

Appendix F

Hydraulics Report



Final Hydraulics Report





Kern River Intake Replacement Project

Prepared for Water Works Engineers, LLC

March 26, 2024

➔ The Power of Commitment



| Project name | | Kern River Hydraulic Analysis | | | | | |
|-----------------------|----------|---|--------------|---|--------------------|---|---------|
| Document title | | Final Hydraulics Report Kern River Intake Replacement Project | | | | | |
| Project number | | 12613817 | | | | | |
| File name | | 12613817-RPT-Kern River Intake Hydraulics Report.docx | | | | | |
| Status Code | Revision | Author | Reviewer | | Approved for issue | | |
| | | | Name | Signature | Name | Signature | Date |
| S3 | 0 | Ashlan Finn | Seth Stevens |  | Erik Fanselau |  | 3/22/24 |
| S4 | 1 | Ashlan Finn | Seth Stevens |  | Erik Fanselau |  | 3/26/24 |
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1. Introduction

The community of Kernville, in Kern County, is planning to construct a new water intake structure on the Kern River just upstream of the Kernville Road bridge (see Figure 1) and Water Works Engineers is providing the design of the intake structure. The project is within a Federal Emergency Management Agency (FEMA) Regulatory Floodway and as such requires a No-Rise Certificate for the construction of the intake structure. Water Works Engineers engaged GHD to conduct a study to estimate the impact of the proposed intake structure on the flood elevations in the vicinity of the project. The methods and results of that study are presented in this report.



Figure 1 *Project vicinity map*

1.1 Purpose of this report

The purpose of this report is to summarize the methods and results from the hydraulic analysis performed by GHD intended to assess the flood impacts of the proposed intake structure replacement project. The analysis evaluated the impacts of the intake structure on the 100-year water surface elevations within the Kern River in the vicinity of the intake structure.

1.2 Scope and limitations

This report has been prepared by GHD for Water Works Engineers, LLC and may only be used and relied on by Water Works Engineers, LLC for the purpose agreed between GHD and Water Works Engineers, LLC as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Water Works Engineers, LLC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared the hydraulic model ("Model") for, and for the benefit and sole use of, Water Works Engineers, LLC to support this study and must not be used for any other purpose or by any other person.

The Model is a representation only and does not reflect reality in every aspect. The Model contains simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Model. Accordingly, the outputs of the Model cannot be relied upon to represent actual conditions without due consideration of the inherent and expected inaccuracies. Such considerations are beyond GHD's scope.

The information, data, and assumptions ("Inputs") used as inputs into the Model are from publicly available sources or provided by or on behalf of the Water Works Engineers, LLC, (including possibly through stakeholder engagements). GHD has not independently verified or checked Inputs beyond its agreed scope of work. GHD's scope of work does not include review or update of the Model as further Inputs becomes available.

The Model is limited by the mathematical rules and assumptions that are set out in the Report or included in the Model and by the software environment in which the Model is developed.

The Model is a customised model and not intended to be amended in any form or extracted to other software for amending. Any change made to the Model, other than by GHD, is undertaken on the express understanding that GHD is not responsible, and has no liability, for the changed Model including any outputs.

GHD has prepared this report on the basis of information provided by Water Works Engineers, LLC and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

The information included in this report is based on the following assumptions:

- The project topographic data is representative of the actual existing conditions at the site.
- Cross-sections were surveyed from river station 9,391 to 12,095, however the surveyed bathymetry was incomplete due to fast flowing water in the channel. Where data was unavailable, the bathymetry was estimated by a combination of interpolation and estimation from the HEC-2 data.
- Detailed survey information for the Kernville Road bridge was not provided and the top of deck elevation was interpolated between surveyed high points at either end of the bridge. The deck thickness and corresponding low chord elevation were taken from the HEC-2 model.

2. Sources of data

2.1 FEMA

The existing effective FEMA hydraulic model for the Kern River is a HEC-2 model and the model input and output were provided to GHD in PDF format, referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). The FEMA Flood Insurance Study (FIS) for Kern County specifies the average vertical datum conversion factor for the Kern River at Kernville as adding 3.3 feet to elevations to convert from the NGVD 29 to the North American Vertical Datum of 1988 (NAVD 88) (FEMA, 2021). The National Flood Hazard Layer (NFHL) GIS data was obtained from FEMA and used to map the river centerline, floodway, and the special flood hazard areas that are represented on the Flood Insurance Rate Map (FIRM), which is included in Appendix A. The FIS was referenced for the 1% Annual Chance (100-year) peak discharge and associated flood water surface elevations at the cross-sections shown on the FIRM. The HEC-2 data was used for cross-section information and bridge geometry. The FIS 100-year peak discharge of 69,000 cubic feet per second (cfs) was used as the design flow.

2.2 Topographic survey

Topographic survey data was collected for the design of the project and the hydraulic analysis presented herein by Fugro in 2023. The data included a LiDAR digital elevation model with 10-foot grid spacing extending beyond the limits of the flood inundation extents and surveyed channel cross-sections were used in the updated hydraulic models to better represent the current existing conditions in the area. Channel cross-sections were surveyed approximately every two hundred feet along the study reach, although complete cross-sections were unable to be surveyed due to fast flowing water in the channel. Where cross-section data was not obtained, the channel bottom was approximated by interpolation or estimation from the HEC-2 data. The horizontal and vertical datums used were:

- **Horizontal Datum:** North American Datum of 1983 (NAD 83)
- **State Plane Coordinate System:** California State Plane, Zone 5
- **Vertical Datum:** North American Vertical Datum of 1988 (NAVD 88)
- **Units:** U.S. Foot

2.3 Proposed improvements

The proposed improvements include a new intake structure and an associated electrical equipment stand. The proposed intake structure has been designed such that it does not project out from the existing riverbank and is assumed to cause zero obstruction to flow. The electrical equipment stand is located out of the main channel but within the floodplain and the obstructed area attributed to it was calculated using the submerged cross-sectional area

of the structure perpendicular to the flow of the Kern River. The obstructed area of the electrical stand was calculated to be 23.5 square feet.

3. Hydraulic analysis

A steady flow, one-dimensional (1-D) hydraulic analysis was performed using the United States Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) software (Version 6.3.1).

3.1 Duplicate Effective Model

A Duplicate Effective Model (DEM) was developed for the Kern River in the vicinity of the project using data from the HEC-2 model for the cross-sections and the Kernville Road bridge. A hydraulic work map showing the FEMA FIS cross-sections, HEC-2 cross-sections, floodway, and special flood hazard areas is shown in Figure 1 of Appendix B. The DEM was created from the HEC-2 data according to the following methodology:

- Cross-section and bridge information was compiled from the HEC-2 data and converted from the NGVD 29 to NAVD 88 adding the average conversion factor of 3.3 feet as specified in the FIS. The cross-section information included station and elevation data, bank stations, and downstream reach lengths as well as Manning's roughness coefficients ("n" values), contraction, and expansion coefficients. The bridge information included bridge deck, pier, and abutment geometry as well as total loss, pier, and discharge coefficients.
- A non-georeferenced 1-D river reach was created in HEC-RAS and the compiled HEC-2 information from FIS cross-section J to FIS cross-section M was added to the model geometry.
- Roughness coefficients (Manning's "n" values) varied from 0.04 to 0.041 in the main channel and 0.04 to 0.056 in the overbanks.

3.2 Existing Conditions Model

An Existing Conditions Model (ECM) was developed to incorporate updates to the channel geometry based on the survey data collected for the project. The ECM was created according to the following methodology:

- The topographic survey was imported into HEC-RAS and a 1-D river reach was created following the Kern River centerline from the FIRM extending from FIS cross-section J (station 8,792) at the downstream end to FIS cross-section M (station 12,095) at the upstream end.
- Cross-sections were added at the approximate HEC-2 cross-section locations from FIS cross-section J to HEC-2 cross-section 125 (station 9,341) using the downstream reach lengths as measured from FIS cross-section K just upstream of Kernville Road bridge (station 9,391). Cross-sections were added upstream of the bridge at the surveyed river stations from station 9,391 to station 12,095.
- Where bathymetry data was missing, the main channel elevations were updated to match the HEC-2 channel bathymetry from station 8,792 to station 9,341 and estimated by interpolation between cross-sections from station 9,391 to station 12,095.
- Roughness coefficients (Manning's "n" values) were set to match those from the DEM.
- Levees were added to the west side of cross-sections from station 8,792 to station 10,865.
- The Kernville Road bridge was added to the model with the high chord of the bridge deck linearly interpolated between the high points at either end of the bridge in the topographic survey. The low chord of the bridge deck was assumed to be five feet below the high chord as documented in the HEC-2 data. The bridge was skewed 24 degrees as measured from the topographic survey. The piers were added at the surveyed locations and widths.
- An ineffective flow area was added to cross-sections extending upstream from the Kernville Road bridge western abutment at 45 degrees, from station 9,391 to station 10,406.

A hydraulic work map showing the updated cross-sections in addition to the FEMA cross-sections, floodway, and special flood hazard areas is shown in Figure 2 of Appendix B.

3.3 Proposed Conditions Model

A Proposed Conditions Model (PCM) was developed to incorporate the proposed improvements into the existing conditions model. The PCM was created by modifying the ECM according to the following methodology:

- Adding the calculated obstructed area of 23.5 square feet to the cross-section at station 9,498 at the proposed intake structure.

3.4 Model results

The DEM, ECM, and PCM were run as subcritical, steady flow with the FIS 100-year peak discharge of 69,000 cfs and a downstream boundary condition of the water surface elevation at cross-section J that is published in the FIS. The water surface elevation results from the DEM were within 0.5 feet of the published FIS water surface elevations, as shown in Table 1 and Figure 2. The water surface elevation results for the ECM vary from the results for the DEM due to the updated cross-section elevations and bridge geometry from the topographic survey.

The water surface elevation results from the PCM were compared to the ECM to determine the magnitude of the flooding impact attributed to the proposed structures. The results show a decrease of the water surface elevation at the obstructed cross-section (station 9,498) of 0.06 feet and an increase of 0.09 feet at the cross-section just upstream of the proposed improvements (station 9,606). The decrease in water surface elevation at the obstruction is expected as the velocity increases due to the reduced flow area. The increase in water surface elevation upstream of the obstruction is expected as the flow backs up due to the constricted flow area downstream. The water surface elevation comparison is summarized in Table 1 and Figure 2 shows the water surface profiles for each model. The complete hydraulic results are included Appendix C.

Table 1 *Water surface elevation comparison for the 100-year peak discharge*

| Description | River Station (ft) | Water Surface Elevation (ft, NAVD 88) | | | | |
|---|--------------------|---------------------------------------|---------|---------|---------|-----------|
| | | FIS | DEM | ECM | PCM | PCM - ECM |
| US Study Limit FIS cross-section M | 12,095 | 2663.80 | 2663.79 | 2660.99 | 2660.99 | 0.00 |
| | 11,480 | - | - | 2659.18 | 2659.18 | 0.00 |
| FIS cross-section L | 10,865 | 2656.00 | 2656.45 | 2655.01 | 2655.01 | 0.00 |
| | 10,606 | - | - | 2654.46 | 2654.46 | 0.00 |
| | 10,406 | - | - | 2653.92 | 2653.92 | 0.00 |
| | 10,207 | - | - | 2653.92 | 2653.92 | 0.00 |
| | 10,006 | - | - | 2653.42 | 2653.42 | 0.00 |
| | 9,806 | - | - | 2650.44 | 2650.44 | 0.00 |
| | 9,606 | - | - | 2649.96 | 2650.05 | 0.09 |
| Proposed Intake Structure | 9,498 | - | - | 2647.48 | 2647.42 | -0.06 |
| | 9,414 | - | - | 2648.36 | 2648.36 | 0.00 |
| US Kernville Road bridge FIS cross-section K | 9,391 | 2647.40 | 2647.27 | 2647.44 | 2647.44 | 0.00 |
| DS Kernville Road bridge HEC-2 cross-section 125 | 9,341 | - | 2646.04 | 2646.71 | 2646.71 | 0.00 |
| HEC-2 cross-section 1 | 9,326 | - | 2647.46 | 2647.09 | 2647.09 | 0.00 |
| HEC-2 cross-section 2 | 9,224 | - | 2646.11 | 2646.67 | 2646.67 | 0.00 |
| HEC-2 cross-section 3 | 9,122 | - | 2646.41 | 2646.69 | 2646.69 | 0.00 |
| HEC-2 cross-section 4 | 9,020 | - | 2646.22 | 2645.67 | 2645.67 | 0.00 |
| DS Study Limit FIS cross-section J | 8,792 | 2645.20 | 2645.20 | 2645.20 | 2645.20 | 0.00 |

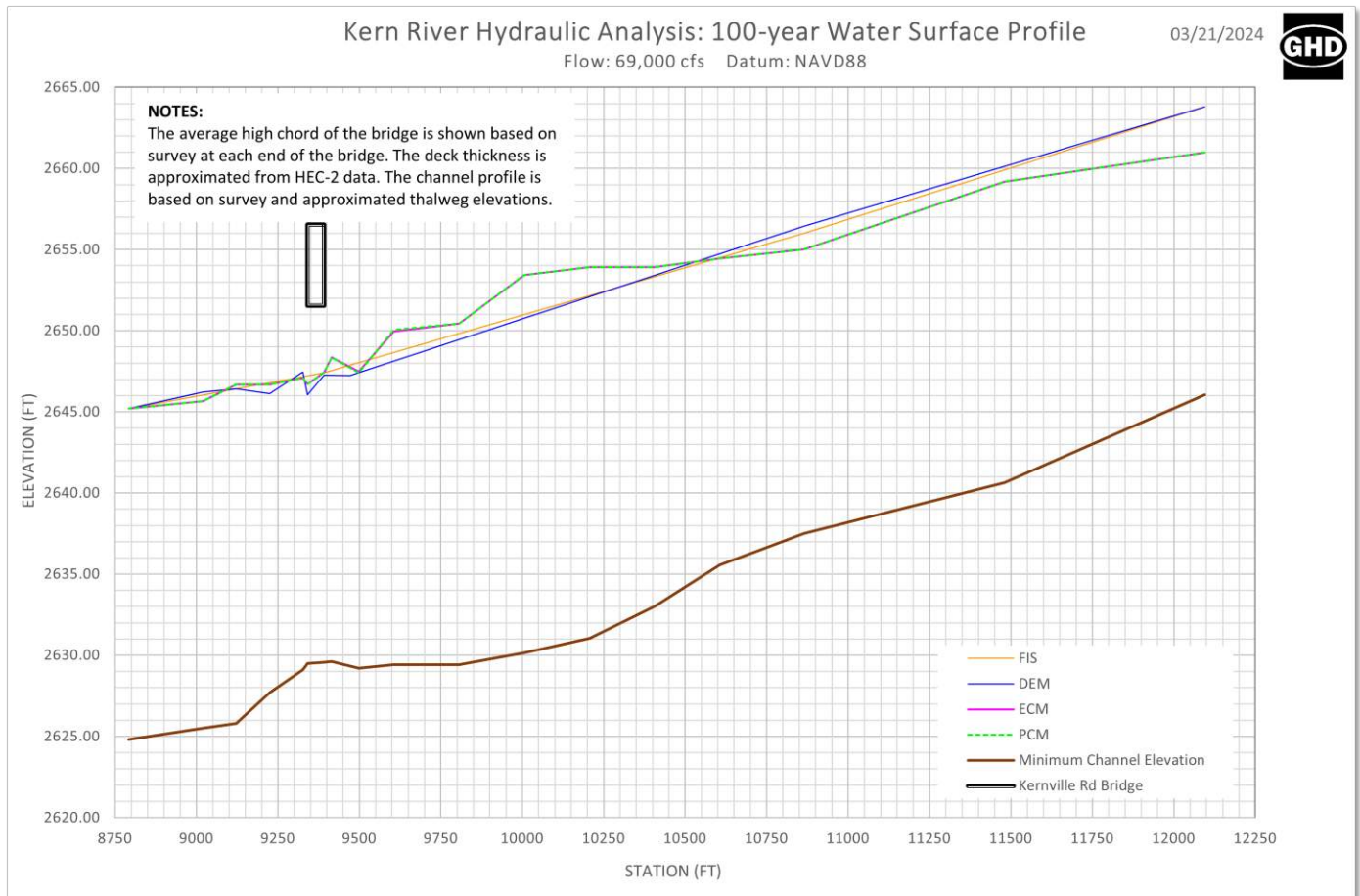


Figure 2 *Water surface profile comparison for the 100-year peak discharge*

4. Conclusion

This hydraulic analysis demonstrates that the proposed improvements for the Kern River Intake Replacement Project will result in a rise in the 100-year flood water surface elevation of up to 0.09 feet extending approximately 110 feet upstream of the project. This rise results in a slight expansion of the flood inundation extents in this area as compared to the ECM. Per coordination with the Central Valley Flood Protection Board, a rise of less than 0.1 feet meets their criterion for a No-Rise Certification.

5. References

FEMA. (2021). *Flood Insurance Study - Kern County, California and Incorporated Areas*.

Appendices

Appendix A

FEMA Information

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.

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 table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD83, GRS1980. 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.

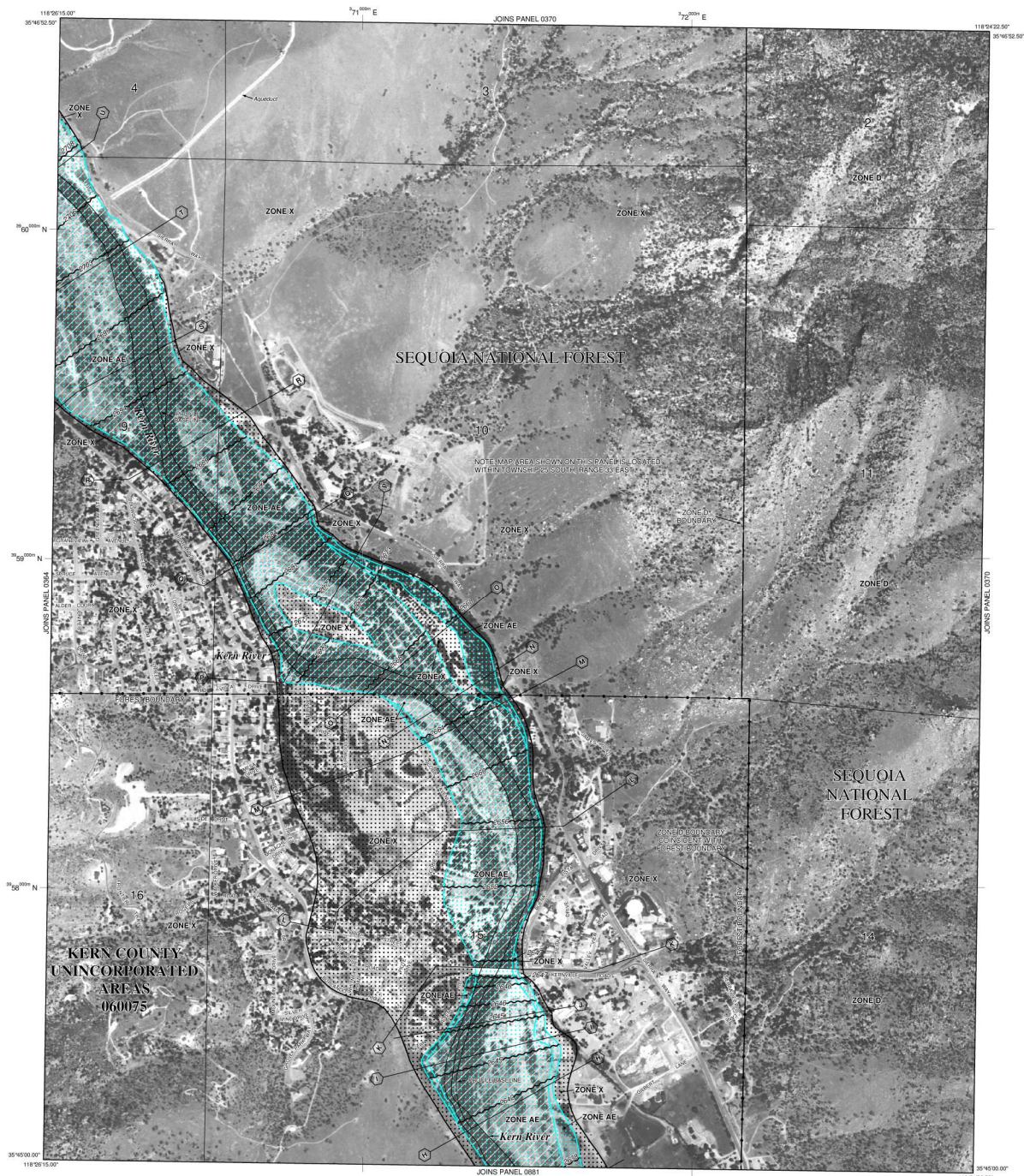
NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

Base map information shown on this FIRM was derived from USDA –Farm Service Agency –Aerial Photography Field Office dated 2005 and from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1992 or later.

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.

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://www.msc.fema.gov/>.

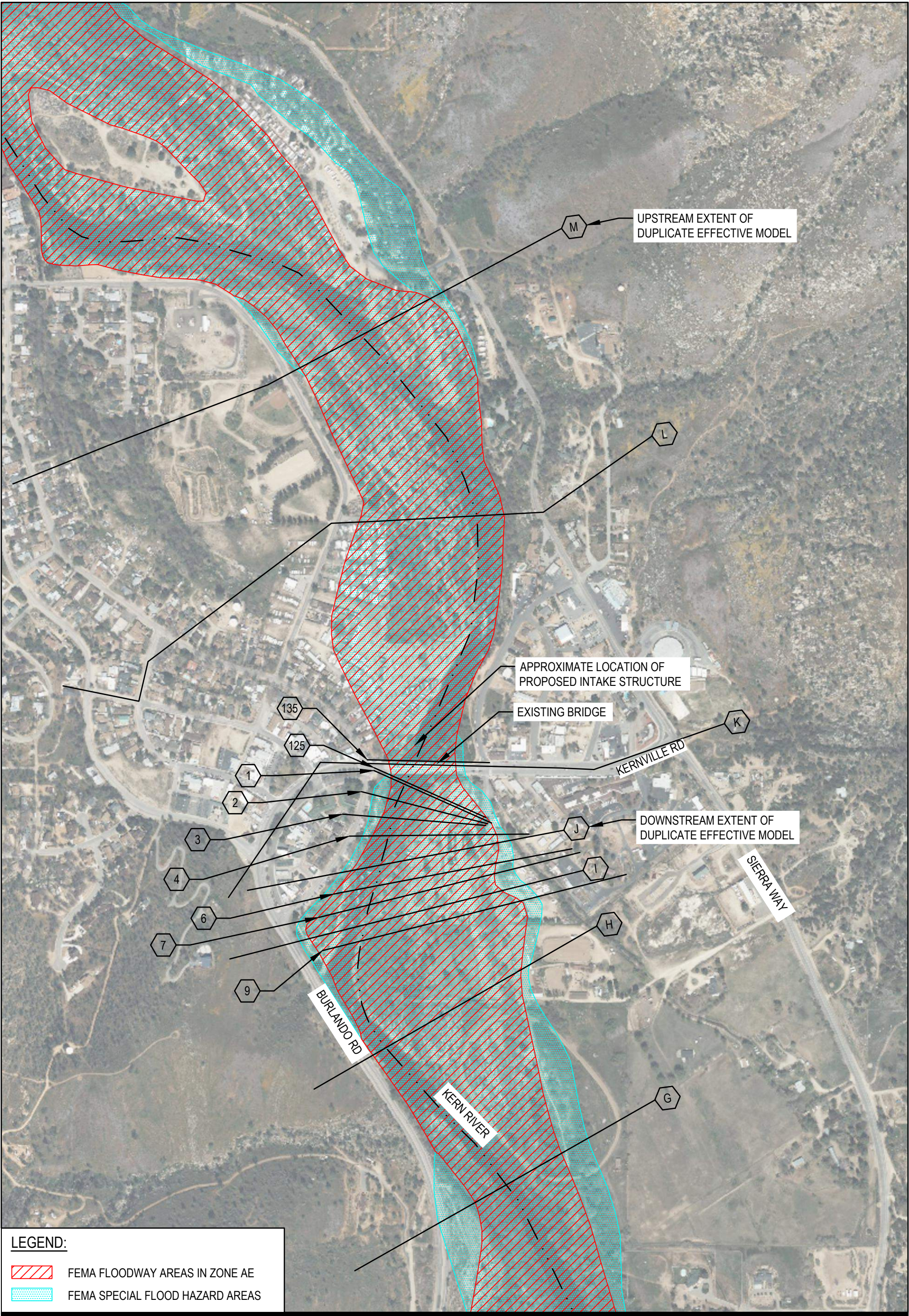
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/>.

