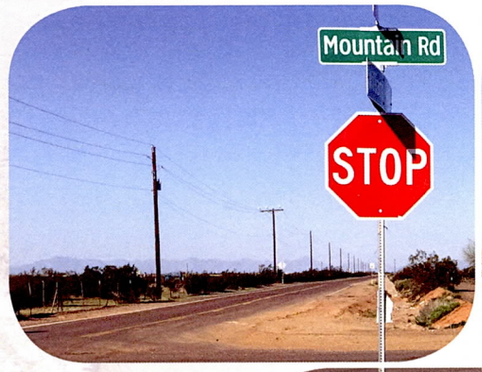
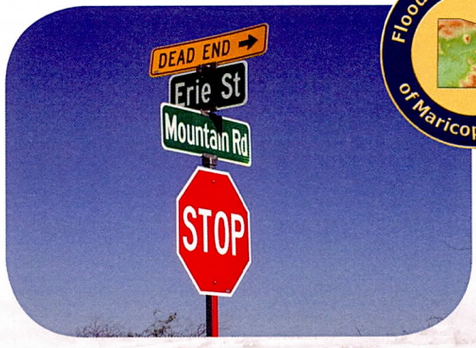


FINAL REPORT

TASK ASSIGNMENT #3 FCD2014C001

MOUNTAIN ROAD & ERIE STREET DRAINAGE IMPROVEMENTS DESIGN CONCEPT REPORT



PREPARED FOR **FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**
AND THE **MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION**

JUNE 2015 » PREPARED BY Kimley»Horn

Kimley»Horn

FINAL

Mountain Road/Erie Street Drainage Improvements Design Concept Report

Contract FCD 2014C001 – Assignment No. 3
PCN A442.03.20

Prepared for:

Flood Control District of Maricopa County
2801 W. Durango
Phoenix, Arizona 85009

Maricopa County Department of Transportation
2901 W. Durango
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Prepared by:

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June 2015
KHA Project #091131026

Exp 9/30/17

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EXECUTIVE SUMMARY

The purpose of the Mountain Road/Erie Street Drainage Improvements Design Concept Report (DCR) is to define a recommended drainage system to mitigate the flooding along Mountain Road from Williams Field Road to Ivanhoe Street, and along Erie Street from Mountain Road to the Meridian Road alignment. The project is located in unincorporated Maricopa County, Arizona.

Three main project components were considered as alternatives:

1. A proposed detention basin north of the east end of Erie Street to capture and attenuate flows from the northeast and discharge into the existing channel north of Erie Street.
2. A channel on the west side of Mountain Road to convey flows from Erie Street south to the existing channel on the northeast corner of Mountain and Williams Field Roads.
3. A channel on the east side of Mountain Road to convey flows from Erie Street south to the existing channel on the northeast corner of Mountain and Williams Field Roads.

A hydrologic analysis was conducted for the proposed Erie Street basin, which was a common component to the two Mountain Road channel alternatives. A hydraulic analysis was conducted for the two channel alternatives, known as Mountain Road West and Mountain Road East, to determine the size and cost of each alternative. Preliminary opinions of probable cost were developed for each alternative to assist in the alternatives evaluation.

The alternatives were presented to the Flood Control District of Maricopa County and the Maricopa County Department of Transportation (MCDOT) at a meeting held April 13, 2015. It was noted that even with attenuation from the proposed detention basin, the existing Erie Street channel did not have sufficient capacity for the 25-year flood. The Flood Control District of Maricopa County and MCDOT evaluated the alternatives using the following criteria:

- Level of protection
- Construction cost
- Right-of-way acquisition cost
- Maintenance and life cycle costs

Based on a comparison of the three components, the Mountain East channel was selected to go forward as the Recommended Alternative for the DCR Drainage System. Due to relatively high cost and low benefit, MCDOT decided to not carry the detention basin component forward in the DCR process. Further refinements were made to the hydrologic and hydraulic analysis of this alternative and a revised opinion of probable cost was developed. Conceptual design plans (15% level) were prepared for the Recommended Alternative. These concept plans identify the sizes, slopes, profiles, alignments, and cross sections of the proposed channel associated with the Recommended Alternative.

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LIST OF APPENDICES

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1 INTRODUCTION

The objective of the Mountain Road/Erie Street Channel and Basin Design Concept Report (DCR) is to define a recommended drainage system to mitigate the flooding along Mountain Road from Williams Field Road to Ivanhoe Street, and along Erie Street from Mountain Road to the Meridian Road alignment. The project is located in unincorporated Maricopa County, Arizona. Kimley-Horn has been retained to perform these services as part of Flood Control District of Maricopa County (District) On-Call Contract FCD 2014C001-3. The Maricopa County Department of Transportation (MCDOT) is a stakeholder on this project and has provided input and feedback on the alternatives development.

The Mountain Road and Erie Street corridors are subject to frequent flooding and road closures. This project will define a recommended drainage system to mitigate the flooding along these corridors.

2 PROJECT AND DESIGN CRITERIA

The alternatives for this project were developed for the existing conditions 25-year, 6-hour storm event. The following constraints were also used in the alternative development and evaluation:

- Minimize the size of the channel through the selection of the most hydraulically efficient materials and cross section
- Do not exceed the capacity of the Erie Street Channel, with the consideration of hydrologic timing of peak flows
- Improvements to the Erie Street Channel are not included as part of this project

The following design manuals, policies, and procedures were followed in the development of the alternatives:

- Drainage Policy and Standards Manual for Maricopa County, Arizona (2007)
- Drainage Design Manual for Maricopa County Volume I Hydrology (2013)
- Drainage Design Manual for Maricopa County Volume II Hydraulics (2013)
- Drainage Design Manual for Maricopa County Volume III Erosion Control (2013)

3 HYDROLOGY

This section includes hydrology for the proposed detention basin, which was a common component to the two channel alternatives. Discussion of the modifications to the hydrology that were completed for the Recommended Alternative is included in Section 6.1.

The existing conditions 100-year, 6-hour HEC-1 model that was developed by the District as part of the EMADMPU was modified to create a model for the 25-year, 6-hour storm, which was then used to evaluate the alternatives. Areas outside of the Mountain Road/Erie

Street DCR study area were removed from the EMADMPU model. This generally includes areas north of Galveston Street, south of Williams Field Road, and west of Mountain Road. The model was also modified to provide storage routing for the proposed Erie Basin, and several existing subbasins were subdivided to remove areas not contributing to this study area.

Stage-storage-discharge rating tables were developed for the basin assuming a 0.1% sloped bottom and 4:1 side slopes. The average-end area method was used to determine the volume. The stage-discharge rating curves were obtained by modeling the outlet pipes in HY-8. The basin was designed with no freeboard to maximize detention capacity.

This modified hydrology model was used to evaluate the feasibility of the proposed basin and the two channel alternatives. Changes were limited to parameters that were significantly relevant to the performance of the basin and channel alternatives. See **Appendix A** for the HEC-1 schematic and **Appendix B** for the hydrology model.

4 HYDRAULICS

This section includes a discussion of the hydraulics for the existing Erie Street Channel and the two proposed Mountain Road channel alternatives. Discussion of the modifications to the hydraulics that were completed for the Recommended Alternative is included in Section 6.2. Cross section geometry was taken from a detailed survey of the areas to the west and east of Mountain Road between Erie Street and Williams Field Road completed for this project by WHPacific, Inc. in February 2015.

Channel hydraulic calculations for the existing Erie Street Channel were completed in HEC-RAS. Manning's n-values were obtained from Table 7.6 of the District's 2013 Drainage Design Manual – Hydraulics (Hydraulics Manual). Based on the hydraulic analysis, it was determined that the Erie Street Channel does not have sufficient capacity to convey attenuated flows from the detention basin without overtopping. The limiting reach of the channel conveys approximately 15 cfs before spilling onto Erie Street and about 21 cfs before overtopping the south edge of pavement.

Channel hydraulic calculations for the two Mountain Road channel alternatives were also completed in HEC-RAS. Channel slopes were approximated by the existing downstream and upstream elevations. Manning's n-values were obtained from Table 7.6 of the District's Hydraulics Manual. Two different channel types were used. A concrete channel was used for the entire reach of the Mountain Road West alternative due to limited availability of right-of-way. The Mountain Road East alternative is an earthen channel for the upper 900 feet. A concrete channel is used for the lower reach because of hydraulic limitations with the Mountain Road culvert crossing just north of Williams Field Road. With one exception, both the west and east channels were configured to maintain an average of approximately 0.5 feet of freeboard. The lower, concrete reach of the east channel was configured with little to no freeboard because of downstream backwater constraints from the Mountain Road culvert. The Mountain Road culvert was modeled using HY-8, and the calculated

headwater was subsequently used as the downstream boundary condition for the Mountain Road East channel. Hydraulic calculations are included in **Appendix C**.

5 ALTERNATIVE ANALYSIS

Three main components were used to formulate alternatives as possible solutions to the flooding issues in the Mountain Road and Erie Street corridors.

1. A detention basin north of the east end of Erie Street to capture and attenuate flows from the northeast and discharge into the existing Erie Street channel (common to both alternatives).
2. A channel west of Mountain Road to convey flows from the Erie Street channel south to Williams Field Road and discharge to an existing channel along the north side of Williams Field Road (Mountain Road West alternative).
3. A channel east of Mountain Road to convey flows from the Erie Street channel south to Williams Field Road and discharge to an existing channel along the north side of Williams Field Road (Mountain Road East alternative).

The preliminary evaluation of each component is presented in subsequent sections. The Recommended plan evaluation is presented in **Section 6**.

5.1 Erie Street Basin

The proposed Erie Street Basin is a component that was common to both the Mountain Road West and East alternatives. See the **Alternatives Exhibit** in **Appendix A** for an overview of the alternative.

The Erie Street Basin is to be an inline detention basin located north of the east end of Erie Street. The basin ranges in depth from 3 to 4 ft and has a capacity of 17 ac-ft. The basin covers approximately 9 acres. Basin side slopes are 4:1 and the bottom slopes at 0.1%. Runoff is discharged from the Erie Street Basin through six 24-in reinforced concrete pipes to the Erie Street Channel. The basin has a 50 ft emergency spillway and channel to convey flows into the Erie Street Channel.

The existing Erie Street Channel has limited conveyance capacity. Some preliminary analysis was conducted to evaluate the feasibility of making improvements to increase the hydraulic capacity, such as lowering the channel profile and/or widening the channel. It was determined that lowering the channel profile is not feasible without removing and replacing all of the existing driveway culverts and headwalls and changing the profile, causing a utility conflict with the existing asbestos concrete (AC) water line at the NEC of Mountain and Williams Field Roads. Widening the channel would result in right-of-way impacts to adjacent property owners and would also not significantly increase hydraulic capacity without also lowering the channel profile.

5.2 Mountain Road West Alternative

See the **Alternatives Exhibit** in **Appendix A** for an overview of the Mountain Road West Alternative.

The proposed Mountain Road West channel conveys runoff from the existing Erie Street Channel south to the existing channel north of Williams Field Road. The channel would be located west of the Mountain Road alignment. The channel would connect to the existing Erie Street Channel with a culvert across Mountain Road. Five driveway culvert crossings will be needed for this channel in order to maintain private access to residences west of Mountain Road.

The proposed channel lining consists of concrete in order to minimize encroachments on existing developed properties to the west. The proposed top width for Mountain Road West channel ranges from approximately 17 to 38 feet. The additional right-of-way width to be acquired for this alternative ranges from 6 to 23 feet. The plan and profile for this channel was established to avoid a levee condition.

5.3 Mountain Road East Alternative

See the **Alternatives Exhibit** in **Appendix A** for an overview of the Mountain Road East Alternative.

The proposed Mountain Road East channel conveys runoff from the existing Erie Street Channel south to the existing channel on the north side of Williams Field Road. The channel would be located east of the Mountain Road alignment. The channel would connect to the existing channel north of Williams Field Road with culvert improvements across Mountain Road.

The upper 900 feet of the proposed channel consists of an earthen section. The lower 350 feet of the channel is concrete-lined. The proposed top width for the earthen channel is approximately 40 feet. The top width for the concrete channel ranges from approximately 35 to 50 feet. The channel alignment is set back from the existing right-of-way in order to avoid the existing AC water line and some large communication pedestals on the east side of Mountain Road. The additional right-of-way width to be acquired for this alternative ranges from approximately 75 to 97 feet. The plan and profile for this channel was established to avoid a levee condition.

5.4 Opinions of Probable Cost

Opinions of probable cost (OPC) were determined for each of the components. Construction costs were estimated for major construction items based on recent ADOT construction costs as well as typical estimates on recent projects. Right-of-way costs were determined per acre, assuming a cost per acre of $125,000. Potential utility relocations were identified based on available information. A summary of the opinions of probable cost is presented in **Table 1.** These costs were revised for the recommended alternative. A more detailed analysis is included in **Appendix E**.

Table 1. Summary of Opinions of Probable Cost for Major Alternative Components

Component	Construction Cost [$ MM]	Right-of-Way Cost [$ MM]	Potential Utility Relocation Cost [$ MM]	Total Cost [2] [$ MM]
Erie Basin [1]	0.45	1.6	0.00	2.2
Mtn West Channel	0.47	0.08	0.03	0.7
Mtn East Channel	0.18	0.26	0.00	0.5

Note:

1. *Erie Basin is common to both Mountain East and West Channel alternatives.*
2. *Total Cost includes estimated design cost, construction admin and contingency.*

As shown on the above table, the total cost for the Erie Basin, which is a common component to both the Mountain East and West Channel alternatives, is significantly higher than the costs of the other components. This is primarily due to right-of-way costs.

While the Mountain East Channel requires more right-of-way than the West Channel, the higher right-of-way costs were offset by the lower construction costs due to less concrete channel lining and fewer culvert crossings.

6 Recommended Alternative

The alternatives were presented to the District and MCDOT at a meeting held on April 13, 2015. It was noted that even with attenuation from the proposed detention basin, the existing Erie Street channel did not have sufficient capacity for the 25-year flood. The Flood Control District of Maricopa County and MCDOT evaluated the alternatives based on level of protection, construction cost, right-of-way acquisition cost and maintenance / life cycle costs.

Based on a comparison of the three components, the Mountain East channel was selected to go forward as the Recommended Alternative for the DCR Drainage System, but the detention basin component was dropped from further consideration due to relatively high cost and low benefit.

6.1 Hydrology

Once the Recommended Alternative was selected, further refinements were made to the hydrology model to remove the proposed Erie detention basin from the model. Without the detention basin in place, the 25-year peak discharge for the Mountain Road corridor is approximately 180 cfs. Based on the limited hydraulic capacity in the existing Erie Street channel, it was decided to design the Mountain East Channel for a discharge of 120 cfs. Based on a review of the hydrology results for the 10- and 25-year models, it was determined that this 120 cfs design discharge would provide a level of protection somewhere between the 10- and 25-year, 6-hour storm event. Refined hydrology model output is included in **Appendix E**.

6.2 Hydraulics

Further refinements were also made to the hydraulic analysis. The proposed Mountain Road culvert which was originally modeled in HY-8 was added to the HEC-RAS model. Other refinements included adjustments to the Manning's n-values as well as adjustments to cross sections to improve modeling the transition from the earthen channel section to the concrete channel section. The design maintained a minimum freeboard of 0.5 feet for the earthen section of the channel and little to no freeboard for the concrete section. Refined hydraulic calculations are included in **Appendix E**.

6.3 Mountain Road East Channel

See the Concept Plans in **Appendix F** for the Mountain Road East Recommended Alternative.

The proposed Mountain Road East channel conveys runoff from the existing Erie Street Channel south to the existing channel on the north side of Williams Field Road. The channel is located east of the Mountain Road alignment. The channel connects to the existing channel north of Williams Field Road with culvert improvements across Mountain Road.

The upper reach of the proposed channel is an earthen section. The lower reach of the channel is concrete-lined. The channel alignment is set back from the existing right-of-way in order to avoid the existing AC water line and some large communication pedestals on the east side of Mountain Road. The additional right-of-way width to be acquired for the channel ranges from approximately 95 to 97 feet.

6.4 Opinion of Probable Cost

A revised OPC was prepared for the Recommended Alternative based on the refinements and modifications discussed. Widening the upper portion of the channel to convey the design flow of 120 cfs with 0.5 ft of freeboard had the biggest impact on the revised OPC costs. Right-of-way costs were determined per acre, assuming a cost per acre of $125,000 with an additional allowance for miscellaneous damages. A summary of the revised OPC is provided in **Table 2** and a detailed OPC is included at the end of **Appendix E**.

Table 2. Summary of Recommended Alternative Opinion of Probable Cost

Construction Cost [$ MM]	Right-of-Way Cost [$ MM]	Potential Utility Relocation Cost [$ MM]	Total Cost [$ MM]
0.24	0.57	0.0	0.9

7 SUMMARY

1. The Recommended Alternative consists of a proposed channel east of Mountain Road which provides mitigation to flooding along Mountain Road from Williams Field Road to Erie Street. The proposed channel will discharge into an existing channel north of Williams Field Road and will require improvements to the existing culvert crossing Mountain Road.
2. The Mountain Road East Channel was configured with a design of flow of 120 cfs. This protection is estimated to be for an event between the 10- and 25-year, 6-hour storm events.
3. The upper reach of the Mountain Road East Channel is an earthen section, and the lower reach is a concrete section. The concrete section was used because of hydraulic limitations caused by the backwater of the downstream culvert crossing Mountain Road.
4. The Mountain Road East Channel was designed with a minimum of 0.5 feet of freeboard for the earthen section and little to no freeboard for the concrete section.
5. MCDOT decided not to carry the detention basin component forward in the DCR process.
6. The opinion of probable cost for the Recommended Alternative is $0.9M. This cost includes construction, utility relocation, right-of-way, design, and contingency costs.

8 REFERENCES

Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County Volume I Hydrology*, August 2013.

Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County Volume II Hydraulics*, August 2013.

Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County Volume III Erosion Control*, August 2013.

Flood Control District of Maricopa County, *Drainage Policy and Standards Manual for Maricopa County*, January 2007.

Flood Control District of Maricopa County, East Mesa Area Drainage Master Plan Update – Hydrologic Analysis, August 2011.

Maricopa County Department of Transportation, *Drainage Report, Erie Street Drainage Improvements, Final Design*, prepared by Ritoch-Powell & Associates, June 2012.

Maricopa County Department of Transportation, *Drainage Report for Erie Street Drainage Improvements*, prepared by Prestige, June 2008.

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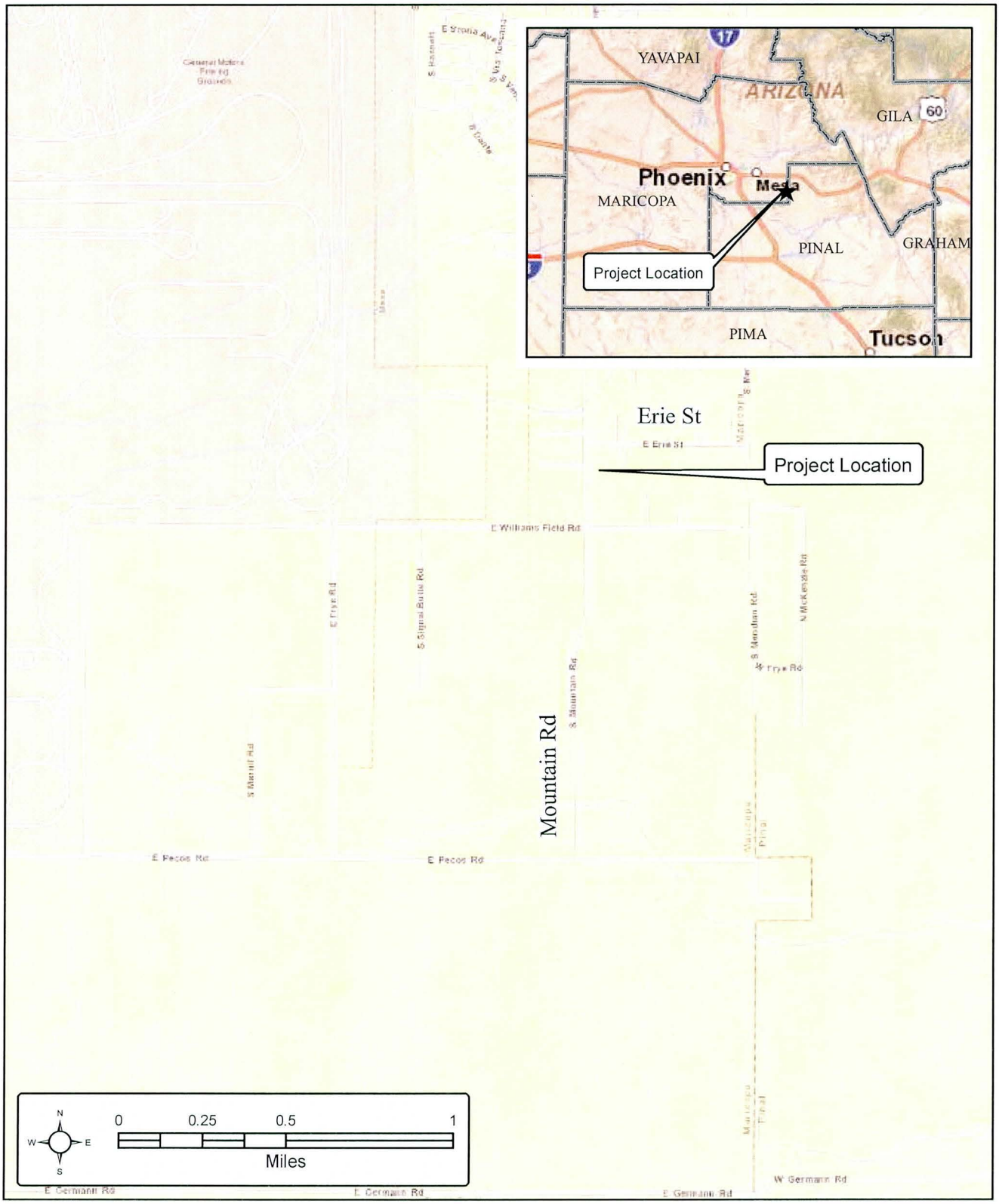
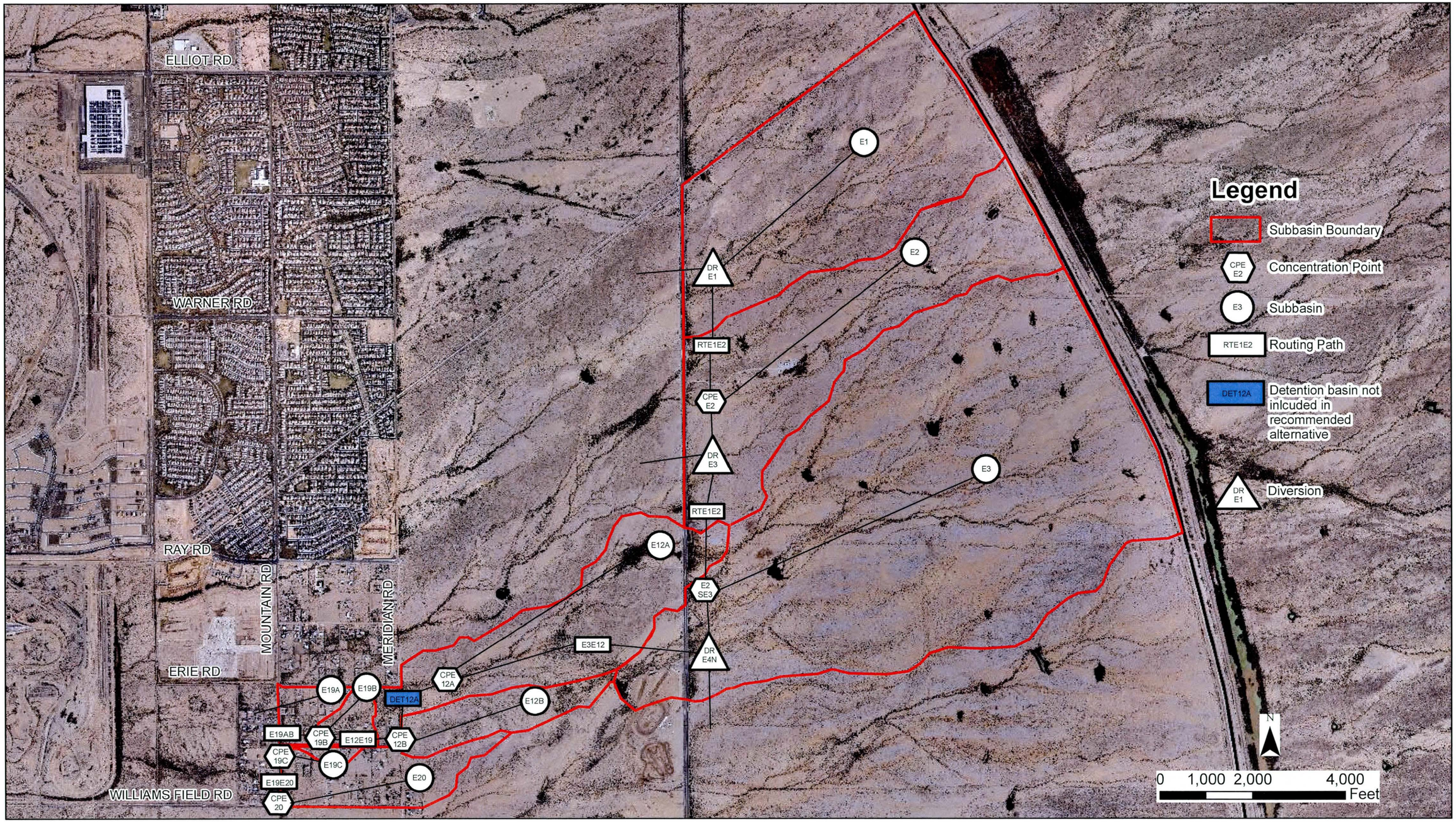
Appendix A. Exhibits

