6.3

EQ 6-2

$$\frac{y_2}{y_1} = \left(\frac{Q_2}{Q_1}\right)^{6/7} \left(\frac{W_1}{W_2}\right)^{K_1}$$

| | | |
|---|---|---|
| $y_2$ | 11.0 | Average depth in the contracted section, ft |
| $y_1$ | 9.74 | Average depth in the upstream main channel section, ft |
| $y_0$ | 5.17 | Existing depth in the contracted section before scour, ft |
| $Q_{ue}$ | 2878.1 | Effective channel discharge for live-bed conditions and bridge overtopping flow (ft3/s) |
| $Q_2$ | 2571 | Flow in the contracted channel ft3/s |
| $W_1$ | 77.2 | Bottom width of the upstream main channel that is transporting bed material, ft |
| $W_2$ | 54.96 | Bottom width of the main channel in the contracted section less pier widths, ft |
| $k_1$ | 0.64 | Exponent (see adjacent table) |
| $V_*$ | 0.42 | Shear velocity in the upstream section, ft/s |
| $\omega$ | 0.4264 | Fall velocity of bed material based on the D50 |
| g | 32.2 | Acceleration of gravity, 32.3 ft/s2 |
| $S_1$ | 0.000574 | Slope of energy grade line of main channel, ft/ft |
| $V_*/\omega$ | 1.00 | |

$V_c = K_u y^{1/6} D^{1/3}$

where:

$V_c$ = Critical velocity above which bed material of size D and smaller

| | | | | | |
|---|---|---|---|---|---|
| | Project: | **RPRP** | Prepared: NA | Date: | 9/1/2016 |
| | Subject: | **Br 9.4Scour** | Checked: | Date: | |
| | Task: | **100-Year Abutment Scour** | | | |
| | Job#: | **268339** | No: | | |

Reference: FHWA - HEC-18 Evaluating Scour at Bridges 2012, Chapter 8

### Set-Back Ratio and Unit Discharge

| | Proposed | |
|---|---|---|
| | 0.0 | Set-back Length, ft |
| | 5.17 | Average channel depth, ft |
| SBR | 0.0 | Set-Back Ratio |

No overbank flow under bridge.

SBR<5 both abutments Figure 8.14

| | | |
|---|---|---|
| A | 523.6 | Flow Area, ft2 |
| Q | 2571.5 | Total Bridge Flow, cfs |
| V | 4.91 | Velocity Bridge Opening, ft/s |
| | 55.0 | Top Width, ft (net top width BR) |
| d | 9.53 | Hydraulic Depth Bridge, ft |
| q2c | **46.79** | Unit Bridge Discharge, cfs/ft |

### Projected Length

| | | |
|---|---|---|
| L | 1.0 | Project Length of Abutment, L |
| $B_r$ | 1.0 | Width of Floodplain, ft |
| $L/B_r$ | 100.00% | |

**>75%**

### Live-Bed Contraction Scour

$$y_c = y_1\left(\frac{q_{2c}}{q_1}\right)^{6/7}$$

| | | |
|---|---|---|
| $y_1$ | 9.74 | Upstream flow depth, ft |
| $q_1$ | 37.68 | Upstream unit discharge $ft^2/s$ V*d |
| $q_{2c}$ | **46.79** | Unit discharge in the constricted opening accounting for non-uniform flow distribution, $ft^2/s$ |
| $y_c$ | **11.7** | Flow depth including live-bed contraction scour, ft |

### Live-Bed Abutment Scour Equation

$$y_{max} = \alpha_A y_c$$

| | | |
|---|---|---|
| q2c/q1 | 1.24 | |
| αA | 1.67 | Amplification Factor from Fig 8.9 |
| $y_c$ | **11.7** | Flow depth including live-bed contraction scour, ft |
| $y_{max}$ | **19.6** | Maximum flow depth resulting from abutment scour, ft |
| $y_o$ | 9.53 | Flow depth prior to scour, ft |
| $y_s$ | **10.1** | Abutment Scour depth, ft |

| | | | | | |
|---|---|---|---|---|---|
| | Project: | **RPRP** | Prepared: NA | Date: | 9/1/2016 |
| | Subject: | **Br 9.4Scour** | Checked: | Date: | |
| | Task: | **100-Year Bendway Scour** | | | |
| | Job#: | **268339** | No: | | |

Software - Channel pro

US XS: 1119

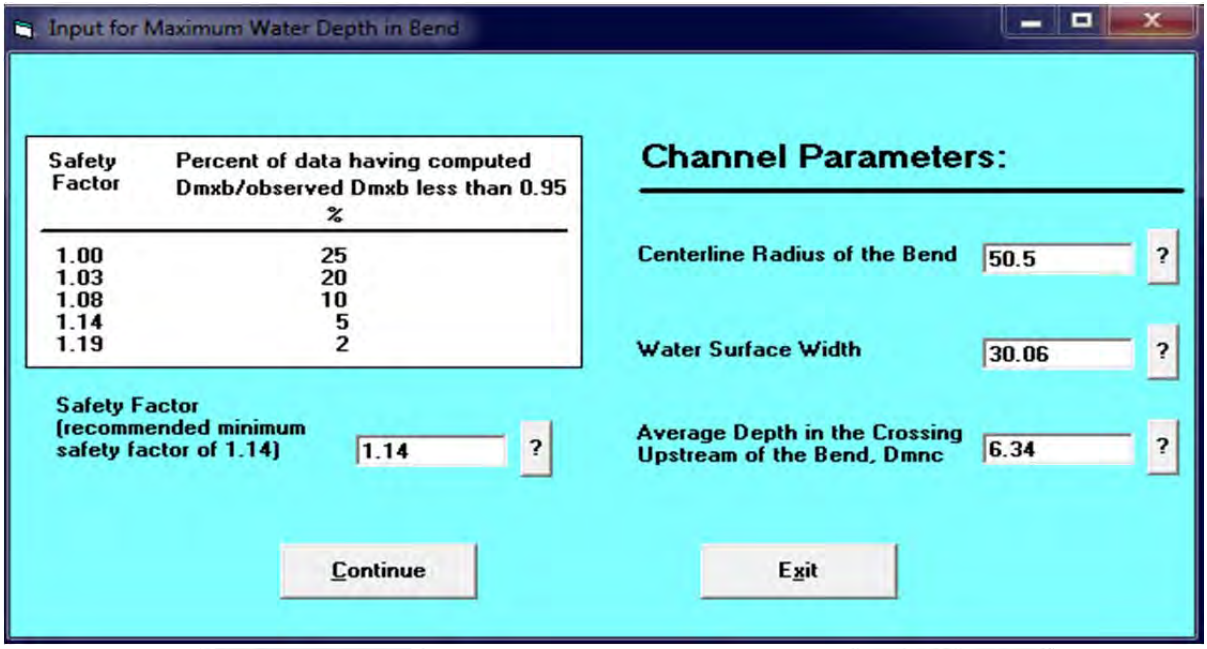
Average Depth in the Crossing Upstream 6.3 ft

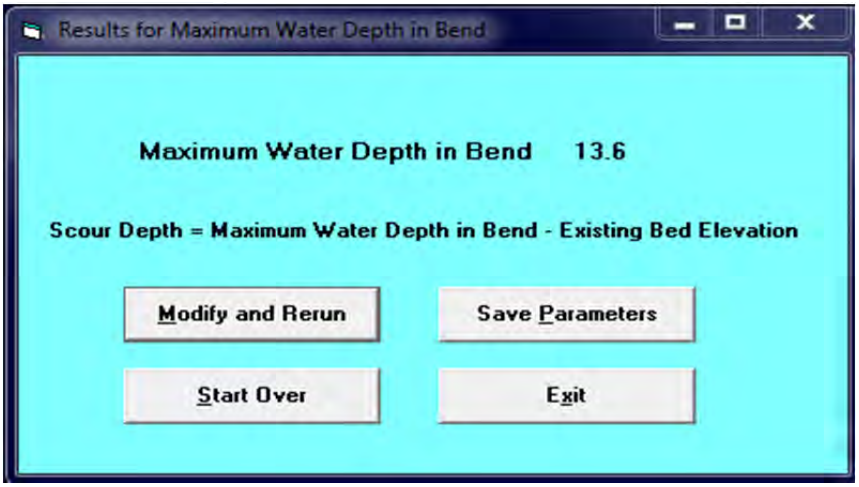
Scour Depth = Mazimum Water Depth in Bend - Existing Bed Elevation