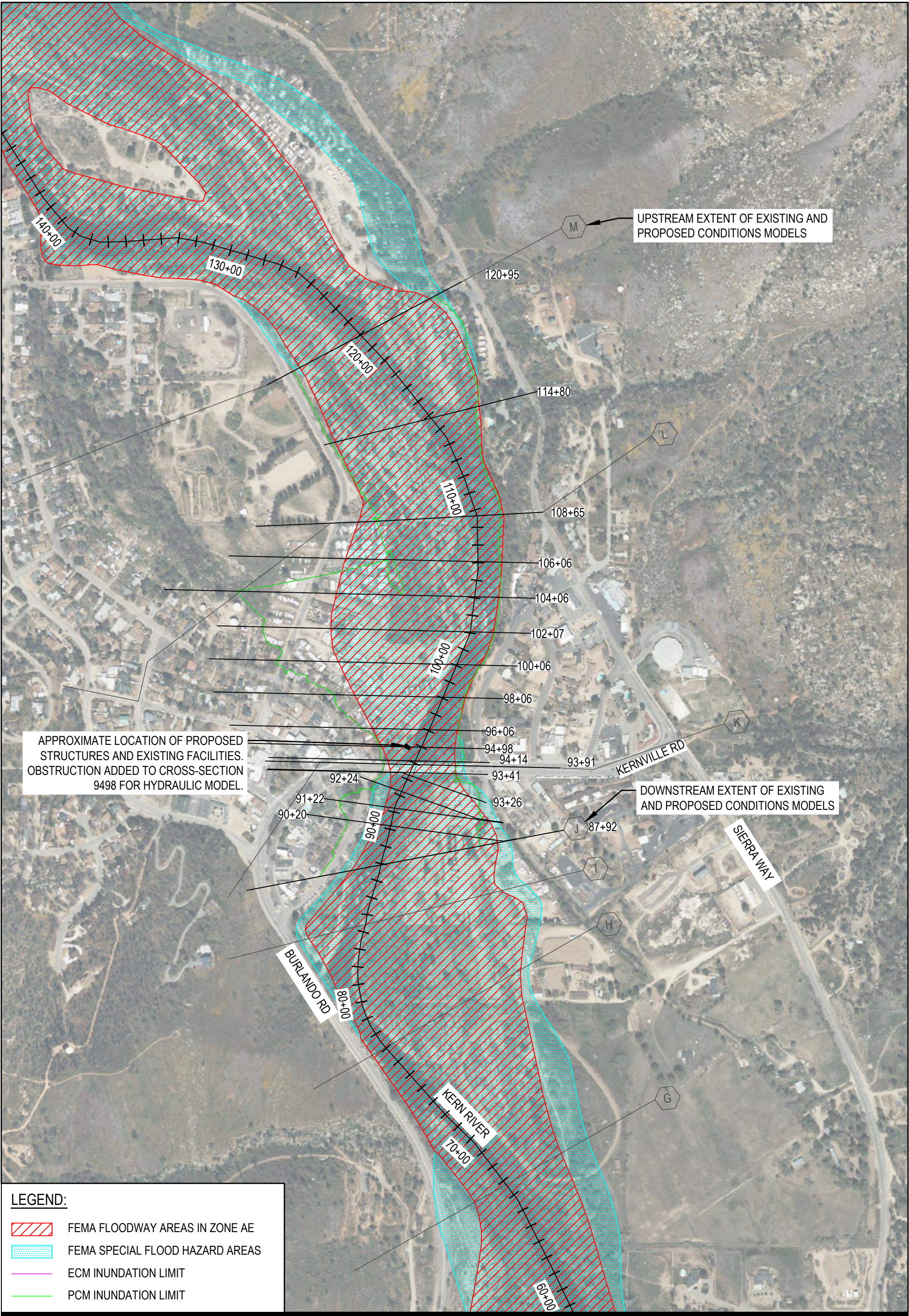


SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO

Appendix B

Hydraulic Work Maps





Appendix C

Hydraulic Results

Kern River Hydraulic Analysis

Project: Kern River Intake Replacement Project
Project #: 12613817
Updated: 3/21/2024
By: A Finn



Obstruction calculations for project at cross section 9498

Obstruction Conditions

| Condition | Obstruction Area (sf) | Obstructions |
|----------------|-----------------------|----------------------------------|
| Existing (ECM) | 0.00 | None |
| Proposed (PCM) | 23.53 | New Intake, new electrical stand |

| | ECM | PCM |
|--|---------|---------|
| 100-yr Water Surface Elevation at XS 9498 (69,000cfs) (ft) | 2647.48 | 2647.43 |

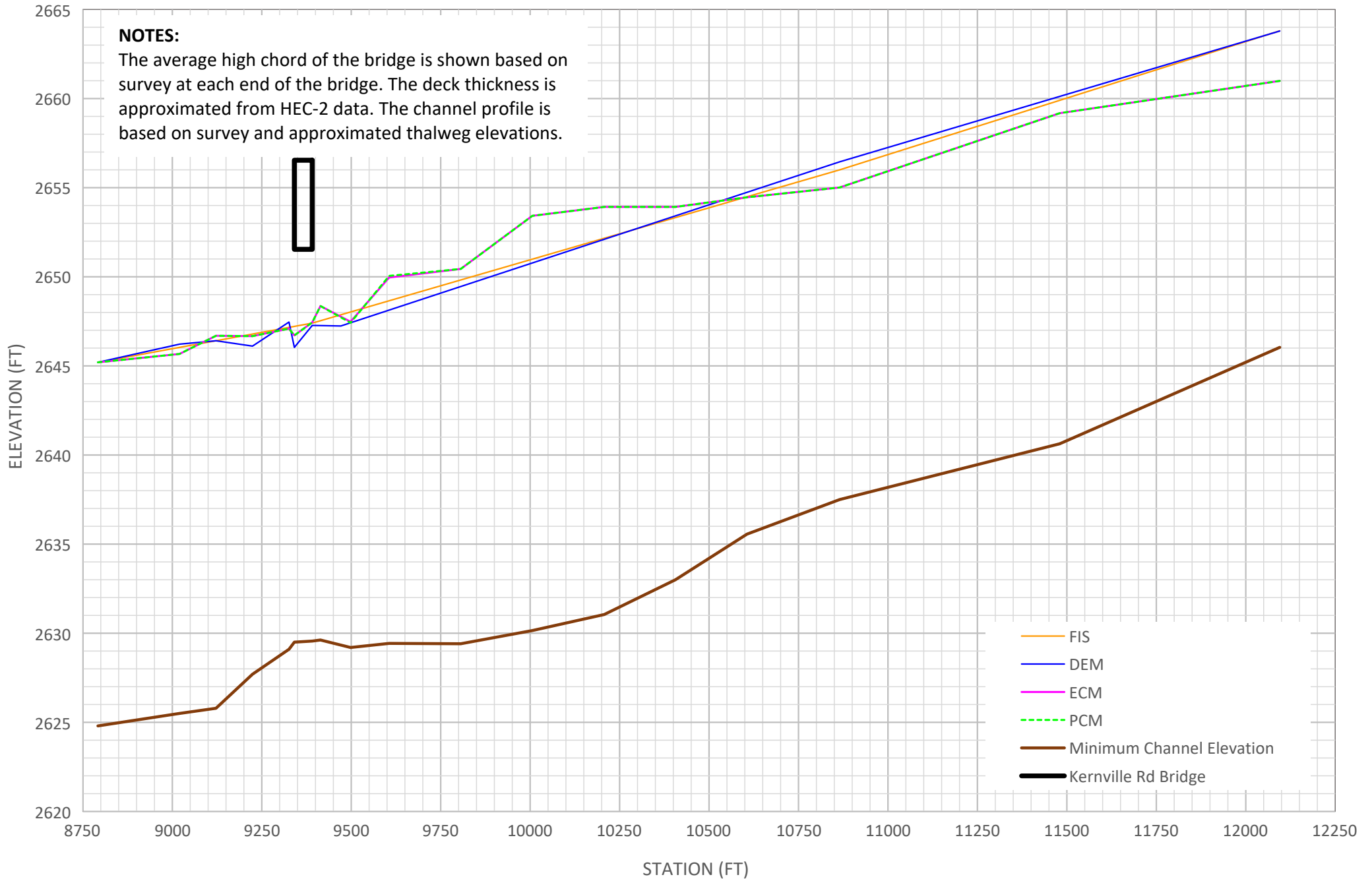
Proposed Condition

| Obstruction | Top Elevation (ft) | Bottom Elevation (ft) | Width (ft) | Obstruction Area (sf) |
|----------------------|--------------------|-----------------------|------------|-----------------------|
| New Intake Structure | - | - | - | 0.0 |
| New Electrical Stand | 2654.5 | 2642 | 4.3 | 23.5 |
| Proposed Total | | | | 23.5 |

*installed below existing grade

Kern River Hydraulic Analysis: 100-year Water Surface Profile 03/21/2024

Flow: 69,000 cfs Datum: NAVD88



Kern River FIS Water Surface Elevation

Project: Kern River Intake Replacement Project

Project #: 12613817

Updated: 8/2/2023



| | |
|---------------------|--------|
| Vertical Datum: | NAVD88 |
| 100YR Flow, Q (cfs) | 69000 |

Notes:
- FIS: FEMA Flood Insurance Study model

| | | | | Table 23 Floodway Data | | |
|------------|--------|--------------------|-----------------------|------------------------------|------------------------------------|---------------------------------|
| HEC-2 XS # | FIS XS | HEC-2 Station (ft) | Adjusted Station (ft) | Regulatory WS Elevation (ft) | Without Floodway WS Elevation (ft) | With Floodway WS Elevation (ft) |
| 150 | M | 12151 | 12095 | 2663.80 | 2663.8 | 2663.9 |
| 140 | L | 10901 | 10865 | 2656.00 | 2656 | 2656 |
| 130 | K | 9391 | 9391 | 2647.40 | 2647.4 | 2647.5 |
| 5 | J | 8835 | 8792 | 2645.20 | 2645.2 | 2645.3 |

Kern River HEC-RAS: DEM Output

Project: Kern River Intake Replacement Project
Project #: 12613817
Updated: 3/21/2024



| | |
|---------------------|--------|
| Vertical Datum: | NAVD88 |
| 100YR Flow, Q (cfs) | 69000 |

Notes:
- DEM: Duplicate Effective Model from HEC2

| HEC-2 XS # | FIS XS | HEC-2 River Sta | Adjusted 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 |
|------------|--------|-----------------|--------------------|---------|---------|-----------|-----------|-----------|-----------|------------|----------|-----------|-----------|--------------|
| | | (ft) | (ft) | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| 150 | M | 12151 | 12095 | PF 1 | 69000 | 2644 | 2663.79 | | 2665.36 | 0.003746 | 12.08 | 7657.69 | 1344.47 | 0.61 |
| 140 | L | 10901 | 10865 | PF 1 | 69000 | 2640.5 | 2656.45 | 2655.54 | 2659.24 | 0.006746 | 15.24 | 6801.54 | 1927.63 | 0.8 |
| 135 | | 9471 | 9471 | PF 1 | 69000 | 2631.3 | 2647.24 | | 2650.74 | 0.005287 | 16.36 | 5071.64 | 457.41 | 0.75 |
| 130 | K | 9391 | 9391 | PF 1 | 69000 | 2630.8 | 2647.27 | 2643.42 | 2650.17 | 0.00438 | 14.6 | 5305.9 | 471.7 | 0.66 |
| 125 | | 9341 | 9341 | PF 1 | 69000 | 2630.8 | 2646.04 | | 2649.62 | 0.005653 | 15.6 | 4781.52 | 462.81 | 0.74 |
| 1 | | 9326 | 9326 | PF 1 | 69000 | 2629.1 | 2647.46 | | 2648.94 | 0.002096 | 10.01 | 7441.8 | 643.55 | 0.46 |
| 2 | | 9224 | 9224 | PF 1 | 69000 | 2627.7 | 2646.11 | | 2648.56 | 0.003804 | 13.06 | 6050.79 | 666.57 | 0.61 |
| 3 | | 9122 | 9122 | PF 1 | 69000 | 2625.8 | 2646.41 | | 2647.93 | 0.003065 | 10.17 | 7122.3 | 703.94 | 0.53 |
| 4 | | 9020 | 9020 | PF 1 | 69000 | 2625.5 | 2646.22 | | 2647.6 | 0.002597 | 9.79 | 7623.87 | 756.56 | 0.49 |
| 5 | J | 8835 | 8792 | PF 1 | 69000 | 2624.8 | 2645.20 | 2641.24 | 2647.03 | 0.003006 | 11.34 | 7237.91 | 1002.8 | 0.54 |

Kern River HEC-RAS: Existing Conditions Model Output

Project: Kern River Intake Replacement Project

Project #: 12613817

Updated: 3/21/2024



| | |
|---------------------|--------|
| Vertical Datum: | NAVD88 |
| 100YR Flow, Q (cfs) | 69000 |

Notes:

- ECM: Existing Conditions Model
- Kernville Road Bridge at station 9366
- Obstruction added at XS 9498

| 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) | |
| Reach 1 | 12095 | PF 1 | 69000 | 2646.04 | 2660.99 | 2660.58 | 2663.56 | 0.006192 | 16.25 | 6184.1 | 906.07 | 0.79 |
| Reach 1 | 11480 | PF 1 | 69000 | 2640.63 | 2659.18 | | 2660.83 | 0.002789 | 12.39 | 7535.96 | 842.66 | 0.55 |
| Reach 1 | 10865 | PF 1 | 69000 | 2637.5 | 2655.01 | 2654.25 | 2658.24 | 0.006021 | 16.38 | 5383.52 | 683.94 | 0.77 |
| Reach 1 | 10606 | PF 1 | 69000 | 2635.56 | 2654.46 | 2652.34 | 2656.67 | 0.004049 | 13.81 | 6077.71 | 602.36 | 0.63 |
| Reach 1 | 10406 | PF 1 | 69000 | 2633 | 2653.92 | 2651.19 | 2655.82 | 0.003557 | 13.56 | 8087.16 | 1490.12 | 0.6 |
| Reach 1 | 10207 | PF 1 | 69000 | 2631.05 | 2653.92 | 2650.88 | 2655.11 | 0.001825 | 10.78 | 9706.69 | 1310.78 | 0.44 |
| Reach 1 | 10006 | PF 1 | 69000 | 2630.15 | 2653.42 | 2650.17 | 2654.75 | 0.001645 | 11.29 | 9261.4 | 1152.12 | 0.44 |
| Reach 1 | 9806 | PF 1 | 69000 | 2629.41 | 2650.44 | 2650.44 | 2653.99 | 0.004683 | 17.03 | 5562.7 | 733.88 | 0.7 |
| Reach 1 | 9606 | PF 1 | 69000 | 2629.43 | 2649.96 | 2647.62 | 2652.83 | 0.003566 | 14.86 | 5713.79 | 555.14 | 0.63 |
| Reach 1 | 9498 | PF 1 | 69000 | 2629.2 | 2647.48 | 2647.26 | 2652.13 | 0.006876 | 18.22 | 4480.31 | 469.06 | 0.84 |
| Reach 1 | 9414 | PF 1 | 69000 | 2629.62 | 2648.36 | 2644.69 | 2651.16 | 0.003606 | 13.93 | 5494.83 | 441.42 | 0.62 |
| Reach 1 | 9391 | PF 1 | 69000 | 2629.56 | 2647.44 | 2645.05 | 2650.99 | 0.005518 | 15.37 | 4675.99 | 376.08 | 0.73 |
| Reach 1 | 9341 | PF 1 | 69000 | 2629.5 | 2646.71 | 2643.8 | 2650 | 0.00478 | 14.71 | 4858.69 | 379.98 | 0.68 |
| Reach 1 | 9326 | PF 1 | 69000 | 2629.1 | 2647.09 | 2643.75 | 2649.74 | 0.004023 | 13.48 | 5709.26 | 582.26 | 0.63 |
| Reach 1 | 9224 | PF 1 | 69000 | 2627.7 | 2646.67 | 2643.42 | 2649.33 | 0.004122 | 13.38 | 5732.32 | 647.58 | 0.63 |
| Reach 1 | 9122 | PF 1 | 69000 | 2625.79 | 2646.69 | 2641.72 | 2648.83 | 0.002814 | 12.04 | 6573.96 | 814.51 | 0.53 |
| Reach 1 | 9020 | PF 1 | 69000 | 2625.5 | 2645.67 | 2642.91 | 2648.41 | 0.004527 | 13.59 | 5692.51 | 741.03 | 0.66 |
| Reach 1 | 8792 | PF 1 | 69000 | 2624.8 | 2645.2 | 2642.34 | 2647.29 | 0.003657 | 12.65 | 6921.02 | 929.59 | 0.6 |

Kernville Road Bridge

| River Station (ft) | Elevation (ft) |
|--------------------|----------------|
| 9391 | 2656.54 |
| 9391 | 2651.54 |
| 9341 | 2651.54 |
| 9341 | 2656.54 |
| 9391 | 2656.54 |

High Chord

Low Chord

Low Chord

High Chord

High Chord

Kern River HEC-RAS:Proposed Conditions Model Output

Project: Kern River Intake Replacement Project

Project #: 12613817

Updated: 3/21/2024



| | |
|---------------------|--------|
| Vertical Datum: | NAVD88 |
| 100YR Flow, Q (cfs) | 69000 |

Notes:

- PCM: Proposed Conditions Model
- Kernville Road Bridge at station 9366
- Obstruction added at XS 9498

| 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) | |
| Reach 1 | 12095 | PF 1 | 69000 | 2646.04 | 2660.99 | 2660.58 | 2663.56 | 0.006192 | 16.25 | 6184.1 | 906.07 | 0.79 |
| Reach 1 | 11480 | PF 1 | 69000 | 2640.63 | 2659.18 | | 2660.83 | 0.002789 | 12.39 | 7535.96 | 842.66 | 0.55 |
| Reach 1 | 10865 | PF 1 | 69000 | 2637.5 | 2655.01 | 2654.25 | 2658.24 | 0.006021 | 16.38 | 5383.52 | 683.94 | 0.77 |
| Reach 1 | 10606 | PF 1 | 69000 | 2635.56 | 2654.46 | 2652.34 | 2656.67 | 0.004049 | 13.81 | 6077.71 | 602.36 | 0.63 |
| Reach 1 | 10406 | PF 1 | 69000 | 2633 | 2653.92 | 2651.19 | 2655.82 | 0.003557 | 13.56 | 8087.16 | 1490.12 | 0.6 |
| Reach 1 | 10207 | PF 1 | 69000 | 2631.05 | 2653.92 | 2650.88 | 2655.11 | 0.001825 | 10.78 | 9706.69 | 1310.78 | 0.44 |
| Reach 1 | 10006 | PF 1 | 69000 | 2630.15 | 2653.42 | 2650.17 | 2654.75 | 0.001645 | 11.29 | 9261.13 | 1152.12 | 0.44 |
| Reach 1 | 9806 | PF 1 | 69000 | 2629.41 | 2650.44 | 2650.44 | 2653.99 | 0.004683 | 17.03 | 5562.7 | 733.88 | 0.7 |
| Reach 1 | 9606 | PF 1 | 69000 | 2629.43 | 2650.05 | 2647.62 | 2652.88 | 0.003495 | 14.76 | 5762.87 | 559.9 | 0.62 |
| Reach 1 | 9498 | PF 1 | 69000 | 2629.2 | 2647.42 | 2647.3 | 2652.17 | 0.007132 | 18.37 | 4431.03 | 468.55 | 0.85 |
| Reach 1 | 9414 | PF 1 | 69000 | 2629.62 | 2648.36 | 2644.69 | 2651.16 | 0.003606 | 13.93 | 5494.83 | 441.42 | 0.62 |
| Reach 1 | 9391 | PF 1 | 69000 | 2629.56 | 2647.44 | 2645.05 | 2650.99 | 0.005518 | 15.37 | 4675.99 | 376.08 | 0.73 |
| Reach 1 | 9341 | PF 1 | 69000 | 2629.5 | 2646.71 | 2643.8 | 2650 | 0.00478 | 14.71 | 4858.69 | 379.98 | 0.68 |
| Reach 1 | 9326 | PF 1 | 69000 | 2629.1 | 2647.09 | 2643.75 | 2649.74 | 0.004023 | 13.48 | 5709.26 | 582.26 | 0.63 |
| Reach 1 | 9224 | PF 1 | 69000 | 2627.7 | 2646.67 | 2643.42 | 2649.33 | 0.004122 | 13.38 | 5732.32 | 647.58 | 0.63 |
| Reach 1 | 9122 | PF 1 | 69000 | 2625.79 | 2646.69 | 2641.72 | 2648.83 | 0.002814 | 12.04 | 6573.96 | 814.51 | 0.53 |
| Reach 1 | 9020 | PF 1 | 69000 | 2625.5 | 2645.67 | 2642.91 | 2648.41 | 0.004527 | 13.59 | 5692.51 | 741.03 | 0.66 |
| Reach 1 | 8792 | PF 1 | 69000 | 2624.8 | 2645.2 | 2642.34 | 2647.29 | 0.003657 | 12.65 | 6921.02 | 929.59 | 0.6 |

Kern River Water Surface Elevation Comparison

Project: Kern River Intake Replacement Project
Project #: 12613817
Updated: 3/21/2024



| | |
|----------------------|--------|
| Vertical Datum: | NAVD88 |
| 100YR Flow, Q (cfs): | 69,000 |

- Notes:
- Obstruction added at: XS 9498
 - Kernville Road Bridge at station 9366
 - ECM: Existing Conditions Model
 - PCM: Proposed Conditions Model