Location Map
HEC-1 Schematic
Alternatives Exhibit
Recommended Alternative



Kimley»Horn	Mountain Rd/Erie St Drainage Improvements Design Concept Report	Maricopa County, Arizona
	Location Map	



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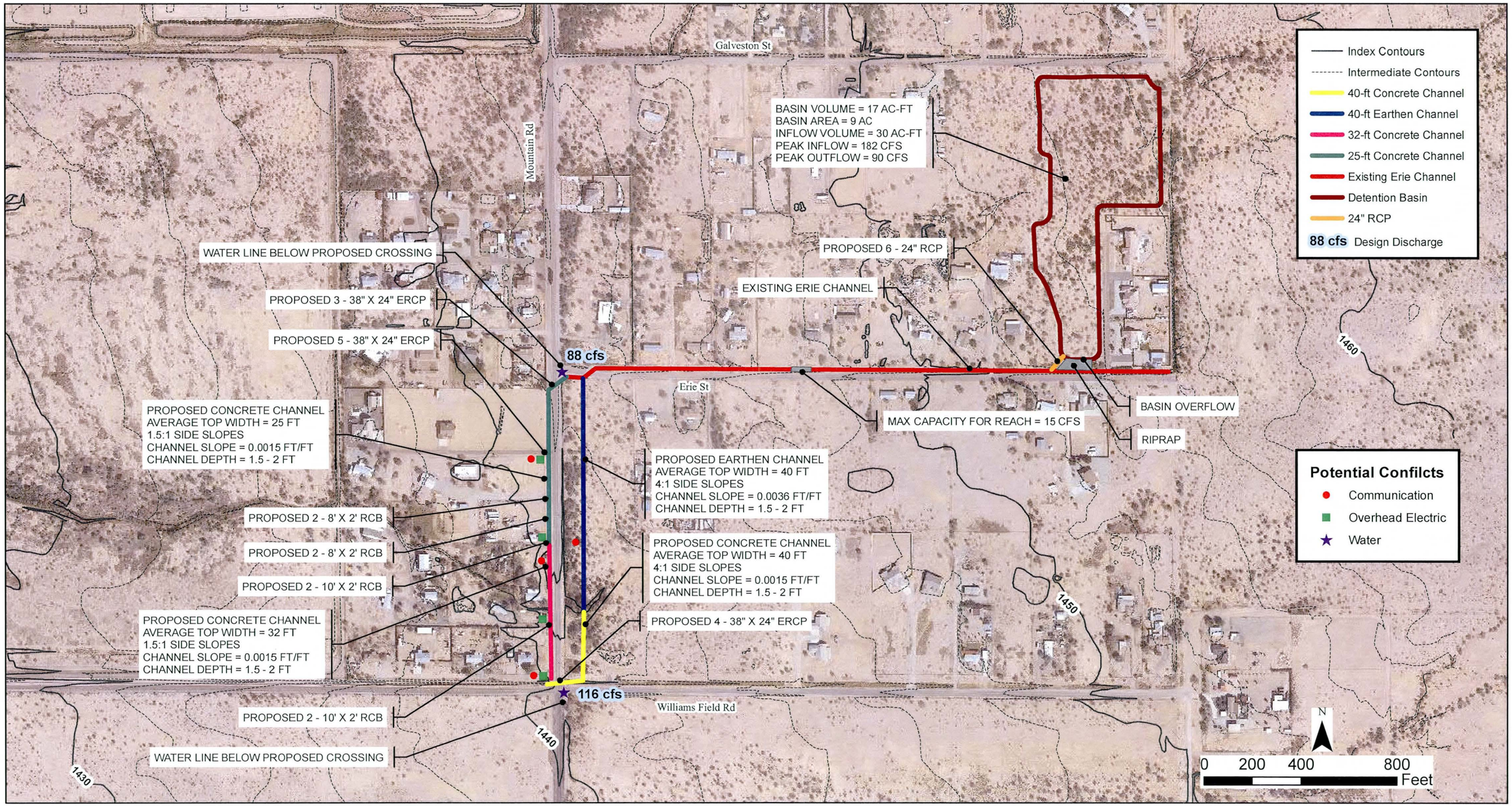
Flood Control District of Maricopa County

MOUNTAIN RD/ERIE ST CHANNEL IMPROVEMENTS DESIGN CONCEPT REPORT	Maricopa County
HEC-1 SCHEMATIC DCR DRAINAGE SYSTEM	



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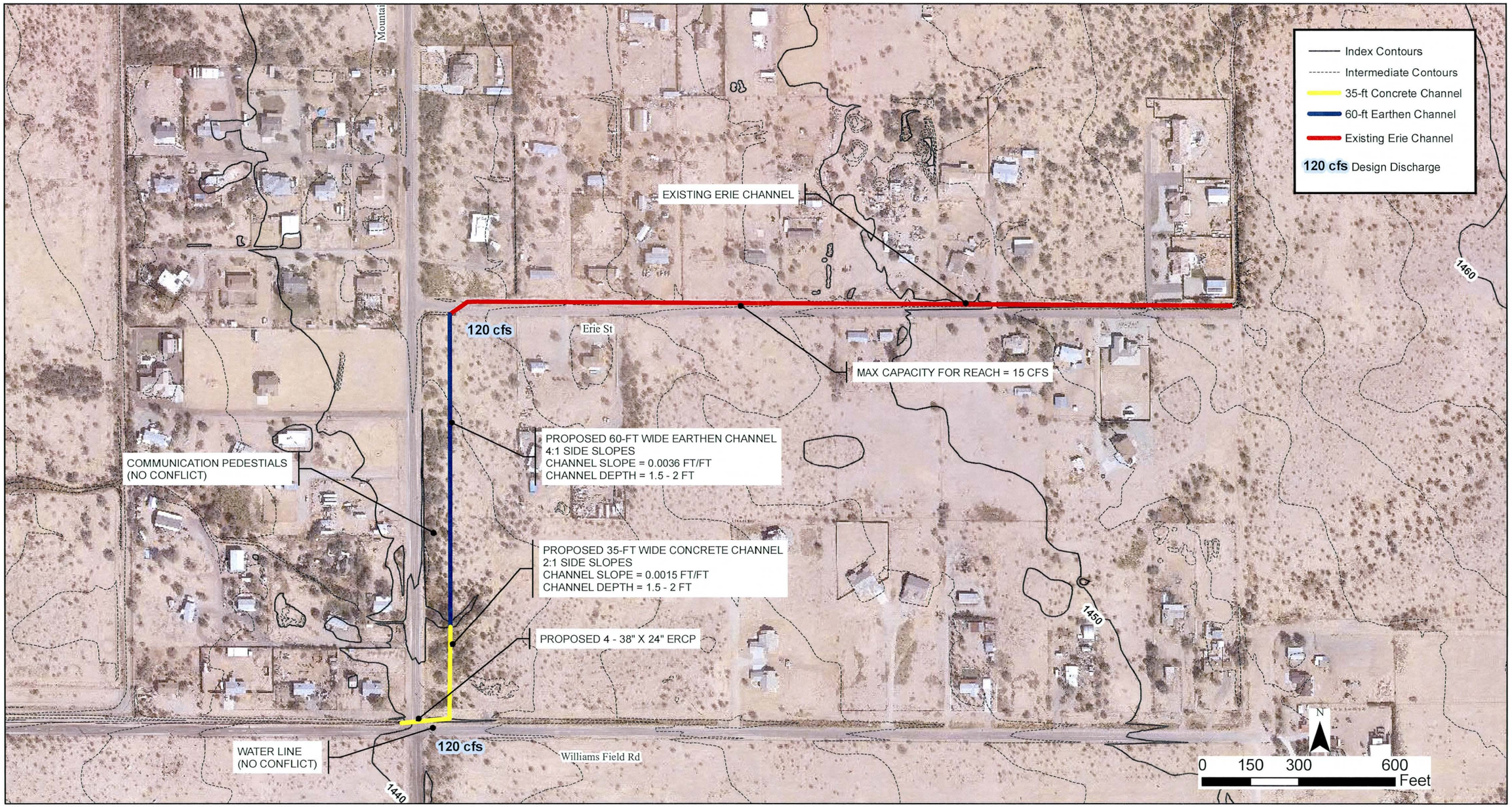
Flood Control District of Maricopa County

Mountain Rd/Erie St Drainage Improvements
Design Concept Report

Flood Control District of Maricopa County
City of Mesa

Alternatives



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Flood Control District of Maricopa County

Mountain Rd/Erie St Channel Improvements **Design Concept Report**	**Flood Control District of Maricopa County** **City of Mesa**
Recommended Alternative	

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Appendix B. Alternatives Hydrology

HEC-1 Model Output
Stage-storage-discharge table

```
1*****************************************
*                                       *
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*            VERSION 4.1                *
*                                       *
*  RUN DATE   03JUN15  TIME  16:58:20   *
*                                       *
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
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X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1         ID    Mountain and Erie Channel and Basin Design Concept Report
    2         ID    DCR System Model
    3         ID    Existing Conditions with Recommended Alternative
    4         ID
    5         ID    Prepared for Flood Control District of Maricopa County (District)
    6         ID    District Project Number FCD 2014C001
    7         ID
    8         ID    Prepared by Kimley-Horn and Associates, Inc
    9         ID    Kimley-Horn Project Number 091131026-3
   10         ID    June 2015
   11         ID
   12         ID    Model based on the East Mesa Area Drainage Master Plan Update (EMADPU)
   13         ID    existing conditions model prepared by the District.
   14         ID    The model was revised to include only those areas contributing to
   15         ID    Erie Channel and the Mountain Road proposed channels.
   16         ID
   17         ID    List of Changes:
   18         ID    - Changed precipitation data to create model for 25-yr, 6-hour storm.
   19         ID    - Subbasin E12 was subdivided into Subbasins E12A and E12B because it
   20         ID      was determined portions of the subbasin flow west and south,
   21         ID      respectively.
   22         ID    - Area was taken from Subbasin E19 and added to Subbasin E12A to
   23         ID      reflect the location of the proposed detention basin.
   24         ID    - This model includes a proposed detention basin below Subbasin E12.
   25         ID    - Subbasin E19 was subdivided into Subbasins E19A, E19B, and E19C to
   26         ID      reflect portions of the subbasin either crossing Mountain Road or
   27         ID      staying south of Erie Street.
   28         ID    - Routing reach E12E19 was revised and E19AB was added to account for
   29         ID      different inflow points into the Erie St Channel.
   30         ID    - Routing reache E19E20 was added to model the proposed channel
   31         ID      alternatives east or west of Mountain Road.
   32         ID
   33         ID
   34         ID
   35         ID        Flood Control District of Maricopa County
   36         ID        MNTERIE_25YR_6HR
   37         ID        25 YEAR
   38         ID        6 Hour  Storm
   39         ID        Unit Hydrograph: S-Graph
   40         ID        Storm: Multiple
   41         ID        06/03/2015
              *DIAGRAM
   42         IT       5  1JAN99       0    2000
   43         IO       5
   44         IN      15
              *
              *  PRECIPITATION DATA CHANGED TO MODEL 25-YEAR, 6-HOUR STORM
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   46         PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
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1 HEC-1 INPUT PAGE 2

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 61          KK      E1   BASIN
 62          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 63          BA   0.886
 64          LG    0.35    0.35    3.99    0.47       0
 65          UI       0      55      55     115     203     259     301     338     392     455
 66          UI     596     700     574     488     430     369     320     273     228     162
 67          UI      96      92      88      55      55      34      17      17      17      17
 68          UI      17      17      17       0       0       0       0       0       0       0
 69          UI       0       0       0       0       0       0       0       0       0       0
             *
 70          KK    DE1S  DIVERT
 71          KM   FLOW DIVERTED FROM E1 TO E2. NO CHANGE FROM FCD 2011 EXIST MODEL
 72          DT    DRE2      0.0     0.0
 73          DI     0.0    88.0   176.0   264.0   352.0   440.0   528.0     0.0     0.0     0.0
 74          DQ     0.0    58.0   126.0   201.0   277.0   355.0   434.0     0.0     0.0     0.0
             *
 75          KM

 76          KK    DE1SRETRIEVE
 77          KM   FLOW RETRIEVED FROM DE1S DIVERT. NO CHANGE FROM FCD 2011 EXIST MODEL
 78          DR    DRE2
             *
 79          KK  RTE1E2   ROUTE
 80          KM   NO CHANGE FROM FCD 2011 EXISTING MODEL
 81          RS       1    FLOW
 82          RC   0.035   0.030   0.025    4100  0.0035    6.00
 83          RX    0.00  100.00  700.00 1050.00 1090.00 1110.00 1140.00 1240.00
 84          RY    6.00    6.00    4.00    1.00    1.00    5.00    6.00    6.00
             *
 85          KK      E2   BASIN
 86          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 87          BA   0.779
 88          LG    0.35    0.35    4.22    0.41       0
 89          UI       0      45      45      77     159     202     234     263     298     342
 90          UI     412     536     556     456     394     352     304     267     228     196
 91          UI     145      95      78      74      58      45      45      19      14      14
 92          UI      14      14      14      14      14       0       0       0       0       0
 93          UI       0       0       0       0       0       0       0       0       0       0
             *
1                                        HEC-1 INPUT                                        PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 94          KK    CPE2 COMBINE
 95          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 96          HC       2    1.67
             *
 97          KK    DE2S  DIVERT
 98          KM    FLOW DIVERTED FROM E2 TO E3. NO CHANGE FROM FCD 2011 EXIST MODEL
 99          DT    DRE3      0.0     0.0
100          DI     0.0   135.0   279.0   431.0   583.0   738.0   894.0     0.0     0.0     0.0
101          DQ     0.0    15.0   121.0   243.0   370.0   504.0   636.0     0.0     0.0     0.0
             *
102          KK    DE2SRETRIEVE
103          KM    FLOW RETRIEVED FROM DE2S DIVERT. NO CHANGE FROM FCD 2011 EXIST MODEL
104          DR    DRE3
             *
105          KK  RTE2E3   ROUTE
106          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
107          RS       1    FLOW
108          RC   0.035   0.030   0.025    3678  0.0035    6.00
109          RX    0.00  100.00  700.00 1050.00 1090.00 1110.00 1140.00 1240.00
110          RY    6.00    6.00    4.00    1.00    1.00    5.00    6.00    6.00
             *
111          KK      E3   BASIN
112          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
113          BA   2.234
114          LG    0.35    0.35    4.65    0.32       0
115          UI       0      91      91      91     136     303     356     427     467     510
116          UI     552     605     672     731     857    1035    1206    1075     936     840
117          UI     769     712     638     576     531     468     432     369     285     220
118          UI     162     158     150     150      92      91      91      79      28      28
119          UI      28      28      28      28      28      28      28      28      28      28
120          UI       0       0       0       0       0       0       0       0       0       0
             *
121          KK   E2SE3 COMBINE
```

```
          122          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
          123          HC       2     3.9
                       *

          124          KK    DE3S  DIVERT
          125          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
          126          DT   DRE4N      0.0      0.0
          127          DI     0.0   192.0   476.0   774.0  1079.0  1390.0  1699.0      0.0      0.0      0.0
          128          DQ     0.0     5.0   197.0   415.0   656.0   912.0  1175.0      0.0      0.0      0.0
                       *
1                                                  HEC-1 INPUT                                                 PAGE  4

        LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          129          KK   E3E12   ROUTE
          130          KM   FLOW ROUTED FROM E3 TO CPE12A. NO CHANGE FROM 2011 EXIST MODEL
          131          RS       1    FLOW
          132          RC   0.060   0.050   0.060    4852  0.0054    5.50
          133          RX    0.00  500.00  980.00 1003.00 1007.00 1031.00 1511.00 2011.00
          134          RY    5.50    4.50    4.00    1.00    1.00    4.00    4.50    5.50
                       *

          135          KK    E12A   BASIN
          136          KM   ADDED SUBBASIN. NORTH PORTION OF E12 IN FCD 2011 EXIST MODEL, WHICH FLOWS
          137          KM   TO CPE12A
          138          BA   0.465
          139          LG    0.35    0.34    4.12    0.43       1
          140          UI       0      24      24      24      76      95     113     129     141     158
          141          UI     179     206     261     308     266     228     202     183     161     143
          142          UI     125     112      90      67      42      41      39      32      24      24
          143          UI      16       7       7       7       7       7       7       7       7       7
          144          UI       0       0       0       0       0       0       0       0       0       0
                       *

          145          KK  CPE12A COMBINE
          146          KM   COMBINE E3E12 AND E12A
          147          HC       2
                       *

          148          KK  DET12A STORAGE
          149          KM   ADDED PROPOSED DETENION BASIN FOR FLOWS FROM CPE12A.
          150          KO
          151          RS       1    STOR
          152          SV            2.54    9.02   17.51      21      25
          153          SQ              18      51      95     150     350
          154          SE  1449.5 1450.60 1451.60 1452.60 1453.00 1453.50
                       *

          155          KK    E12B   BASIN
          156          KM   ADDED SUBBASIN. SOUTH PORTION OF E12 IN FCD 2011 EXIST MODEL, WHICH FLOWS
          157          KM   TO CPE12B
          158          BA   0.134
          159          LG    0.35    0.35    4.17    0.42       0
          160          UI       0      12      20      48      64      77      96     138     141     108
          161          UI      89      71      56      36      21      19      12       8       4       4
          162          UI       4       4       4       0       0       0       0       0       0       0
          163          UI       0       0       0       0       0       0       0       0       0       0
          164          UI       0       0       0       0       0       0       0       0       0       0
                       *

          165          KK  CPE12B COMBINE
          166          KM   COMBINE FLOWS FROM CPE12A AND E12B
          167          HC       2
                       *
1                                                  HEC-1 INPUT                                                 PAGE  5

        LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          168          KK  E12E19   ROUTE
          169          KM   MODIFIED ROUTE TO REPRESENT UPSTREAM REACH OF EXISTING CHANNEL NORTH OF
          170          KM   ERIE ST
          171          RS       1    FLOW
          172          RC   0.040   0.035   0.040    1261  0.0038    0.00
          173          RX    0.00   20.00   40.00   47.50   57.50   65.00   85.00  105.00
          174          RY    4.50    3.50    3.00    0.00    0.00    3.00    3.50    4.50
                       *

          175          KK    E19B   BASIN
          176          KM   ADDED SUBBASIN. SUBDIVIDED E19 IN FCD 2011 EXIST MODEL. E19B IS THE PORTION
          177          KM   OF E19 THAT FLOWS IN THE ERIE ST CHANNEL
          178          BA   0.042
          179          LG    0.30    0.15    8.36    0.09      15
          180          UI       0     114     184      24       0       0       0       0       0       0
          181          UI       0       0       0       0       0       0       0       0       0       0
          182          UI       0       0       0       0       0       0       0       0       0       0
          183          UI       0       0       0       0       0       0       0       0       0       0
          184          UI       0       0       0       0       0       0       0       0       0       0
                       *

          185          KK  CPE19B COMBINE
          186          KM   COMBINE FLOWS FROM E19B AND E12E19
          187          HC       2
                       *
```

```
          188          KK   E19AB   ROUTE
          189          KM   ADDED ROUTE. DOWNSTREAM REACH OF THE ERIE CHANNEL
          190          RS       1    FLOW
          191          RC   0.040   0.035   0.040     832  0.0038    0.00
          192          RX    0.00   20.00   40.00   47.50   57.50   65.00   85.00  105.00
          193          RY    4.50    3.50    3.00    0.00    0.00    3.00    3.50    4.50
                       *

          194          KK    E19C   BASIN
          195          KM   ADDED SUBBASIN. SUBDIVIDED E19 IN FCD 2011 EXIST MODEL. E19C IS THE PORTION
          196          KM   OF E19 THAT FLOWS ALONG THE SOUTH OF ERIE STREET.
          197          BA   0.017
          198          LG    0.30    0.25    6.00    0.22      15
          199          UI       0      63      62       6       0       0       0       0       0       0
          200          UI       0       0       0       0       0       0       0       0       0       0
          201          UI       0       0       0       0       0       0       0       0       0       0
          202          UI       0       0       0       0       0       0       0       0       0       0
          203          UI       0       0       0       0       0       0       0       0       0       0
                       *

          204          KK  CPE19C COMBINE
          205          KM   ADDED COMBINE. COMBINE FLOW FROM E19AB AND E19C, AT THE INTERSECTION OF
          206          KM   MOUNTAIN ROAD AND ERIE STREET.
          207          HC       2
                       *
1                                                  HEC-1 INPUT                                                  PAGE  6

        LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          208          KK  E19E20   ROUTE
          209          KM   ADDED ROUTE. REPRESENTS PROPOSED CHANNEL ALONG MOUNTAIN ROAD
          210          RS       1    FLOW
          211          RC   0.040   0.035   0.040    1342  0.0026    0.00
          212          RX    0.00   10.00   25.00   35.00   55.00   65.00   75.00   85.00
          213          RY    4.00    3.00   25.00    0.00    0.00    2.50    3.00    4.00
                       *

          214          KK     E20   BASIN
          215          KM   NO CHANGE FROM FCD 2011 EXISTING MODEL
          216          BA   0.169
          217          LG    0.32    0.28    4.51    0.40      10
          218          UI       0      17      33      72      93     115     153     206     161     129
          219          UI     102      79      50      29      24      17       8       5       5       5
          220          UI       5       0       0       0       0       0       0       0       0       0
          221          UI       0       0       0       0       0       0       0       0       0       0
          222          UI       0       0       0       0       0       0       0       0       0       0
                       *

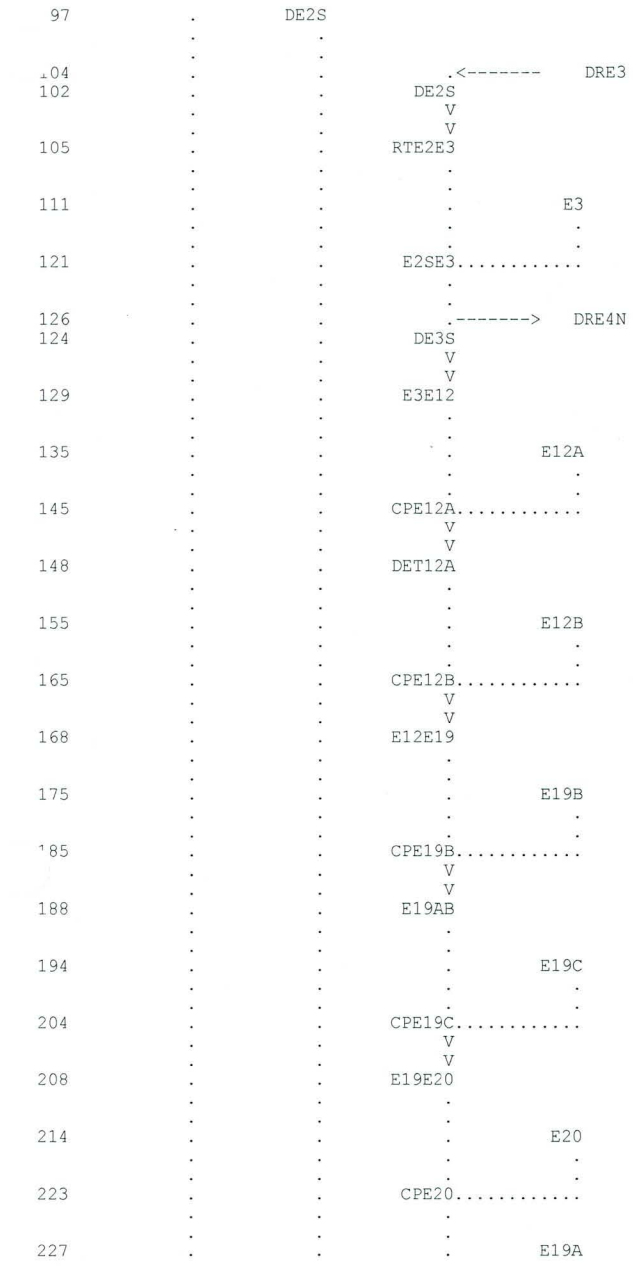
          223          KK   CPE20 COMBINE
          224          KM   ADDED COMBINE. COMBINE FLOWS FROM E20 AND E19E20, AT THE INTERSECTION OF
          225          KM   MOUNTAIN ROAD AND WILLIAMS FIELD ROAD.
          226          HC       2
                       *

          227          KK    E19A   BASIN
          228          KM   ADDED SUBBASIN. SUBDIVIDED E19 IN FCD 2011 EXIST MODEL. E19A IS THE PORTION
          229          KM   OF E19 THAT FLOWS WEST ACROSS MOUNTAIN ROAD (AND DOES NOT REACH THE PROPOSED
          230          KM   MOUNTAIN ROAD CHANNEL).
          231          BA   0.050
          232          LG    0.30    0.15    8.85    0.08      15
          233          UI       0      34     101     147      72      22       6       0       0       0
          234          UI       0       0       0       0       0       0       0       0       0       0
          235          UI       0       0       0       0       0       0       0       0       0       0
          236          UI       0       0       0       0       0       0       0       0       0       0
          237          UI       0       0       0       0       0       0       0       0       0       0
                       *
          238          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    61          E1
                 .
                 .
    72           .-------->    DRE2
    70        DE1S
                 .
                 .
    78           .           .<-------    DRE2
    76           .        DE1S
                 .           V
                 .           V
    79           .      RTE1E2
                 .           .
                 .           .
    85           .           .          E2
                 .           .           .
                 .           .           .
    94           .        CPE2.............
                 .           .
                 .           .
    99           .           .-------->    DRE3
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   03JUN15  TIME  16:58:20   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Mountain and Erie Channel and Basin Design Concept Report
DCR System Model
Existing Conditions with Recommended Alternative

Prepared for Flood Control District of Maricopa County (District)
District Project Number FCD 2014C001

Prepared by Kimley-Horn and Associates, Inc
Kimley-Horn Project Number 091131026-3
June 2015

Model based on the East Mesa Area Drainage Master Plan Update (EMADPU)
existing conditions model prepared by the District.
The model was revised to include only those areas contributing to