Maximum Water Depth in Bend = 13.6 ft

Existing Existing Maximum Depth in Bend = 10.49 ft

Scour Depth = 3.11 ft



| | | | | | |
|---|---|---|---|---|---|
| Project: | RPRP | Prepared: JW | Date: | | |
| Subject: | Br 9.4Scour | Checked: JH | Date: | 1/26/2017 | |
| Task: | Long Term Degradation | | | | |
| Job#: | 268339 | | | | |

**Equilibrium Slope Calculation and Degradation Estimate**

| Q10 (cfs) | Width (ft) | Velocity (ft/s) | Depth (ft) | n | D50 (mm) | a | b | c |
|---|---|---|---|---|---|---|---|---|
| 620 | 15.63 | 10.82 | 4.81 | 0.03 | 0.9 | 5.17419E-06 | 4.964 | -0.4897 |

| qs (cfs/ft) | q cfs/ft) | $\frac{10}{3(c-b)}$ | $\frac{2(2b+3e)}{3(c-b)}$ | K | SEQ |
|---|---|---|---|---|---|
| 0.3262 | 39.667 | -0.61121673 | -1.0339946 | 1.486 | 0.00778 |

| | |
|---|---|
| SEX | 0.0177 |
| SEQ | 0.00778 |
| L (ft) | 406 |
| **DEG (ft)** | **4.03** |

## Sand and fine gravel—reduced sediment supply from upstream

It is not uncommon to have the sediment supply reduced to a stream reach. This occurs when a watershed is reforested, in later stages of urbanization, bed material is mined, diversions are constructed, or when reservoirs are placed in one or more subwatersheds. The concept of equilibrium slope remains valid for these conditions. Use observed bed-material sediment discharge data to fit a regression function of the form:

$$q_s = au^b y^c \qquad \text{(eq. TS14B–8)}$$

where:

$q_s$ = sediment transport capacity in dimensions of volume per unit width per unit time, $ft^2/s$ ($m^2/s$)
u = mean streamwise velocity, ft/s (m/s)
y = mean flow depth, ft (m)
a, b, c = coefficients and exponents from regression

The sediment transport capacity may be converted to dimensions of weight per unit width per unit time (tons/d) by multiplying by 7,144 (228,960 to convert $m^2/s$ to metric tons/d).

For purposes of equilibrium slope computation, $q_s$ should be computed using the mean velocity and flow depth corresponding to the channel-forming discharge as defined in NEH654.05. Since sediment supply and sediment transport capacity are determined for the same water discharge, computation of equilibrium slope is not very sensitive to errors in determining effective discharge. If available sediment data are inadequate to generate a reliable regression, a sediment transport relationship may be used to synthesize coefficients. For sand streambeds, the following formulas are available for the coefficients a, b, and c in equation TS14B–8 (Yang 1996):

$$a = 0.025n^{(2.39-0.8\log D_{50})}(D_{50} - 0.07)^{-0.14} \qquad \text{(eq. TS14B–9)}$$

$$b = 4.93 - 0.74\log D_{50} \qquad \text{(eq. TS14B–10)}$$

$$c = -0.46 + 0.65\log D_{50} \qquad \text{(eq. TS14B–11)}$$

$D_{50}$ has units of millimeters.

When SI units are used in the equation for $q_s$ coefficients b and c are unchanged, and the coefficient, a, must be multiplied by a factor of $0.3048^{(2-b-c)}$. These formulas are based on regression of a large data set with ranges given in table TS14B–6.

Similar regression coefficients for sediment transport under conditions outside these ranges (0.1 mm < $D_{50}$ < 5.0 mm) are provided by Richardson, Simons, and Lagasse (2001). If it is assumed that bed-material size and channel width do not change as the channel degrades, the equilibrium slope may be computed by:

$$S_{eq} = \left(\frac{a}{q_s}\right)^{\frac{10}{3(c-b)}} q^{\frac{2(2b+3e)}{3(c-b)}} \left(\frac{n}{K}\right)^2 \qquad \text{(eq. TS14B–12)}$$

where:

K = 1.486 (1.0 for SI units), and other variables are as previously defined

| | | | | | |
|---|---|---|---|---|---|
| | Project: | **RPRP** | Prepared: NA | Date: | 9/6/2016 |
| | Subject: | **Br 9.4 Scour** | Checked: | Date: | |
| | Task: | **Summary 100-Year Scour** | | | |
| | Job#: | **268339** | No: | | |

| Flow | Contraction Scour (ft) | Pier Scour (ft) | Pressure Scour[1] (ft) | Long Term Scour[2] (ft) | Bendway Scour (ft) | Total Pier Scour (ft) | Abutment Scour (ft) |
|---|---|---|---|---|---|---|---|
| 100 Year | 5.7 | 9.0 | 7.8 | 4.0 | 3.1 | 20.9 | 10.1 |

1: Horizontal contraction scour included in pressure scour

2: Long term scour assumed to be zero due downstream culvert.

# Attachment 5

## Digital Information (CD)

# MITIGATION MONITORING AND REPORTING PROGRAM

## 1.0 INTRODUCTION

The California Environmental Quality Act (CEQA) requires a lead or responsible agency to adopt a monitoring and reporting program (MMRP) when approving or carrying out a project (Section 21081.6 of the California Public Resources Code). The purpose of this program is to ensure that when an environmental document, either an Environmental Impact Report (EIR) or a mitigated negative declaration, identifies measures to reduce potential adverse environmental impacts to less than significant levels that those measures are implemented as detailed in the environmental document. As lead agency for the Project, the San Bernardino Associated Governments (SANBAG), acting in its roles as the San Bernardino County Transportation Commission, is responsible for implementation of this MMRP per the requirements of the (CEQA). In its role as the federal lead agency under the National Environmental Policy Act (NEPA), the Federal Transit Administration (FTA), Region IX, will use this MMRP for verifying the implementation of the mitigation measures proposed in conjunction with its issuance of the Record of Decision.

In this context, this MMRP was prepared to provide a monitoring strategy to ensure the implementation of the adopted mitigation measures. Once SANBAG adopts the MMRP, the mitigation monitoring/reporting requirements will be incorporated into the appropriate permits and construction documents (i.e., engineering specifications, engineering and construction plans, real estate entitlements, etc.). Therefore, in accordance with the aforementioned requirements, this MMRP lists each mitigation measure, describes the methods for implementation and verification, and identifies the responsible party or parties as detailed below in Section 3.

## 2.0 MONITORING AND REPORTING PROCEDURES

This MMRP was developed for the Locally Preferred Alternative (LPA) for SANBAG's Redlands Passenger Rail Project (RPRP or Project) (State Clearinghouse Number 2012041012). The MMRP will be in place through all phases of the Project, including design, construction, and operation, and will facilitate the implementation of mitigation measures proposed to avoid, minimize, or reduce significant environmental effects. SANBAG will be responsible for administering the MMRP and ensuring that all parties, including its contractors, comply with its provisions. SANBAG may delegate implementation and monitoring activities to staff, consultants, or contractors. SANBAG will require that its construction contractors submit an environmental compliance plan for approval by SANBAG and construction manager prior to the beginning construction activities. This plan shall document how the contractor intends to comply with all measures applicable to the contract, including the application of best management practices (BMPs) in accordance with instruction listed in the construction specifications. SANBAG also will ensure that monitoring is documented through systematic compliance verification and reporting and that deficiencies are promptly corrected. The designated environmental compliance manager will track and document compliance with mitigation measures, notify SANBAG of any problems or deficiencies, as appropriate, and take appropriate action to rectify problems.