Obstruction Conditions

| Condition | Obstruction Area (sf) | Obstructions |
|----------------|-----------------------|----------------------------------|
| Existing (ECM) | 0.00 | None |
| Proposed (PCM) | 23.53 | New Intake, new electrical stand |

| FEMA XS # | Station (ft) | Water Surface Elevation (ft) | | Comparison (ft) |
|--------------------|--------------|------------------------------|---------|-----------------|
| | | ECM | PCM | PCM - ECM |
| FIS XS M | 12095 | 2660.99 | 2660.99 | 0.00 |
| | 11480 | 2659.18 | 2659.18 | 0.00 |
| FIS XS L | 10865 | 2655.01 | 2655.01 | 0.00 |
| | 10606 | 2654.46 | 2654.46 | 0.00 |
| | 10406 | 2653.92 | 2653.92 | 0.00 |
| | 10207 | 2653.92 | 2653.92 | 0.00 |
| | 10006 | 2653.42 | 2653.42 | 0.00 |
| | 9806 | 2650.44 | 2650.44 | 0.00 |
| | 9606 | 2649.96 | 2650.05 | 0.09 |
| | 9498 | 2647.48 | 2647.42 | -0.06 |
| | 9414 | 2648.36 | 2648.36 | 0.00 |
| FIS XS K | 9391 | 2647.44 | 2647.44 | 0.00 |
| HEC-2 XS 125 | 9341 | 2646.71 | 2646.71 | 0.00 |
| HEC-2 XS 1 | 9326 | 2647.09 | 2647.09 | 0.00 |
| HEC-2 XS 2 | 9224 | 2646.67 | 2646.67 | 0.00 |
| HEC-2 XS 3 | 9122 | 2646.69 | 2646.69 | 0.00 |
| HEC-2 XS 4 | 9020 | 2645.67 | 2645.67 | 0.00 |
| HEC-2 XS 5 (FIS J) | 8792 | 2645.20 | 2645.20 | 0.00 |

*obstruction location

HEC-RAS HEC-RAS 6.3.1 September 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X        X   X      X   X      X   X      X
X      X  X        X        X   X      X   X      X
XXXXXXXX XXXX      X        XXX XXXX      XXXXXX   XXXX
X      X  X        X        X   X      X   X          X
X      X  X        X   X      X   X      X   X          X
X      X  XXXXXX   XXXX      X   X      X   X      XXXXX

```

PROJECT DATA

Project Title: Kern River
Project File : KernRiver.prj
Run Date and Time: 3/21/2024 3:14:24 PM

Project in English units

Project Description:

Analysis of proposed intake structure improvements at Kern River upstream of Kernville Road bridge.

PLAN DATA

Plan Title: DEM - Q100
Plan File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.p11

Geometry Title: DEM
Geometry File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.g11

Flow Title : DEM - Q100
Flow File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.f03

Plan Summary Information:

Number of: Cross Sections = 10 Multiple Openings = 0
Culverts = 0 Inline Structures = 0

Bridges = 1 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: DEM - Q100

Flow File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS
Model\KernRiver.f03

Flow Data (cfs)

| River | Reach | RS | PF 1 |
|-----------|-------|-------|-------|
| KernRiver | 1 | 12151 | 69000 |

Boundary Conditions

| River | Reach | Profile | Upstream |
|-----------|-------|---------|----------|
| KernRiver | 1 | PF 1 | |

Downstream
Known WS = 2645.2

SUMMARY OF MANNING'S N VALUES

River:KernRiver

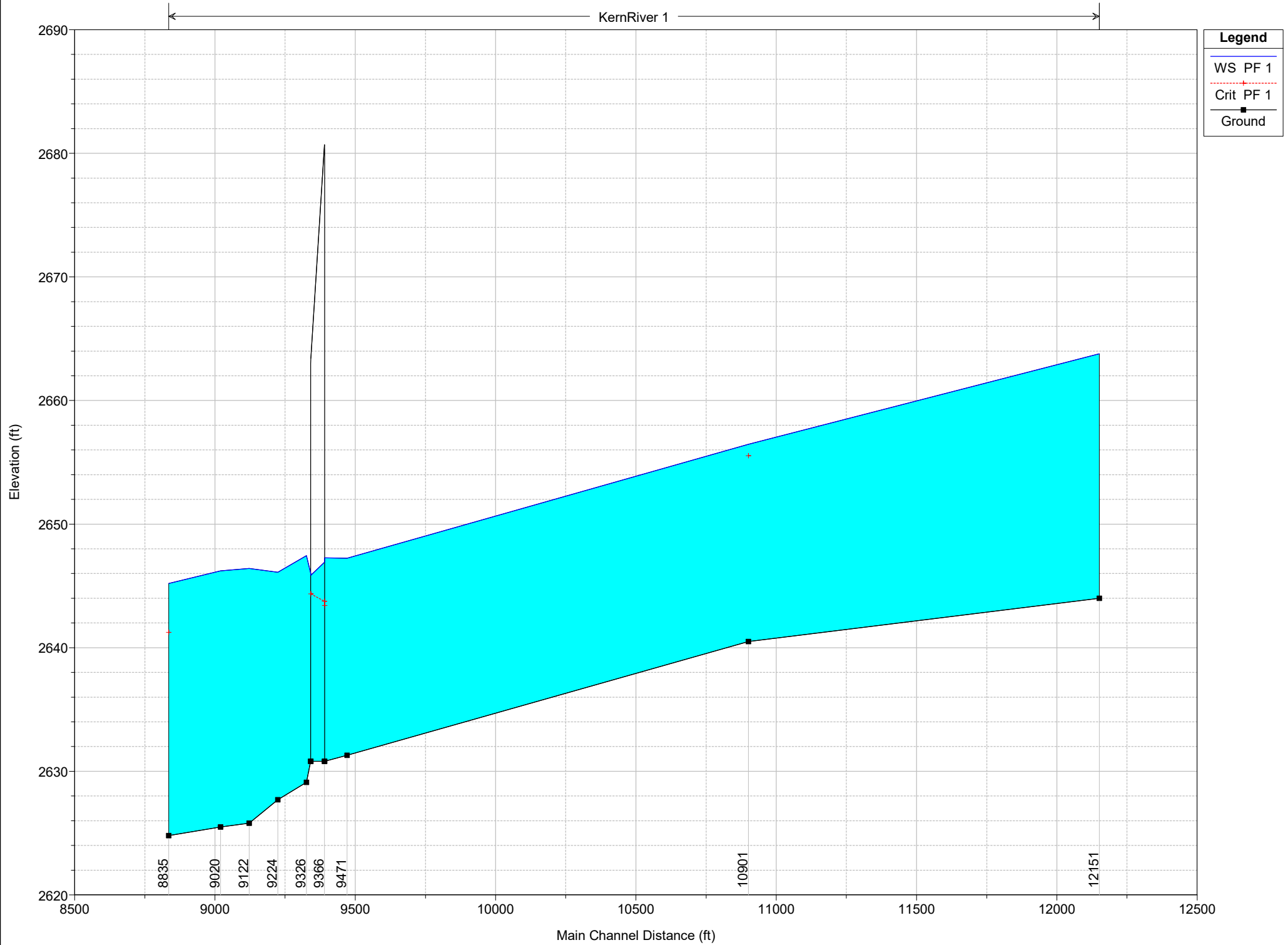
| Reach | River Sta. | n1 | n2 | n3 |
|-------|------------|----|----|----|
|-------|------------|----|----|----|

| | | | | |
|---|-------|--------|------|------|
| 1 | 12151 | .045 | .04 | .04 |
| 1 | 10901 | .045 | .04 | .04 |
| 1 | 9471 | .045 | .04 | .055 |
| 1 | 9391 | .046 | .041 | .056 |
| 1 | 9366 | Bridge | | |
| 1 | 9341 | .046 | .041 | .043 |
| 1 | 9326 | .046 | .041 | .043 |
| 1 | 9224 | .046 | .041 | .043 |
| 1 | 9122 | .046 | .041 | .043 |
| 1 | 9020 | .046 | .041 | .043 |
| 1 | 8835 | .046 | .041 | .043 |

Profile Output Table - Standard Table 1

| Reach E.G. Elev (ft) | River Sta E.G. Slope (ft/ft) | Profile Vel Chnl (ft/s) | Q Total Flow Area (cfs) (sq ft) | Min Ch El Top Width (ft) | W.S. Elev Froude # Chl (ft) | Crit W.S. (ft) |
|----------------------------|------------------------------------|-------------------------------|--|--------------------------------|-----------------------------------|-------------------|
| 1 | 12151 | PF 1 | 69000.00 | 2644.00 | 2663.79 | |
| 2665.36 | 0.003746 | 12.08 | 7657.69 | 1344.47 | 0.61 | |
| 1 | 10901 | PF 1 | 69000.00 | 2640.50 | 2656.45 | 2655.54 |
| 2659.24 | 0.006746 | 15.24 | 6801.54 | 1927.63 | 0.80 | |
| 1 | 9471 | PF 1 | 69000.00 | 2631.30 | 2647.24 | |
| 2650.74 | 0.005287 | 16.36 | 5071.64 | 457.41 | 0.75 | |
| 1 | 9391 | PF 1 | 69000.00 | 2630.80 | 2647.27 | 2643.42 |
| 2650.17 | 0.004380 | 14.60 | 5305.90 | 471.70 | 0.66 | |
| 1 | 9366 | Bridge | | | | |
| 1 | 9341 | PF 1 | 69000.00 | 2630.80 | 2646.04 | |
| 2649.62 | 0.005653 | 15.60 | 4781.52 | 462.81 | 0.74 | |
| 1 | 9326 | PF 1 | 69000.00 | 2629.10 | 2647.46 | |
| 2648.94 | 0.002096 | 10.01 | 7441.80 | 643.55 | 0.46 | |
| 1 | 9224 | PF 1 | 69000.00 | 2627.70 | 2646.11 | |
| 2648.56 | 0.003804 | 13.06 | 6050.79 | 666.57 | 0.61 | |
| 1 | 9122 | PF 1 | 69000.00 | 2625.80 | 2646.41 | |
| 2647.93 | 0.003065 | 10.17 | 7122.30 | 703.94 | 0.53 | |
| 1 | 9020 | PF 1 | 69000.00 | 2625.50 | 2646.22 | |
| 2647.60 | 0.002597 | 9.79 | 7623.87 | 756.56 | 0.49 | |
| 1 | 8835 | PF 1 | 69000.00 | 2624.80 | 2645.20 | 2641.24 |
| 2647.03 | 0.003006 | 11.34 | 7237.91 | 1002.80 | 0.54 | |

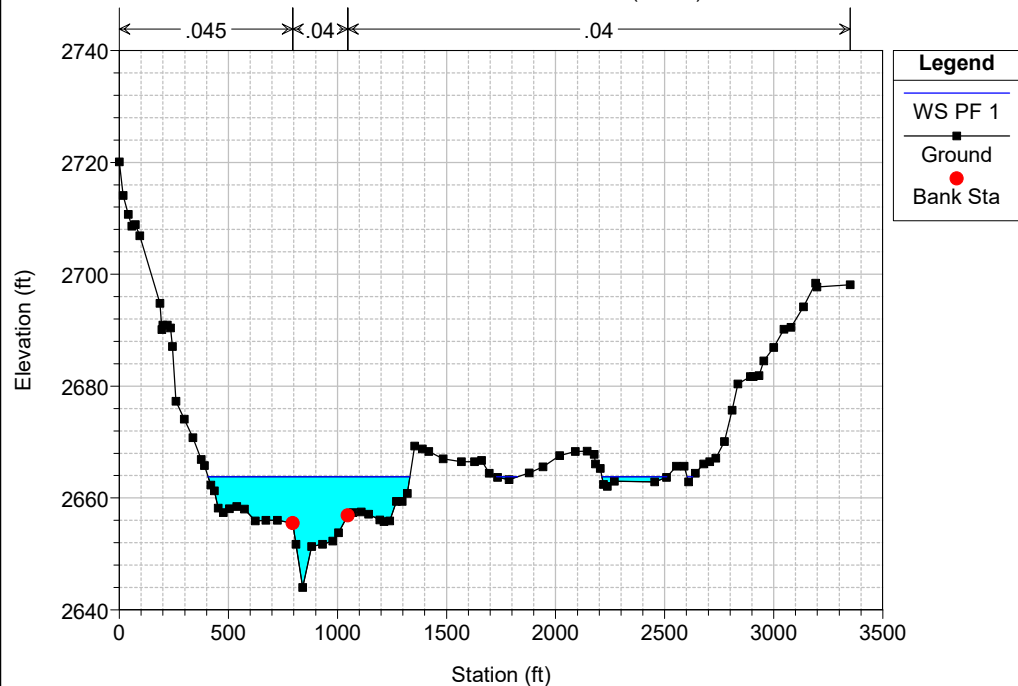
| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|-------|-----------|---------|----------|-----------|-----------|-----------|-----------|------------|----------|-----------|-----------|--------------|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| 1 | 12151 | PF 1 | 69000.00 | 2644.00 | 2663.79 | | 2665.36 | 0.003746 | 12.08 | 7657.69 | 1344.47 | 0.61 |
| 1 | 10901 | PF 1 | 69000.00 | 2640.50 | 2656.45 | 2655.54 | 2659.24 | 0.006746 | 15.24 | 6801.54 | 1927.63 | 0.80 |
| 1 | 9471 | PF 1 | 69000.00 | 2631.30 | 2647.24 | | 2650.74 | 0.005287 | 16.36 | 5071.64 | 457.41 | 0.75 |
| 1 | 9391 | PF 1 | 69000.00 | 2630.80 | 2647.27 | 2643.42 | 2650.17 | 0.004380 | 14.60 | 5305.90 | 471.70 | 0.66 |
| 1 | 9366 | | Bridge | | | | | | | | | |
| 1 | 9341 | PF 1 | 69000.00 | 2630.80 | 2646.04 | | 2649.62 | 0.005653 | 15.60 | 4781.52 | 462.81 | 0.74 |
| 1 | 9326 | PF 1 | 69000.00 | 2629.10 | 2647.46 | | 2648.94 | 0.002096 | 10.01 | 7441.80 | 643.55 | 0.46 |
| 1 | 9224 | PF 1 | 69000.00 | 2627.70 | 2646.11 | | 2648.56 | 0.003804 | 13.06 | 6050.79 | 666.57 | 0.61 |
| 1 | 9122 | PF 1 | 69000.00 | 2625.80 | 2646.41 | | 2647.93 | 0.003065 | 10.17 | 7122.30 | 703.94 | 0.53 |
| 1 | 9020 | PF 1 | 69000.00 | 2625.50 | 2646.22 | | 2647.60 | 0.002597 | 9.79 | 7623.87 | 756.56 | 0.49 |
| 1 | 8835 | PF 1 | 69000.00 | 2624.80 | 2645.20 | 2641.24 | 2647.03 | 0.003006 | 11.34 | 7237.91 | 1002.80 | 0.54 |



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

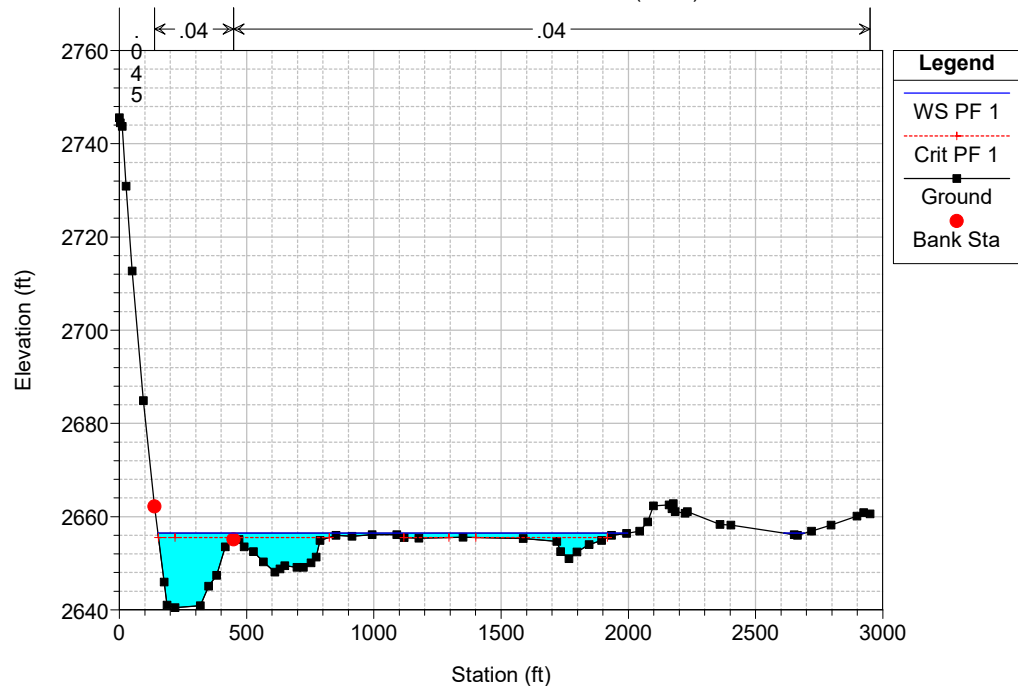
RS = 12151 HEC-2 XS 150 (FIS M)



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

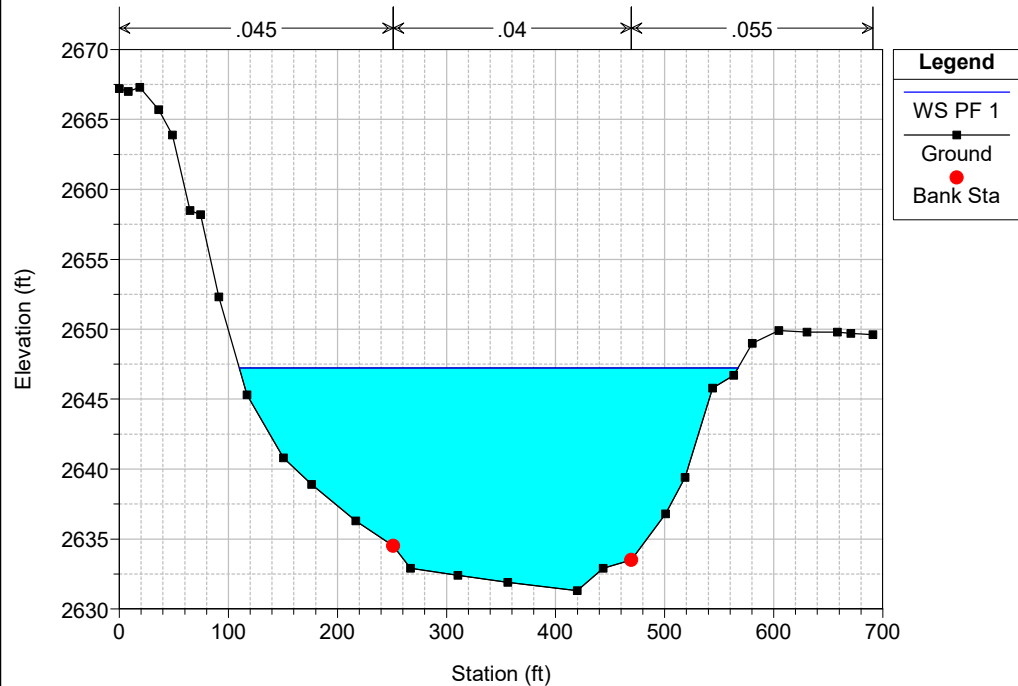
RS = 10901 HEC-2 XS 140 (FIS L)



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

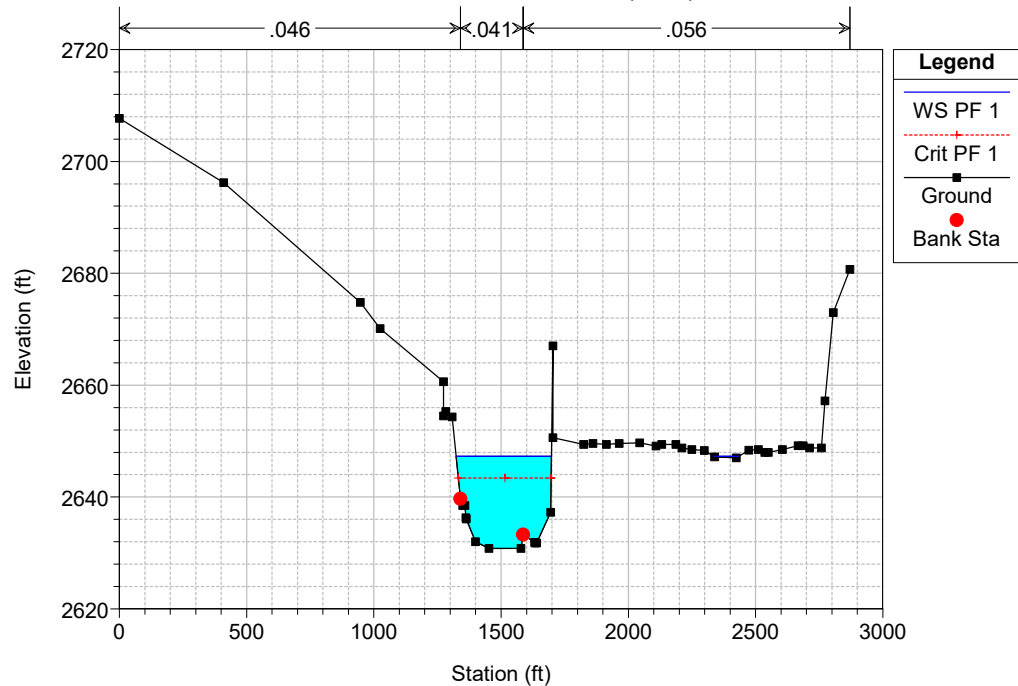
RS = 9471 HEC-2 XS 135



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

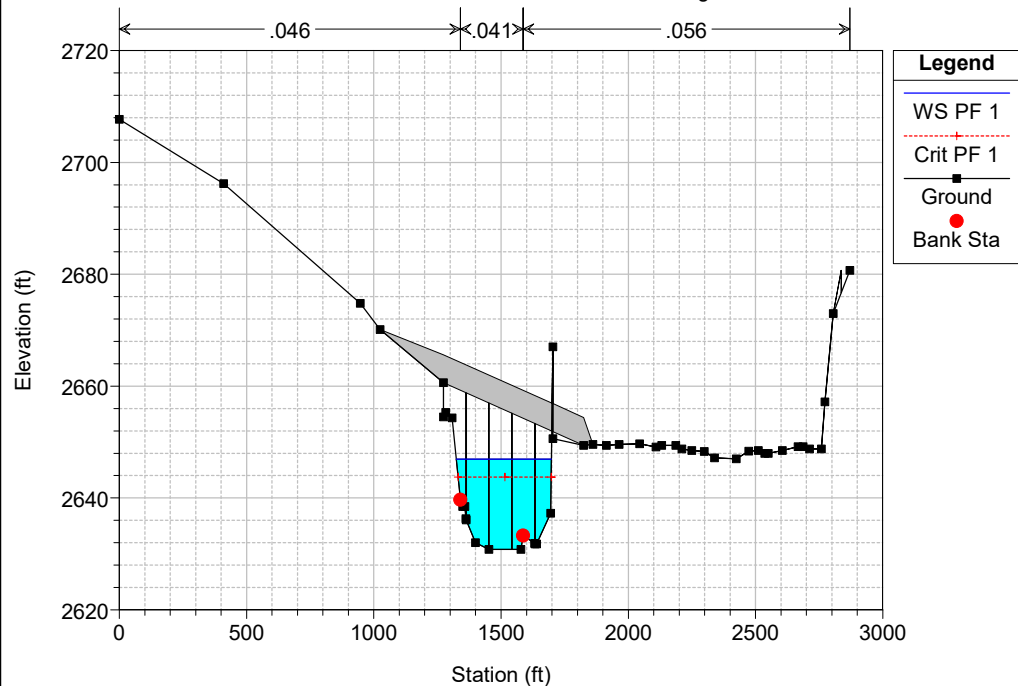
RS = 9391 HEC-2 XS 130 (FIS K)



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

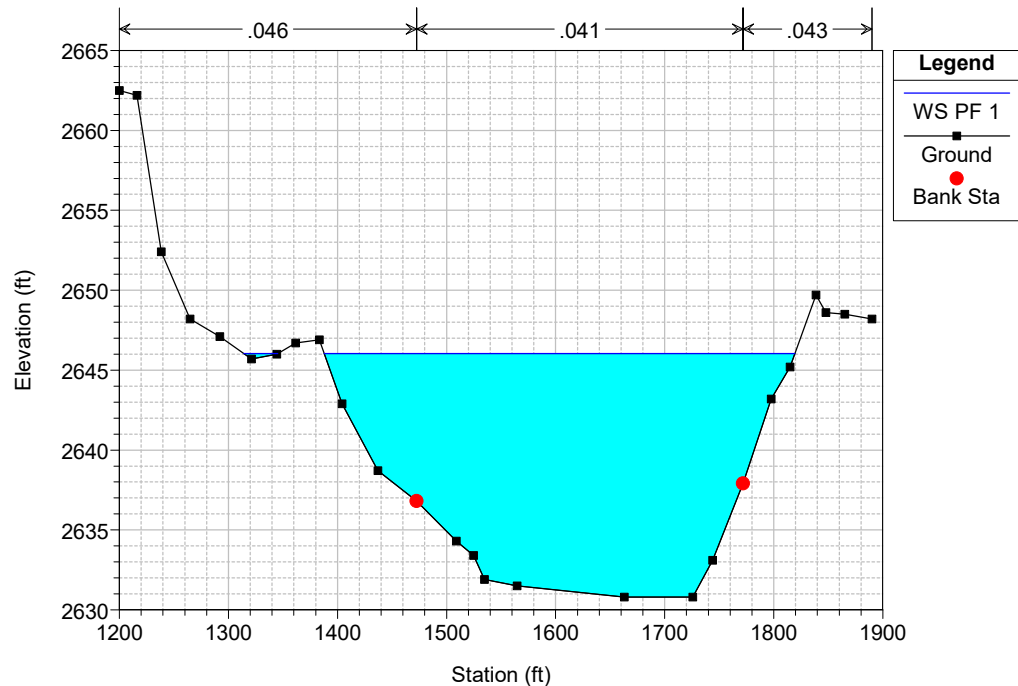
RS = 9366 BR Kernville Road Bridge



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

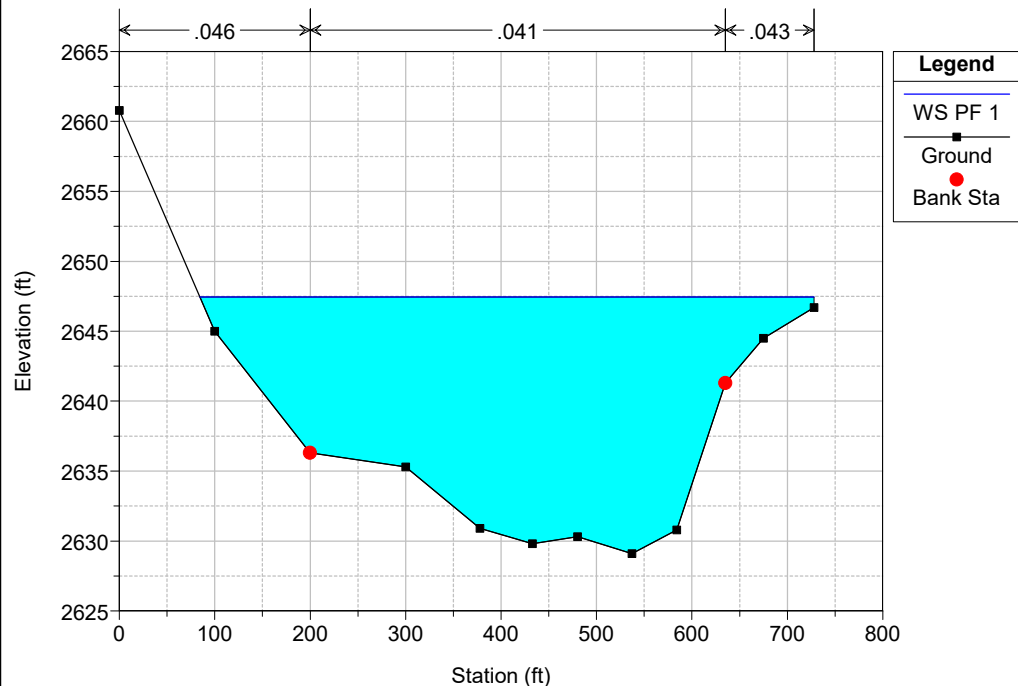
RS = 9341 HEC-2 XS 125



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

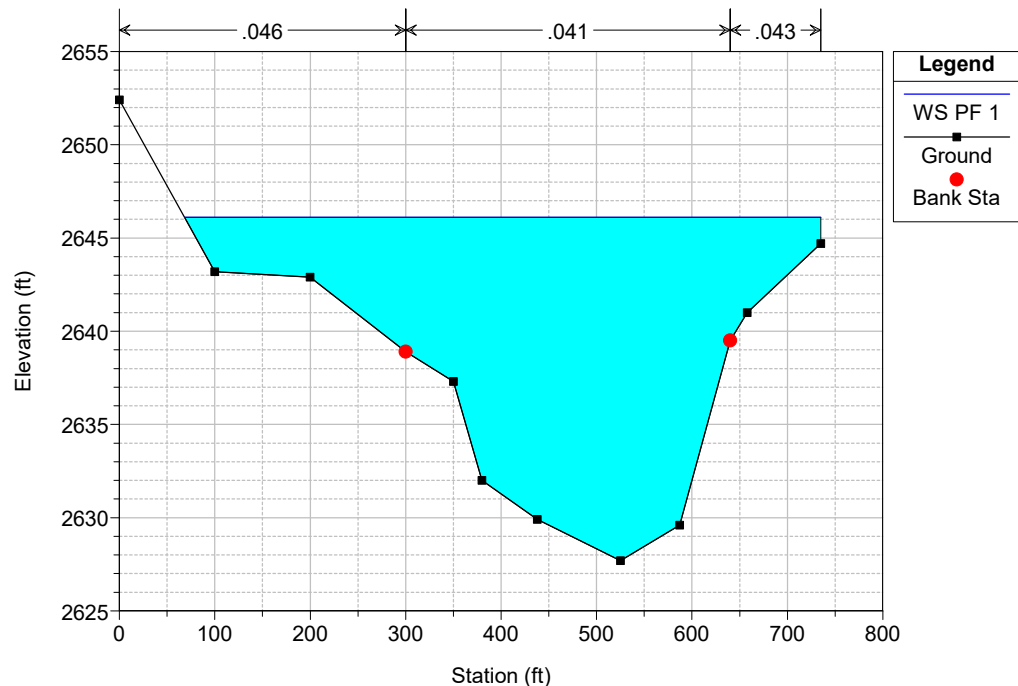
RS = 9326 HEC-2 XS 1



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

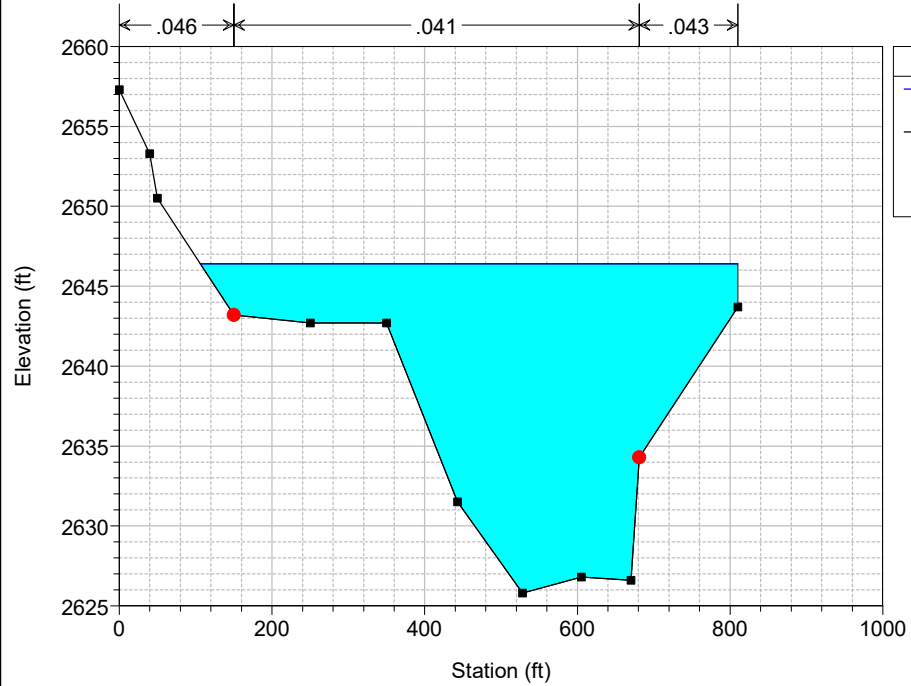
RS = 9224 HEC-2 XS 2



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

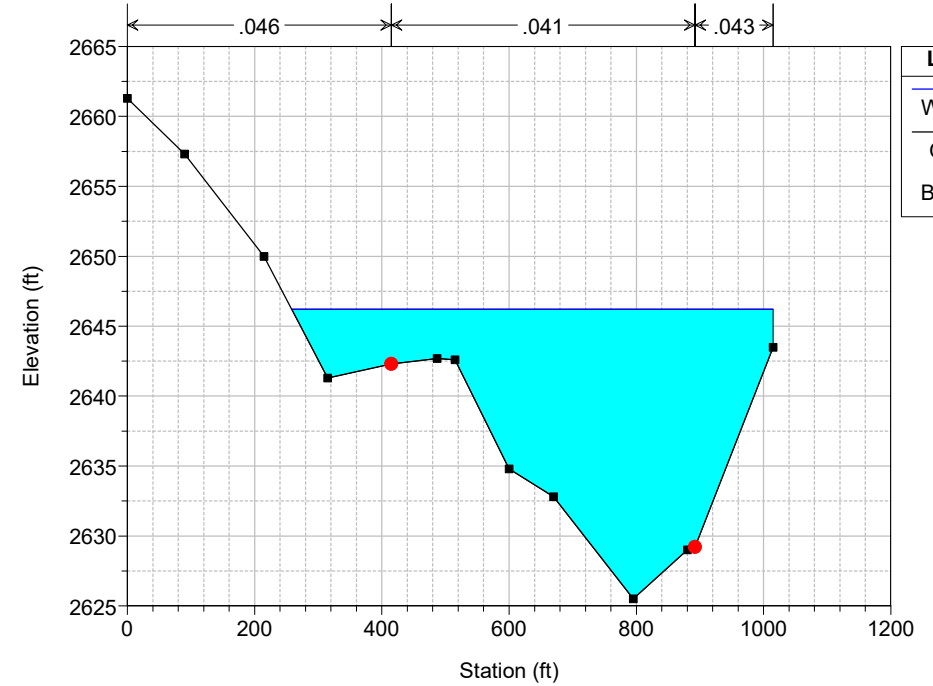
RS = 9122 HEC-2 XS 3



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

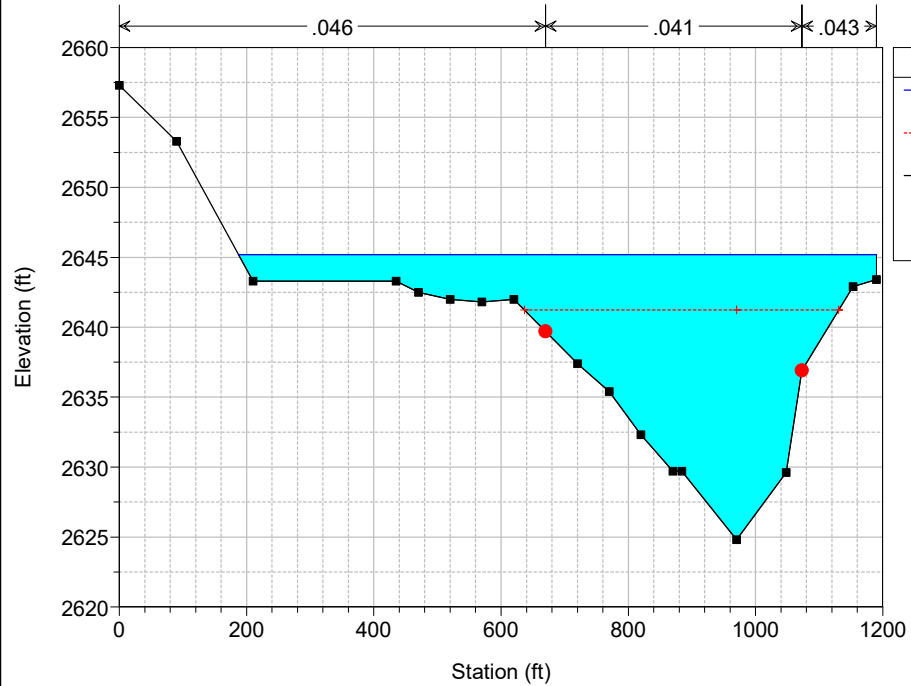
RS = 9020 HEC-2 XS 4



Kern River Plan: DEM - Q100 3/21/2024

Geom: DEM Flow: DEM - Q100

RS = 8835 HEC-2 XS 5 (FIS J)



HEC-RAS HEC-RAS 6.3.1 September 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX   XXXX       XXXX       XX       XXXX
X      X  X        X   X       X   X       X   X       X
X      X  X        X         X   X       X   X       X
XXXXXXXX XXXX      X         XXX XXXX      XXXXXX      XXXX
X      X  X        X         X   X       X   X           X
X      X  X        X   X       X   X       X   X           X
X      X  XXXXXX   XXXX       X   X       X   X       XXXXX