```
                        Erie Channel and the Mountain Road proposed channels.

                        List of Changes:
                        - Changed precipitation data to create model for 25-yr, 6-hour storm.
                        - Subbasin E12 was subdivided into Subbasins E12A and E12B because it
                          was determined portions of the subbasin flow west and south,
                          respectively.
                        - Area was taken from Subbasin E19 and added to Subbasin E12A to
                          reflect the location of the proposed detention basin.
                        - This model includes a proposed detention basin below Subbasin E12.
                        - Subbasin E19 was subdivided into Subbasins E19A, E19B, and E19C to
                          reflect portions of the subbasin either crossing Mountain Road or
                          staying south of Erie Street.
                        - Routing reach E12E19 was revised and E19AB was added to account for
                          different inflow points into the Erie St Channel.
                        - Routing reache E19E20 was added to model the proposed channel
                          alternatives east or west of Mountain Road.


                         Flood Control District of Maricopa County
                         MNTERIE_25YR_6HR
                         25 YEAR
                         6 Hour  Storm
                         Unit Hydrograph: S-Graph
                         Storm: Multiple
                         06/03/2015

43 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1JAN99  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     7JAN99  ENDING DATE
                    NDTIME       2235  ENDING TIME
                     ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE  166.58 HOURS

       ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT

45 JD            INDEX STORM NO. 1
                       STRM        2.03  PRECIPITATION DEPTH
                       TRDA         .00  TRANSPOSITION DRAINAGE AREA

46 PI              PRECIPITATION PATTERN
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .01       .01       .01       .01       .01       .01       .03
                    .03       .03       .05       .05       .05       .15       .15       .15       .03       .03
                    .03       .01       .01       .01       .01       .01       .01       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00

49 JD            INDEX STORM NO. 2
                       STRM        2.01  PRECIPITATION DEPTH
                       TRDA         .50  TRANSPOSITION DRAINAGE AREA

50 PI              PRECIPITATION PATTERN
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .01       .01       .01       .01       .01       .01       .03
                    .03       .03       .05       .05       .05       .15       .15       .15       .03       .03
                    .03       .01       .01       .01       .01       .01       .01       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00

53 JD            INDEX STORM NO. 3
                       STRM        1.97  PRECIPITATION DEPTH
                       TRDA        2.80  TRANSPOSITION DRAINAGE AREA

54 PI              PRECIPITATION PATTERN
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .01       .01       .01       .01       .01       .01       .03
                    .03       .03       .07       .07       .07       .08       .08       .08       .05       .05
                    .05       .02       .02       .02       .01       .01       .01       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00
```

```
   57 JD          INDEX STORM NO. 4
                        STRM        1.87  PRECIPITATION DEPTH
                        TRDA       16.00  TRANSPOSITION DRAINAGE AREA

   58 PI            PRECIPITATION PATTERN
                       .01       .01       .00       .00       .00       .00       .00       .00       .00       .01
                       .01       .01       .00       .01       .00       .00       .00       .00       .00       .00
                       .00       .00       .01       .00       .00       .00       .00       .01       .01       .01
                       .01       .01       .01       .01       .01       .01       .02       .02       .02       .03
                       .03       .03       .06       .06       .06       .07       .07       .07       .04       .04
                       .04       .02       .02       .02       .01       .01       .01       .01       .01       .01
                       .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                       .00       .00

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
   148 KK     *    DET12A  *      STORAGE
              *            *
              **************

   150 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                RUNOFF SUMMARY
                                          FLOW IN CUBIC FEET PER SECOND
                                       TIME IN HOURS,  AREA IN SQUARE MILES