# 3.0 MITIGATION MONITORING AND REPORTING PROGRAM IMPLEMENTATION

This MMRP was prepared to verify compliance with individual mitigation measures proposed in the Final Environmental Impact Statement (EIS)/EIR for the Project. Table 1 of this MMRP identifies each mitigation measure by discipline, the entity responsible for its implementation, and the performance standard required to demonstrate compliance with each measure. Certain inspections and reports may require preparation by qualified individuals and these are specified as needed. The timing and method of verification for each measure are also specified.

## Table 1. MMRP Mitigation Measures

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| ***Land Use, Planning, and Communities*** | | | | | |
| **LU-1: Minimize Project Land Requirements and Comply with Federal and State Relocation Laws.** As part of final design, SANBAG shall maximize opportunities to minimize the Project's land requirements and associated property acquisition. In instances where avoidance is not feasible, SANBAG shall provide just compensation consistent with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act and California Relocation Act. If the acquisition of one or more properties requires relocation of existing residences or businesses, SANBAG shall provide relocation assistance to residential and business tenants prior to the start of construction. | Final design | Entire Project | SANBAG | None | |
| ***Transportation*** | | | | | |
| **TR-1: Prepare a Traffic Management Plan.** SANBAG shall prepare a Traffic Management Plan prior to the start of construction, and the provisions of the Traffic Management Plan shall be implemented prior to, and during construction, as appropriate, to address traffic considerations of pedestrian and bicycle access and safety, and vehicular flow. The objective of the Traffic Management Plan will be to reduce construction related effects to traffic, non-motorized forms of transportation (e.g., bicycle and pedestrians), and existing public transit (e.g., buses) and will include the following:<br>• Construction detour plans and designated construction truck access routes for each phase of construction;<br>• Maintain maximum travel lane capacity to the greatest extent possible during construction periods and provide advanced notice to drivers or roadway changes or closures; | Prior to and during construction | Entire Project | SANBAG | Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| • Signage indicating the construction limits, access routes, and entrances to individual business sites and community facilities that may be affected by construction activities. In addition, the construction contractor would supply "open for business" signs to encourage normal business activity during construction;<br>• Pre-planning, outreach, and signage indicating pedestrian and bicycle routes detours;<br>• Coordination with public transit service providers, as necessary;<br>• Heavy trucks and other construction transport vehicles shall avoid the busiest commute hours to the greatest extent possible (weekdays 7 a.m. to 8 a.m. and 5 p.m. to 6 p.m. – High traffic intersections (Greater than 10,000 ADT) – 6:30 a.m. to 8:30 a.m. and 4:30 p.m. to 6:30 p.m.);<br>• Early notification to emergency service providers and area drivers of any road closures or detours and the timeframes of the closures or detours. This information will be posted in a local newspaper, via SANBAG's web site and will be updated on a monthly basis;<br>• Coordination with the Cities of San Bernardino, Loma Linda, and Redlands for community events in the area to accommodate crowds and road closures;<br>• Pavement damage resulting from project construction will be repaired prior to the completion of construction; and<br>• SANBAG shall maximize opportunities for coordinated construction and installation of | | | | | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| improvements that occurs outside the SANBAG ROW with the Cities of San Bernardino, Loma Linda, and Redlands to the greatest extent practical. | | | | | |
| **TR-2: Existing LOS and V/C Year 2018 and 2038 Impact Roadway Improvements.** As part of the Project construction, SANBAG shall coordinate with the appropriate agency in which the intersection improvement is located (Cities of San Bernardino, Loma Linda, Redlands, or Caltrans) to pay SANBAG's "fair share" of the identified roadway improvements prior to the start of operations of the Project in 2018:<br>• **California Street and I-10 Eastbound Off-Ramp –** SANBAG shall coordinate with Caltrans to fund its fair share of construction for a ramp improvement to include a right-turn pocket. The existing right-turn lane will become a shared right-turn lane to accommodate the high number of right turns. The improvements will include replacing existing pedestrian and bicycle facilities, where present.<br>SANBAG shall provide its fair share for the funding of the following improvements prior to the year 2038:<br>• **California Street and I-10 West On-Ramp –** SANBAG shall coordinate with Caltrans to fund its fair share to the construction of a dual southbound right and a dual northbound left turn pocket. The improvements will include replacing existing pedestrian and bicycle facilities, where present.<br>• **Alabama Street and Industrial Avenue –** SANBAG shall coordinate with the City of Redlands to stripe an exclusive westbound right turn lane with 50-feet of storage to accommodate a high number of right turns. The improvements will include | Prior to the start of operations (2038 improvements will be evaluated at 5-year increments following 2018) | Roadway improvements | SANBAG | Cities of San Bernardino and Redlands; Caltrans | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| replacing existing pedestrian and bicycle facilities, where present. | | | | | |
| **TR-3: Approval from CPUC for Grade Crossings and Safety Measures.** SANBAG shall coordinate with the CPUC prior to the start of construction for re-design and/or closure of all grade crossings to ensure that all grade crossings and safety improvements comply with CPUC standards. SANBAG shall provide verification to the CPUC that all rail safety measures identified in the hazard analysis as part of the "formal application" or "GO 88-B" authorization" from CPUC have been installed. | Final design and post-construction | Grade Crossings | SANBAG | CPUC | |
| **TR-4: Recommended Pre-Signals for Queuing.** Prior to the start of operations, pre-signals shall be implemented at the following grade crossing locations and shall be operational prior to the start of 2018:<br>• Eastbound I-10 Ramps and California Street crossing;<br>• Industrial Park Avenue and Alabama Street crossing; and<br>• Redlands Boulevard and Tennessee Street crossing.<br>Prior to 2038 and if warranted based on future intersection operations (as determined through reevaluation in 5-year increments by SANBAG following procedures in the Los Angeles Metropolitan Transportation Authority (MTA) Grade Crossing Policy for Light Rail Transit), pre-signals will be implemented at the following grade crossing locations:<br>• Waterman Avenue and Orange Show Road Crossing (Northbound Approach);<br>• Orange Show Road and Waterman Avenue Crossing (Eastbound Approach; | Prior to the start of operations (2038 improvements will be evaluated at 5-year increments following 2018) | Grade Crossings | SANBAG | CPUC, Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| • Redlands Boulevard and California Street Crossing; and Redlands Boulevard and Alabama Street Crossing. | | | | | |
| **TR-5: Transit Operations Realignment.** SANBAG will work with affected transit service providers as part of their service realignment process (or major service change) to maximize transit efficiencies offered by interfacing existing transit service with Project operations. SANBAG shall develop a transit integration plan in coordination with local transit service providers to establish a framework for service integration. The plan shall, at a minimum, include an approach or strategy for coordinating existing transit scheduling with proposed train operations, maximizing route interfaces with the proposed station locations, and optimizing existing transit routes to minimize duplication in service. | Prior to the start of operations | Project station stops | SANBAG | Omnitrans | |
| ***Visual Quality and Aesthetics*** | | | | | |