```

PROJECT DATA

Project Title: Kern River
Project File : KernRiver.prj
Run Date and Time: 3/21/2024 3:24:04 PM

Project in English units

Project Description:

Analysis of proposed intake structure improvements at Kern River upstream of Kernville Road bridge.

PLAN DATA

Plan Title: ECM - Q100
Plan File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.p09

Geometry Title: ECM
Geometry File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.g10

Flow Title : Q100
Flow File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.f02

Plan Summary Information:

Number of: Cross Sections = 18 Multiple Openings = 0
Culverts = 0 Inline Structures = 0

Bridges = 1 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Q100

Flow File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS
Model\KernRiver.f02

Flow Data (cfs)

| River | Reach | RS | PF 1 |
|------------|---------|-------|-------|
| Kern River | Reach 1 | 12095 | 69000 |

Boundary Conditions

| River | Reach | Profile | Upstream |
|-------------------|---------|---------|----------|
| Kern River | Reach 1 | PF 1 | |
| Downstream | | | |
| Known WS = 2645.2 | | | |

SUMMARY OF MANNING'S N VALUES

River:Kern River

| Reach | River Sta. | n1 | n2 | n3 |
|-------|------------|----|----|----|
|-------|------------|----|----|----|

| | | | | |
|---------|-------|--------|------|------|
| Reach 1 | 12095 | .045 | .04 | .04 |
| Reach 1 | 11480 | .045 | .04 | .04 |
| Reach 1 | 10865 | .045 | .04 | .04 |
| Reach 1 | 10606 | .045 | .04 | .04 |
| Reach 1 | 10406 | .045 | .04 | .04 |
| Reach 1 | 10207 | .045 | .04 | .04 |
| Reach 1 | 10006 | .045 | .04 | .04 |
| Reach 1 | 9806 | .045 | .04 | .04 |
| Reach 1 | 9606 | .045 | .04 | .04 |
| Reach 1 | 9498 | .045 | .04 | .055 |
| Reach 1 | 9414 | .045 | .04 | .055 |
| Reach 1 | 9391 | .046 | .041 | .056 |
| Reach 1 | 9366 | Bridge | | |
| Reach 1 | 9341 | .046 | .041 | .043 |
| Reach 1 | 9326 | .046 | .041 | .043 |
| Reach 1 | 9224 | .046 | .041 | .043 |
| Reach 1 | 9122 | .046 | .041 | .043 |
| Reach 1 | 9020 | .046 | .041 | .043 |
| Reach 1 | 8792 | .046 | .041 | .043 |

Profile Output Table - Standard Table 1

| Reach E.G. Elev (ft) | River Sta E.G. Slope (ft/ft) | Profile Vel Chnl (ft/s) | Q Total Flow Area (cfs) (sq ft) | Min Ch El Top Width (ft) | W.S. Elev Froude # Chl (ft) | Crit W.S. (ft) |
|----------------------------|------------------------------------|-------------------------------|--|--------------------------------|-----------------------------------|-------------------|
| Reach 1 | 12095 | PF 1 | 69000.00 | 2646.04 | 2660.99 | 2660.58 |
| 2663.56 | 0.006192 | 16.25 | 6184.10 | 906.07 | 0.79 | |
| Reach 1 | 11480 | PF 1 | 69000.00 | 2640.63 | 2659.18 | |
| 2660.83 | 0.002789 | 12.39 | 7535.96 | 842.66 | 0.55 | |
| Reach 1 | 10865 | PF 1 | 69000.00 | 2637.50 | 2655.01 | 2654.25 |
| 2658.24 | 0.006021 | 16.38 | 5383.52 | 683.94 | 0.77 | |
| Reach 1 | 10606 | PF 1 | 69000.00 | 2635.56 | 2654.46 | 2652.34 |
| 2656.67 | 0.004049 | 13.81 | 6077.71 | 602.36 | 0.63 | |
| Reach 1 | 10406 | PF 1 | 69000.00 | 2633.00 | 2653.92 | 2651.19 |
| 2655.82 | 0.003557 | 13.56 | 8087.16 | 1490.12 | 0.60 | |
| Reach 1 | 10207 | PF 1 | 69000.00 | 2631.05 | 2653.92 | 2650.88 |
| 2655.11 | 0.001825 | 10.78 | 9706.69 | 1310.78 | 0.44 | |
| Reach 1 | 10006 | PF 1 | 69000.00 | 2630.15 | 2653.42 | 2650.17 |
| 2654.75 | 0.001645 | 11.29 | 9261.40 | 1152.12 | 0.44 | |
| Reach 1 | 9806 | PF 1 | 69000.00 | 2629.41 | 2650.44 | 2650.44 |
| 2653.99 | 0.004683 | 17.03 | 5562.70 | 733.88 | 0.70 | |
| Reach 1 | 9606 | PF 1 | 69000.00 | 2629.43 | 2649.96 | 2647.62 |
| 2652.83 | 0.003566 | 14.86 | 5713.79 | 555.14 | 0.63 | |
| Reach 1 | 9498 | PF 1 | 69000.00 | 2629.20 | 2647.48 | 2647.26 |
| 2652.13 | 0.006876 | 18.22 | 4480.31 | 469.06 | 0.84 | |

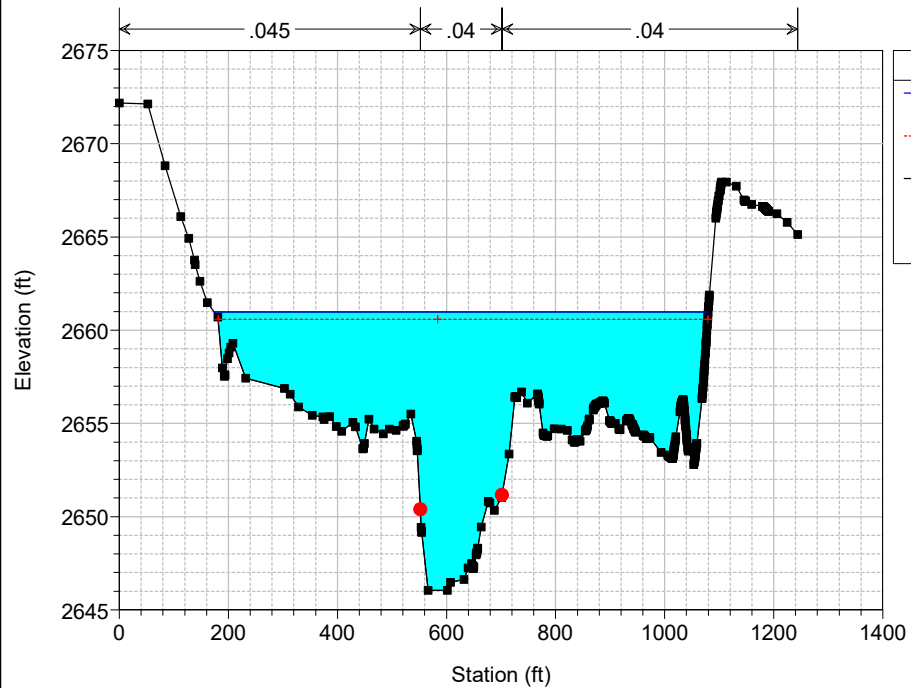
| | | | | | | |
|---------|----------|-------|----------|---------|---------|---------|
| Reach 1 | 9414 | PF 1 | 69000.00 | 2629.62 | 2648.36 | 2644.69 |
| 2651.16 | 0.003606 | 13.93 | 5494.83 | 441.42 | 0.62 | |
| Reach 1 | 9391 | PF 1 | 69000.00 | 2629.56 | 2647.44 | 2645.05 |
| 2650.99 | 0.005518 | 15.37 | 4675.99 | 376.08 | 0.73 | |
| Reach 1 | 9366 | | Bridge | | | |
| Reach 1 | 9341 | PF 1 | 69000.00 | 2629.50 | 2646.71 | 2643.80 |
| 2650.00 | 0.004780 | 14.71 | 4858.69 | 379.98 | 0.68 | |
| Reach 1 | 9326 | PF 1 | 69000.00 | 2629.10 | 2647.09 | 2643.75 |
| 2649.74 | 0.004023 | 13.48 | 5709.26 | 582.26 | 0.63 | |
| Reach 1 | 9224 | PF 1 | 69000.00 | 2627.70 | 2646.67 | 2643.42 |
| 2649.33 | 0.004122 | 13.38 | 5732.32 | 647.58 | 0.63 | |
| Reach 1 | 9122 | PF 1 | 69000.00 | 2625.79 | 2646.69 | 2641.72 |
| 2648.83 | 0.002814 | 12.04 | 6573.96 | 814.51 | 0.53 | |
| Reach 1 | 9020 | PF 1 | 69000.00 | 2625.50 | 2645.67 | 2642.91 |
| 2648.41 | 0.004527 | 13.59 | 5692.51 | 741.03 | 0.66 | |
| Reach 1 | 8792 | PF 1 | 69000.00 | 2624.80 | 2645.20 | 2642.34 |
| 2647.29 | 0.003657 | 12.65 | 6921.02 | 929.59 | 0.60 | |

| 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) | |
| Reach 1 | 12095 | PF 1 | 69000.00 | 2646.04 | 2660.99 | 2660.58 | 2663.56 | 0.006192 | 16.25 | 6184.10 | 906.07 | 0.79 |
| Reach 1 | 11480 | PF 1 | 69000.00 | 2640.63 | 2659.18 | | 2660.83 | 0.002789 | 12.39 | 7535.96 | 842.66 | 0.55 |
| Reach 1 | 10865 | PF 1 | 69000.00 | 2637.50 | 2655.01 | 2654.25 | 2658.24 | 0.006021 | 16.38 | 5383.52 | 683.94 | 0.77 |
| Reach 1 | 10606 | PF 1 | 69000.00 | 2635.56 | 2654.46 | 2652.34 | 2656.67 | 0.004049 | 13.81 | 6077.71 | 602.36 | 0.63 |
| Reach 1 | 10406 | PF 1 | 69000.00 | 2633.00 | 2653.92 | 2651.19 | 2655.82 | 0.003557 | 13.56 | 8087.16 | 1490.12 | 0.60 |
| Reach 1 | 10207 | PF 1 | 69000.00 | 2631.05 | 2653.92 | 2650.88 | 2655.11 | 0.001825 | 10.78 | 9706.69 | 1310.78 | 0.44 |
| Reach 1 | 10006 | PF 1 | 69000.00 | 2630.15 | 2653.42 | 2650.17 | 2654.75 | 0.001645 | 11.29 | 9261.40 | 1152.12 | 0.44 |
| Reach 1 | 9806 | PF 1 | 69000.00 | 2629.41 | 2650.44 | 2650.44 | 2653.99 | 0.004683 | 17.03 | 5562.70 | 733.88 | 0.70 |
| Reach 1 | 9606 | PF 1 | 69000.00 | 2629.43 | 2649.96 | 2647.62 | 2652.83 | 0.003566 | 14.86 | 5713.79 | 555.14 | 0.63 |
| Reach 1 | 9498 | PF 1 | 69000.00 | 2629.20 | 2647.48 | 2647.26 | 2652.13 | 0.006876 | 18.22 | 4480.31 | 469.06 | 0.84 |
| Reach 1 | 9414 | PF 1 | 69000.00 | 2629.62 | 2648.36 | 2644.69 | 2651.16 | 0.003606 | 13.93 | 5494.83 | 441.42 | 0.62 |
| Reach 1 | 9391 | PF 1 | 69000.00 | 2629.56 | 2647.44 | 2645.05 | 2650.99 | 0.005518 | 15.37 | 4675.99 | 376.08 | 0.73 |
| Reach 1 | 9366 | | Bridge | | | | | | | | | |
| Reach 1 | 9341 | PF 1 | 69000.00 | 2629.50 | 2646.71 | 2643.80 | 2650.00 | 0.004780 | 14.71 | 4858.69 | 379.98 | 0.68 |
| Reach 1 | 9326 | PF 1 | 69000.00 | 2629.10 | 2647.09 | 2643.75 | 2649.74 | 0.004023 | 13.48 | 5709.26 | 582.26 | 0.63 |
| Reach 1 | 9224 | PF 1 | 69000.00 | 2627.70 | 2646.67 | 2643.42 | 2649.33 | 0.004122 | 13.38 | 5732.32 | 647.58 | 0.63 |
| Reach 1 | 9122 | PF 1 | 69000.00 | 2625.79 | 2646.69 | 2641.72 | 2648.83 | 0.002814 | 12.04 | 6573.96 | 814.51 | 0.53 |
| Reach 1 | 9020 | PF 1 | 69000.00 | 2625.50 | 2645.67 | 2642.91 | 2648.41 | 0.004527 | 13.59 | 5692.51 | 741.03 | 0.66 |
| Reach 1 | 8792 | PF 1 | 69000.00 | 2624.80 | 2645.20 | 2642.34 | 2647.29 | 0.003657 | 12.65 | 6921.02 | 929.59 | 0.60 |

Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

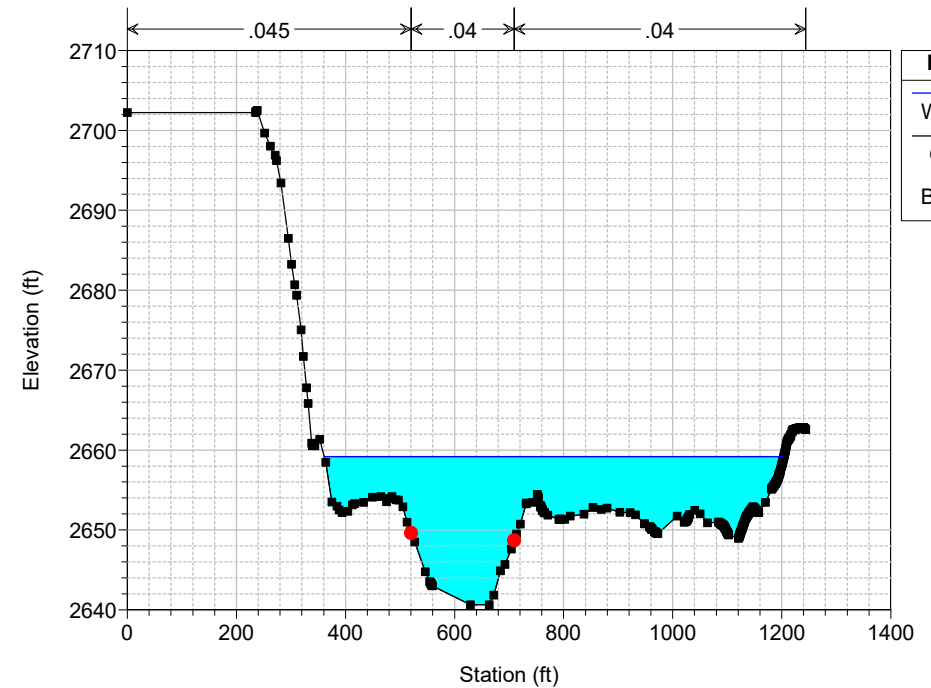
RS = 12095 FIS XS M



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

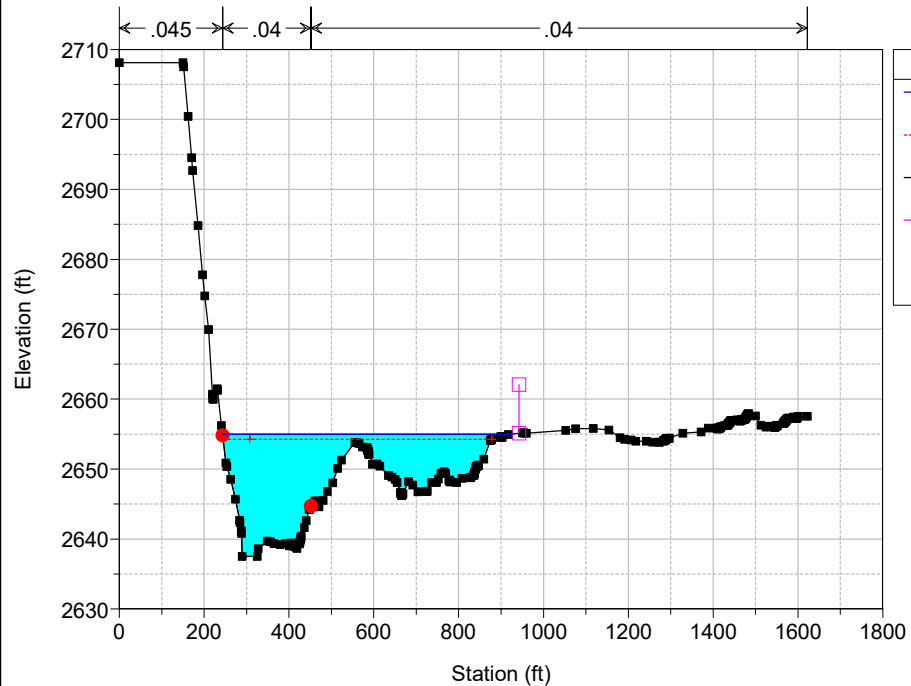
RS = 11480



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

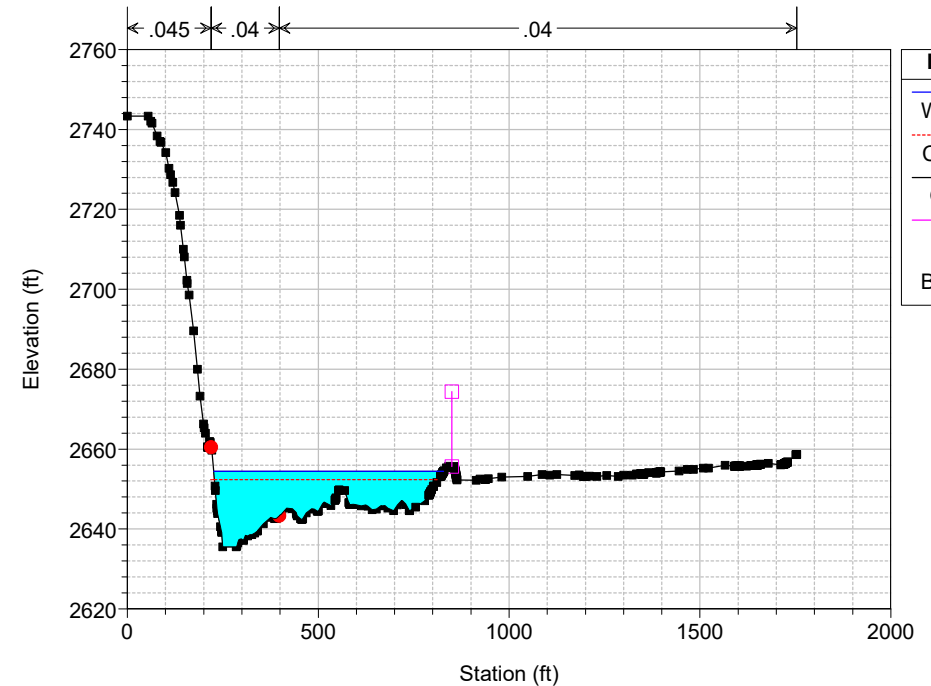
RS = 10865 FIS XS L



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

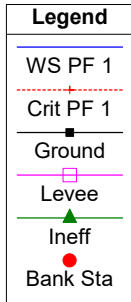
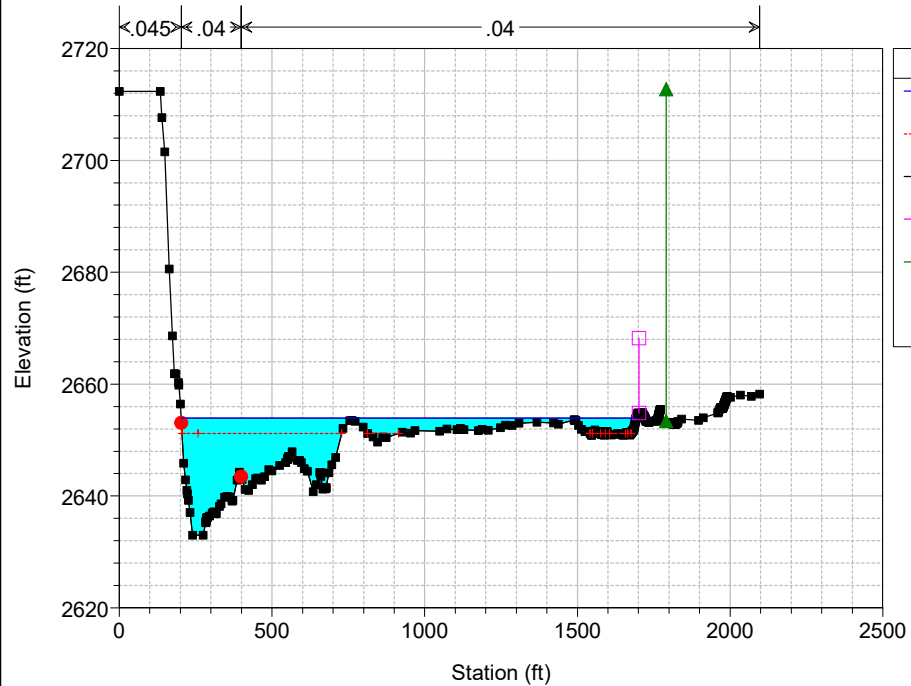
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Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

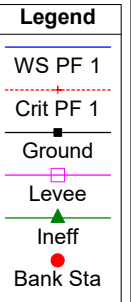
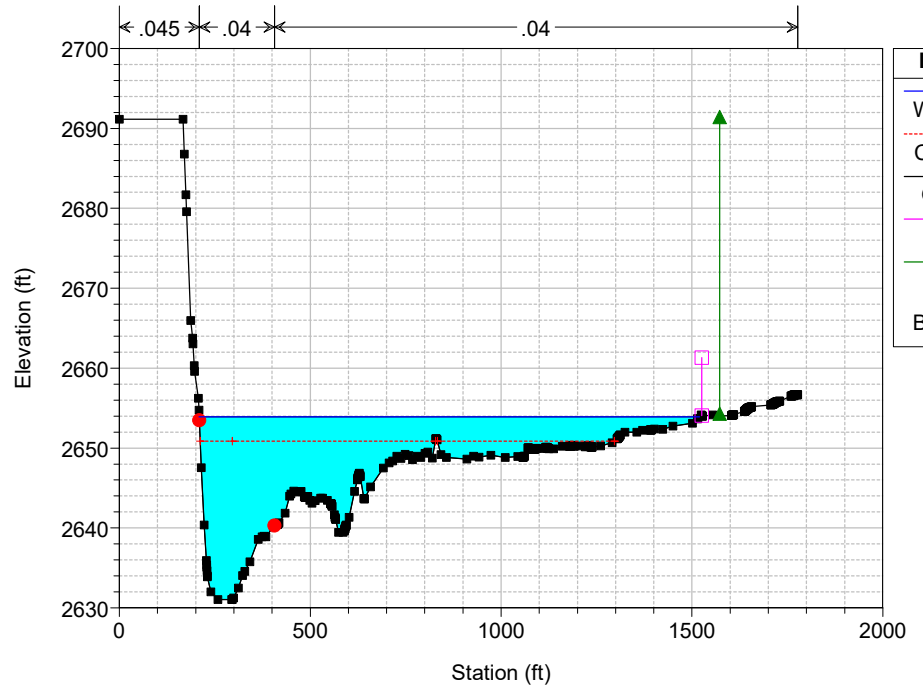
RS = 10406



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

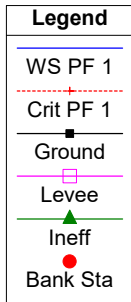
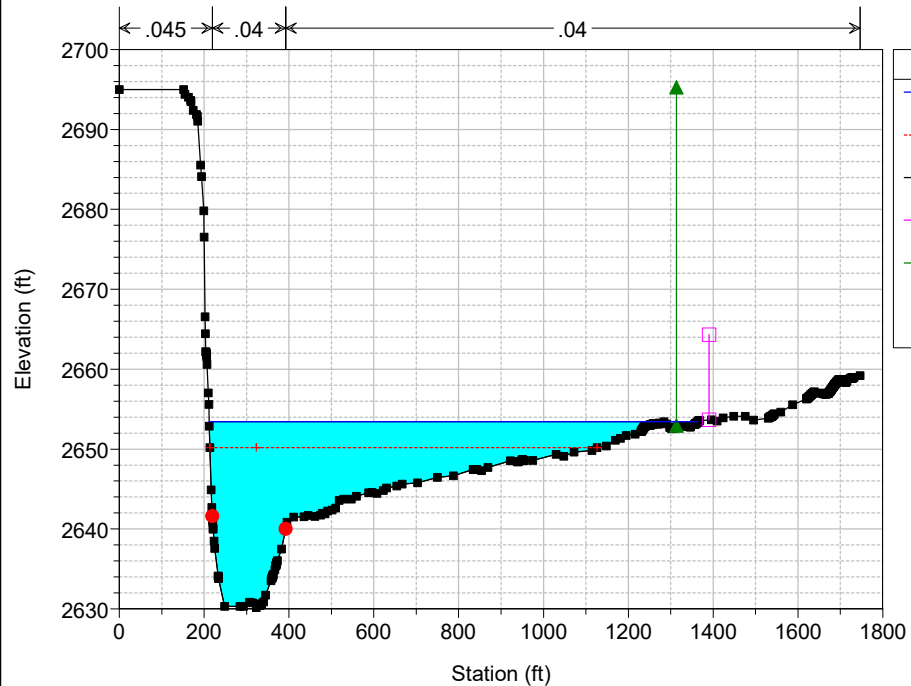
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Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

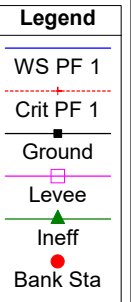
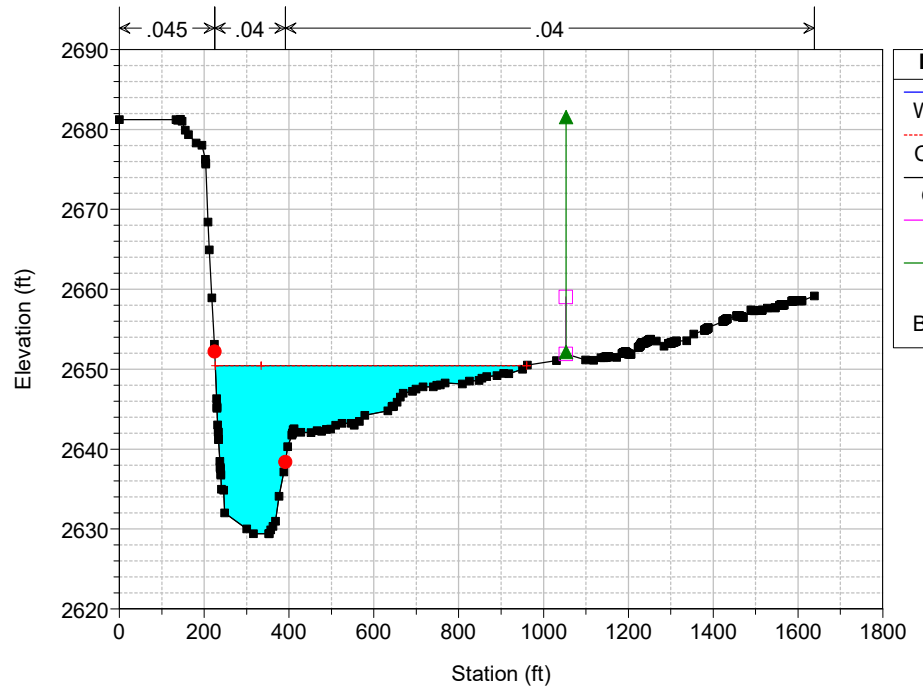
RS = 10006