                                                PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION               FLOW     PEAK                                          AREA      STAGE     MAX STAGE
+                                                                      6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                                  E1            249.    4.83          38.         9.          3.        .89
          DIVERSION TO
+                                DRE2            191.    4.83          27.         7.          2.        .89
          HYDROGRAPH AT
                                 DE1S            58.    4.83          11.         3.          1.        .89
          HYDROGRAPH AT
+                                 DE1S           191.    4.83          27.         7.          2.        .89
          ROUTED TO
+                               RTE1E2           115.    5.17          27.         7.          2.        .89
          HYDROGRAPH AT
+                                  E2            239.    4.92          39.        10.          3.        .78
          2 COMBINED AT
+                                CPE2            207.    4.92          42.        11.          4.       1.67
          DIVERSION TO
+                                DRE3             80.    4.92          11.         3.          1.       1.67
          HYDROGRAPH AT
+                                 DE2S           126.    4.92          31.         8.          3.       1.67
          HYDROGRAPH AT
+                                 DE2S            80.    4.92          11.         3.          1.       1.67
          ROUTED TO
+                               RTE2E3            49.    5.33          11.         3.          1.       1.67
          HYDROGRAPH AT
+                                  E3            331.    5.25          77.        19.          6.       2.23
          2 COMBINED AT
+                               E2SE3            255.    5.33          61.        15.          5.       3.90
          DIVERSION TO
+                               DRE4N             57.    5.33           5.         1.          0.       3.90
          HYDROGRAPH AT
+                                 DE3S           198.    5.33          55.        14.          5.       3.90
          ROUTED TO
+                                E3E12           170.    5.75          55.        14.          5.       3.90
          HYDROGRAPH AT
                                  E12A           157.    5.00          28.         7.          2.        .47
          2 COMBINED AT
+                              CPE12A            182.    5.58          60.        15.          5.       4.37
          ROUTED TO
+                              DET12A             90.    6.58          53.        15.          5.       4.37
          HYDROGRAPH AT
```

+	E12B	72.	4.58	8.	2.	1.	.13
	2 COMBINED AT						
	CPE12B	90.	6.58	54.	16.	5.	4.50
	ROUTED TO						
+	E12E19	89.	6.67	53.	16.	5.	4.50
	HYDROGRAPH AT						
+	E19B	90.	4.08	5.	1.	0.	.04
	2 COMBINED AT						
+	CPE19B	89.	6.67	54.	17.	6.	4.54
	ROUTED TO						
+	E19AB	88.	6.67	54.	17.	6.	4.54
	HYDROGRAPH AT						
+	E19C	33.	4.08	2.	0.	0.	.02
	2 COMBINED AT						
+	CPE19C	88.	6.67	54.	17.	6.	4.56
	ROUTED TO						
+	E19E20	87.	6.75	54.	17.	6.	4.56
	HYDROGRAPH AT						
+	E20	116.	4.50	14.	3.	1.	.17