| **VQA-1: Screening of Construction Staging Areas.** For construction staging areas within 500 feet of a residence, park, or educational facility, the contractor will be required to shield the staging area to the extent feasible and coordinate with the local jurisdiction regarding the type and method of screening, which may include but is not limited to, the use of fence slats, netting, or mesh or tarps. SANBAG shall limit construction to daylight hours to the extent possible. If nighttime lighting or construction is necessary, the SANBAG shall ensure that unshielded lights, reflectors, or spotlights are not located and directed to shine toward or be directly visible from adjacent properties or streets. To the extent possible, SANBAG shall minimize the use of nighttime construction lighting within 500 feet of existing residences. This measure shall be identified on grading plans and in construction contracts. | Prior to and during construction | Entire Project | SANBAG | Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| **VQA-2: Enhance Exterior Appearance of Structural Facilities.** The external appearance of the stations and layover facility, including the choice of color and materials, shall seek to reduce the visual impact of these facilities on adjacent land uses. Bright reflective materials and colors shall be avoided. As appropriate, the exterior design of these facilities should follow design guidelines provided in applicable land use plans. Minimum exterior design requirements shall include, but are not limited to, the following:<br>• Painting (with earth-colored tones) of structural façades to blend with surrounding land uses;<br>• Maximize the use of textured or other non-reflective exterior surfaces and non-reflective glass to prevent glare;<br>• Use of fencing or structural materials, shall be similar to those used by nearby land uses and compatible with surrounding architecture;<br>• Development of a landscaping plan for each station and layover facility site that uses a combination of locally derived native vegetation, earthen features (e.g., boulders), and, if appropriate, topographical separations (e.g., berms) to maximize site appearance and shield the new facilities from nearby sensitive receptors to the extent feasible; and<br>• Clustering of structural facilities to maximize open space buffering.<br>SANBAG shall coordinate final design plans with the Cities of San Bernardino and Redlands prior to final approval. | Final design | Stations | SANBAG | Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| **VQA-3: Tree Replacement.** Prior to construction, SANBAG shall have a registered arborist conduct a tree survey to identify native and ornamental trees requiring removal outside SANBAG's ROW. The arborist will identify measures to avoid and minimize indirect impacts on trees, where feasible, and develop a plan for the replacement of trees that cannot be avoided. The plan will include planting and irrigation design details and a weaning schedule for the establishment period. Trees with a diameter at breast height of 6 inches or greater will be replaced at a minimum ratios of 1:1 and consistent with City of Redlands and San Bernardino standards. | Prior to construction | Entire Project | SANBAG | Cities of San Bernardino and Redlands | |
| **VQA-4: Sound Barrier Screening and Surface Treatments.** To reduce effects associated with the sound walls, where SANBAG ROW widths allow, drought tolerant landscaping (i.e., trees, vines, and/or shrubs) shall be provided. If the SANBAG ROW width is insufficient to permit landscaping or if landscaping cannot adequately reduce visual impacts, surface treatments that are compatible with surrounding architecture shall be applied to the outside of the sound walls (residential or school facing side). Architectural detailing such as pilasters, wall caps, interesting block patterns, and offset wall layouts shall be used to add visual interest and reduce apparent height of the walls. SANBAG shall coordinate the final design plans with the Cities of San Bernardino and Redlands, as applicable, prior to final approval. | Final design (if constructed) | Sound wall locations | SANBAG | Cities of San Bernardino and Redlands | |
| **VQA-5: Minimize Exterior Lighting in Adjacent Uses.** To prevent unintended spillover of lighting, lighting fixtures constructed or relocated as part of the Project shall be oriented and focused onto the specific on-site location intended for illumination (e.g., parking lots) and shielded | Final design | Stations and Layover Facility | SANBAG | Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| away from adjacent sensitive uses (e.g., schools, residential properties) and public rights of way to minimize light spillover onto off-site areas. New driveways shall be located and oriented into parking lots, to the extent feasible, in a manner that will not result in headlights from vehicles entering or exiting the parking areas oriented directly at off-site sensitive uses. SANBAG shall coordinate the final design plans with the Cities of San Bernardino and Redlands, as applicable, prior to final approval. | | | | | |
| ***Noise and Vibration*** | | | | | |
| **NV-1: Employ Noise-Reducing Measures during Construction.** SANBAG shall require its construction contractors to employ measures to minimize and reduce construction noise. Noise reduction measures that shall be implemented to reduce construction noise to acceptable levels may include but are not limited to the following:<br>• Use available noise suppression devices and techniques, including:<br>- Equipping all internal combustion engine-driven equipment with mufflers, air-inlet silencers, and any other shrouds, shields, or other noise-reducing features that are in good operating condition and appropriate for the equipment (5 to 10 dB reduction possible).<br>- Using “quiet” models of air compressors and other stationary noise sources where such technology exists.<br>- Using electrically powered equipment instead of pneumatic or internal combustion-powered equipment, where feasible. | During Construction | Entire Project | SANBAG | Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| - Using noise-producing signals, including horns, whistles, alarms, and bells, for safety-warning purposes only.<br>- Locating stationary noise-generating equipment, construction parking, and maintenance areas as far as reasonable from sensitive receivers when sensitive receivers adjoin or are near the construction Project APE.<br>- Prohibiting unnecessary idling of internal combustion engines (i.e., in excess of 5 minutes).<br>- Placing temporary soundwalls or enclosures around stationary noise-generating equipment when located near noise-sensitive areas (5 to 15 decibel reduction possible).<br>- Ensuring that project-related public address or music systems are not audible at any adjacent receiver.<br>- Notifying adjacent residents in advance of construction work. | | | | | |
| **NV-2: Prepare a Community Notification Plan for Project Construction.** The construction contractor shall prepare and maintain a community notification plan to address project construction issues the community may have during construction. Components of the plan may include construction phasing to minimize the duration of noise or vibration at any one location. Initial information packets shall be prepared and mailed to all residences within a 500-foot radius of project construction, with updates prepared as necessary to indicate new scheduling or processes. A project liaison shall be identified who will be available to | Prior to and during construction | Entire Project | SANBAG | Cities of San Bernardino and Redlands | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| respond to questions from the community or other interested groups. | | | | | |
| **NV-3: Establish Quiet Zones.** At-grade crossings shall be designed and constructed to be compatible with the formation of Quiet Zones. Prior to the operation, SANBAG shall coordinate with the City of San Bernardino, City of Loma Linda, and the City of Redlands, to construct and establish quiet zones at the following grade crossings:<br>• South Arrowhead Avenue;<br>• South Sierra Way;<br>• West Central Avenue;<br>• East Orange Show Road;<br>• South Waterman Avenue;<br>• South Tippecanoe Avenue;<br>• South Richardson Street;<br>• Mountain View Avenue;<br>• West Colton Avenue;<br>• Alabama Street<br>• Tennessee Street;<br>• Church Street; and<br>• North University Street | Prior to operation | Grade Crossing Locations | SANBAG | Cities of San Bernardino and Redlands; CPUC; FRA | |
| **NV-4: Construct Sound Barriers.** SANBAG shall install up to 12-foot in height sound barriers at priority locations along portions of the rail corridor to reduce noise levels at receivers identified with severe noise impacts following the application of quiet zones. | During construction (if required in the absence of quiet zones) | See Figures 8-2A through G (without quiet zones) and 8-3A-F) of the Noise and Vibration TM (October 2014)– See Appendix H of the Final EIS/EIR) | SANBAG | None | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| **NV-5: Wayside Rail Lubrication.** SANBAG shall install wayside applicators for all tight-radius curves on the project alignment prior to the start of Project operations. If the wayside applicators are not sufficient to reduce squeal to an acceptable level, additional reduction may be required through customized profiling of the rail to reduce the forces required for trains to negotiate the curve. | Final design and post-construction | All tight-radius curve locations on the project alignment | SANBAG | None | |
| **NV-6: Use Ballast Mats, Resiliently Supported Ties, or Measures of Comparable Effectiveness on Portions of the Rail near Sensitive Receivers.** SANBAG shall install track design specifications as part of project design to include the use of ballast mats or resiliently supported ties on portions of the track near sensitive receivers to minimize project-related ground-borne vibration and wheel rail noise generated when the trains pass sensitive receivers. The actual measures and their corresponding placement will be determined following more detailed vibration testing and analysis during final engineering design. | Final design and post-construction | Entire Project | SANBAG | None | |
| **NV-7: Provide Building Noise Insulation to Severe- and Moderate-Impact Residences.** For the ten residential structures represented by Receivers 3, 22, and 41, SANBAG will offer to install sound insulation. Treatments may include sealing and relocating vents, caulking and sealing gaps in the building façade and installing new doors and windows that are specially designed to meet acoustical transmission-loss requirements. Acoustical performance ratings are published in terms of Sound Transmission Class (STC) for these special windows. A minimum STC rating of 39 will be used on any window exposed to the noise source. | Final design and during construction | Applicable Receivers | SANBAG | None | |