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

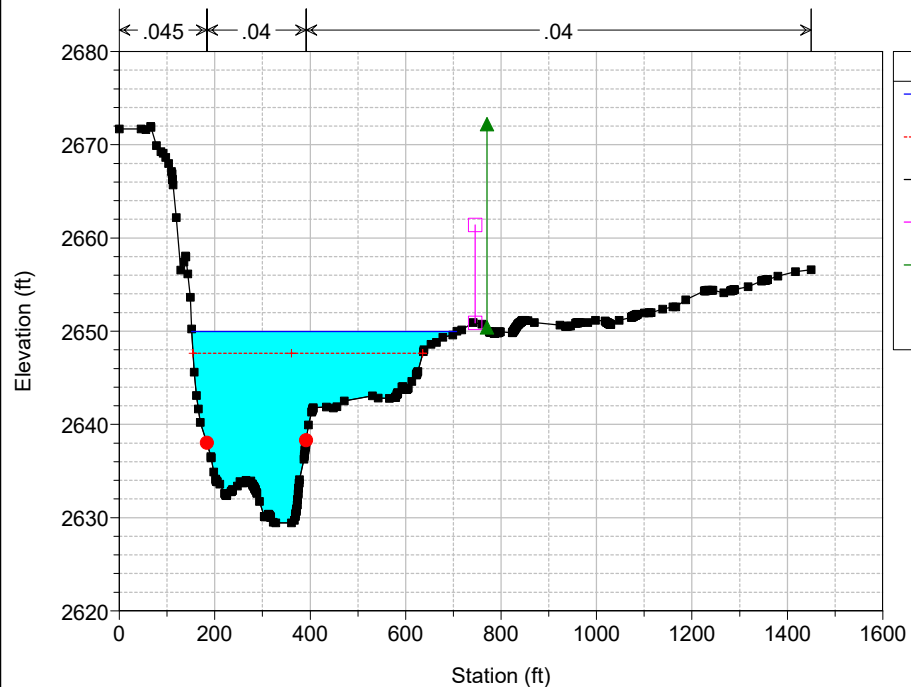
RS = 9806



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

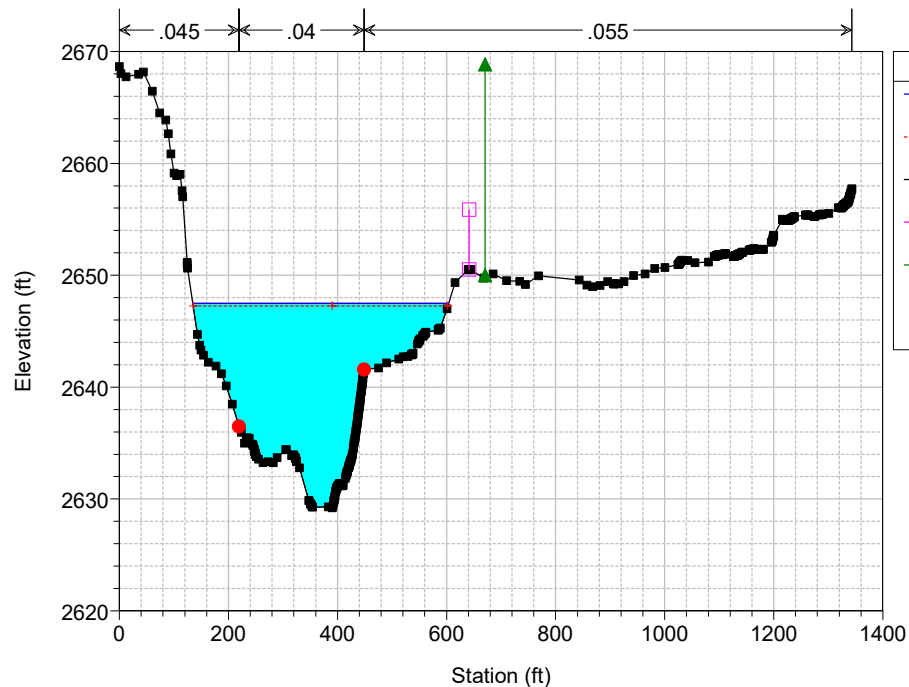
RS = 9606



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

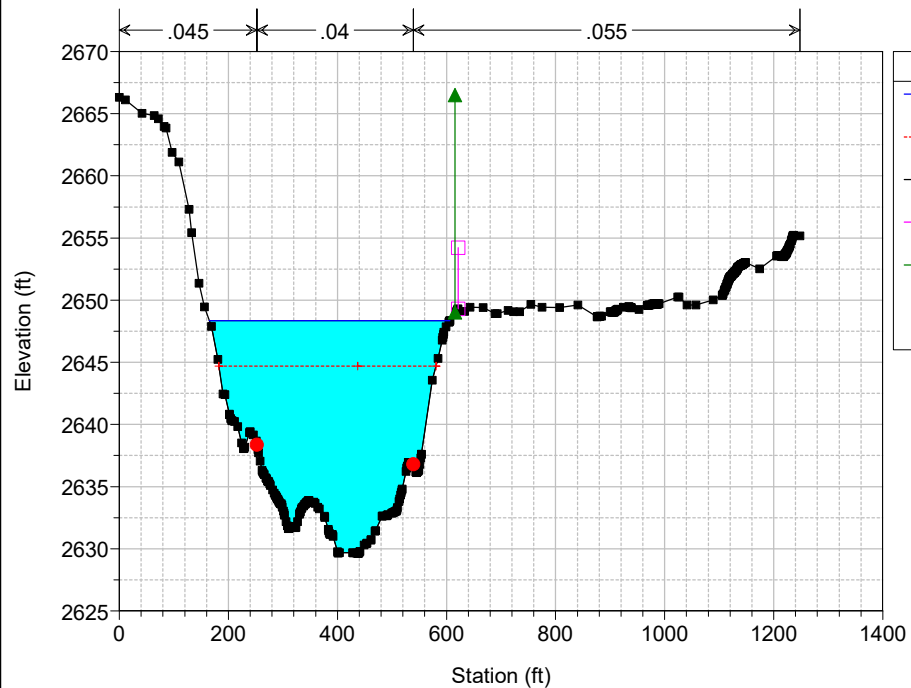
RS = 9498



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

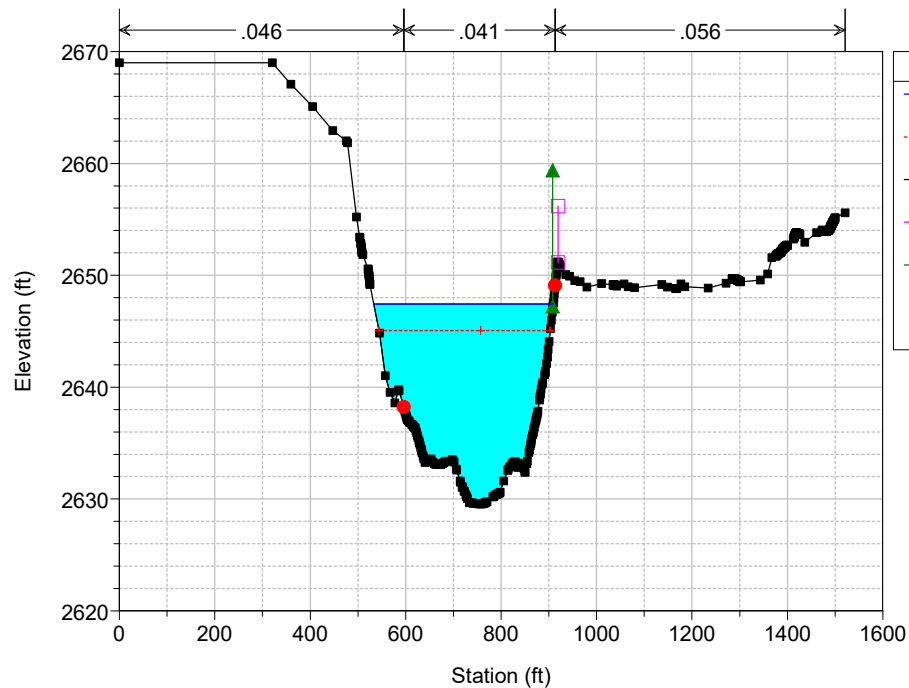
RS = 9414



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

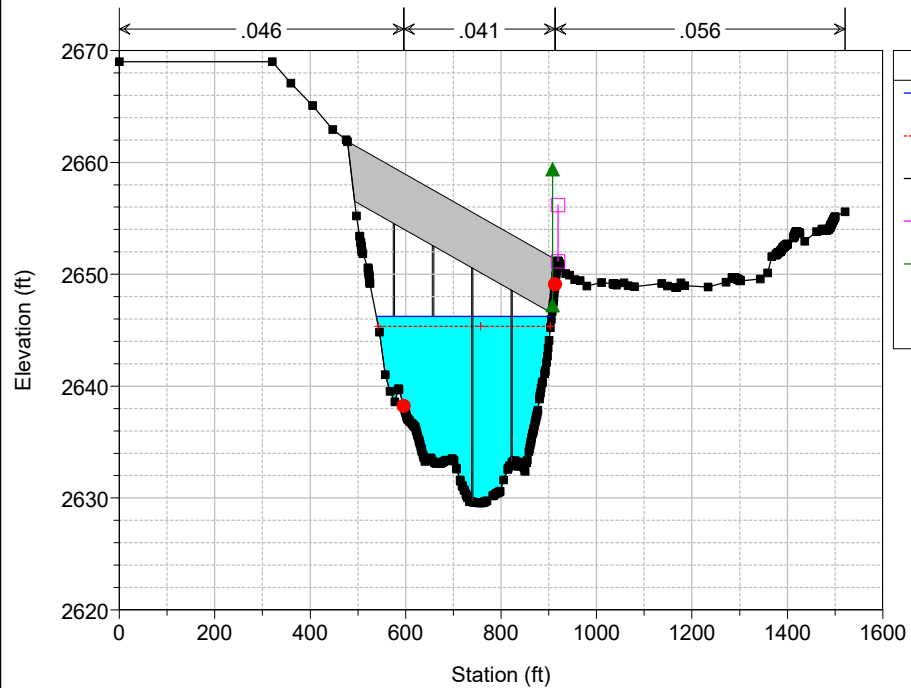
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Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

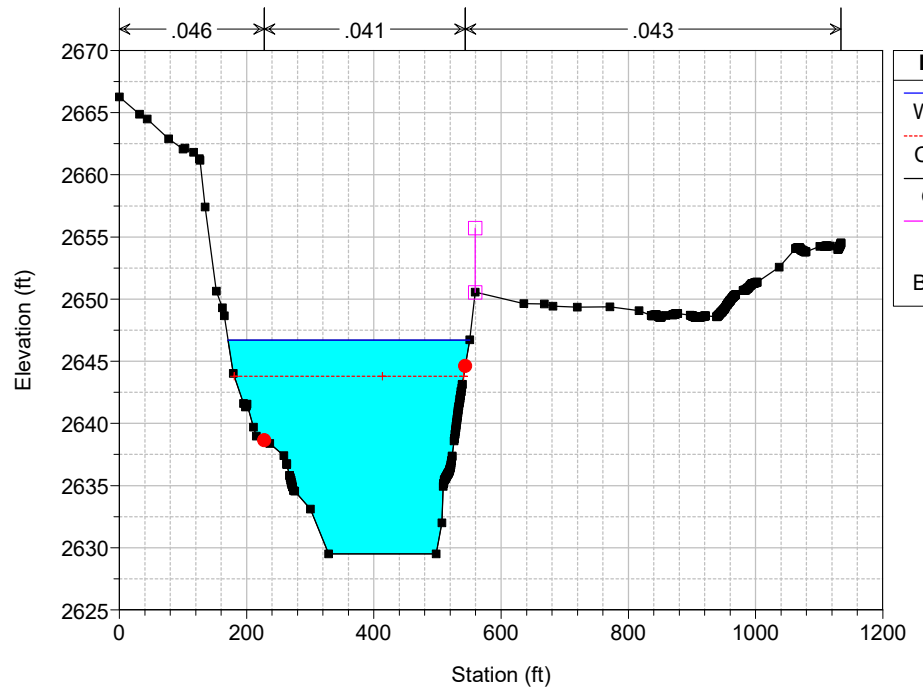
RS = 9366 BR



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

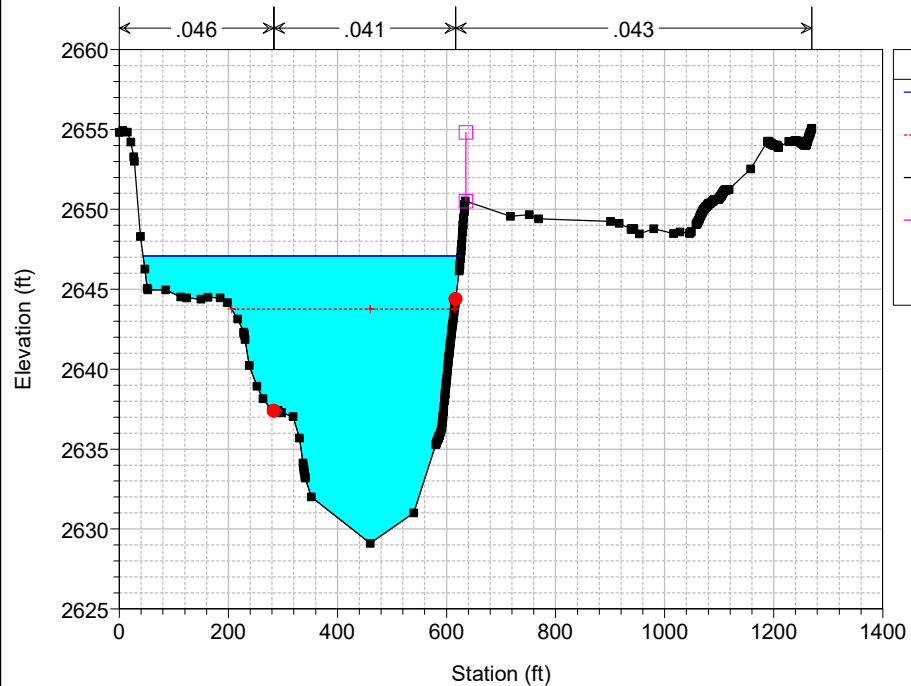
RS = 9341 HEC-2 XS 125



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

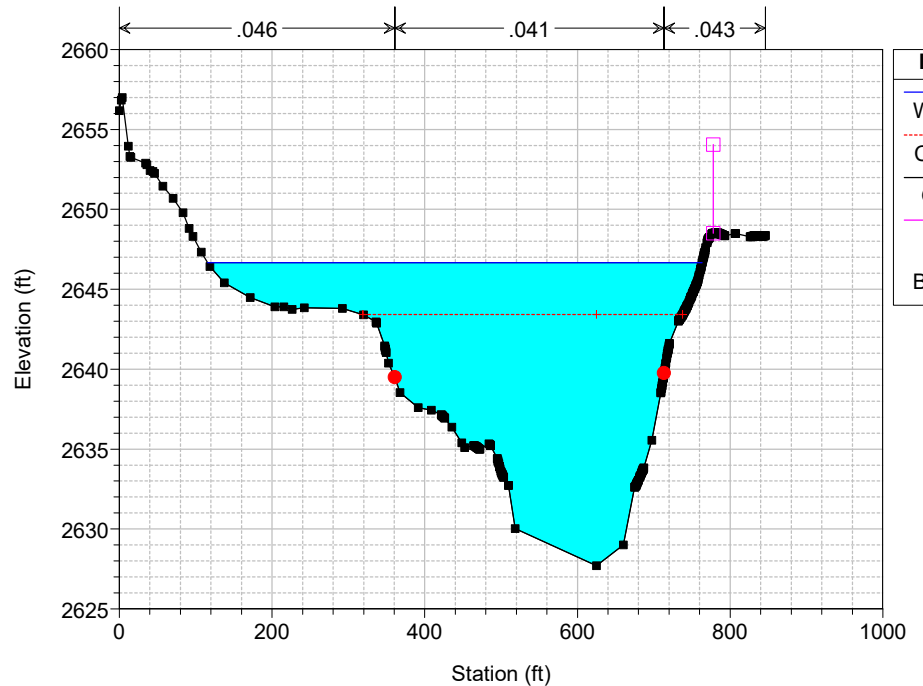
RS = 9326 HEC-2 XS 1



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

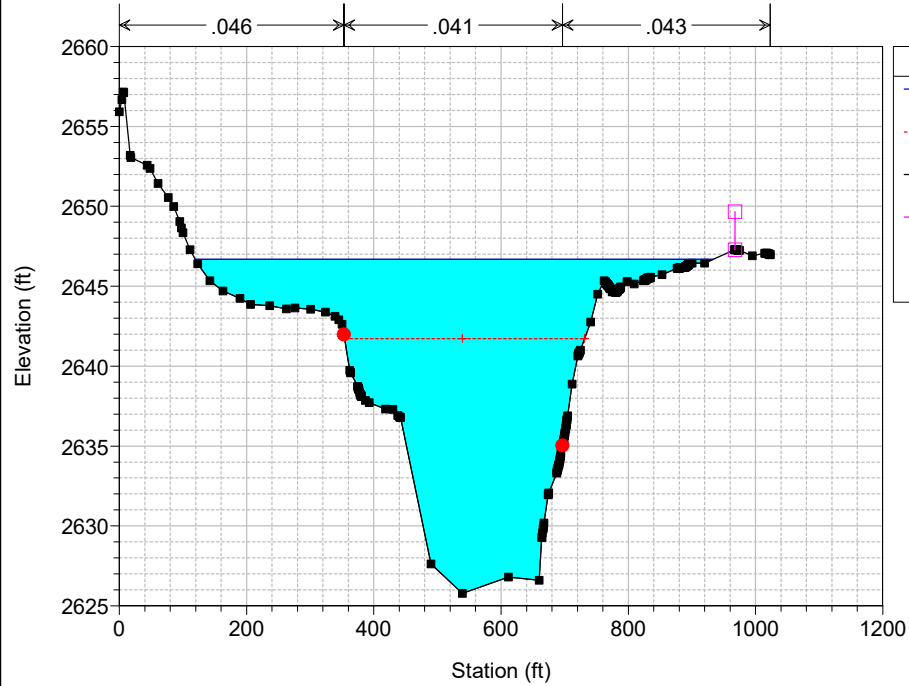
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Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

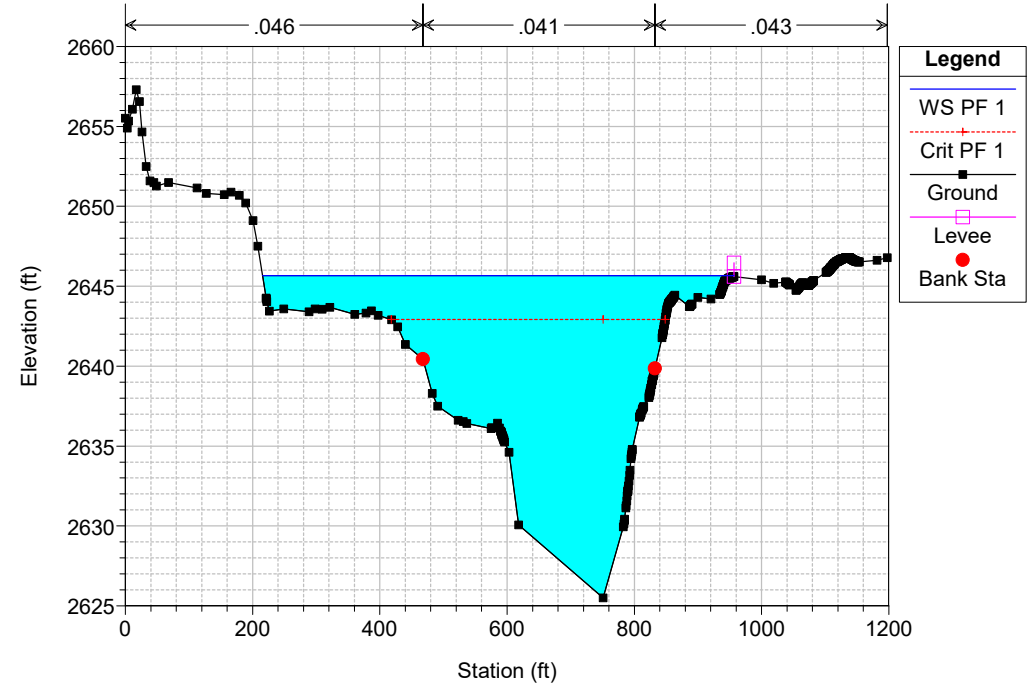
RS = 9122 HEC-2 XS 3



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

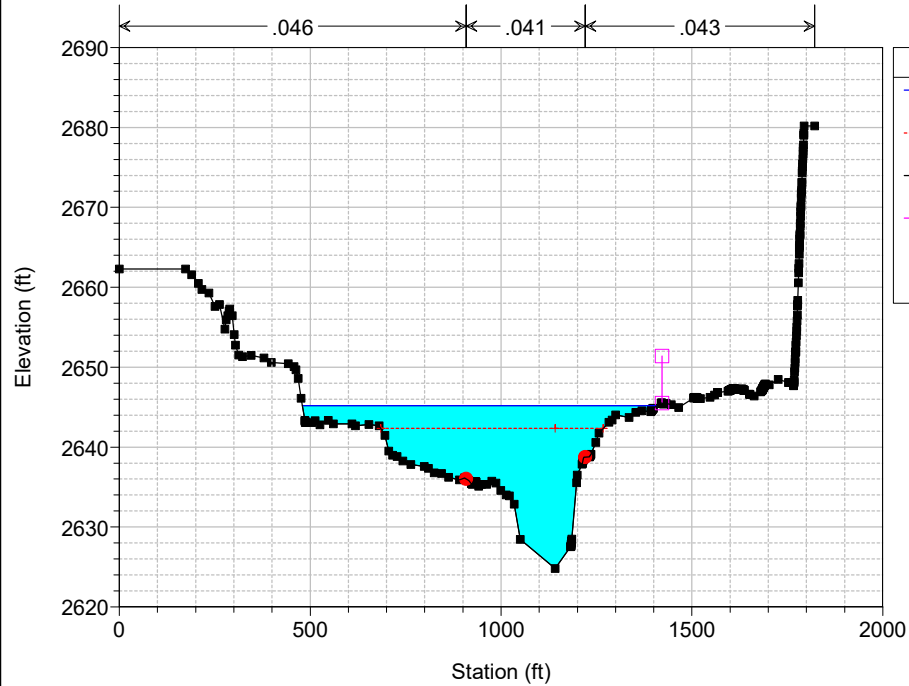
RS = 9020 HEC-2 XS 4



Kern River Plan: ECM - Q100 3/21/2024

Geom: ECM Flow: Q100

RS = 8792 HEC-2 XS 5 (FIS J)



HEC-RAS HEC-RAS 6.3.1 September 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
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X      X  X        X        X  X      X  X      X
XXXXXXXX XXXX      X        XXX XXXX      XXXXXX   XXXX
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PROJECT DATA

Project Title: Kern River
Project File : KernRiver.prj
Run Date and Time: 3/21/2024 3:14:26 PM

Project in English units

Project Description:

Analysis of proposed intake structure improvements at Kern River upstream of Kernville Road bridge.

PLAN DATA

Plan Title: PCM - Q100
Plan File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.p01

Geometry Title: PCM
Geometry File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.g01

Flow Title : Q100
Flow File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS Model\KernRiver.f02

Plan Summary Information:

Number of: Cross Sections = 18 Multiple Openings = 0
Culverts = 0 Inline Structures = 0

Bridges = 1 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Q100

Flow File : C:\Users\afinn2\OneDrive - GHD\Desktop\Models\Kern River HEC-RAS
Model\KernRiver.f02

Flow Data (cfs)

| River | Reach | RS | PF 1 |
|------------|---------|-------|-------|
| Kern River | Reach 1 | 12095 | 69000 |

Boundary Conditions

| River | Reach | Profile | Upstream |
|------------|---------|---------|----------|
| Downstream | | | |
| Kern River | Reach 1 | PF 1 | |

Known WS = 2645.2

SUMMARY OF MANNING'S N VALUES

River:Kern River

| Reach | River Sta. | n1 | n2 | n3 |
|-------|------------|----|----|----|
|-------|------------|----|----|----|

| | | | | |
|---------|-------|--------|------|------|
| Reach 1 | 12095 | .045 | .04 | .04 |
| Reach 1 | 11480 | .045 | .04 | .04 |
| Reach 1 | 10865 | .045 | .04 | .04 |
| Reach 1 | 10606 | .045 | .04 | .04 |
| Reach 1 | 10406 | .045 | .04 | .04 |
| Reach 1 | 10207 | .045 | .04 | .04 |
| Reach 1 | 10006 | .045 | .04 | .04 |
| Reach 1 | 9806 | .045 | .04 | .04 |
| Reach 1 | 9606 | .045 | .04 | .04 |
| Reach 1 | 9498 | .045 | .04 | .055 |
| Reach 1 | 9414 | .045 | .04 | .055 |
| Reach 1 | 9391 | .046 | .041 | .056 |
| Reach 1 | 9366 | Bridge | | |
| Reach 1 | 9341 | .046 | .041 | .043 |
| Reach 1 | 9326 | .046 | .041 | .043 |
| Reach 1 | 9224 | .046 | .041 | .043 |
| Reach 1 | 9122 | .046 | .041 | .043 |
| Reach 1 | 9020 | .046 | .041 | .043 |
| Reach 1 | 8792 | .046 | .041 | .043 |

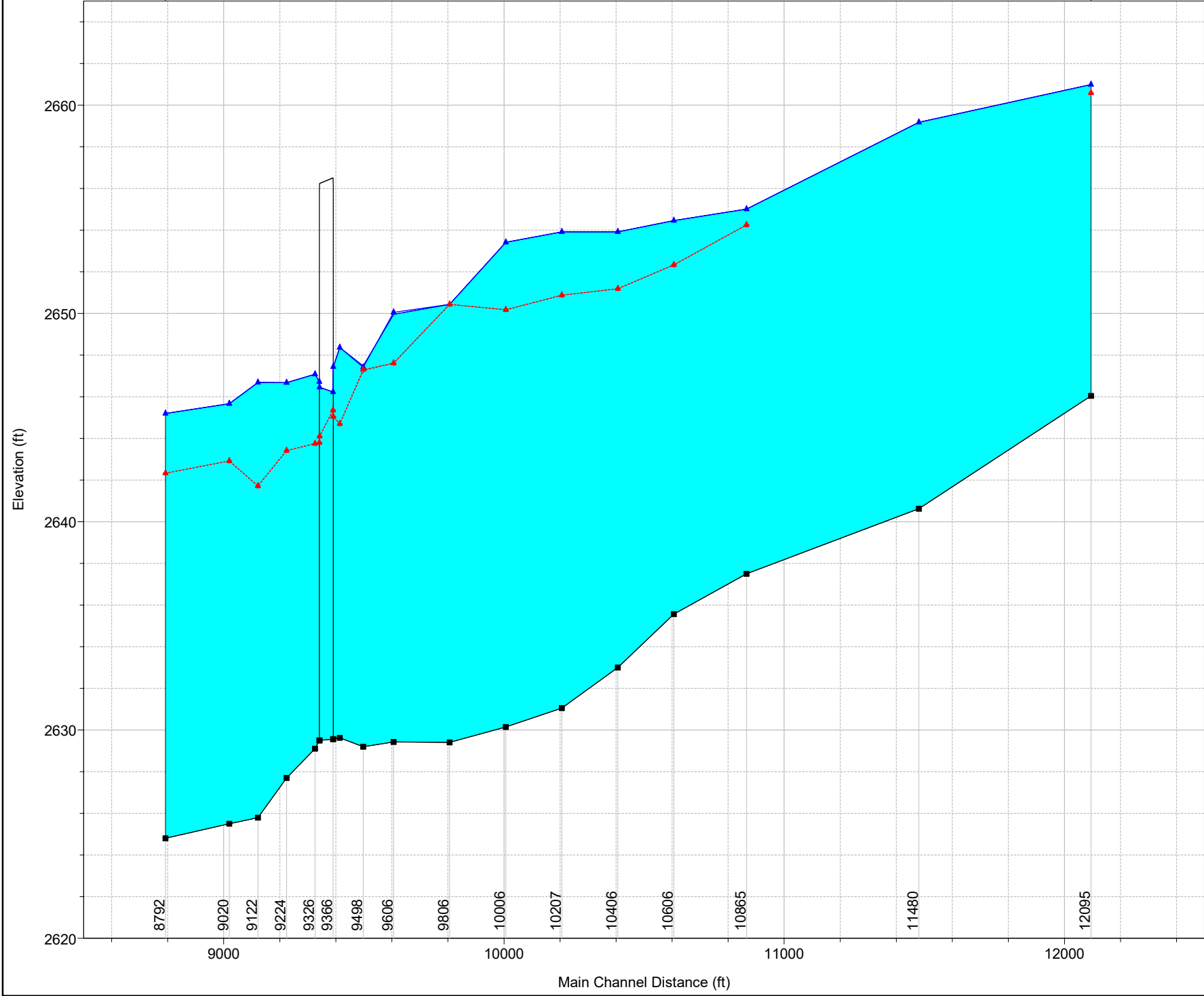
Profile Output Table - Standard Table 1

| Reach E.G. Elev (ft) | River Sta E.G. Slope (ft/ft) | Profile Vel Chnl (ft/s) | Q Total Flow Area (cfs) (sq ft) | Min Ch El Top Width (ft) | W.S. Elev Froude # Chl (ft) | Crit W.S. (ft) |
|----------------------------|------------------------------------|-------------------------------|--|--------------------------------|-----------------------------------|-------------------|
| Reach 1 | 12095 | PF 1 | 69000.00 | 2646.04 | 2660.99 | 2660.58 |
| 2663.56 | 0.006192 | 16.25 | 6184.10 | 906.07 | 0.79 | |
| Reach 1 | 11480 | PF 1 | 69000.00 | 2640.63 | 2659.18 | |
| 2660.83 | 0.002789 | 12.39 | 7535.96 | 842.66 | 0.55 | |
| Reach 1 | 10865 | PF 1 | 69000.00 | 2637.50 | 2655.01 | 2654.25 |
| 2658.24 | 0.006021 | 16.38 | 5383.52 | 683.94 | 0.77 | |
| Reach 1 | 10606 | PF 1 | 69000.00 | 2635.56 | 2654.46 | 2652.34 |
| 2656.67 | 0.004049 | 13.81 | 6077.71 | 602.36 | 0.63 | |
| Reach 1 | 10406 | PF 1 | 69000.00 | 2633.00 | 2653.92 | 2651.19 |
| 2655.82 | 0.003557 | 13.56 | 8087.16 | 1490.12 | 0.60 | |
| Reach 1 | 10207 | PF 1 | 69000.00 | 2631.05 | 2653.92 | 2650.88 |
| 2655.11 | 0.001825 | 10.78 | 9706.69 | 1310.78 | 0.44 | |
| Reach 1 | 10006 | PF 1 | 69000.00 | 2630.15 | 2653.42 | 2650.17 |
| 2654.75 | 0.001645 | 11.29 | 9261.13 | 1152.12 | 0.44 | |
| Reach 1 | 9806 | PF 1 | 69000.00 | 2629.41 | 2650.44 | 2650.44 |
| 2653.99 | 0.004683 | 17.03 | 5562.70 | 733.88 | 0.70 | |
| Reach 1 | 9606 | PF 1 | 69000.00 | 2629.43 | 2650.05 | 2647.62 |
| 2652.88 | 0.003495 | 14.76 | 5762.87 | 559.90 | 0.62 | |
| Reach 1 | 9498 | PF 1 | 69000.00 | 2629.20 | 2647.42 | 2647.30 |
| 2652.17 | 0.007132 | 18.37 | 4431.03 | 468.55 | 0.85 | |