	2 COMBINED AT						
+	CPE20	86.	6.75	60.	18.	6.	4.73
	HYDROGRAPH AT						
+	E19A	92.	4.17	6.	2.	1.	.05

*** NORMAL END OF HEC-1 ***

Kimley»Horn

Project ***Mountain and Erie DCR***
Subject **Proposed Alternative Detention Basin Calculations**
Designed by **AJV** Date 3/18/2015 Project No. 091131026
Checked by **AOM** Date 3/18/2015 FCDMC Ref. No. 2014C001-3

Objective: To estimate the stage-storage-discharge relationship

Detention Basin - Mountain/Erie

Outlet Diameter	2.00 ft	Outlet X-Sect Area	3.142 ft^2
Outlet Elevation	1449.5 ft	No. of Outlet Barrels	6
Overflow Weir Length	50 ft	Outlet Pipe Slope	0.001 ft/ft
		Weir Coefficient	2.8

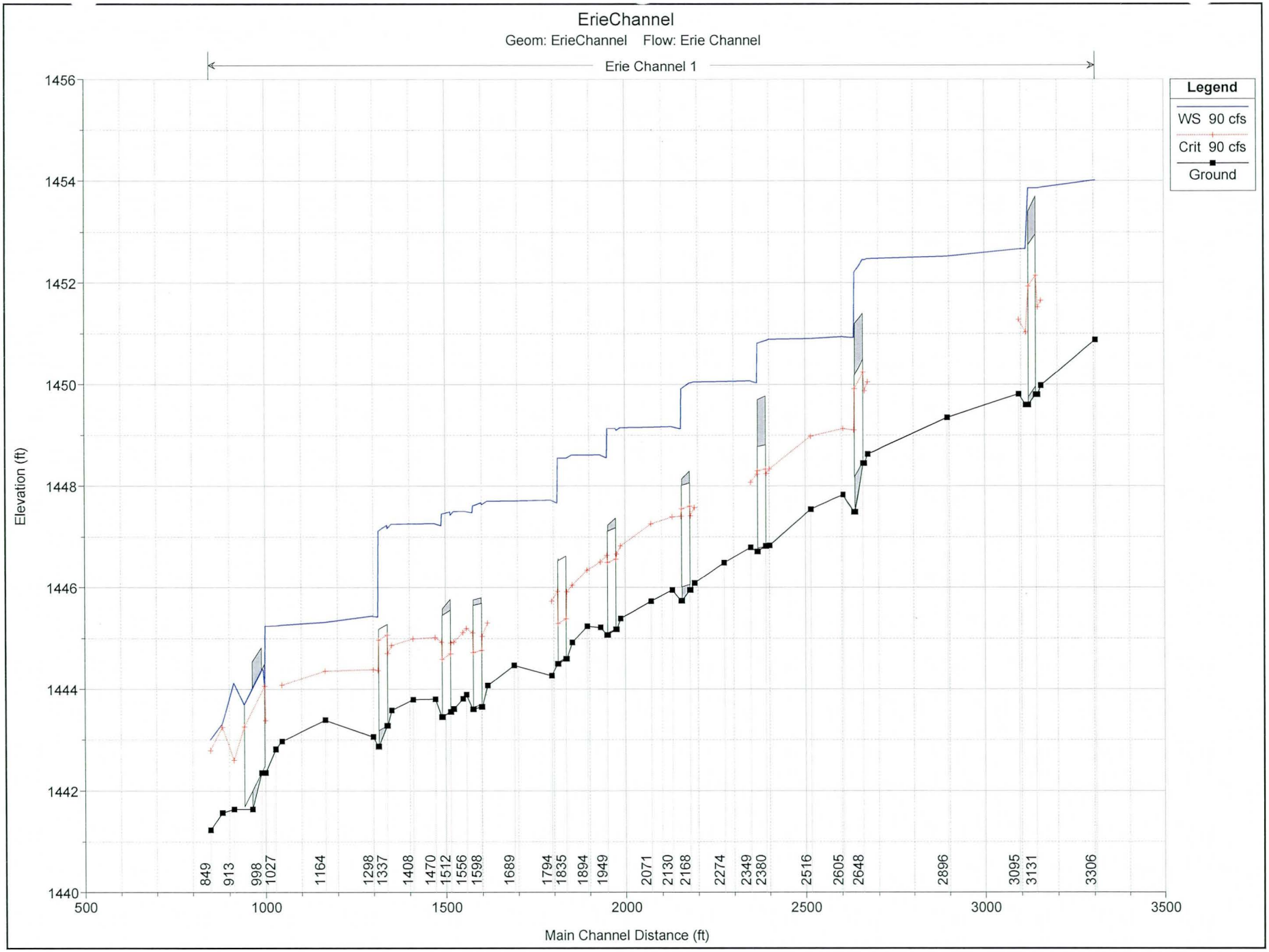
Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1449.5	-	-				0		0	0	0
			2.31	1.1	2.54		3.42			
1450.6	201,438	4.62				2.54		18	0	18
			6.48	1.0	6.48		2.27			
1451.6	363,065	8.33				9.02		51	0	51
			8.48	1.0	8.48		1.41			
1452.6	375,939	8.63				17.51		95	0	95
Overtopping										
			8.69	0.4	3.48					
1453	381,118	8.75				20.98		98	52	150
			8.75	0.5	4.37					
1453.5	381,118	8.75				25.36		81	269	350

Notes:
Flows from HY-8

Kimley»Horn

Appendix C. Alternatives Hydraulic Calculations

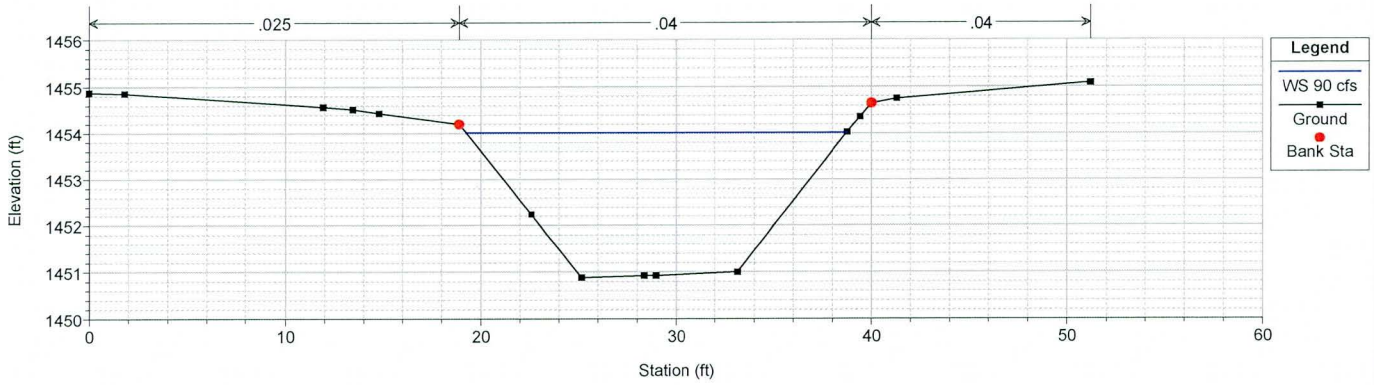
HEC-RAS model output


ErieChannel
Geom: ErieChannel Flow: Erie Channel
Erie Channel 1
Legend
WS 90 cfs
Crit 90 cfs
Ground
Elevation (ft)
Main Channel Distance (ft)
1456
1454
1452
1450
1448
1446
1444
1442
1440
500
1000
1500
2000
2500
3000
3500
849
913
998
1027
1164
1298
1337
1408
1470
1512
1556
1598
1689
1794
1835
1894
1949
2071
2130
2168
2274
2349
2380
2516
2605
2648
2896
3095
3131
3306

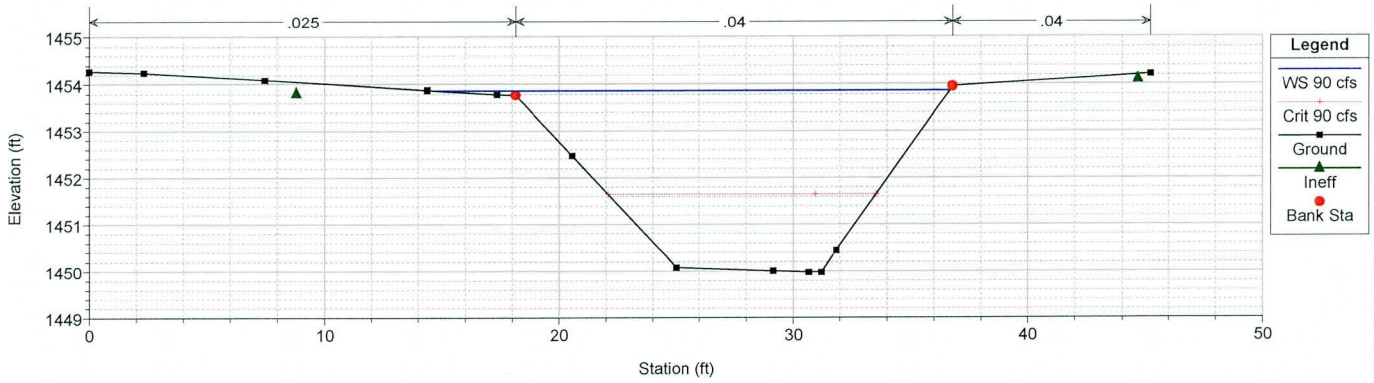
HEC-RAS Plan: Erie River: Erie Channel Reach: 1 Profile: 90 cfs

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	3306	90 cfs	90.00	1450.88	1454.01		1454.08	0.001298	2.13	42.23	19.47	0.26
1	3156	90 cfs	90.00	1449.98	1453.87	1451.65	1453.92	0.000847	1.89	47.84	21.79	0.21
1	3147	90 cfs	90.00	1449.80	1453.85	1451.52	1453.91	0.000870	1.95	46.36	22.45	0.21
1	3131		Culvert									
1	3114	90 cfs	90.00	1449.60	1452.67	1451.02	1452.78	0.001072	2.60	34.61	18.23	0.29
1	3095	90 cfs	90.00	1449.81	1452.67	1451.28	1452.74	0.001124	2.24	40.22	21.17	0.29
1	2896	90 cfs	90.00	1449.35	1452.52		1452.57	0.000577	1.79	52.88	38.75	0.21
1	2672	90 cfs	90.00	1448.63	1452.48	1450.05	1452.50	0.000172	1.18	89.03	50.30	0.12
1	2663	90 cfs	90.00	1448.45	1452.46	1449.87	1452.50	0.000237	1.57	57.48	57.89	0.15
1	2648		Culvert									
1	2635	90 cfs	90.00	1447.49	1450.92	1449.10	1451.05	0.000925	2.84	31.71	20.98	0.28
1	2605	90 cfs	90.00	1447.83	1450.94	1449.13	1450.99	0.000539	1.69	53.55	28.23	0.20
1	2516	90 cfs	90.00	1447.54	1450.90	1448.98	1450.94	0.000451	1.62	59.12	39.07	0.19
1	2401	90 cfs	90.00	1446.83	1450.89	1448.34	1450.91	0.000158	1.12	89.00	45.97	0.12
1	2392	90 cfs	90.00	1446.82	1450.86	1448.24	1450.90	0.000280	1.58	59.73	46.75	0.16
1	2380		Culvert									
1	2367	90 cfs	90.00	1446.71	1450.03	1448.24	1450.16	0.000949	2.94	30.61	43.57	0.29
1	2349	90 cfs	90.00	1446.79	1450.07	1448.07	1450.10	0.000341	1.50	61.39	47.50	0.17
1	2274	90 cfs	90.00	1446.49	1450.05		1450.08	0.000233	1.27	79.12	48.72	0.14
1	2192	90 cfs	90.00	1446.09	1450.05	1447.57	1450.06	0.000127	0.95	98.60	49.97	0.10
1	2181	90 cfs	90.00	1445.95	1450.02	1447.41	1450.06	0.000224	1.45	64.62	48.46	0.14