## Table 1. MMRP Mitigation Measures

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| ***Biological and Wetland Resources*** | | | | | |
| **BIO-1: Pre-Construction Survey - Conduct Preconstruction Survey for Special Status Plants and Wildlife and, if Found, Implement Avoidance and Compensation Measures.** Prior to construction, a qualified biologist retained by SANBAG shall conduct pre-construction surveys for special status plant species including woolly star, slender-horned spineflower, smooth tarplant, and salt spring checkerbloom. Pre-construction surveys will also be required for special status wildlife species including least Bell's vireo, southwestern willow flycatcher, San Bernardino kangaroo rat, yellow-billed cuckoo, burrowing owl, and western spadefoot toad to verify presence or absence in the Project area. If one or more species are detected, then SANBAG shall consult with the USFWS (or CDFW if appropriate) to develop additional minimization measures prior to project construction (if necessary). These additional measures may include construction timing restrictions and/or construction monitoring. | Prior to and during construction | Entire Project | SANBAG | U. S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) | |
| **BIO-2: Least Bells Vireo (LBV).** The following measures will be implemented to minimize direct and indirect impacts to LBV during construction:<br>a. Impacts associated with clearing and grubbing of Southern Cottonwood Willow Riparian Forest (SCWRF) and Southern Willow Scrub (SWS) will be timed to avoid the breeding season of the least Bell's vireo (March 15 to September 15), unless SANBAG provides survey documentation to USFWS that confirms the riparian habitat in not occupied by LBV.<br>b. Temporary impact areas will be restored to pre-grade contours following bridge construction. | Prior to and during construction | Mile Posts 3.3 to 4 (only) | SANBAG | USFWS | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| Natural recruitment is anticipated to occur rapidly due to the large amount of intact native riparian habitat that will remain as a seed source. Additionally, the riparian habitat being impacted is adapted to frequent disturbance. The individual species making up the community tend to have large quantities of seeds and very rapid growth that promote rapid re-establishment. Container planting and seeding has not been proposed due to potential conflicts with County Flood Control Maintenance requirements, high risk of plant material being washed out during subsequent storm events and potential conflicts with future Santa Ana River Trail construction. For erosion control purposes, temporarily impacted areas outside of the active floodplain will be hydroseeded with native grasses and shrubs.<br>i. The temporarily impacted SCWRF and SWS habitat will be monitored annually for five years, until LBV is documented using the re-established habitat or until habitat attains 80 percent cover including both shrub and overstory stratum. If recruitment of SCWRF and SWS species is not evident within two years of project construction or habitat has not attained 60 percent cover within three years, impacts will be treated as permanent and additional mitigation for areas not meeting success criteria shall be provided through in-lieu fee payment to an appropriate mitigation bank for enhancement, restoration or establishment of LBV habitat at a ratio of 1:1. | | | | | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| ii. Temporary direct impacts to potentially suitable LBV habitat will be mitigated as follows: The temporal loss of occupied LBV habitat resulting from temporary removal of SCWRF associated with the Mission Zanja Channel shall be mitigated through in-lieu fee payment to an appropriate mitigation bank for enhancement, restoration or establishment of LBV habitat at a ratio of 3:1. The temporal loss of suitable unoccupied LBV habitat resulting from temporary removal of SCWRF and SWS shall be mitigated through in-lieu fee payment to an appropriate mitigation bank for enhancement, restoration or establishment of LBV habitat at a ratio of 2:1. | | | | | |
| c. Permanent direct impacts to occupied LBV habitat (SCWRF) shall be mitigated at a ratio of 3:1 through in-lieu fee payment to an appropriate mitigation bank for enhancement, restoration and/or creation of LBV habitat within the Santa Ana River watershed. | | | | | |
| d. If active LBV nests are identified during pre-construction surveys and noise levels at the nest exceed 60 dBA Leq, noise attenuation structures will be placed or other noise attenuation measures (e.g., reducing the number of construction vehicles or using different types of construction vehicles) will be implemented to reduce noise levels at the nest to 60 dBA Leq (or ambient noise level if greater than 60 dBA Leq). During construction adjacent to these areas, noise monitoring shall occur during the LBV | | | | | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| breeding season and be reported daily to USFWS. Construction activities that create noise in excess of the aforementioned levels will cease operation until effective noise attenuation measures are in place to the extent practicable. | | | | | |
| **BIO-3: MBTA Covered Species.** Prior to habitat removal during the avian breeding season (February 15-August 31), a qualified biologist shall conduct a pre-construction nest survey (in suitable areas) no more than 3 days prior to ground disturbing activities for migratory birds. Pre-construction surveys will be preformed year-round between MP 3.3 and 4.0 with the timing and implementation done in coordination with the CDFW and USFWS. Should an active nest of any MBTA covered species occur within or adjacent to the project impact area, a 100-foot buffer (300 feet for raptors) shall be established around the nest and no construction shall occur within this area until a qualified biologist determines the nest is no longer active or the young have fledged. | Prior to and during construction | Mile Posts 3.3 to 4 (only) | SANBAG | USFWS | |
| **BIO-4: Protection of Sensitive Plants and Habitats.** SANBAG shall require the construction contractor to implement the following measures to protect sensitive plants and habitats during project-related construction.<br>• SANBAG shall designate an approved biologist (project biologist) who will be responsible for overseeing compliance with protective measures for the biological resources during clearing and work activities within and adjacent to areas of native habitat. The project biologist will be familiar with the local habitats, plants, and wildlife and maintain communications with the contractor to ensure that issues relating to biological resources are | Prior to and during construction | Mile Post 3.3 to 4 | SANBAG | USFWS and CDFW | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| appropriately and lawfully managed. The project biologist will review final plans, designate areas that need temporary fencing, and monitor construction. The biologist will monitor activities within designated areas during critical times such as vegetation removal, the installation of Best Management Practices (BMPs) and fencing to protect native species, and ensure that all avoidance and minimization measures are properly constructed and followed.<br>• Project employees and contractors that will be on-site shall complete environmental worker-awareness training conducted by the project biologist. The training will advise workers of potential impacts to the sensitive habitat and listed species and the potential penalties for impacts to such habitat and species. At a minimum, the program will include the following topics: occurrences of the listed species and sensitive vegetation communities in the area, a physical description and their general ecology, sensitivity of the species to human activities, legal protection afforded these species, penalties for violations of Federal and State laws, reporting requirements, and work features designed to reduce the impacts to these species; and to the extent practicable, promote continued successful occupation of areas adjacent to the work footprint. Included in this program will be color photos of the listed species, which will be shown to the employees. Following the education program, the photos will be posted in the contractor and resident engineer's office, where they will remain through the duration of | | | | | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| the work. Photos of the habitat in which sensitive species are found will also be posted on-site. The contractor will be required to provide SANBAG with evidence of the employee training (e.g., sign in sheet or stickers) upon request. Employees and contractors will be instructed to immediately notify the project biologist of any incidents, such as construction vehicles that move outside of the work area boundary. The project biologist will be responsible for notifying the USFWS within 72 hours of any similar incident.<br>• Prior to construction, SANBAG shall delineate the construction area (including staging and laydown areas) between Mile Posts 3.3 and 4.0 and erect exclusionary construction fencing along the perimeter of the identified construction area to protect adjacent sensitive habitats (SWS, SCWRF, RAFSS, and Santa Ana wooly star). Limits of the exclusionary fencing shall be confirmed by the project biologist prior to habitat clearing. Exclusionary fencing shall be maintained throughout the duration of construction work from Mile Posts 3.3 to 4.0. Exclusionary fencing can be removed at the conclusion of construction work as approved by the project biologist.<br>All construction-related vehicles and equipment storage shall occur in the construction area and/or previously disturbed areas as approved by the project biologist. Project-related vehicle traffic shall be restricted to established access roads, construction areas, storage areas, and staging and parking areas. | | | | | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| If construction activity extends beyond the exclusionary fencing into sensitive vegetation communities, areas of disturbance shall be quantified and an appropriate restoration approach shall be developed in consultation with USFWS and CDFW. For example, if construction extends beyond the limits of the exclusionary fencing, temporarily disturbed areas shall be restored to the natural (preconstruction) conditions, which may include the following: salvage and stockpiling of topsoil, re-grading of disturbed sites with salvaged topsoil, and re-vegetation with native locally available species. | | | | | |