| | | | | | | |
|---------|----------|-------|----------|---------|---------|---------|
| Reach 1 | 9414 | PF 1 | 69000.00 | 2629.62 | 2648.36 | 2644.69 |
| 2651.16 | 0.003606 | 13.93 | 5494.83 | 441.42 | 0.62 | |
| Reach 1 | 9391 | PF 1 | 69000.00 | 2629.56 | 2647.44 | 2645.05 |
| 2650.99 | 0.005518 | 15.37 | 4675.99 | 376.08 | 0.73 | |
| Reach 1 | 9366 | | Bridge | | | |
| Reach 1 | 9341 | PF 1 | 69000.00 | 2629.50 | 2646.71 | 2643.80 |
| 2650.00 | 0.004780 | 14.71 | 4858.69 | 379.98 | 0.68 | |
| Reach 1 | 9326 | PF 1 | 69000.00 | 2629.10 | 2647.09 | 2643.75 |
| 2649.74 | 0.004023 | 13.48 | 5709.26 | 582.26 | 0.63 | |
| Reach 1 | 9224 | PF 1 | 69000.00 | 2627.70 | 2646.67 | 2643.42 |
| 2649.33 | 0.004122 | 13.38 | 5732.32 | 647.58 | 0.63 | |
| Reach 1 | 9122 | PF 1 | 69000.00 | 2625.79 | 2646.69 | 2641.72 |
| 2648.83 | 0.002814 | 12.04 | 6573.96 | 814.51 | 0.53 | |
| Reach 1 | 9020 | PF 1 | 69000.00 | 2625.50 | 2645.67 | 2642.91 |
| 2648.41 | 0.004527 | 13.59 | 5692.51 | 741.03 | 0.66 | |
| Reach 1 | 8792 | PF 1 | 69000.00 | 2624.80 | 2645.20 | 2642.34 |
| 2647.29 | 0.003657 | 12.65 | 6921.02 | 929.59 | 0.60 | |

| 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) | |
| Reach 1 | 12095 | PF 1 | 69000.00 | 2646.04 | 2660.99 | 2660.58 | 2663.56 | 0.006192 | 16.25 | 6184.10 | 906.07 | 0.79 |
| Reach 1 | 11480 | PF 1 | 69000.00 | 2640.63 | 2659.18 | | 2660.83 | 0.002789 | 12.39 | 7535.96 | 842.66 | 0.55 |
| Reach 1 | 10865 | PF 1 | 69000.00 | 2637.50 | 2655.01 | 2654.25 | 2658.24 | 0.006021 | 16.38 | 5383.52 | 683.94 | 0.77 |
| Reach 1 | 10606 | PF 1 | 69000.00 | 2635.56 | 2654.46 | 2652.34 | 2656.67 | 0.004049 | 13.81 | 6077.71 | 602.36 | 0.63 |
| Reach 1 | 10406 | PF 1 | 69000.00 | 2633.00 | 2653.92 | 2651.19 | 2655.82 | 0.003557 | 13.56 | 8087.16 | 1490.12 | 0.60 |
| Reach 1 | 10207 | PF 1 | 69000.00 | 2631.05 | 2653.92 | 2650.88 | 2655.11 | 0.001825 | 10.78 | 9706.69 | 1310.78 | 0.44 |
| Reach 1 | 10006 | PF 1 | 69000.00 | 2630.15 | 2653.42 | 2650.17 | 2654.75 | 0.001645 | 11.29 | 9261.13 | 1152.12 | 0.44 |
| Reach 1 | 9806 | PF 1 | 69000.00 | 2629.41 | 2650.44 | 2650.44 | 2653.99 | 0.004683 | 17.03 | 5562.70 | 733.88 | 0.70 |
| Reach 1 | 9606 | PF 1 | 69000.00 | 2629.43 | 2650.05 | 2647.62 | 2652.88 | 0.003495 | 14.76 | 5762.87 | 559.90 | 0.62 |
| Reach 1 | 9498 | PF 1 | 69000.00 | 2629.20 | 2647.42 | 2647.30 | 2652.17 | 0.007132 | 18.37 | 4431.03 | 468.55 | 0.85 |
| Reach 1 | 9414 | PF 1 | 69000.00 | 2629.62 | 2648.36 | 2644.69 | 2651.16 | 0.003606 | 13.93 | 5494.83 | 441.42 | 0.62 |
| Reach 1 | 9391 | PF 1 | 69000.00 | 2629.56 | 2647.44 | 2645.05 | 2650.99 | 0.005518 | 15.37 | 4675.99 | 376.08 | 0.73 |
| Reach 1 | 9366 | | Bridge | | | | | | | | | |
| Reach 1 | 9341 | PF 1 | 69000.00 | 2629.50 | 2646.71 | 2643.80 | 2650.00 | 0.004780 | 14.71 | 4858.69 | 379.98 | 0.68 |
| Reach 1 | 9326 | PF 1 | 69000.00 | 2629.10 | 2647.09 | 2643.75 | 2649.74 | 0.004023 | 13.48 | 5709.26 | 582.26 | 0.63 |
| Reach 1 | 9224 | PF 1 | 69000.00 | 2627.70 | 2646.67 | 2643.42 | 2649.33 | 0.004122 | 13.38 | 5732.32 | 647.58 | 0.63 |
| Reach 1 | 9122 | PF 1 | 69000.00 | 2625.79 | 2646.69 | 2641.72 | 2648.83 | 0.002814 | 12.04 | 6573.96 | 814.51 | 0.53 |
| Reach 1 | 9020 | PF 1 | 69000.00 | 2625.50 | 2645.67 | 2642.91 | 2648.41 | 0.004527 | 13.59 | 5692.51 | 741.03 | 0.66 |
| Reach 1 | 8792 | PF 1 | 69000.00 | 2624.80 | 2645.20 | 2642.34 | 2647.29 | 0.003657 | 12.65 | 6921.02 | 929.59 | 0.60 |

Kern River Reach 1

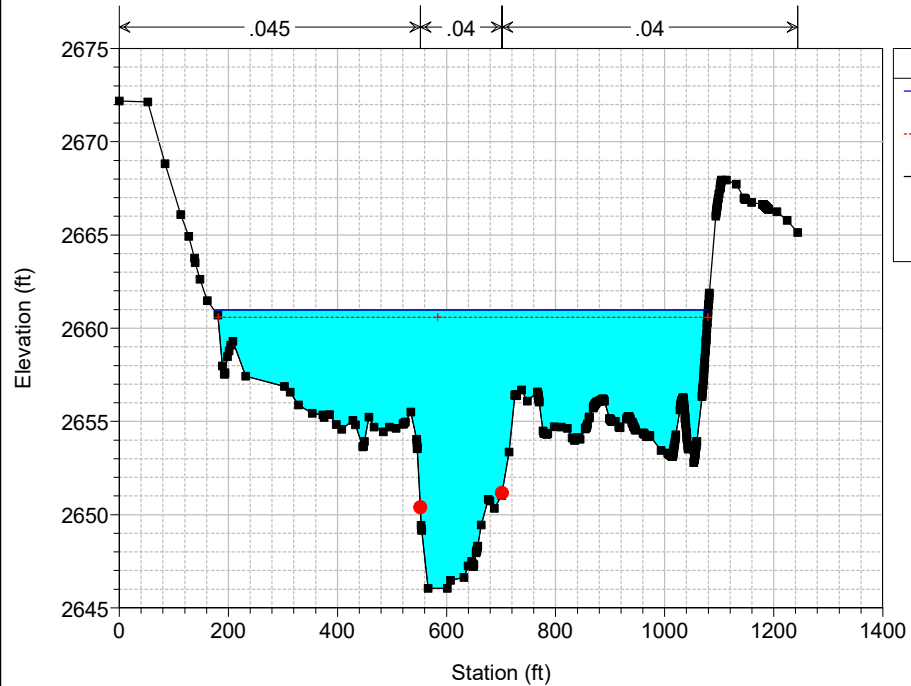


| Legend | |
|------------------------|---|
| WS PF 1 - ECM - Q100 | ▲ |
| WS PF 1 - PCM - Q100 | ▲ |
| Crit PF 1 - ECM - Q100 | ▲ |
| Crit PF 1 - PCM - Q100 | ▲ |
| Ground | ■ |

Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

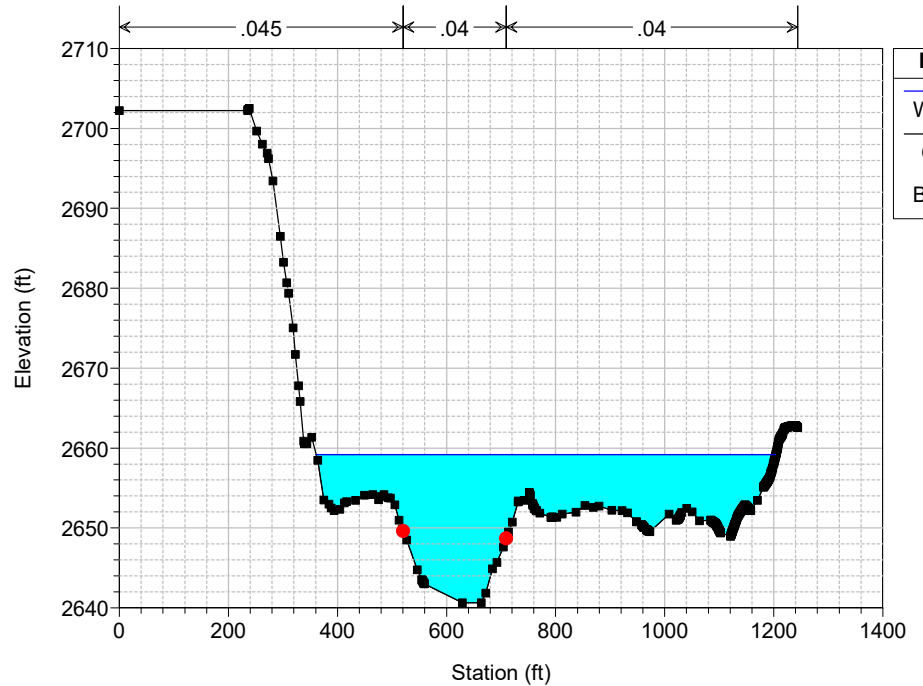
RS = 12095 FIS XS M



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

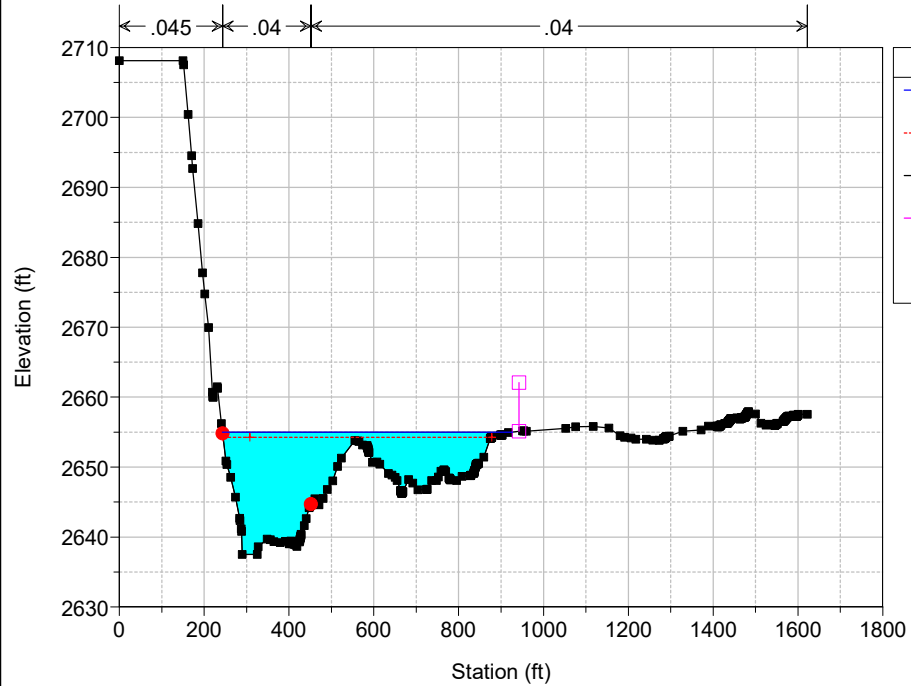
RS = 11480



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

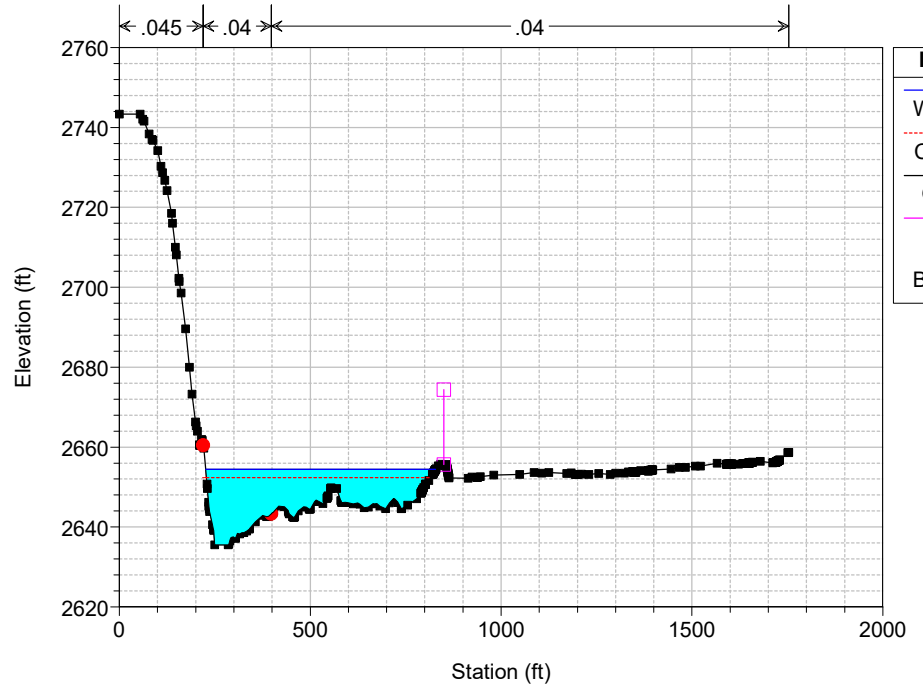
RS = 10865 FIS XS L



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

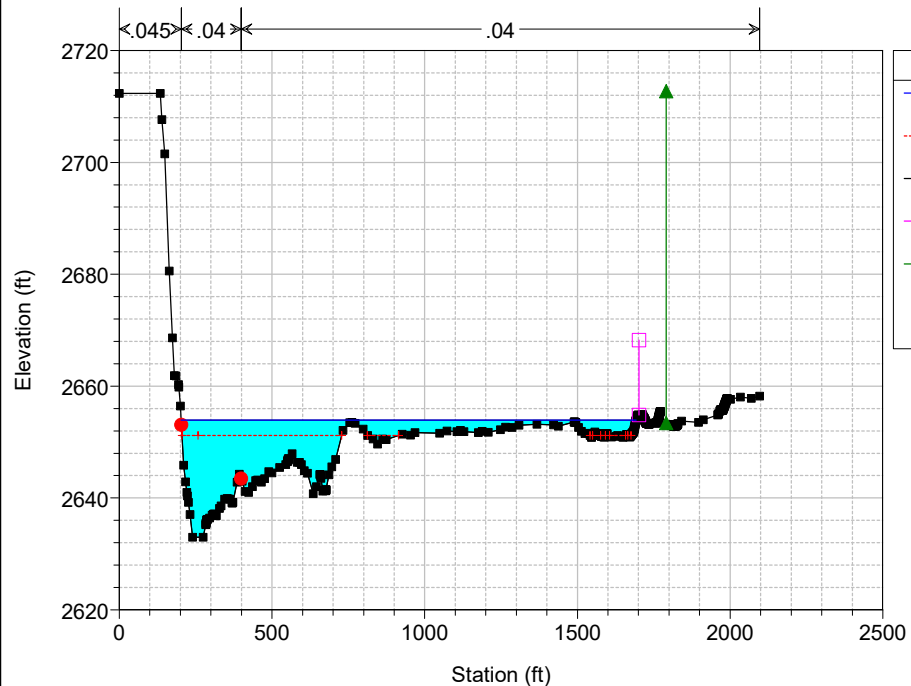
RS = 10606



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

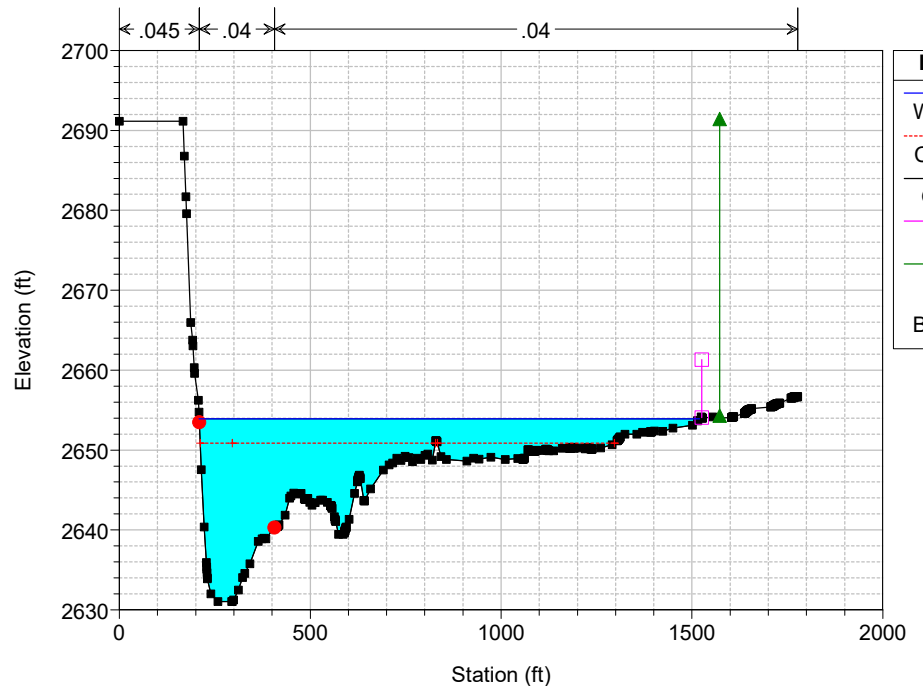
RS = 10406



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

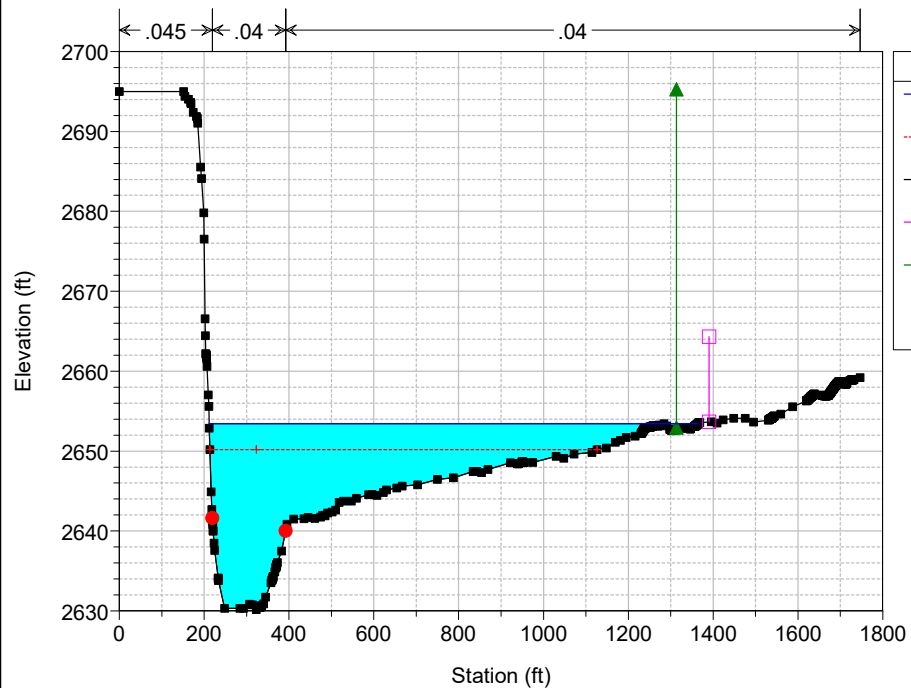
RS = 10207



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

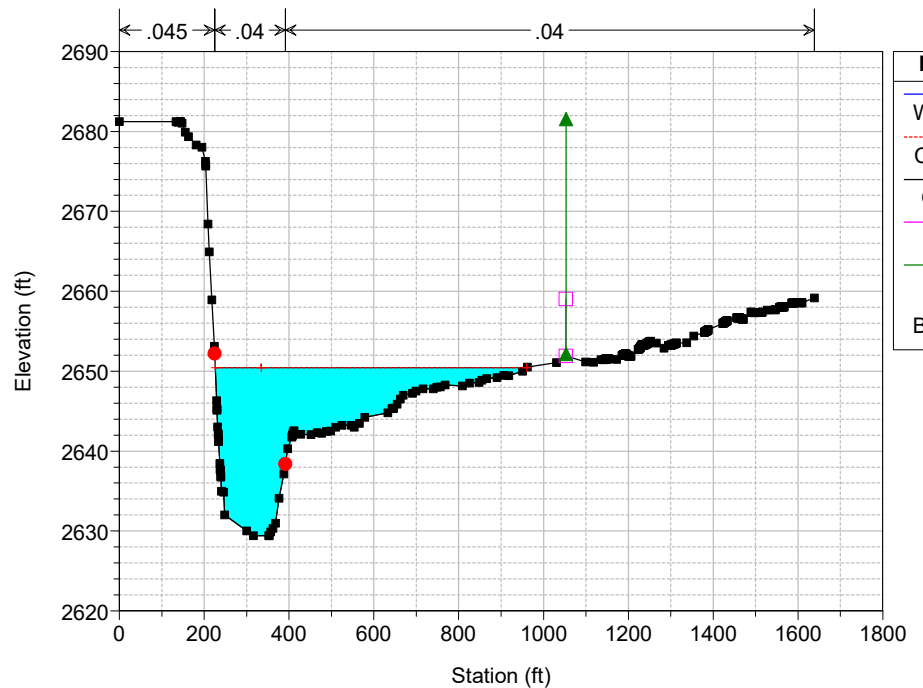
RS = 10006



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

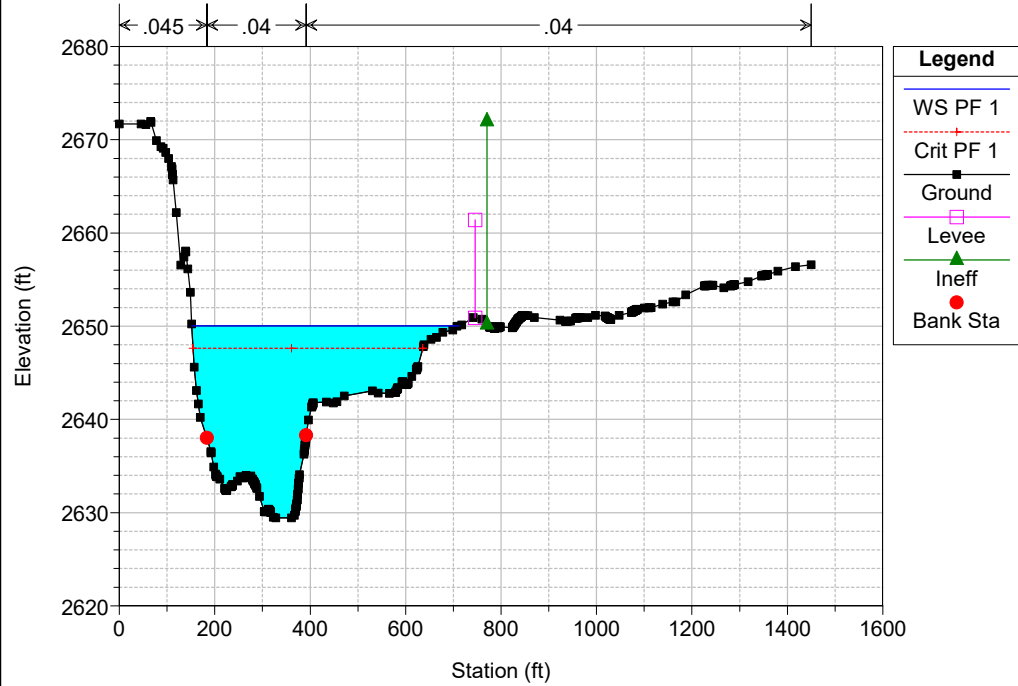
RS = 9806



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

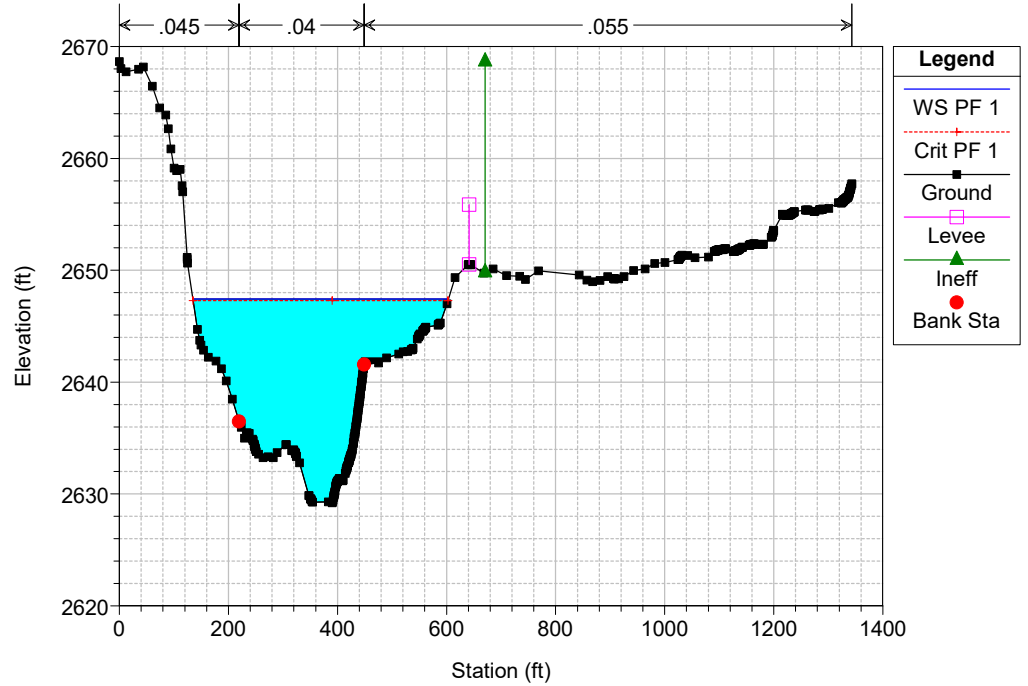
RS = 9606



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

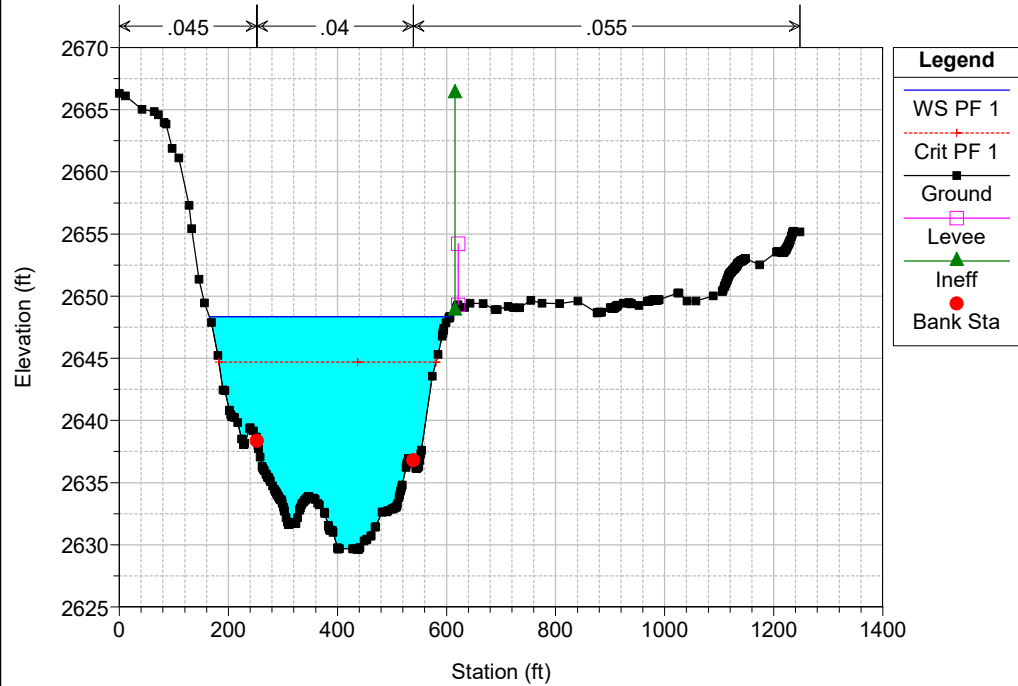
RS = 9498



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

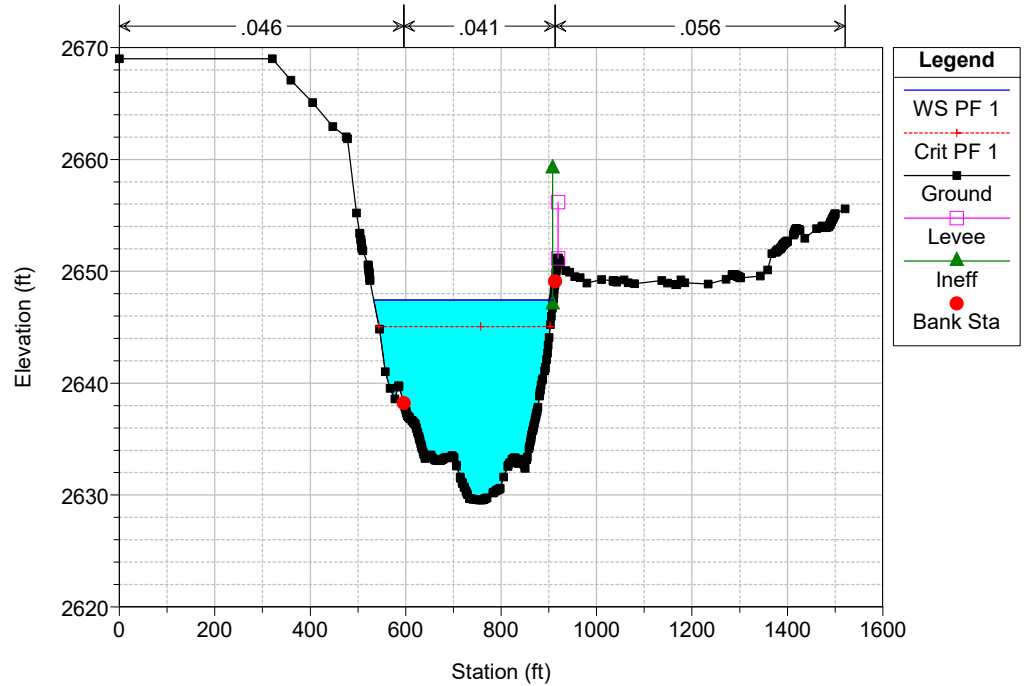
RS = 9414



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

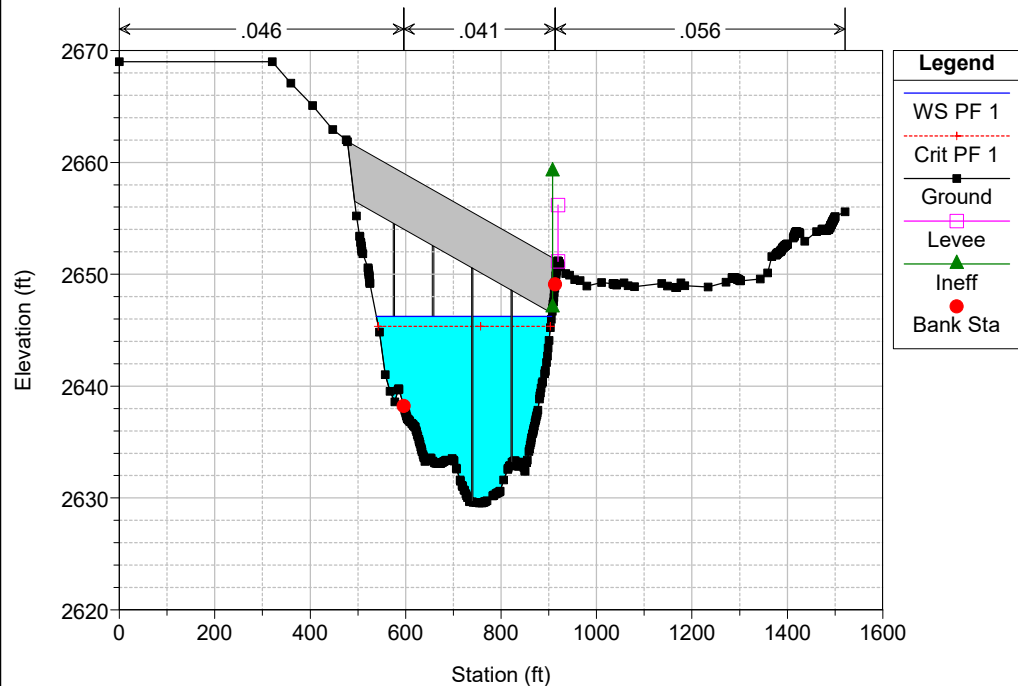
RS = 9391 FIS XS K



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

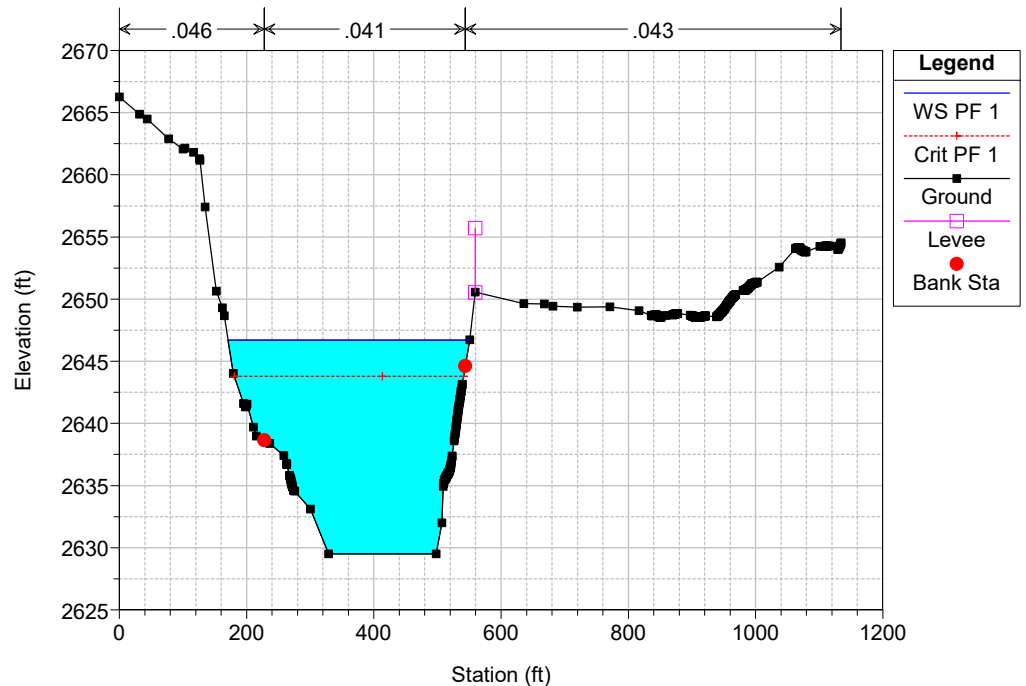
RS = 9366 BR



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

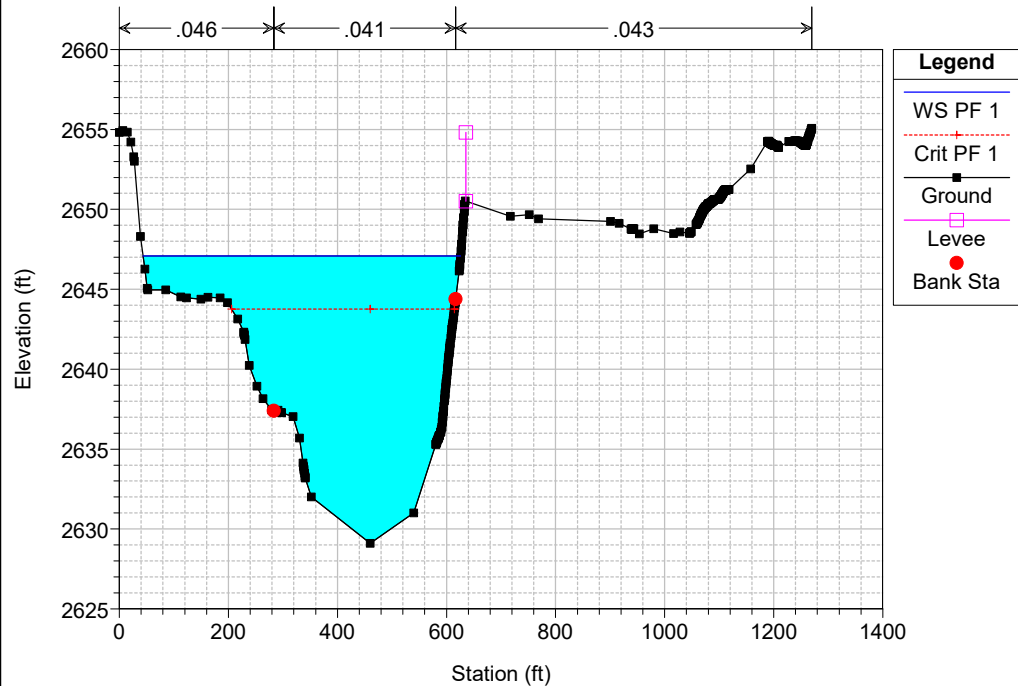
RS = 9341 HEC-2 XS 125



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

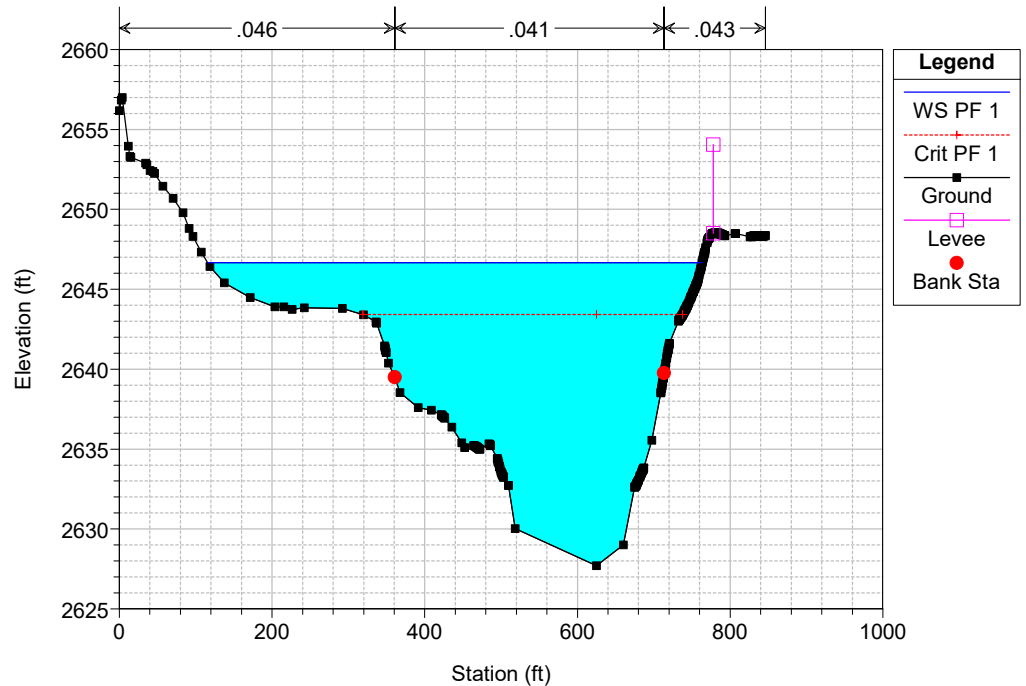
RS = 9326 HEC-2 XS 1



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

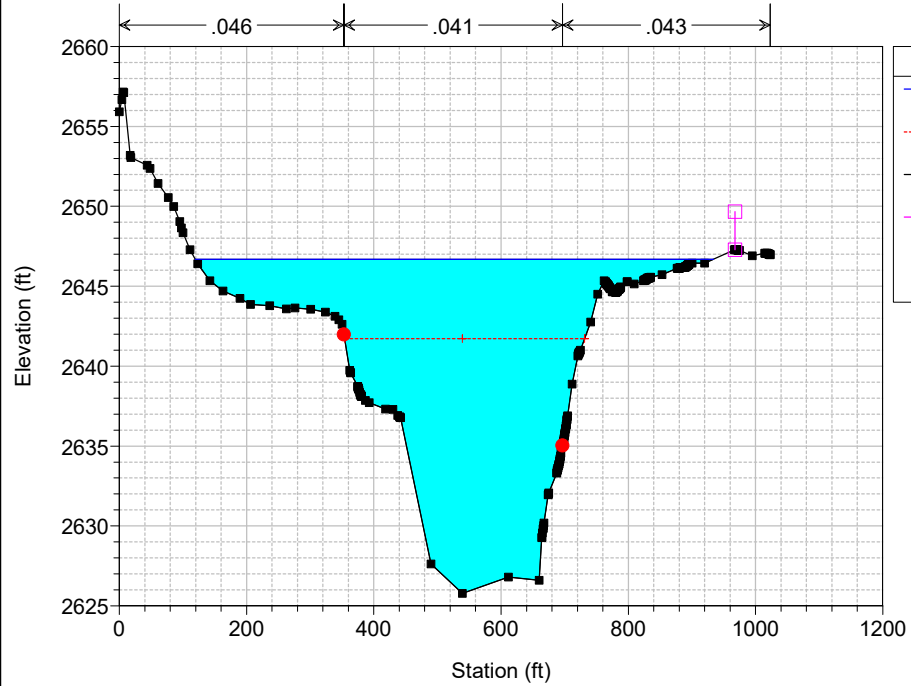
RS = 9224 HEC-2 XS 2



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

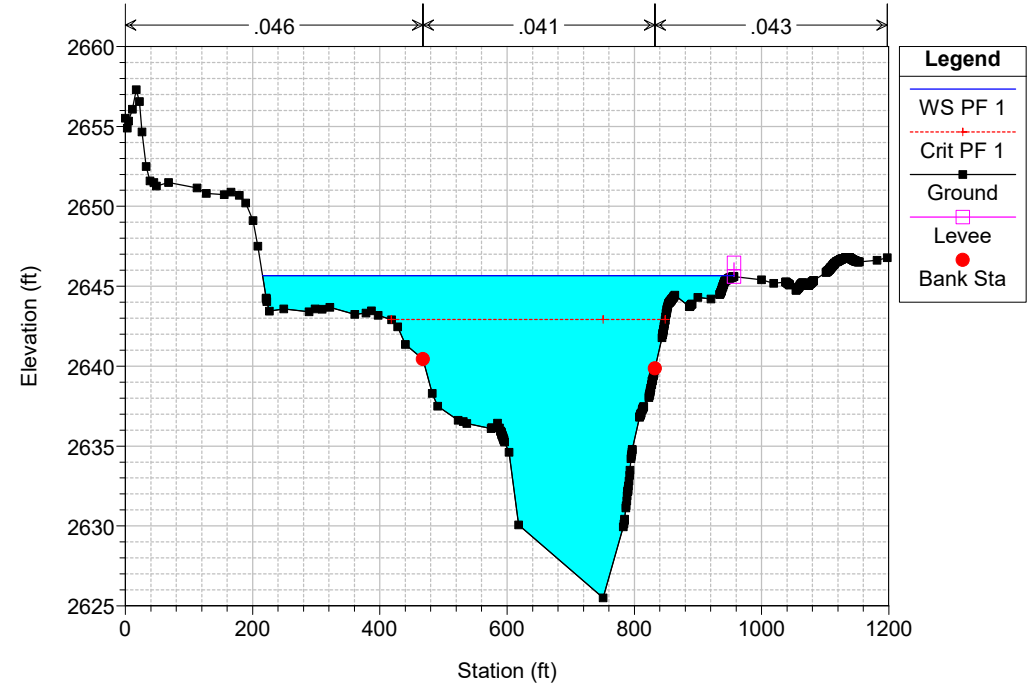
RS = 9122 HEC-2 XS 3



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

RS = 9020 HEC-2 XS 4



Kern River Plan: PCM - Q100 3/21/2024

Geom: PCM Flow: Q100

RS = 8792 HEC-2 XS 5 (FIS J)