1	2168		Culvert									
1	2155	90 cfs	90.00	1445.74	1449.13	1447.40	1449.26	0.001000	2.96	30.37	38.10	0.30
1	2130	90 cfs	90.00	1445.95	1449.17	1447.39	1449.20	0.000312	1.41	71.94	46.72	0.16
1	2071	90 cfs	90.00	1445.73	1449.15	1447.25	1449.18	0.000256	1.30	78.30	47.50	0.14
1	1987	90 cfs	90.00	1445.39	1449.15	1446.82	1449.16	0.000114	0.94	106.34	51.16	0.10
1	1976	90 cfs	90.00	1445.18	1449.10	1446.66	1449.15	0.000350	1.93	46.56	47.02	0.18
1	1962		Culvert									
1	1949	90 cfs	90.00	1445.07	1448.56	1446.63	1448.69	0.000894	2.93	30.68	47.14	0.28
1	1932	90 cfs	90.00	1445.22	1448.61	1446.50	1448.63	0.000148	1.03	94.98	46.69	0.11
1	1894	90 cfs	90.00	1445.24	1448.61	1446.35	1448.62	0.000119	0.96	101.40	46.52	0.10
1	1852	90 cfs	90.00	1444.92	1448.61	1446.04	1448.62	0.000069	0.76	132.21	62.51	0.08
1	1837	90 cfs	90.00	1444.60	1448.55	1445.91	1448.61	0.000330	2.01	44.89	54.97	0.18
1	1835		Culvert									
1	1811	90 cfs	90.00	1444.50	1447.67	1445.92	1447.81	0.000971	3.00	30.00	43.94	0.30
1	1794	90 cfs	90.00	1444.27	1447.72	1445.73	1447.74	0.000221	1.19	79.55	40.39	0.13
1	1689	90 cfs	90.00	1444.47	1447.70		1447.72	0.000133	0.98	95.73	44.20	0.11
1	1615	90 cfs	90.00	1444.07	1447.70	1445.30	1447.71	0.000097	0.89	110.28	51.00	0.09
1	1600	90 cfs	90.00	1443.65	1447.63	1445.04	1447.70	0.000375	2.09	43.04	43.43	0.19
1	1598		Culvert									
1	1574	90 cfs	90.00	1443.60	1447.48	1445.11	1447.55	0.000425	2.13	42.29	42.13	0.20
1	1556	90 cfs	90.00	1443.89	1447.50	1445.20	1447.51	0.000126	0.99	96.40	44.97	0.10
1	1546	90 cfs	90.00	1443.81	1447.50	1445.12	1447.51	0.000118	0.97	97.98	44.20	0.10
1	1521	90 cfs	90.00	1443.61	1447.50	1444.93	1447.51	0.000095	0.88	107.74	48.33	0.09
1	1513	90 cfs	90.00	1443.55	1447.42	1444.91	1447.50	0.000414	2.22	40.48	45.75	0.20
1	1512		Culvert									
1	1488	90 cfs	90.00	1443.45	1447.22	1444.93	1447.32	0.000573	2.54	35.44	46.26	0.23
1	1470	90 cfs	90.00	1443.80	1447.26	1445.02	1447.28	0.000111	0.96	101.54	45.49	0.10
1	1408	90 cfs	90.00	1443.79	1447.26	1445.00	1447.27	0.000113	0.95	101.57	44.97	0.10
1	1349	90 cfs	90.00	1443.58	1447.25	1444.87	1447.26	0.000102	0.90	109.35	49.28	0.09
1	1338	90 cfs	90.00	1443.28	1447.16	1444.71	1447.25	0.000473	2.38	37.87	43.42	0.21
1	1337		Culvert									
1	1312	90 cfs	90.00	1442.87	1445.42	1444.37	1445.60	0.001942	3.35	26.86	20.76	0.39
1	1298	90 cfs	90.00	1443.06	1445.44	1444.39	1445.53	0.001443	2.42	37.25	22.80	0.32
1	1164	90 cfs	90.00	1443.39	1445.32	1444.36	1445.36	0.000843	1.76	54.64	48.24	0.25
1	1044	90 cfs	90.00	1442.97	1445.26	1444.08	1445.29	0.000432	1.41	71.46	51.71	0.18
1	1027	90 cfs	90.00	1442.82	1445.25		1445.28	0.000492	1.51	66.32	49.63	0.19
1	1000	90 cfs	90.00	1442.36	1445.24	1443.38	1445.27	0.000252	1.22	76.97	70.49	0.14
1	998		Culvert									
1	913	90 cfs	90.00	1441.64	1444.12	1442.61	1444.18	0.000645	2.07	43.52	37.63	0.23
1	881	90 cfs	90.00	1441.57	1443.31	1443.25	1443.85	0.014239	5.86	15.36	12.73	0.94
1	849	90 cfs	90.00	1441.23	1443.01	1442.80	1443.40	0.010007	5.00	17.98	14.68	0.80

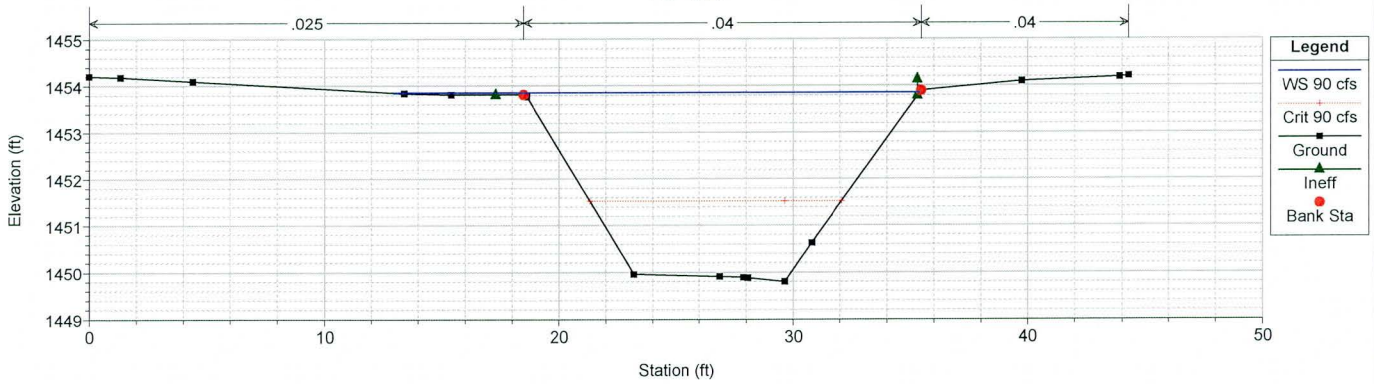
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3306



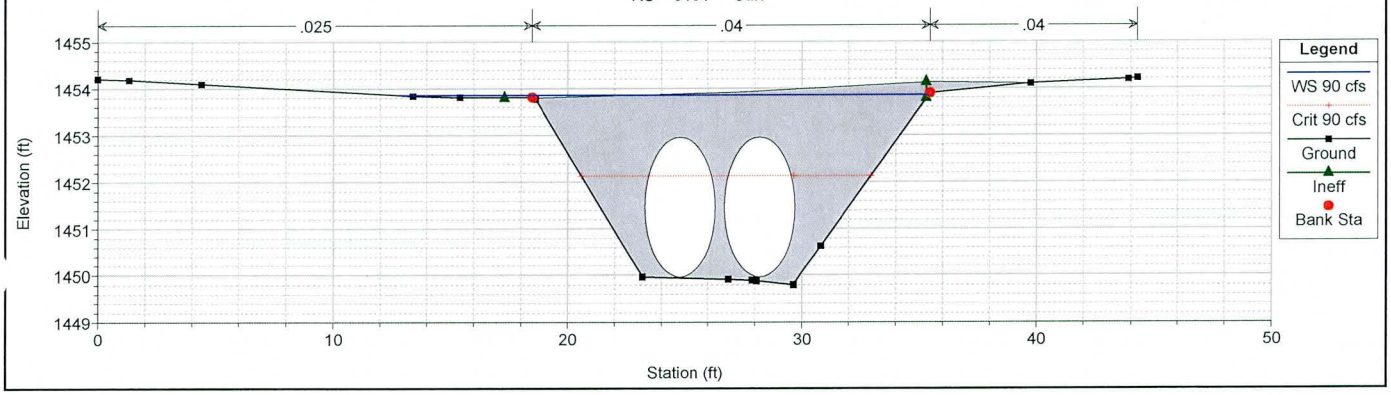
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3156



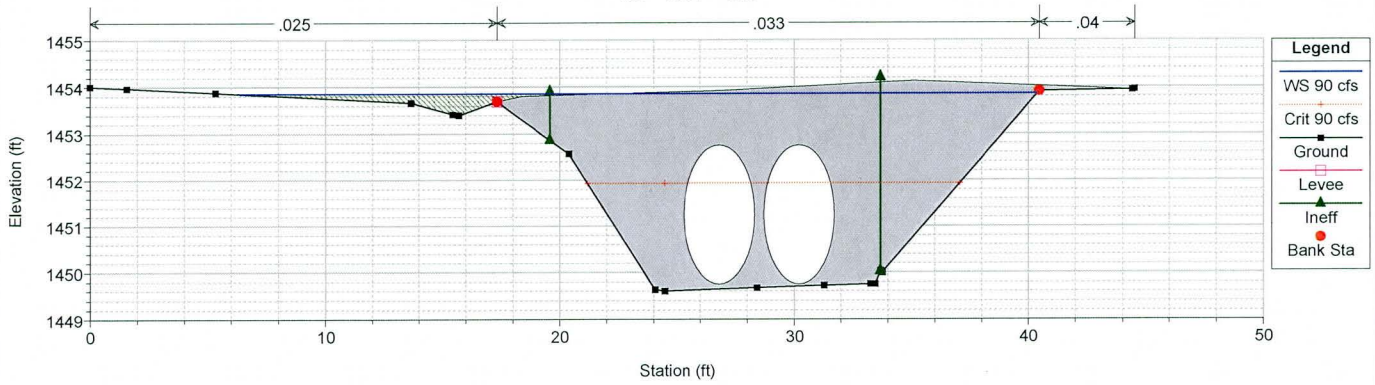
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3147



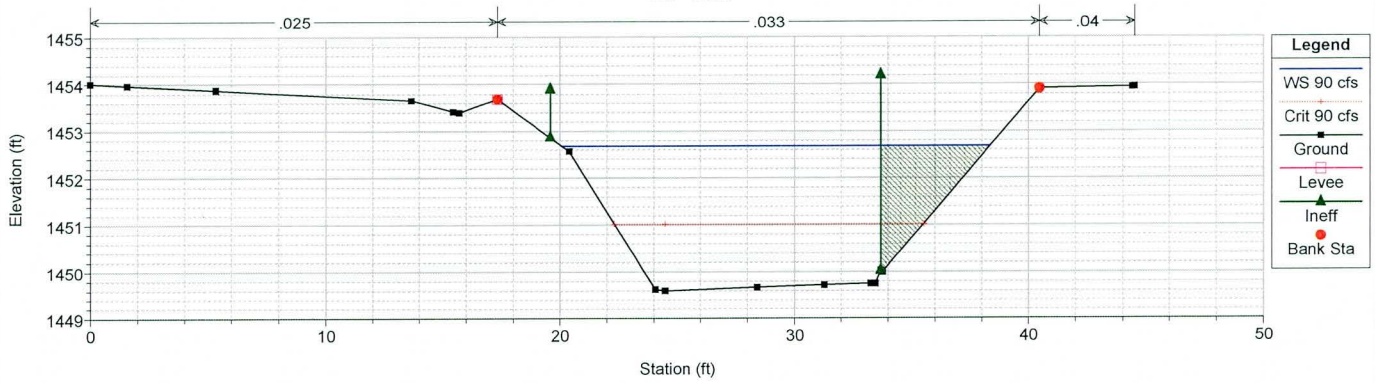