| **BIO-5: Burrowing Owl.** SANBAG will conduct take avoidance (pre-construction) surveys for burrowing owl within 30 days prior to initiating ground disturbance activities. These surveys will be completed in no less than 14 days prior to construction. If burrowing owl is identified, the following shall apply:<br>• If burrowing owl is identified during the breeding season (February 1 through August 31) then an appropriate buffer will be established by the biological monitor in accordance with the 2012 Staff Report on Burrowing Owl Mitigation (CDFW 2012). Construction within the buffer will be avoided until a qualified biologist determines that burrowing owl is no longer present or until young have fledged and a CDFW-approved exclusion plan has been implemented. In addition to avoidance of the occupied habitat, off-site mitigation will be provided as described below:<br>- Replacement of occupied habitat with occupied habitat: 1.5 times 6.5 (9.75) acres per pair or single bird. | Prior to construction | Entire Project | SANBAG | CDFW | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| - Replacement of occupied habitat with habitat contiguous to currently occupied habitat: 2 times 6.5 (13.0) acres per pair or single bird.<br>- Replacement of occupied habitat with suitable unoccupied habitat: 3 times 6.5 (19.5) acres per pair or single bird.<br>• If burrowing owl is identified during the non-breeding season (September 1 through January 31), then a 50 meter buffer will be established by the biological monitor. Construction within the buffer will be avoided until a qualified biologist determines that burrowing owl is no longer present or until a CDFW-approved exclusion plan has been implemented. | | | | | |
| **BIO-6: Secure Clean Water Act (CWA) Section 404 Permit and Implement All Permit Conditions to Ensure No Net Loss of Functions of Wetlands, Other Waters of the U.S., and Waters of the State).** Before the approval of grading or other ground disturbing activities within 50 feet of jurisdictional areas, SANBAG shall obtain a CWA Section 404 permit, Section 401 water quality certification, and CDFW 1602 Streambed Alteration Agreement.<br>As part of the Section 404 permitting process, if the USACE (and/or CDFW) requires compensatory mitigation, a draft wetland mitigation and monitoring plan (MMP) shall be developed for the selected Build Alternative. The MMP shall be consistent with USACE's and EPA's April 10, 2008 Final Rule for Comp Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332 and 40 CFR Part 230).<br>Potential mitigation for impacts to federal and state jurisdictional areas may occur at the following ratios: | Prior to construction | Warm Creek (Historic), Twin Creek, Santa Ana River, Mission Zanja Channel, and Mill Creek Zanja | SANBAG | U. S. Army Corps of Engineers (USACE), Los Angeles District, CDFW, and Regional Water Quality Control Board (RWQCB), Santa Ana Region | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| • USACE Wetland<br>- Permanent: 3:1<br>- Temporary: restoration (in-kind)<br>• USACE Waters<br>- Permanent: 1:1<br>- Temporary: restoration (in-kind)<br>• CDFW Riparian<br>- Permanent: 3:1 (SWS, RAFSS, and SCWRF)<br>- Permanent: 1:1 (unvegetated stream bank)<br>- Temporary: restoration (in-kind) | | | | | |
| **BIO-7. Reseeding for Wooly Star.** Seeds from the closest known occurrences of woolly-star plants found both upstream and downstream of Bridge 3.4 shall be collected in the fall prior to construction of the SAR crossing. If construction activities require the loss of the single wooly-star at the SAR crossing, the collected seeds will be broadcast in the temporary impact areas, near the impacted woolly-star plant, after construction activities are complete and soils have been restored to pre-Project contours.<br>1. Seed collection and broadcast methodologies will be proposed by a qualified seed collector approved by the Service prior to seed collection in a Santa Ana Woolly-Star Management Plan.<br>2. Seed harvest shall be from a minimum of three plants per collection location, limited to no more than 50 percent of the available seeds from any one woolly-star plant.<br>3. Seeds shall be held at the appropriate temperature and humidity for the shortest length of time necessary prior to planting. | Prior to, during, and following construction | Mile Posts 3.4 to 4 | SANBAG | CDFW | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| 4. Planting of seeds shall be coordinated to occur prior to the first rains of the season, typically during early fall.<br>5. If the woolly-star plant known in the Project area is avoided, collected seeds will be hand broadcast near the parental plants where they were collected.<br>If SANBAG confirms that removal of the one individual is required during final design, SANBAG will purchase ILF or mitigation credits from a qualified mitigation program to address the Project's temporal affect on woolly-star during the up to three-year construction period. Credits will be purchased to cover affects to the on-site individual and off-site parental plants. | | | | | |
| ***Floodplains, Hydrology, and Water Quality*** | | | | | |
| **HWQ-1: Prepare Drainage Plan(s) for Structural Facilities.** SANBAG shall prepare a site specific Drainage Plan for all major structural facilities constructed in conjunction with the Project, including stations and parking areas, track improvements, and the proposed layover facility. The Final Drainage Plan shall incorporate measures to maintain on-site runoff during peak conditions to pre-construction discharge levels. Design specifications for the detention and/or infiltration facilities shall provide sufficient temporary storage capacity to attenuate runoff to pre-Project conditions. These improvements will be coordinated with the applicable jurisdictions, including the Cities of Redlands and San Bernardino and the SBCFCD, as appropriate. | Final design | Entire Project | SANBAG | Cities of San Bernardino and Redlands, and the SBCFCD | |
| **HWQ-2: Prepare and Implement a SWPPP.** The construction contractor will develop a SWPPP that complies with the requirements of the NPDES General Construction Permit (Order 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ and 2012-0006-DWQ) for Risk Level 2 | Final design, during construction, and post-construction | Entire Project | SANBAG | RWQCB | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| projects and implement the BMPs described in the SWPPP. The SWPPP shall identify specific actions and BMPs relating to the prevention of stormwater pollution from project-related construction sources by identifying a practical sequence for site restoration, BMP implementation, contingency measures, responsible parties, and agency contacts. The SWPPP shall reflect localized surface hydrological conditions and shall be reviewed and approved by SANBAG prior to commencement of work and shall be made conditions of the contract with the contractor.<br><br>The SWPPP shall be prepared by a qualified SWPPP developer with BMPs selected to achieve maximum pollutant removal and that represent the best available technology that is economically achievable. Emphasis for BMPs shall be placed on controlling discharges of oxygen-depleting substances, floating material, oil and grease, acidic or caustic substances or compounds, and turbidity. BMPs for soil stabilization and erosion control practices and sediment control practices will also be required. Performance and effectiveness of these BMPs shall be determined either by visual means where applicable (i.e., observation of above-normal sediment release), or by actual water sampling in cases where verification of contaminant reduction or elimination, (inadvertent petroleum release) is required to determine adequacy of the measure.<br><br>Following construction, SANBAG will ensure the provision of sufficient drainage inlet and outlet protection through the use of energy dissipaters, vegetated riprap, and/or other appropriate BMPs to slow runoff velocities and prevent erosion at discharge locations from the rail station and parking areas. | | | | | |

## Table 1. MMRP Mitigation Measures

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
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| **HWQ-3: Prepare and Implement a Flow Diversion Plan for Construction.** SANBAG or SANBAG's construction contractor shall develop a Flow Diversion Plan(s) for in-channel construction activities proposed within Warm Creek (Historic)(Bridge 1.1); Twin Creek (Bridge 2.2), SAR (Bridge 3.4), Zanja Channel (Bridges 3.9, and 5.8, and bank improvements), and Mill Creek Zanja (Bridge 9.4). SANBAG's contractor shall incorporate measures to minimize changes to flood flow elevation(s) during construction, address accumulation of floating debris, provide measures that minimize sedimentation to surface waters, and include contingency measures in the event of substantial rainfall. | During construction | Warm Creek (Historic)(Bridge 1.1); Twin Creek (Bridge 2.2), SAR (Bridge 3.4), Zanja Channel (Bridges 3.9, and 5.8, and bank improvements), and Mill Creek Zanja (Bridge 9.4). | SANBAG | | |
| **HWQ-4: Prepare a Natural Hazard Management Plan.** SANBAG shall develop a Natural Hazard Management Plan for the Project. The Natural Hazard Management Plan will include a flood monitoring and evacuation plan for all Project infrastructure located within a delineated 100-year flood zone based on the most recent FEMA mapping. The Plan shall include protocols and procedures for emergency response in the event of a flood, the investigation and repair of track, station, and bridge facilities following inundation, and the provision of interim transit until Project operations resume. | Prior to operation | Entire Project | SANBAG | None | |
| **HWQ-5: Flood-Proofing of Critical Infrastructure.** Where feasible, stations and building pads for the proposed train layover facility shall be designed such that the finished floor elevation will be one-foot above the base 100-year flood elevation, where established. | Final design | Stations at Downtown Redlands and University Street | SANBAG | None | |
| **HWQ-6: Incorporate Post-Construction Runoff BMPs into Project Drainage Plan, Final WQMP, and Industrial SWPPP.** The Project Drainage Plan, Final WQMP, and the | Final design and post-construction | Entire Project | SANBAG | None | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| NPDES Industrial SWPPP shall demonstrate treatment, control, and management of the on- and off-site discharge of stormwater to existing drainage systems or drainage features. The final Drainage Plan shall provide both short- and long-term drainage solutions to ensure the proper sequencing of drainage facilities and the final WQMP will ensure sufficient treatment of runoff generated from Project impervious surfaces prior to off-site discharge.<br><br>SANBAG shall ensure the provision of sufficient outlet protection through the use of energy dissipaters, vegetated rip-rap, soil protection, and/or other appropriate BMPs to slow runoff velocities and prevent erosion at discharge locations for the station platforms, parking areas, and layover facility. A long-term maintenance plan shall be developed and implemented to support the functionality of drainage control devices. The layover facility layout(s) shall also include sufficient container storage and on-site containment and pollution-control devices for drainage facilities to avoid the off-site release of water quality pollutants, including, but not limited to oil and grease, fertilizers, treatment chemicals, and sediment. These measures shall be reflected in the final Industrial SWPPP and WQMP for applicable facilities. The NPDES Industrial SWPPP shall incorporate required maintenance practices and housekeeping to maximize the long-term effectiveness of post-construction BMPs. | | | | | |
| ***Geology, Soils, and Seismicity*** | | | | | |
| **GEO-1: Prepare Final Geotechnical Report for the Project and Implement Recommended Measures.** Facility design for all Project components shall comply with the site-specific design recommendations as provided by a licensed geotechnical or civil engineer to be retained by SANBAG. | Design, prior to and post-construction | Entire Project | SANBAG | None | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| The final geotechnical and/or civil engineering report shall address and make recommendations on the following:<br>• Site preparation;<br>• Soil bearing capacity;<br>• Appropriate sources and types of fill;<br>• Liquefaction;<br>• Lateral spreading;<br>• Settlement;<br>• Landslides (with emphasis on improvements that border the Mission Zanja Flood Control Channel);<br>• Hydroconsolidation;<br>• Compressible/Collapsible soils;<br>• Corrosive soils;<br>• Structural foundations; and<br>• Grading practices.<br>In addition to the recommendations for the conditions listed above, the geotechnical report shall include subsurface testing of soil and groundwater conditions, and shall determine appropriate foundation designs that are consistent with the latest version of the CBC, as applicable at the time building and grading permits are pursued. All recommendations contained in the final geotechnical engineering report shall be implemented by SANBAG. | | | | | |
| ***Hazardous Waste and Materials*** | | | | | |
| **HAZ-1: Prepare and Implement a Construction Hazardous Materials Management Plan and Operational Hazardous Materials Business Plan.** Prior to operation, SANBAG shall prepare and implement a Hazardous Materials Management Plan (HMMP) and Hazardous | Prior to construction (HMMP) and operation (HMBP) | Entire Project | SANBAG | None | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| Materials Business Plan (HMBP) for the Project. The HMMP shall provide for safe storage, containment, and disposal of chemicals and hazardous materials related to Project construction, including the proper disposal of waste materials. The HMBP will provide for safe storage, containment, and disposal of chemicals and hazardous materials related to Project operations. The HMMP and HMBP shall include, but shall not be limited to, the following:<br>• A description of hazardous materials and hazardous wastes used;<br>• A description of handling, transport, treatment, and disposal procedures, as relevant for each hazardous material or hazardous waste;<br>• Preparedness, prevention, contingency, and emergency procedures, including emergency contact information;<br>• A description of personnel training including, but not limited to: (1) recognition of existing or potential hazards resulting from accidental spills or other releases; (2) implementation of evacuation, notification, and other emergency response procedures; (3) management, awareness, and handling of hazardous materials and hazardous wastes, as required by their level of responsibility;<br>• Instructions on keeping Materials Safety and Data Sheets (MSDS) on-site for each on-site hazardous chemical; and<br>• Identification of the locations of hazardous material storage areas, including temporary storage areas, which shall be equipped with secondary containment sufficient in size to contain the volume of the largest container or tank. | | | | | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| **HAZ-2: Pre-Demolition Investigation.** Prior to the demolition of any structures within the Project footprint, a survey shall be conducted for the presence of hazardous building materials such as asbestos-containing materials, lead based paints, and other materials falling under Universal Waste requirements. The results of this survey shall be submitted to SANBAG and the City of San Bernardino's Department of Environmental Health or City of Redlands Department of Environmental Health, as applicable. If any hazardous building materials are discovered, a plan for there proper removal shall be prepared in accordance with applicable requirements of the California Division of Occupational Safety and Health and the County of San Bernardino Environmental Health Services. The contractor performing the work will be required to have a license in the State of California, and possess a C-21, A or B classification. Further and if required, the contractor or their subcontractor will be required to possess a California Contractor License (ASB) to perform any asbestos related work. Prior to any demolition activities, the contractor will be required to secure the site and ensure the disconnection of utilities. | Prior to demolition of any structures | Entire Project | SANBAG | City of San Bernardino Department of Environmental Health or City of Redlands Department of Health, as applicable | |
| **HAZ-3: Prepare Phase I and/or Phase II ESA for Indeterminate or High-Risk Sites.** Prior to grading, further investigation at any of the identified sites of concern with an indeterminate or high risk-ranking shall be conducted, if it is known that ground disturbance at those sites would exceed 18 inches within 50 feet of the site of concern. The additional investigation shall be in the form of a site-specific ASTM-compliant Phase I ESA investigation. The Phase I ESA recommendation would determine if a Phase II Preliminary Site Investigation (drilling and sampling) would be required, as appropriate. Both the Phase I and Phase II | Prior to construction | Entire Project | SANBAG | None | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| ESA investigations would be completed prior to parcel acquisition (therefore, prior to any construction activity). The Project shall comply with recommendations provided in the Phase I ESA and/or Phase II ESA(s). | | | | | |
| **HAZ-4: Halt Construction Work if Potentially Hazardous Materials are Encountered.** All construction contractors shall immediately stop all subsurface activities in the event that potentially hazardous materials are encountered, an odor is identified, or considerably stained soil is visible. Contractors shall follow all applicable local, state, and federal regulations regarding discovery, response, disposal, and remediation for hazardous materials encountered during the construction process. | During construction | Entire Project | SANBAG | None | |
| **HAZ-5: Keep Construction Area Clear of Combustible Materials.** SANBAG shall ensure, through the enforcement of contractual obligations that during construction, staging areas, welding areas, or areas slated for development using spark-producing equipment shall be cleared of dried vegetation or other materials that could serve as fire fuel. The contractor shall keep these areas clear of combustible materials in order to maintain a firebreak. Any construction equipment that normally includes a spark arrester shall be equipped with an arrester in good working order. This includes, but is not limited to, vehicles, heavy equipment, and chainsaws. | During construction | Entire Project (Emphasis Mile Posts 3 to 6) | SANBAG | | |