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3131 Culv



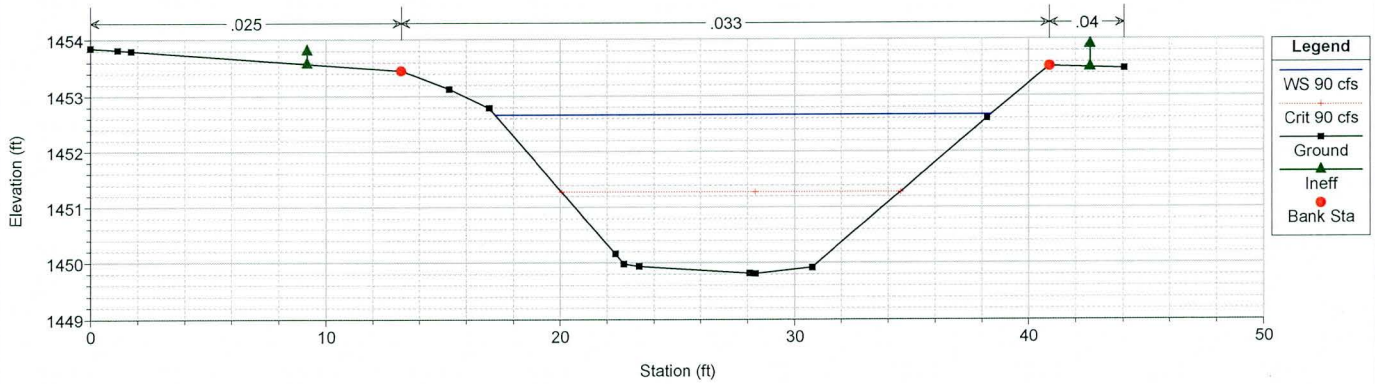
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3131 Culv



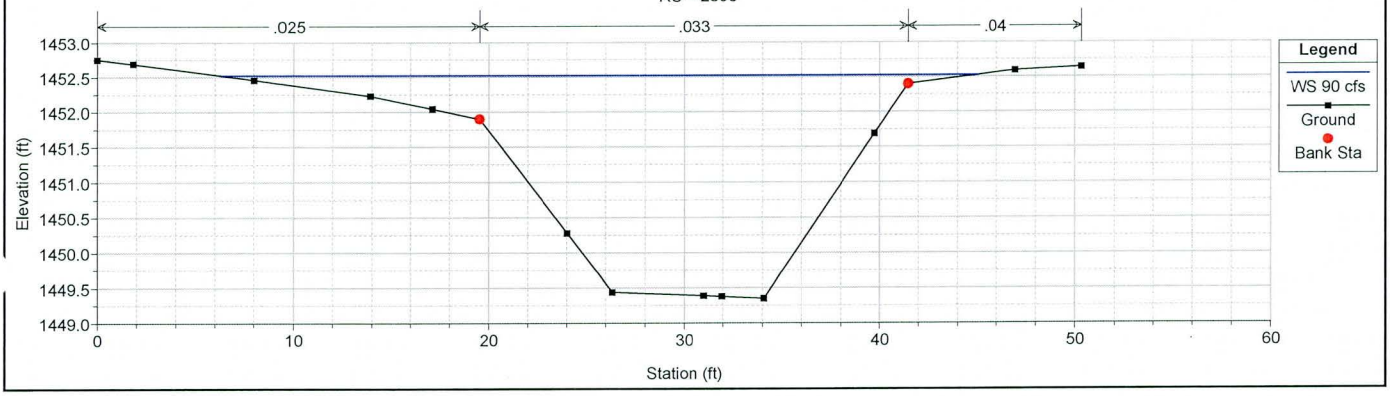
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3114



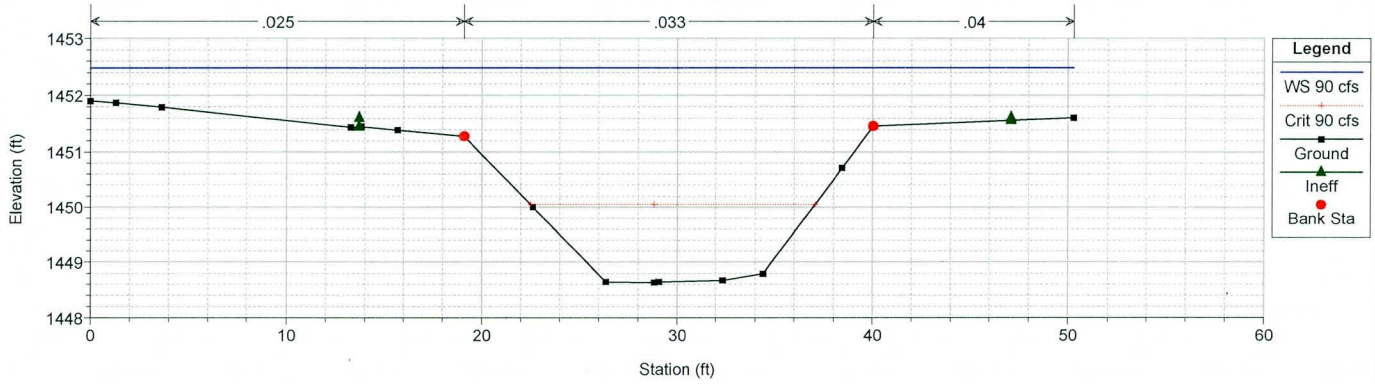
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 3095



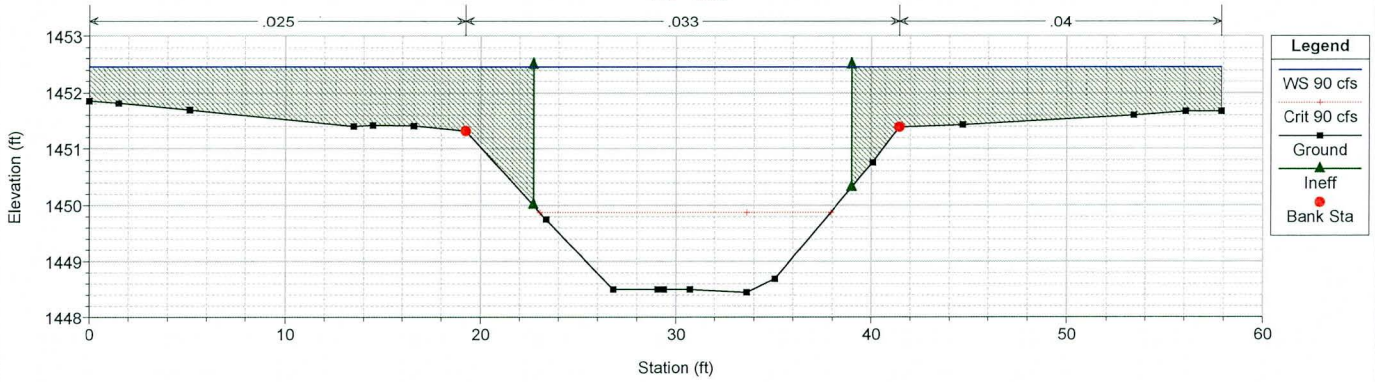
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2896



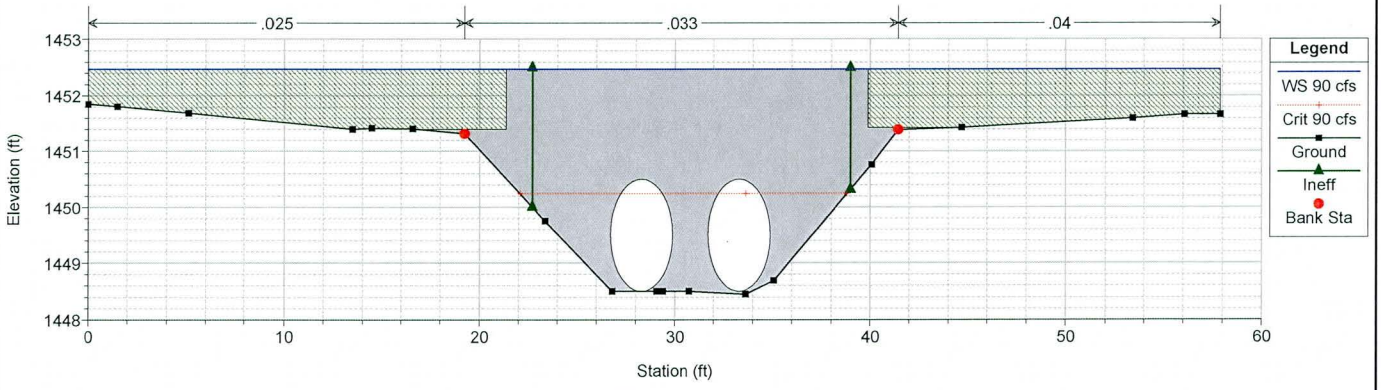
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2672



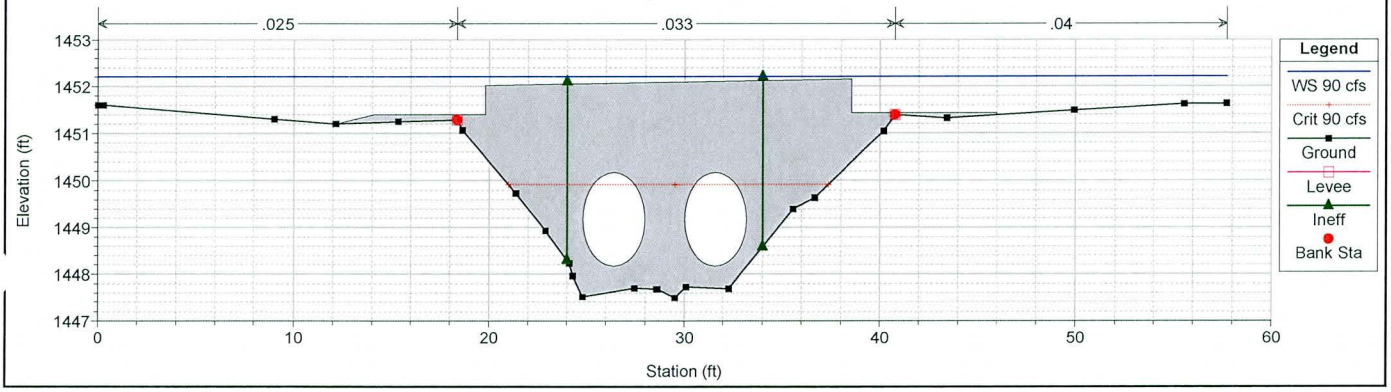
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2663

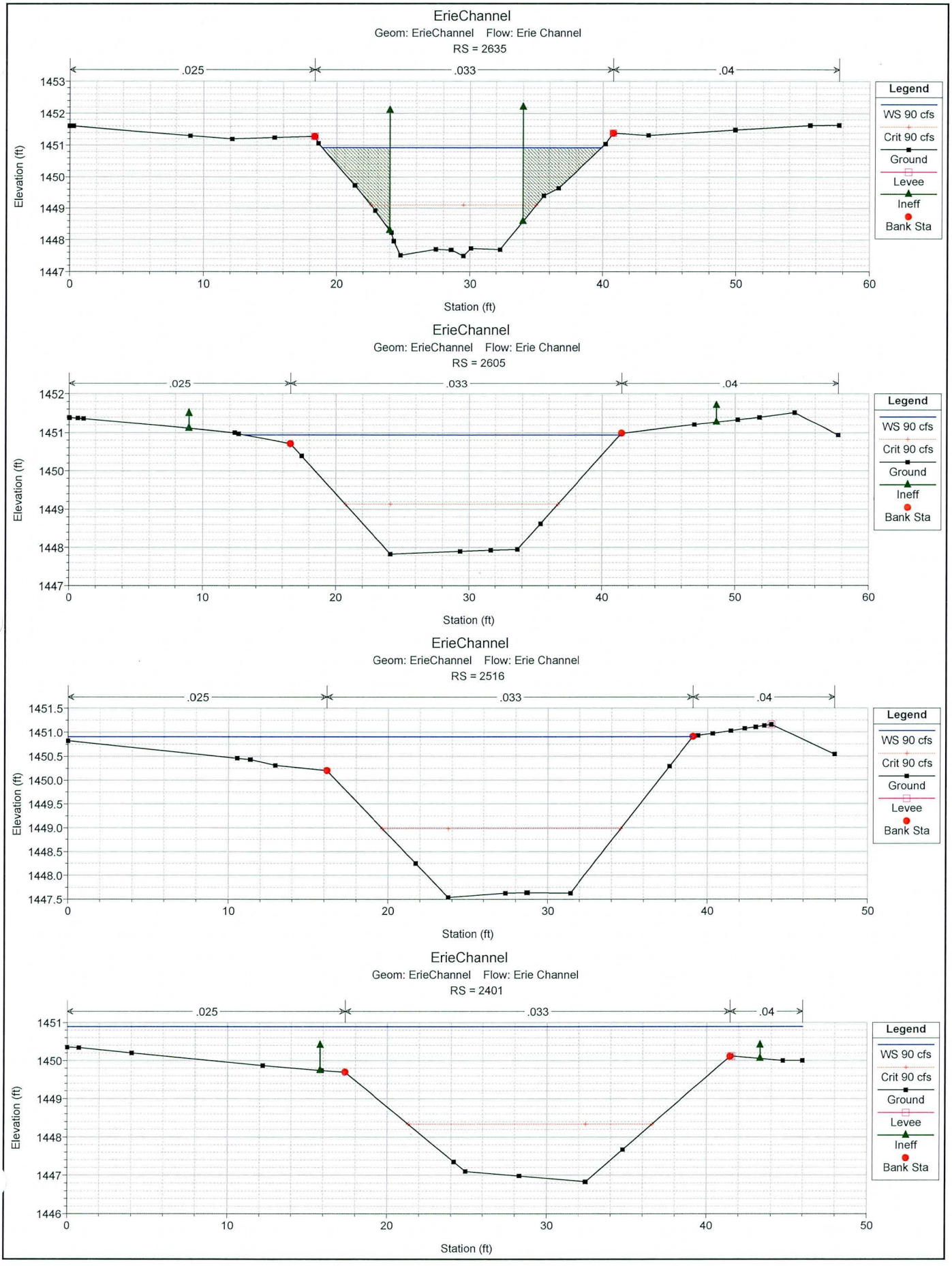


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2648 Culv

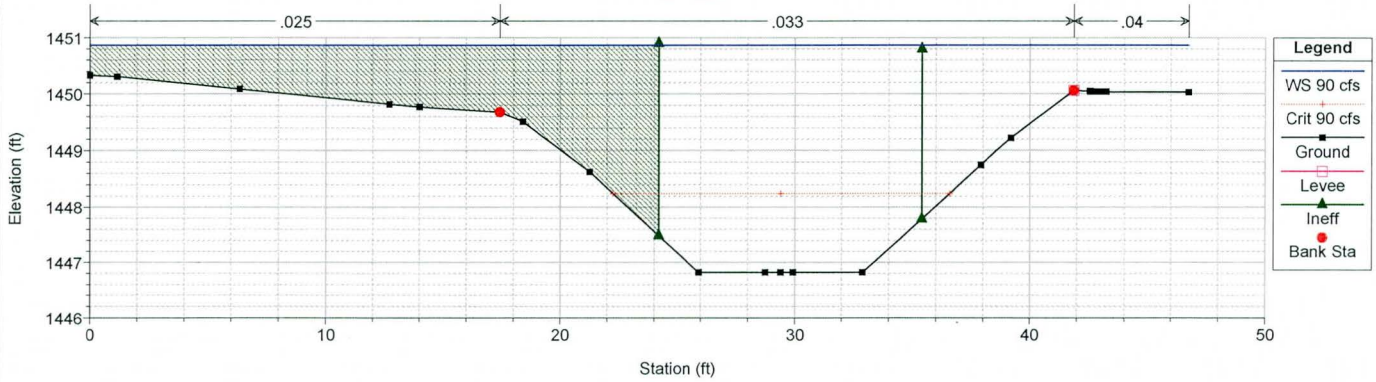


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2648 Culv

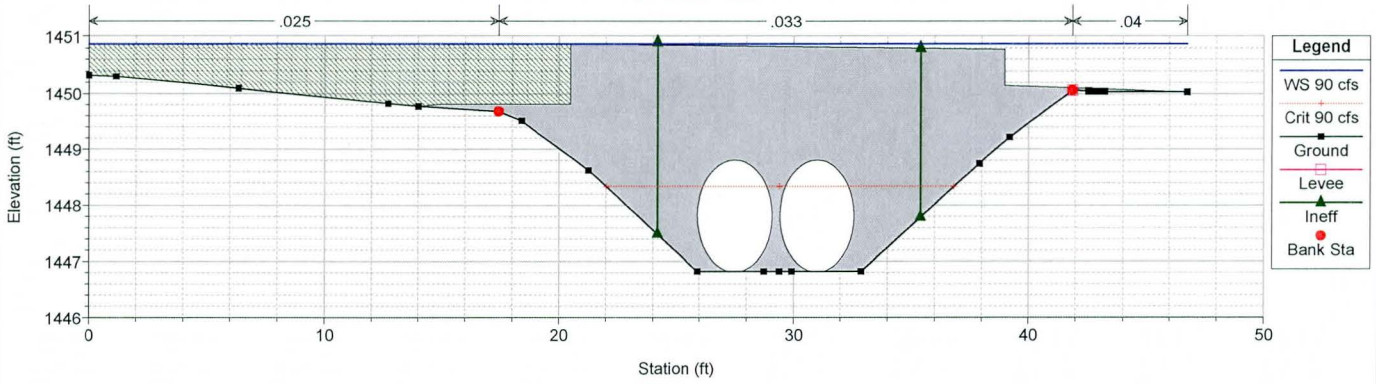



ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2635
.025
.033
.04
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2605
.025
.033
.04
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2516
.025
.033
.04
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2401
.025
.033
.04
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta

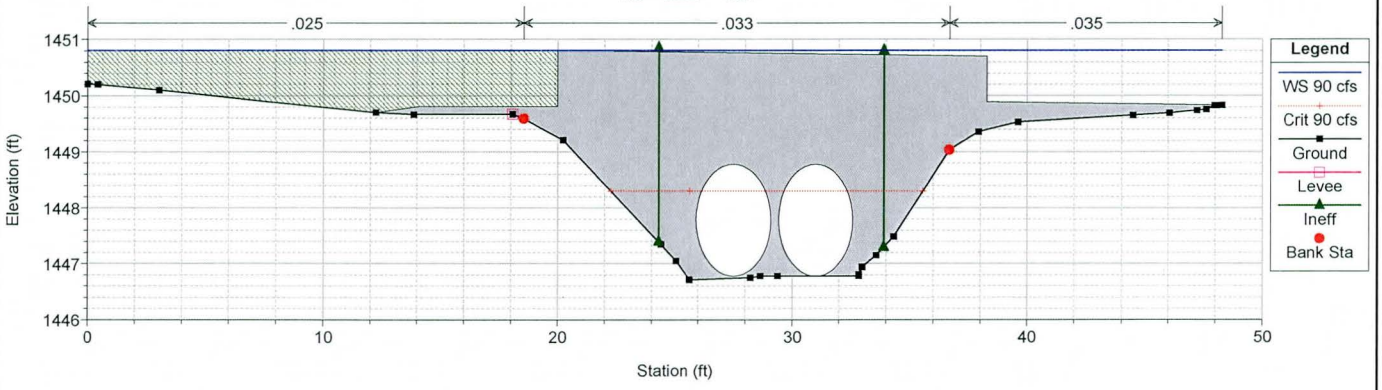
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2392



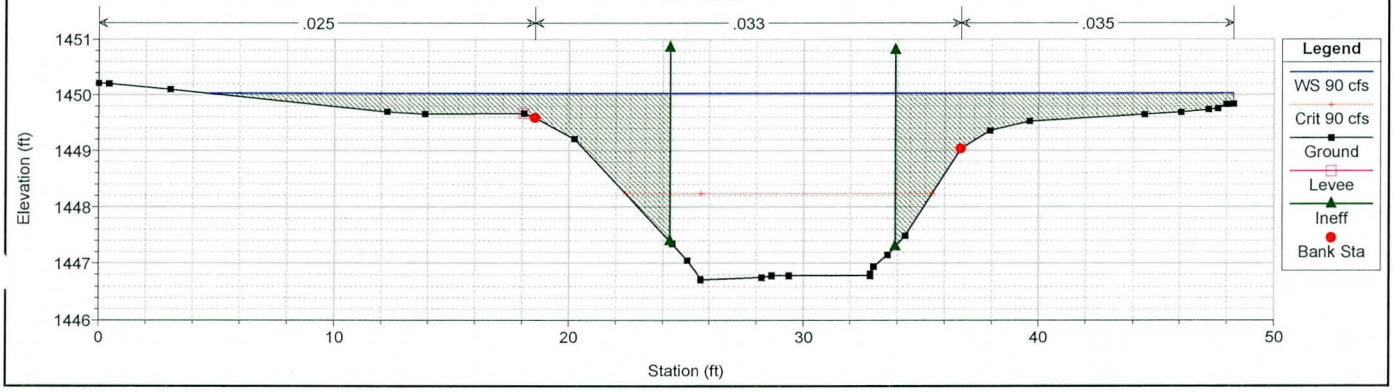
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2380 Culv

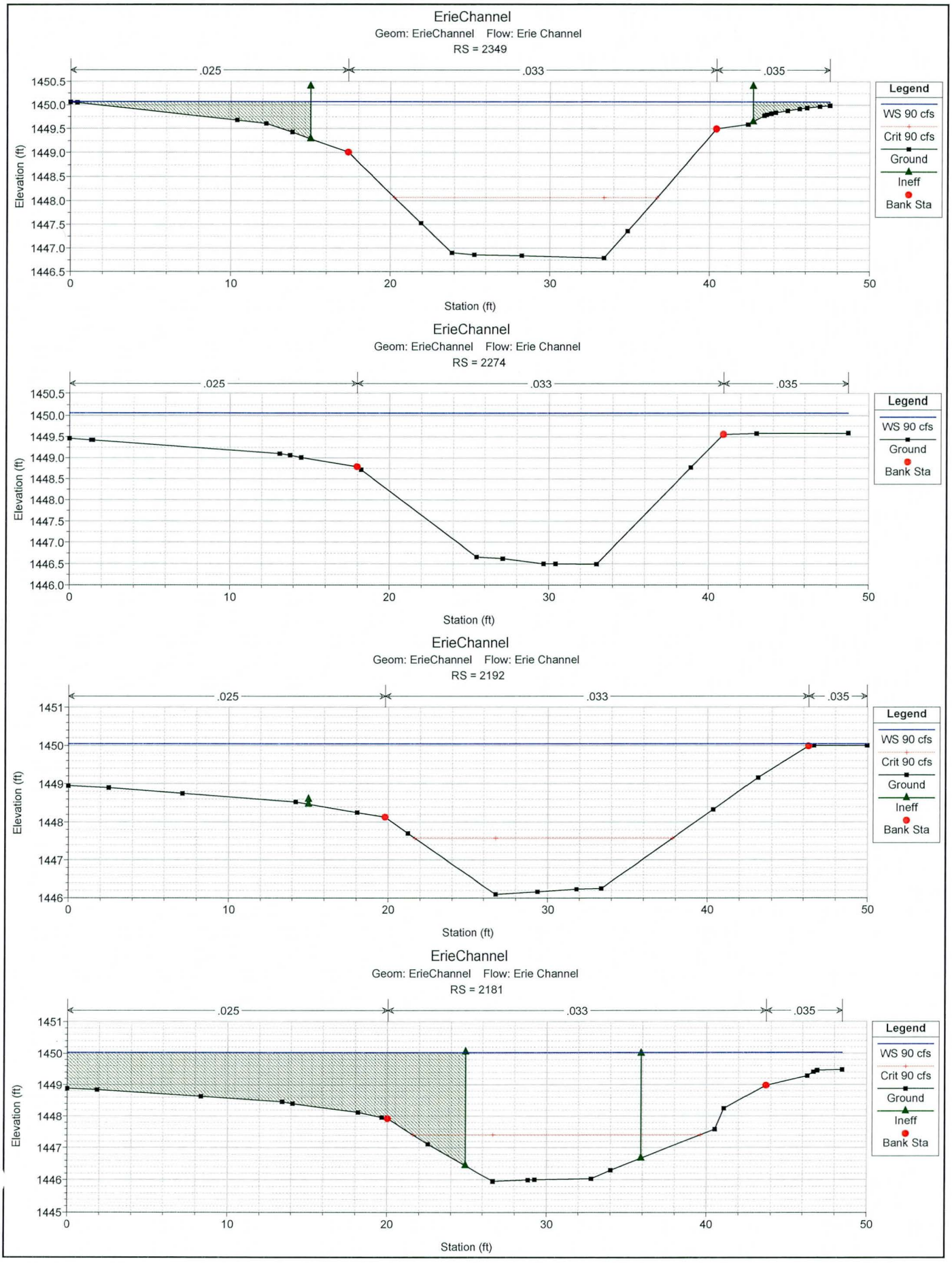


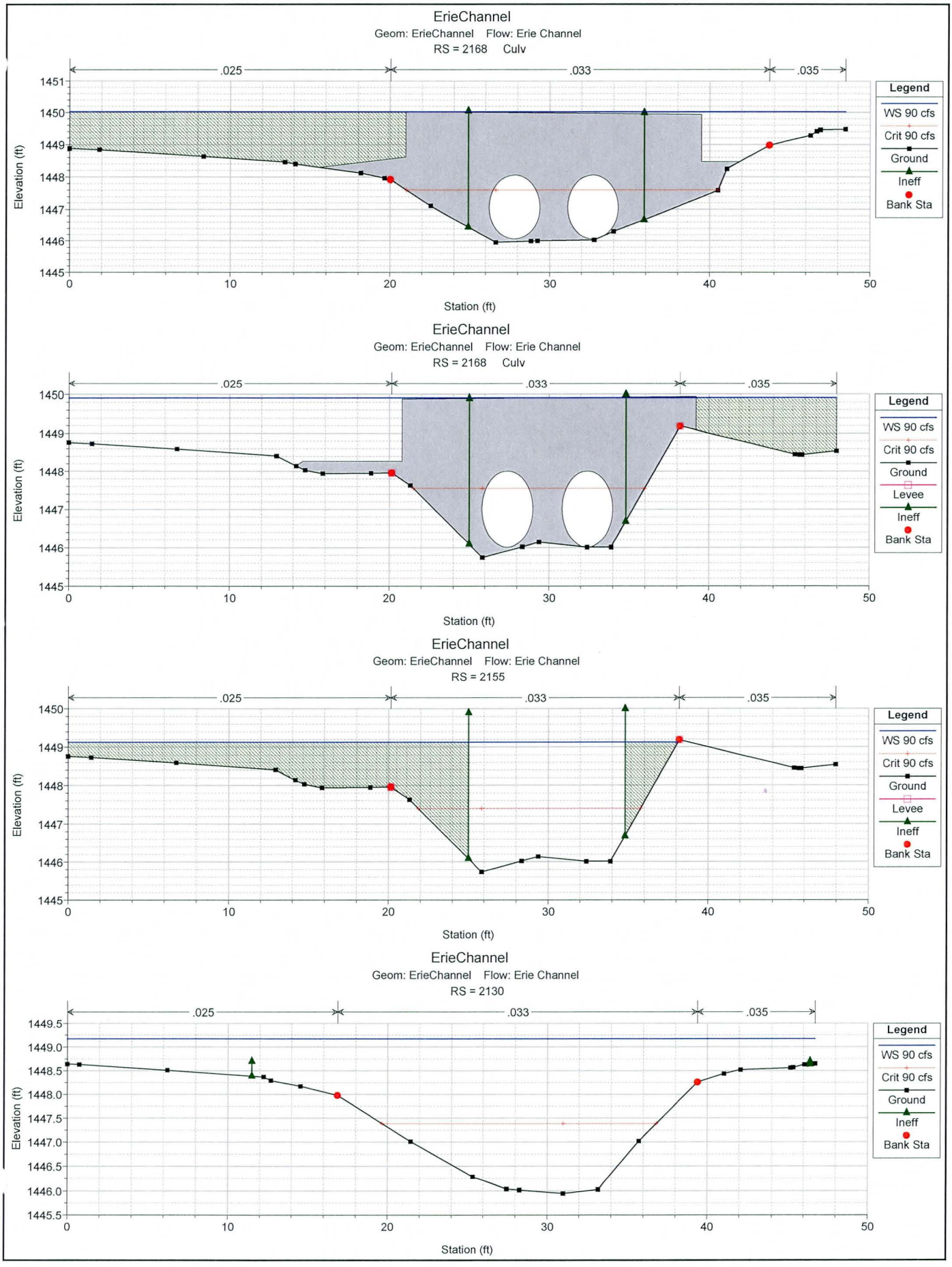
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2380 Culv



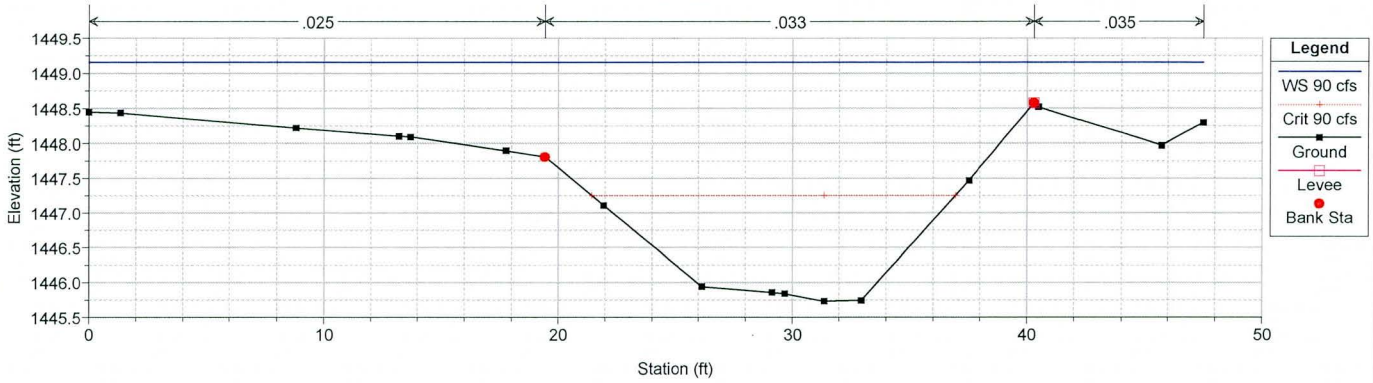
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2367



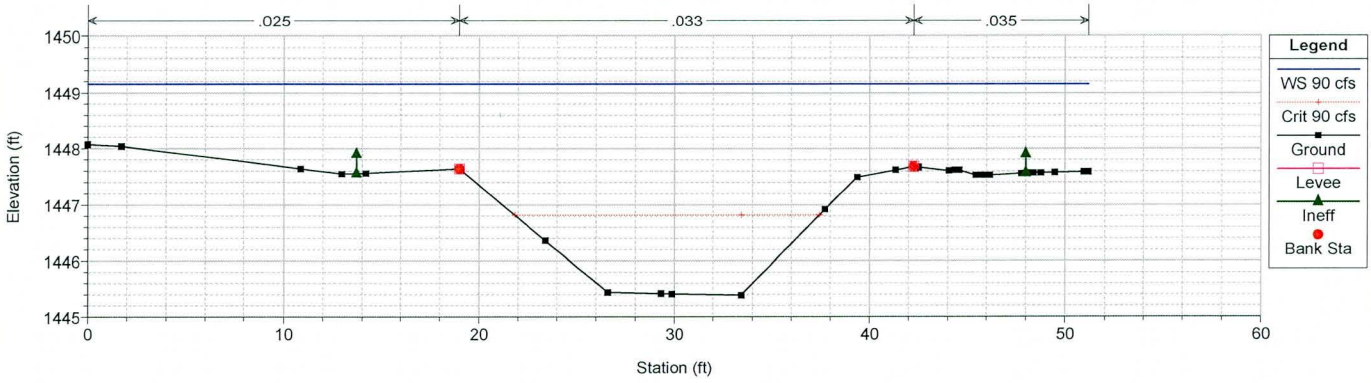

ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2349
.025
.033
.035
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2274
.025
.033
.035
Legend
WS 90 cfs
Ground
Bank Sta
Elevation (ft)
Station (ft)
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2192
.025
.033
.035
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2181
.025
.033
.035
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2168 Culv
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2168 Culv
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2155
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2130
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta

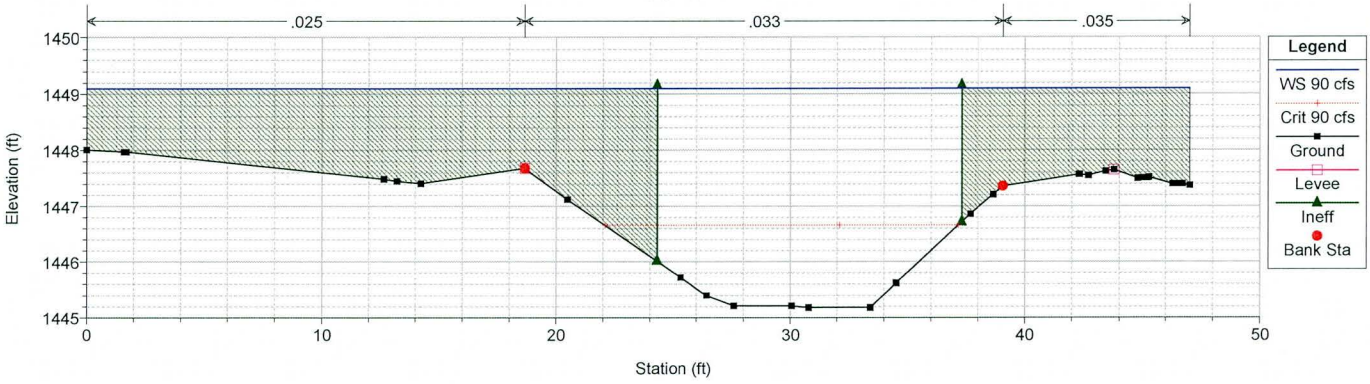
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 2071



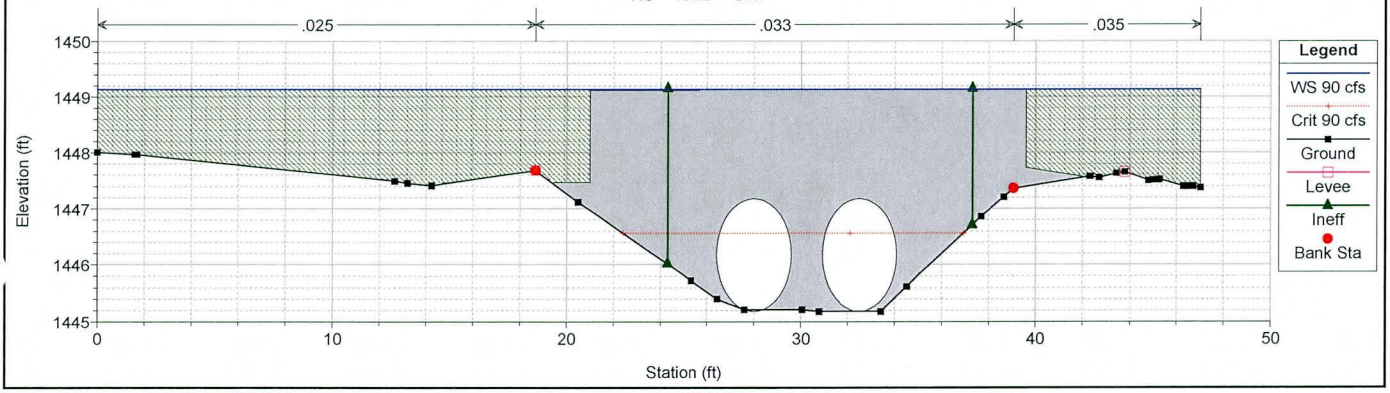
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1987



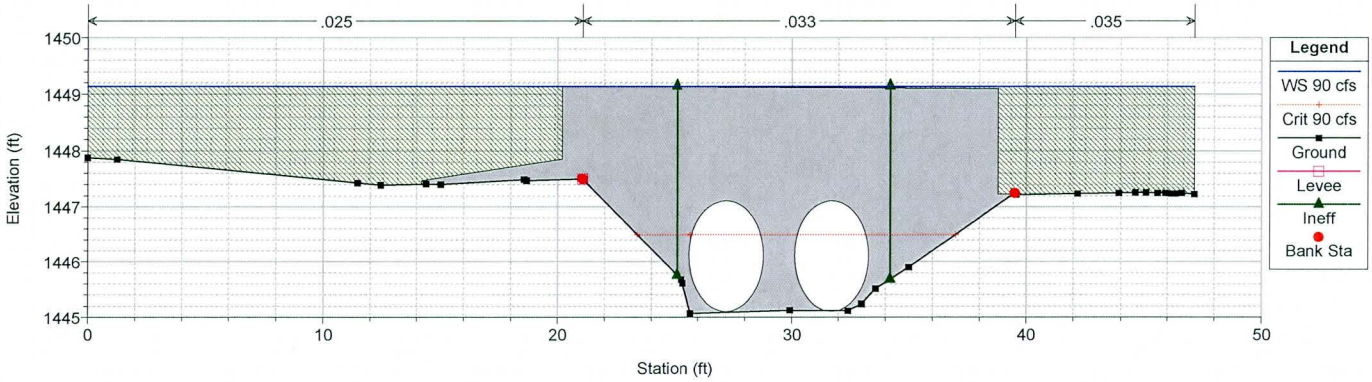
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1976



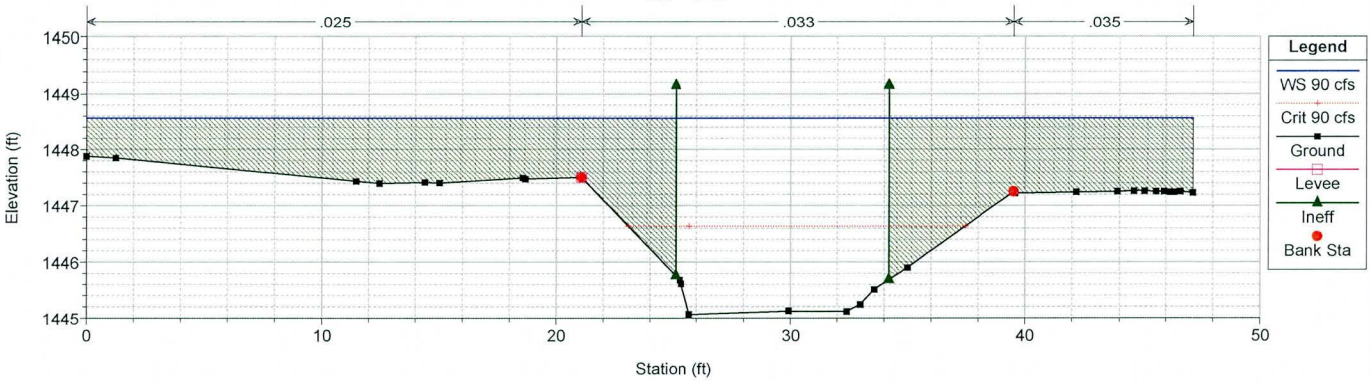
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1962 Culv



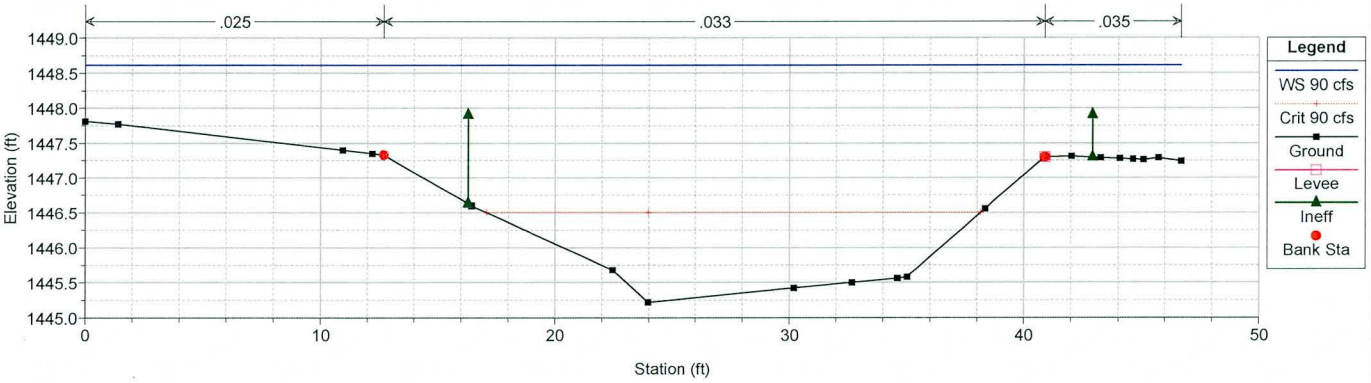
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1962 Culv



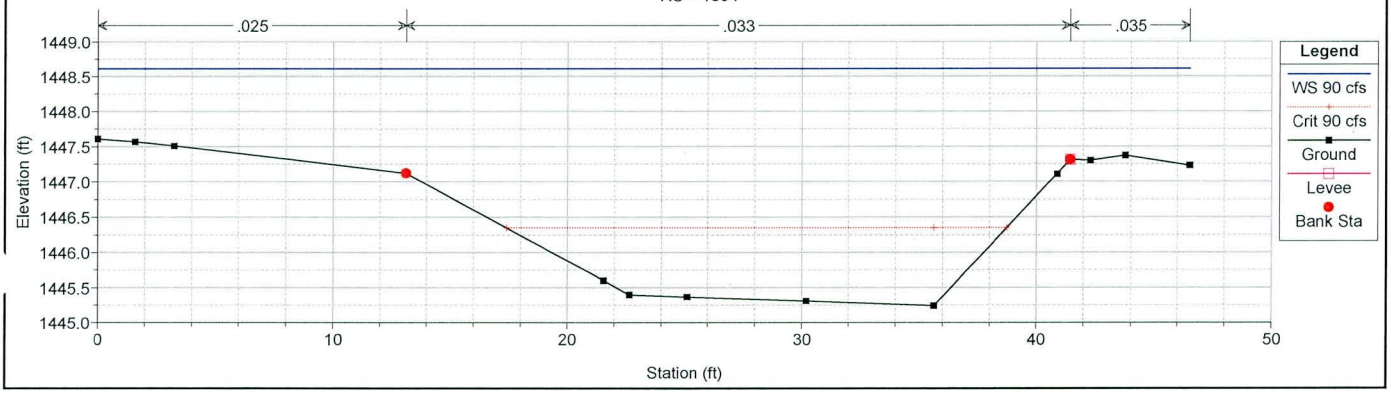
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1949



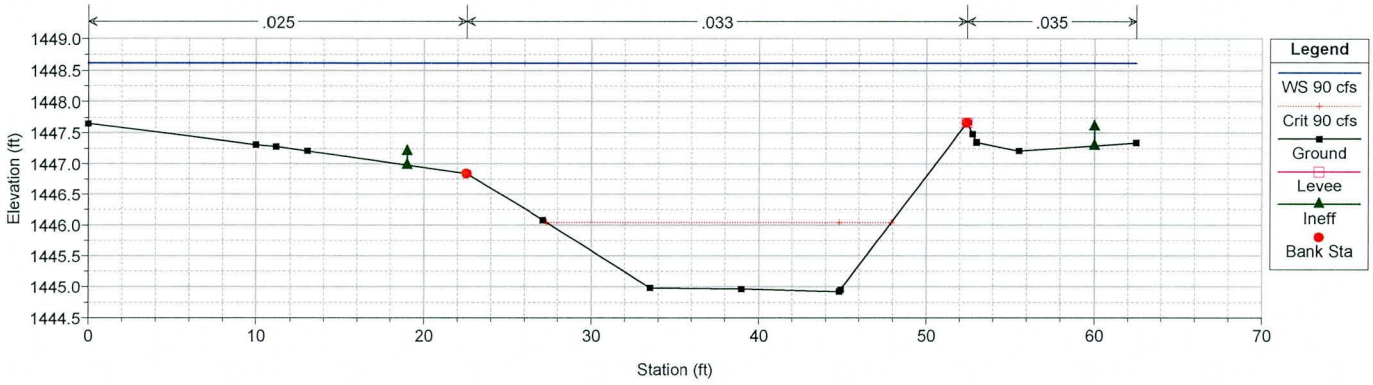
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1932



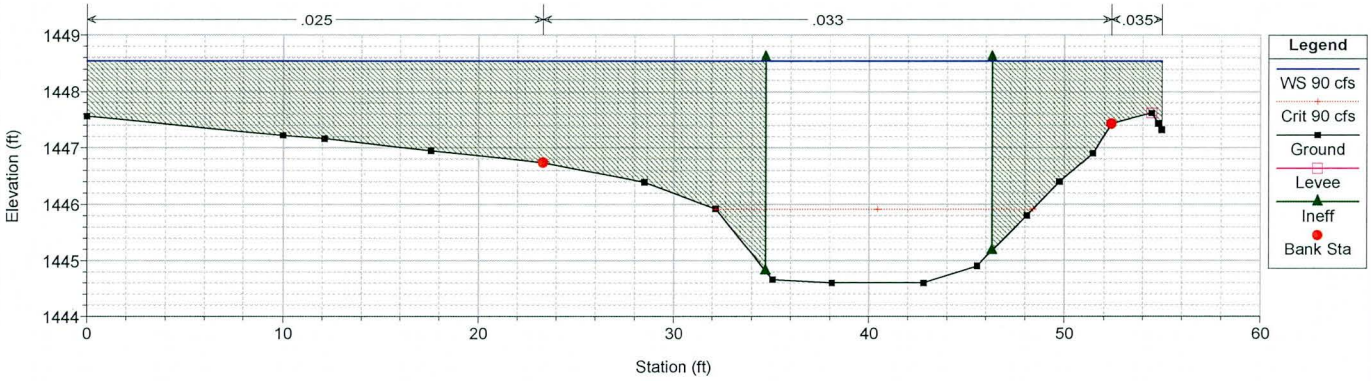
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1894



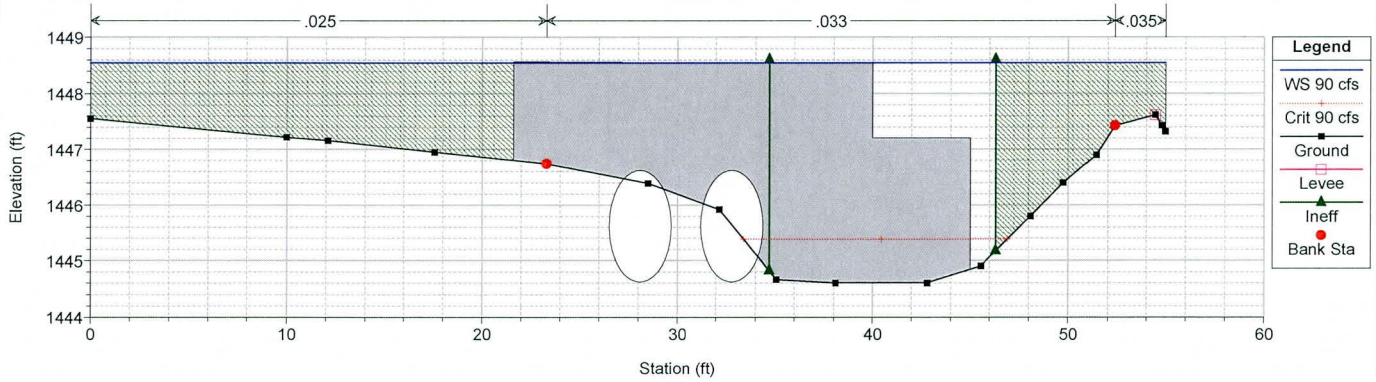