| **HAZ-6: Provide Accessible Fire Suppression Equipment.** Work crews shall be required to have sufficient fire suppression equipment readily available to ensure that any fire resulting from construction activities is immediately extinguished. All off-road equipment using internal combustion engines shall be equipped with spark arrestors. | During construction | Entire Project | SANBAG | None | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| ***Cultural and Historic Resources*** | | | | | |
| **CUL-1: Structural Evaluations.** In order to determine the structural stability of the Redlands Depot, Cope Commercial Company Warehouse, Haight Packing House, Redlands City Transfer, and the brick warehouse at 440 Oriental Avenue, structural evaluations shall be prepared by a qualified engineer for these five buildings prior to the commencement of construction. The structural evaluations will also address maximum allowable levels of vibration during construction and, if appropriate, will recommend reduced levels of stabilization in conjunction with vibration monitoring. Qualified recommendations within the structural evaluation shall be adhered to, as appropriate. Permanent stabilization will follow the Secretary of the Interior's guidelines for the treatment of historic properties; if the buildings are temporarily stabilized for the duration of construction activities, when removed, the buildings will be restored to their pre-construction condition when the stabilization measures are removed. | Final design and prior to construction | Redlands Depot, Cope Commercial Company Warehouse, Haight Packing House, Redlands City Transfer, and the brick warehouse at 440 Oriental Avenue | SANBAG | State Historic Preservation Officer (SHPO), if required | |
| **CUL-2a: Minimize Indirect Visual Effects of Potential Sound Barriers.** Visual surface treatments and drought-tolerant landscaping will be implemented as necessary to minimize indirect effects on the setting and feeling of the Redlands Lawn Bowling Club portion of Sylvan Park and the Second Baptist Church from introduction of sound barriers (if constructed). The surface treatments and landscaping for the sound barrier at the Redlands Lawn Bowling Club will be designed and implemented to harmonize the barrier with the surrounding pastoral park landscape. If a sound barrier is necessary at the Second Baptist Church, surface treatments will be designed and implemented to harmonize the barrier with the Spanish Colonial Revival architecture of the church building. Drought tolerant landscaping will be incorporated into the design of the barrier at the church as needed**.** | Final design and post-construction (if required) | Redlands Lawn Bowling Club portion of Sylvan Park and the Second Baptist Church | SANBAG | Cities of Redlands and San Bernardino | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| **CUL-2b: Conduct Potential Noise Insulation Work at Second Baptist Church in Accordance with Secretary of Interior Standards and Guidelines and Applicable Preservation Briefs**. Sound-attenuating insulation may be necessary for the Second Baptist Church building. If sound-attenuating insulation measures are implemented at the church building, the work will be conducted in accordance with the Secretary of the Interior's Standards for Rehabilitation with Guidelines for Applying the Standards (Hume et al. 1990) and applicable National Park Service preservation briefs, including #3 (Improving Energy Efficiency in Historic Buildings); #22 (The Preservation and Repair of Historic Stucco); #24 (Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches); and # 30 (The Preservation and Repair of Historic Clay Tile Roofs). SANBAG will select and implement the recommended insulation measures in coordination with the property owner and SHPO. | Prior to operations (if required) | Second Baptist Church | SANBAG | SHPO, if required | |
| **CUL-3: Off-Site Replacement of Citrus Trees Removed from California/I10-Grove.** SANBAG shall coordinate with the City of Redlands, including the Citrus Preservation Commission, to provide for the planting of citrus trees at properties within the Redlands Historical Preserve of Citrus to compensate for the trees removed from the California/I-10 Grove in association with the Preferred Project Alternative. The number of citrus trees planted will be equal to the number of trees removed from the California/I-10 Grove. The types of trees to be planted will be determined through consultation between SANBAG and the City of Redlands, including the Citrus Preservation Commission. | Prior to construction | California/I-10 Grove | SANBAG | City of Redlands, Citrus Preservation Commission | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| **CUL-4: Construction Monitoring.** Full-time monitoring for archaeological deposits will be conducted in the Project APE in the vicinity of the Redlands Chinatown site (and a 50-foot buffer on each side of the site boundary) during ground disturbing construction activities. Monitoring will be conducted in accordance with a Construction Monitoring and Discovery Plan to be prepared for the project. Monitoring will occur under the supervision of an archaeologist who meets the Secretary of the Interior's Professional Qualifications Standards.<br>*Unanticipated Discoveries*. In the event an unanticipated discovery of archaeological resources occurs during construction, the following measures will be implemented immediately following the discovery:<br>• All construction within a 50-foot radius of the resource will be halted until a qualified archaeologist can evaluate the resource.<br>• FTA and SHPO will be notified in the event of an unanticipated discovery.<br>• If the discovery is determined to be significant or potentially significant by the qualified archaeologist, the adverse effects under Section 106 to portions of archeological resources determined to be eligible for the NRHP would be resolved in consultation with SHPO through the following tasks:<br>- Discussion with project engineers to determine if impacts can be avoided/minimized, including consideration of preservation in place<br>- Recovery and analysis of archaeological material and associated data | During construction | Project APE in the vicinity of the Redlands Chinatown site | SANBAG | SHPO, if required | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| - Preparation of a data recovery report or other reports<br>- Recovered archaeological material shall be provided to an accredited archaeological repository.<br>Archaeological monitor qualification requirements, detailed approaches to archaeological monitoring of various project elements, and the procedures to follow in the event that unanticipated archaeological resources or human remains are discovered will be defined in the Construction Monitoring and Discovery Plan.<br>*Stop Work if Unanticipated Human Remains Are Encountered*. If human remains are exposed during construction, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the county coroner has made the necessary findings as to origin and disposition pursuant to PRC 5097.98. If the coroner determines the remains to be Native American, the coroner must contact the Native American Heritage Commission and the Project must comply with state laws relating to the disposition of Native American burials that are under the jurisdiction of the Native American Heritage Commission (PRC Section 5097). Construction must halt in the area of the discovery of human remains, the area must be protected, and consultation and treatment would occur as prescribed by law**.** | | | | | |
| ***Parklands, Community Services, and Other Public Facilities*** | | | | | |
| **PCS-1: Coordinate Trail Planning with Local Jurisdictions.** SANBAG will implement the following activities to minimize Project-related conflicts with proposed trails: | Final design | Bridge 3.4 and Orange Blossom Trail | SANBAG | San Bernardino County Parks and Recreation Department and Public Works | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| • Santa Ana River Trail - SANBAG shall coordinate final design and construction of Bridge 3.4 with the San Bernardino County Department of Public Works, Transportation Design Division, and Parks and Recreation Department to integrate the trail as contemplated in the SANBAG's Non-Motorized Transportation Plan (2011) (NMTP), so as to maintain it's planned future continuity along the Santa Ana River. If the trail is constructed and operational in advance of the bridge structure, SANBAG will maintain trail access during the course of construction, to the extent feasible. In instances, where trail closures are required the construction contractor will be required to minimize the duration of the closure and support the County with any noticing, outreach, or implementation of temporary detours.<br>• Orange Blossom Trail - SANBAG shall update the NMTP (2011) as part of it's next cycle update, to include the realignment of the trail segment of the Orange Blossom Trail that is currently shown as being located within the railroad right-of-way, so as to not conflict with the proposed project. SANBAG will coordinate with the City of Redlands and the County Flood Control District to determine available rights-of-way for the placement of the trail and, if necessary, realign the trail to take advantage of connections via existing roadway and other public right-of-ways. | | | | Department, City of Redlands, and the San Bernardino County Flood Control District | |

**Table 1. MMRP Mitigation Measures**

| Mitigation Measure | Timing | Applicable Project Location/ Feature | Primary Responsible Party | Secondary Responsible Party | Verification |
|---|---|---|---|---|---|
| ***Safety and Security*** | | | | | |
| **SS-1: Develop Safety and Security Management Plan.** Prior to construction, SANBAG shall coordinate and consult with local safety and crime prevention authorities to develop a Safety and Security Management Plan (SSMP) for the track alignment, bridges, parking facilities, and station areas. The SSMP shall include a station surveillance element to be developed in coordination with the local jurisdiction and private properties owners, as applicable. If a non-FRA compliant DMU vehicle type is selected for the Project, the SSMP shall include a plan element that includes appropriate levels of safety as may be necessary to facilitate a shared-use operation. | Final design and post construction | Entire Project | SANBAG | Cities of San Bernardino and Redlands | |
| **SS-2: Fencing.** SANBAG's contractor shall erect temporary fencing and visual screening for staging areas and provide security personnel during construction to minimize trespassing and vandalism throughout the duration of construction. | Prior to and during construction | Entire Project | SANBAG | None | |