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1852



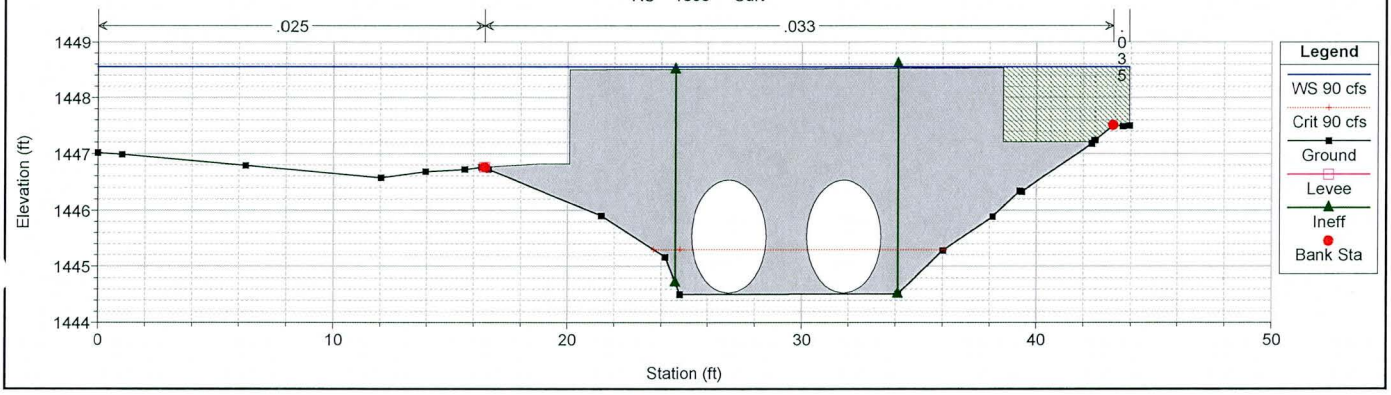
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1837



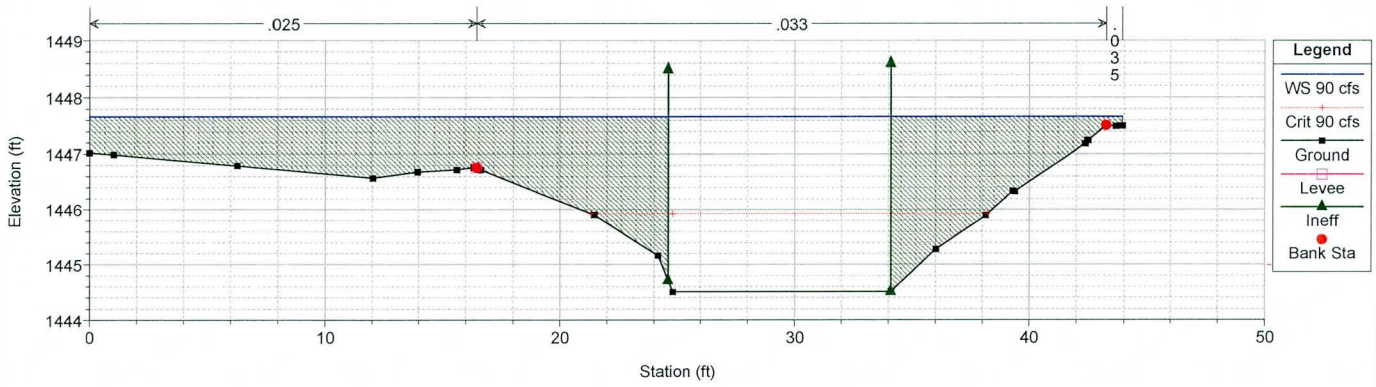
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1835 Culv



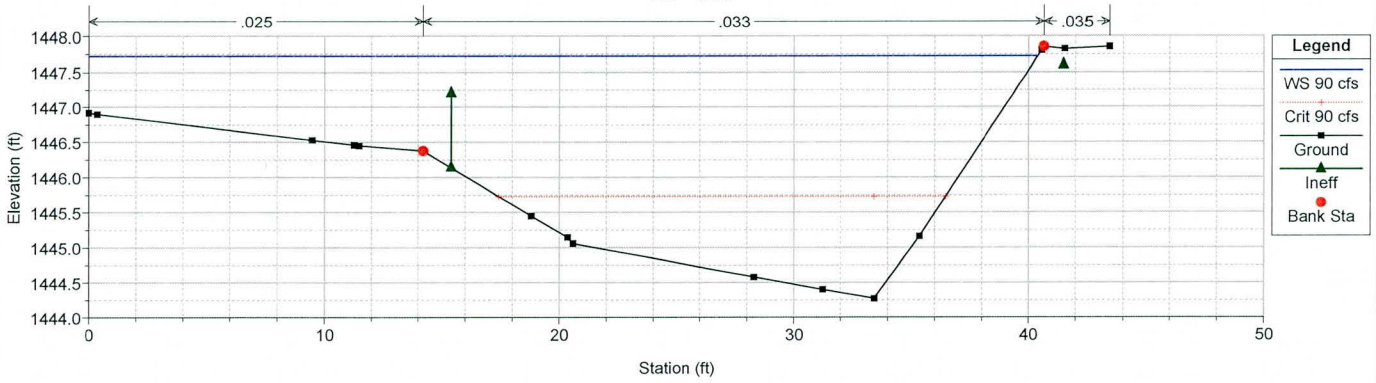
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1835 Culv



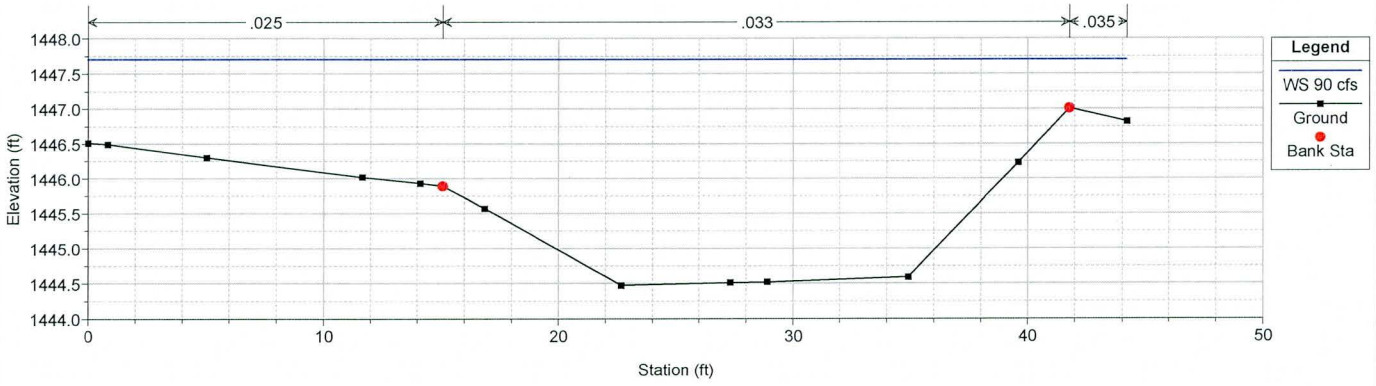
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1811



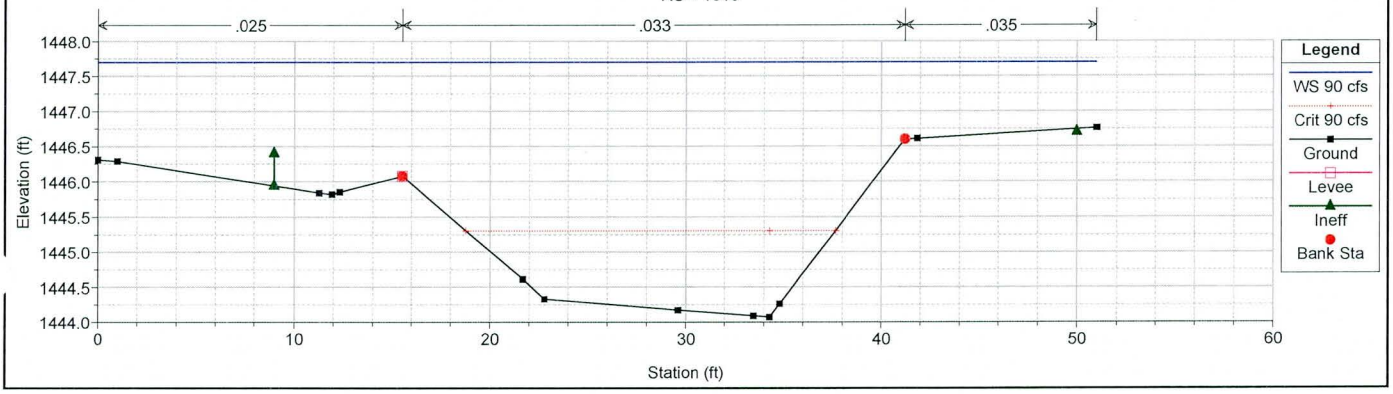
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1794



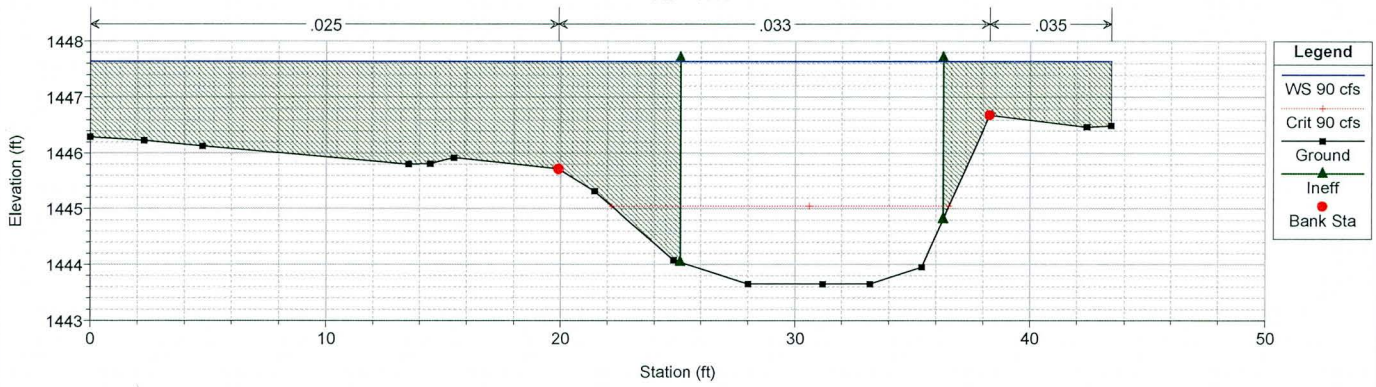
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1689



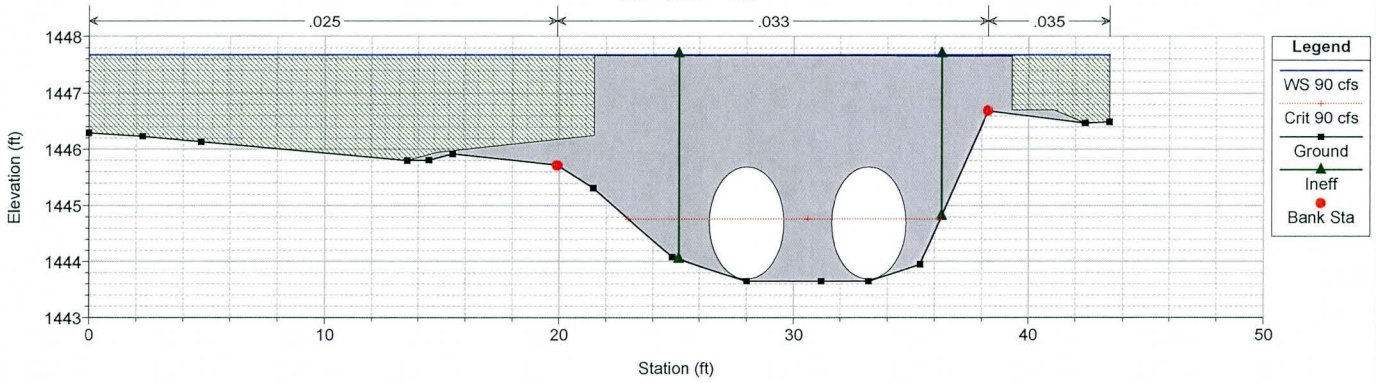
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1615



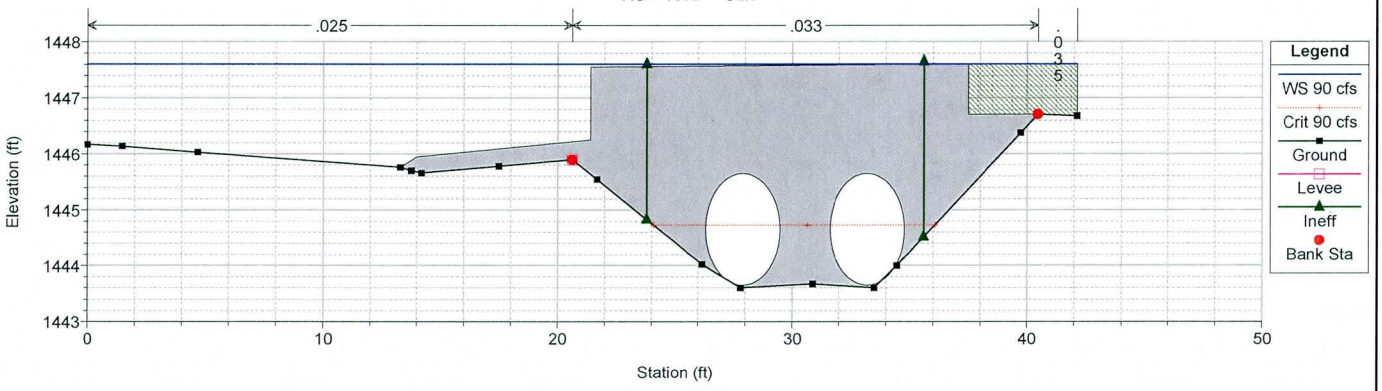
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1600



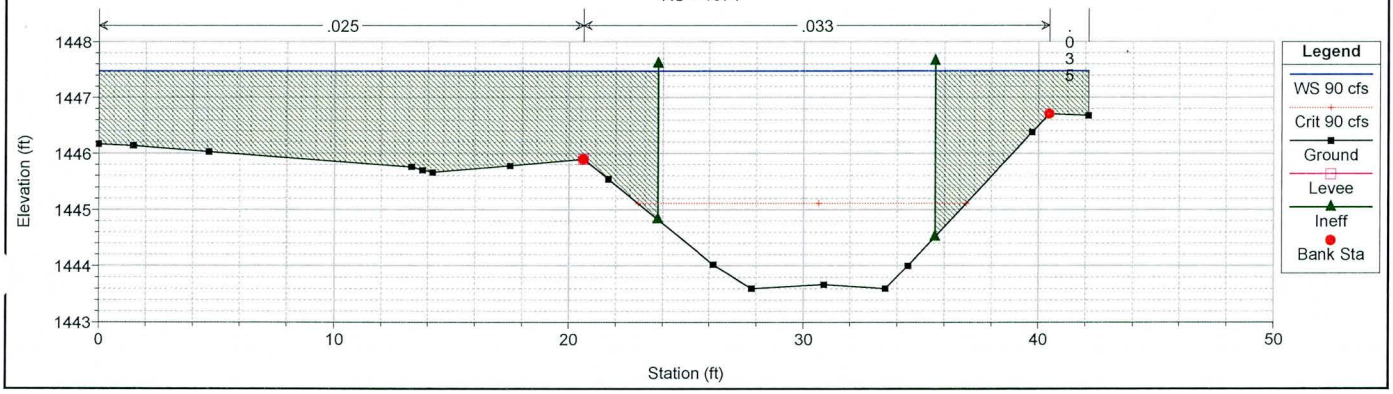
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1598 Culv



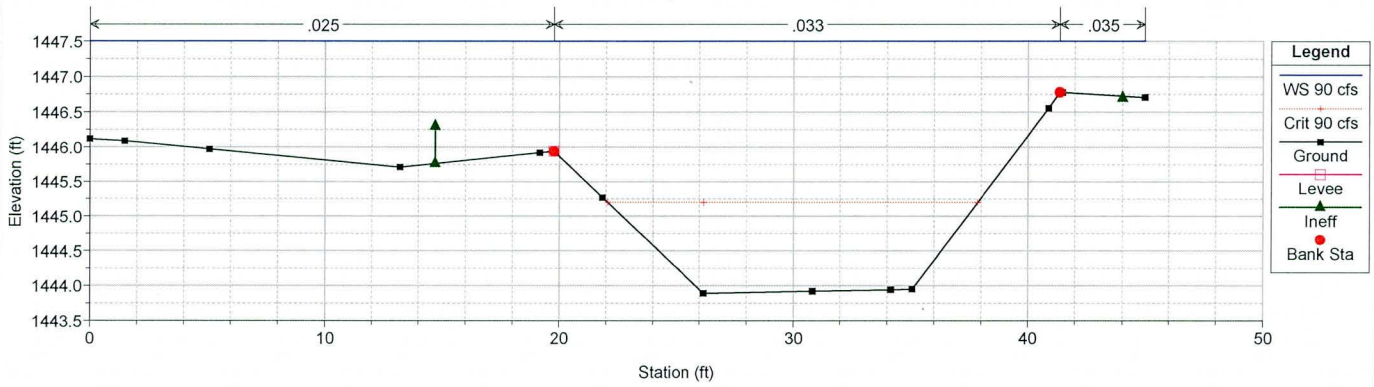
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1598 Culv



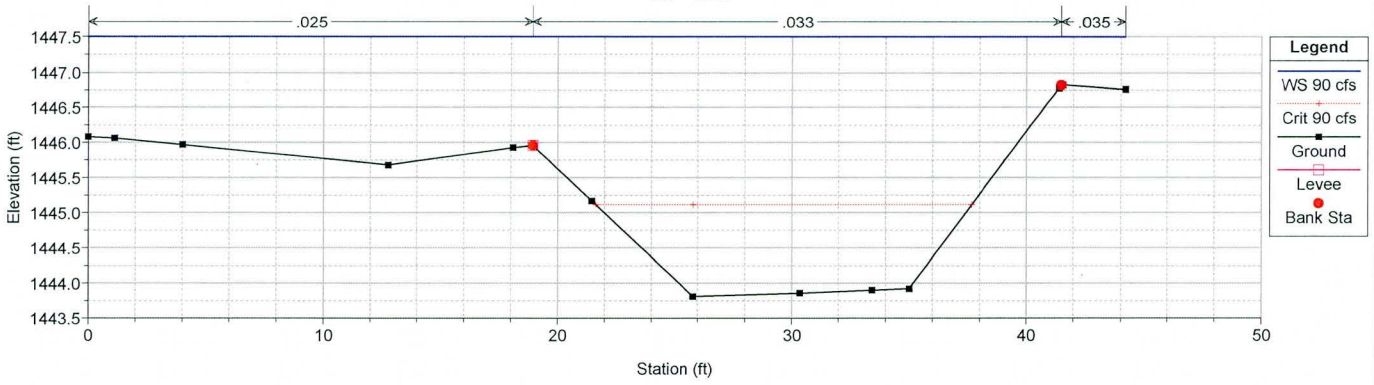
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1574



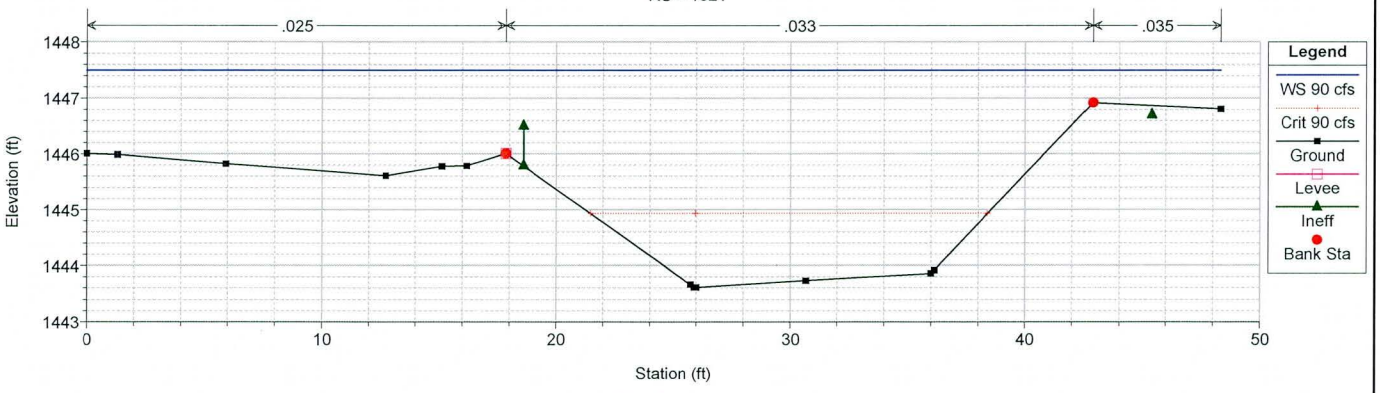
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1556



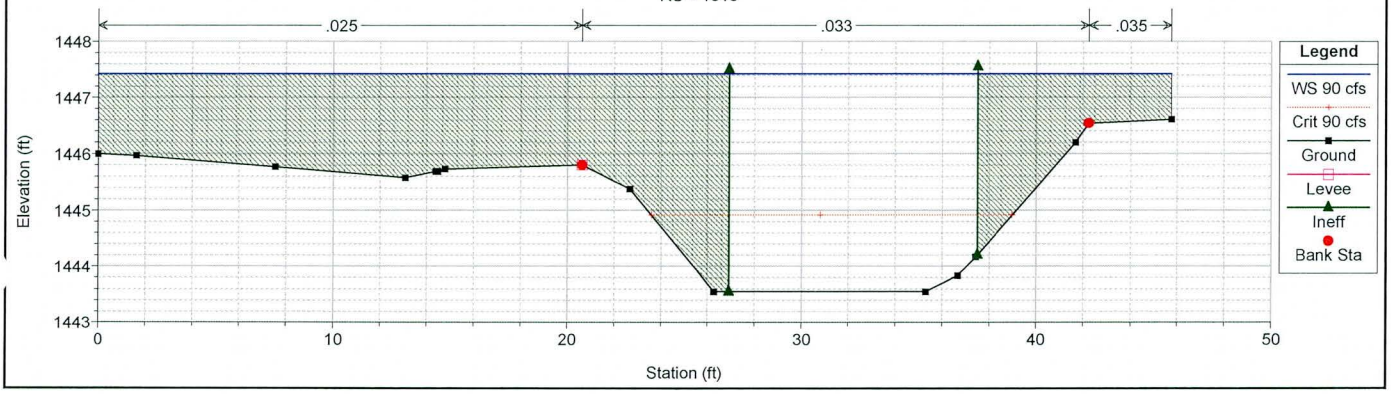
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1546

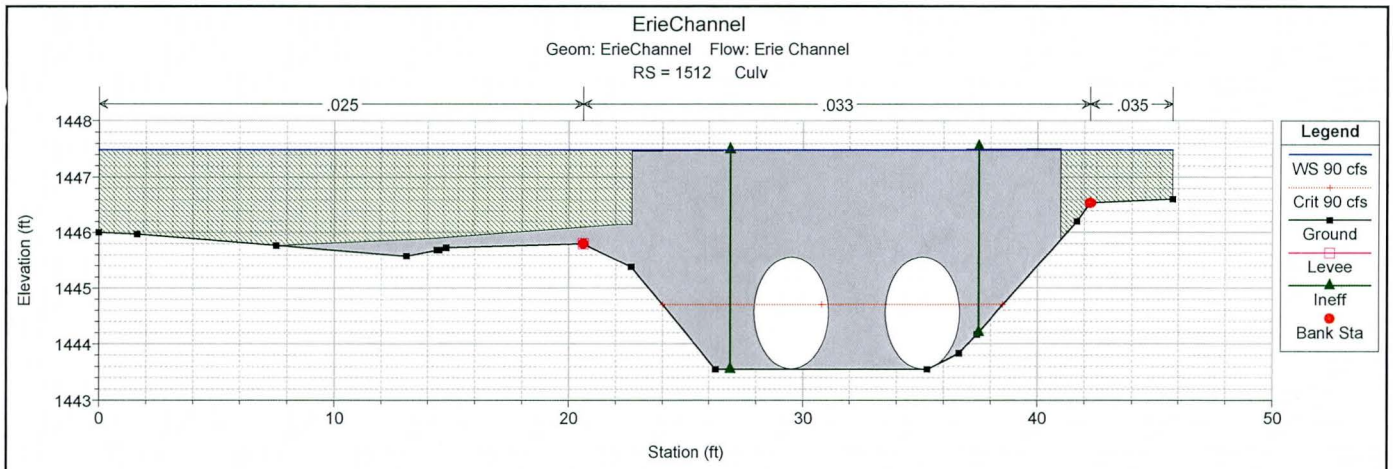


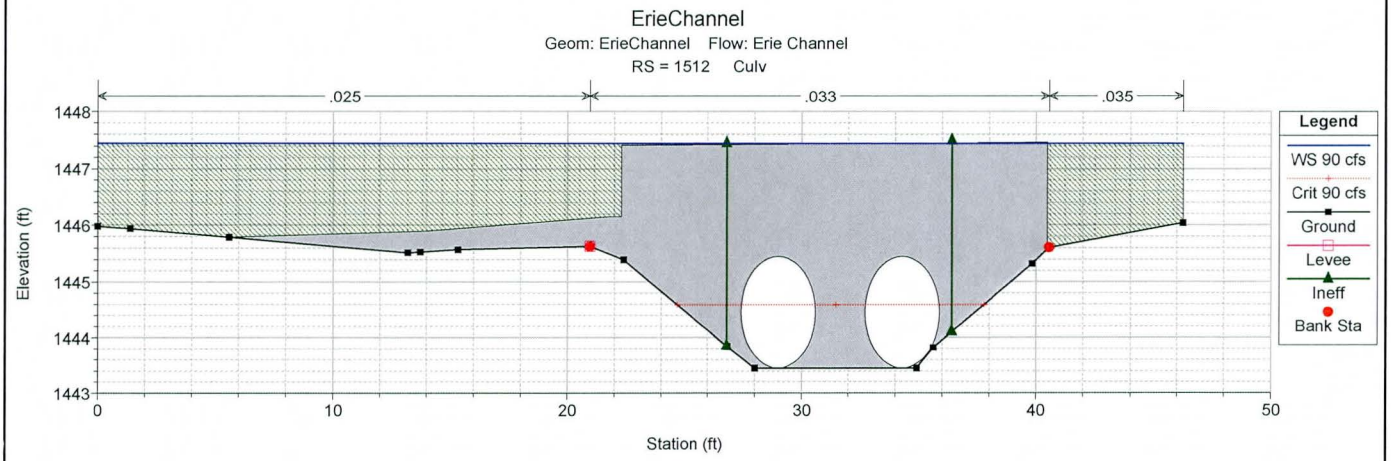
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1521

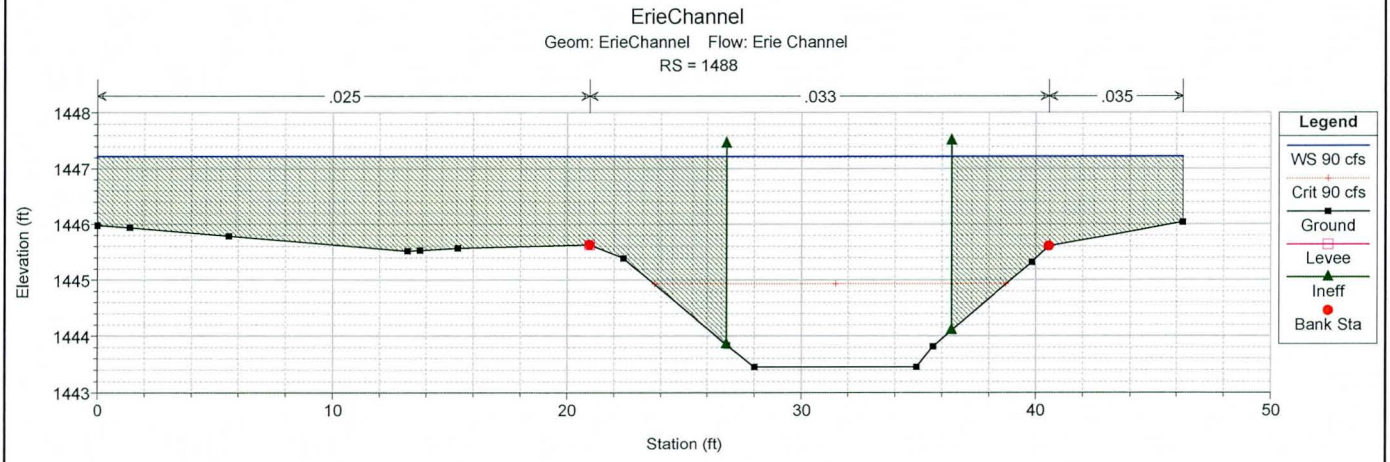


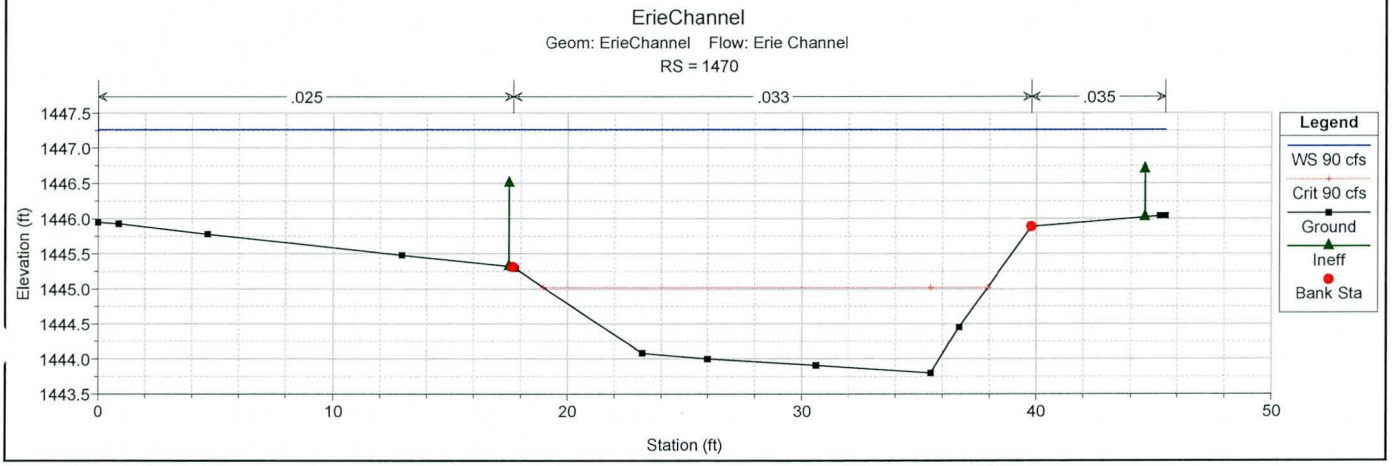
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1513



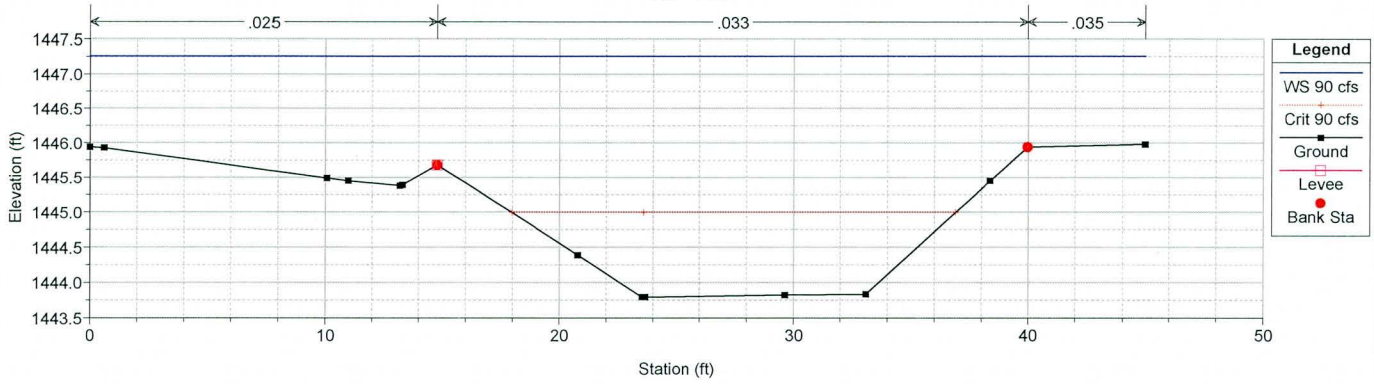

ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1512 Culv
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1512 Culv
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta

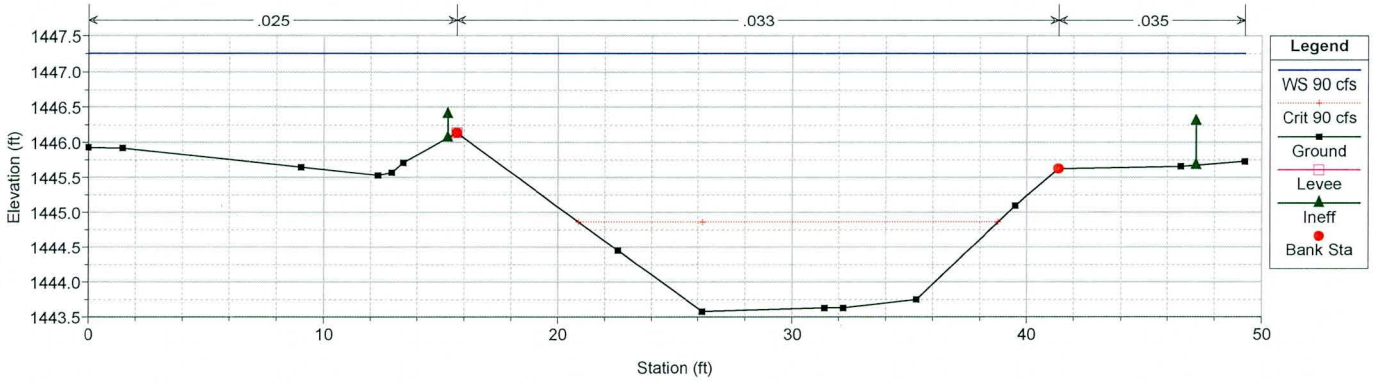

ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1488
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1470
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Ineff
Bank Sta

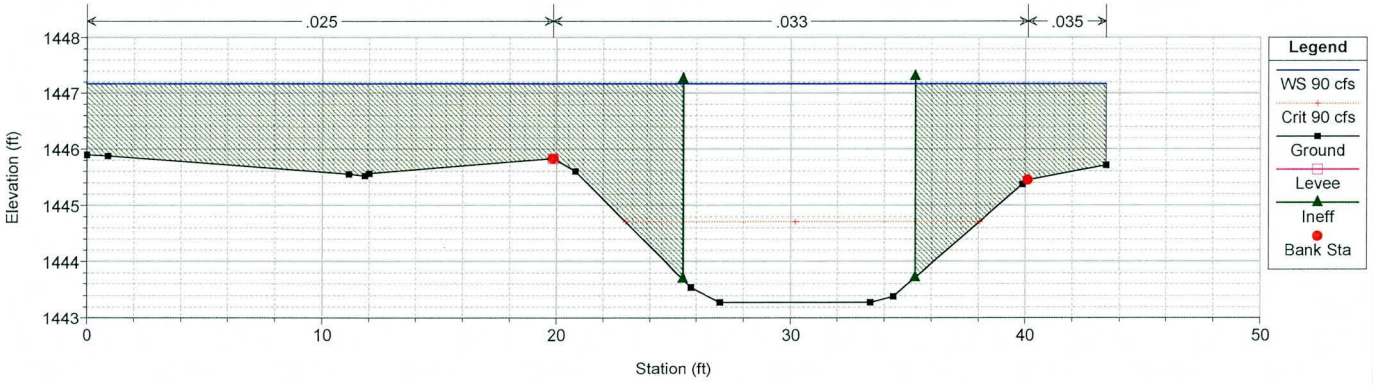
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1408



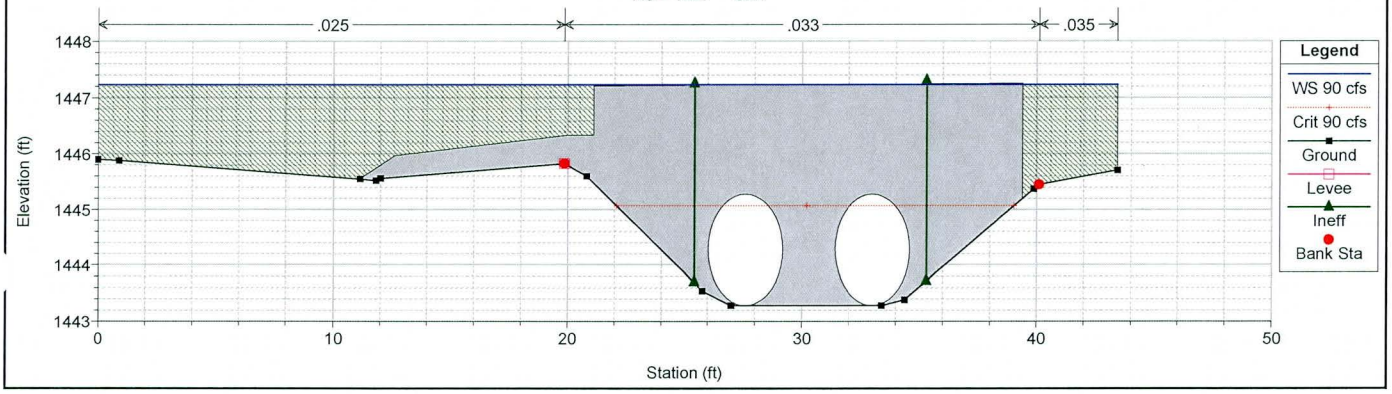
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1349

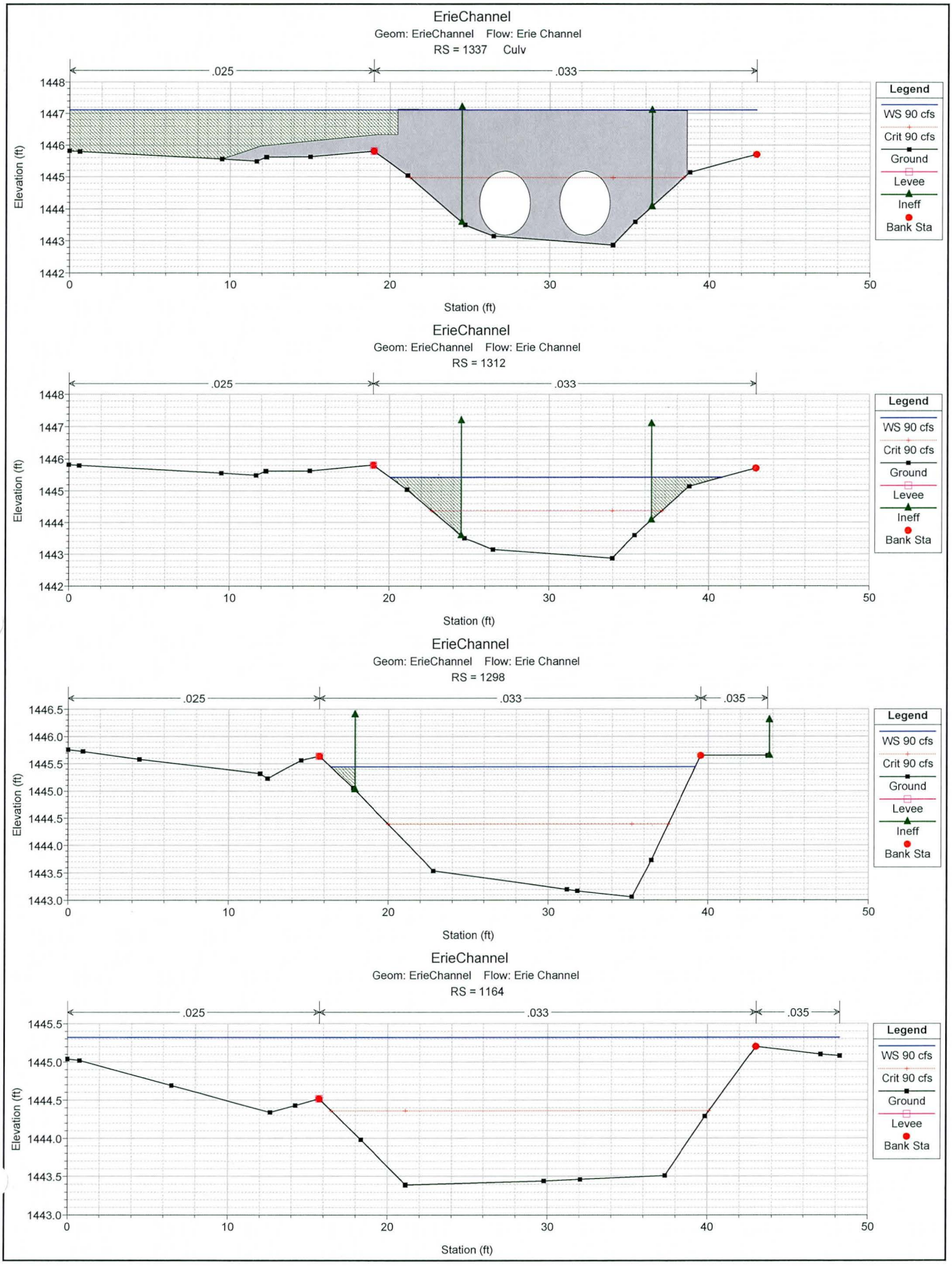


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1338

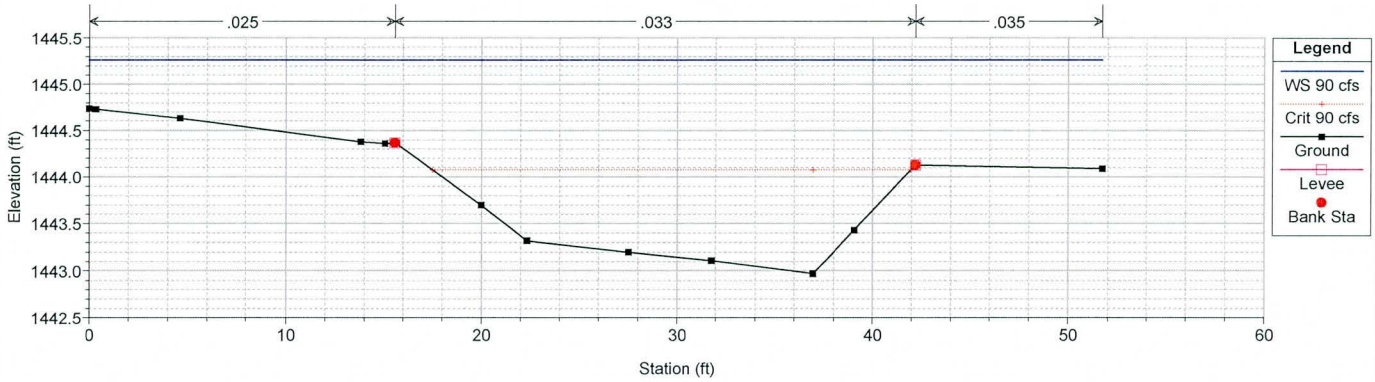


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1337 Culv

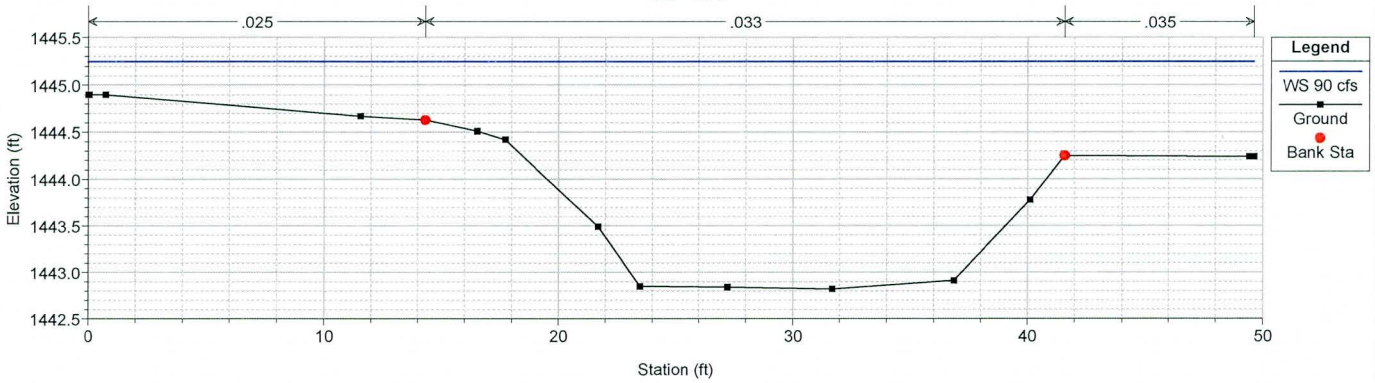



ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1337 Culv
.025
.033
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1312
.025
.033
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1298
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Ineff
Bank Sta
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1164
.025
.033
.035
Elevation (ft)
Station (ft)
Legend
WS 90 cfs
Crit 90 cfs
Ground
Levee
Bank Sta

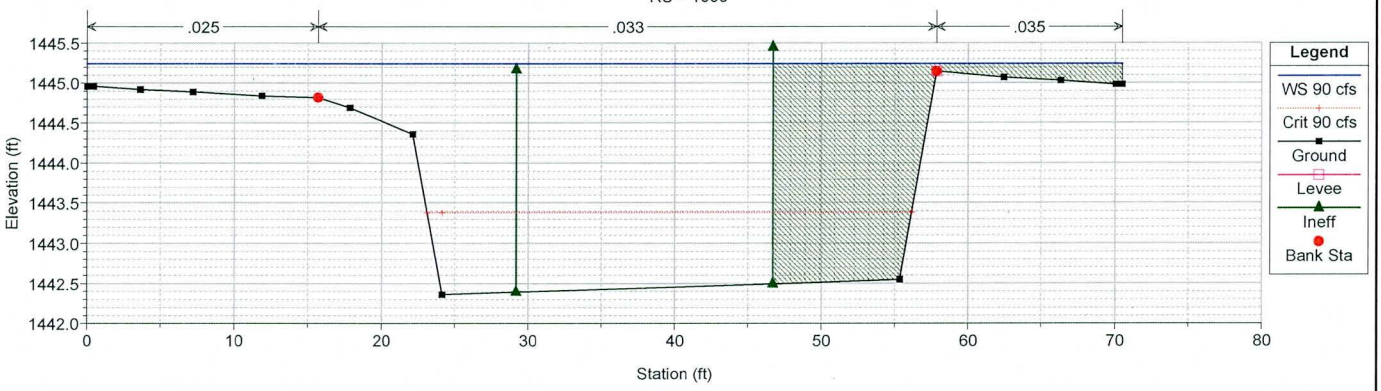
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1044



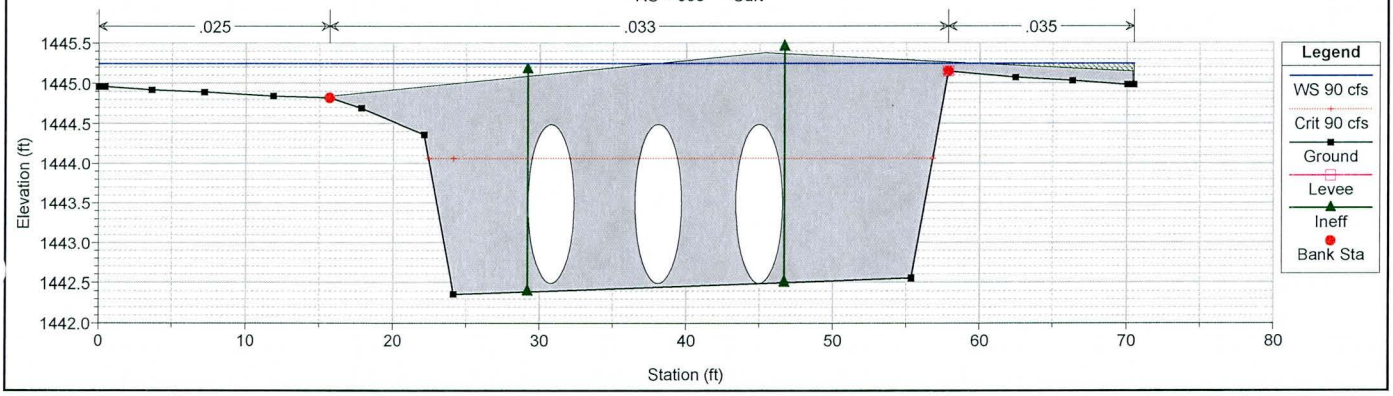
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1027



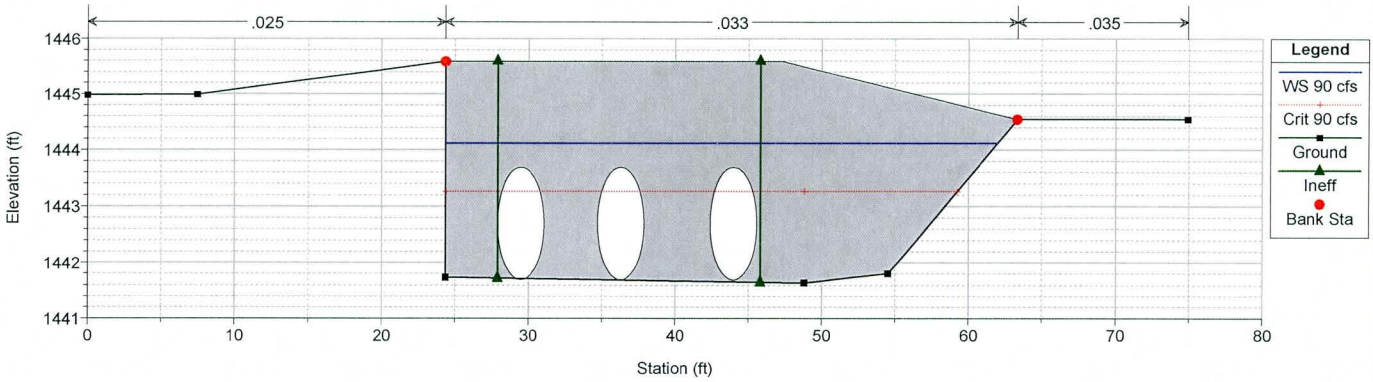
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 1000



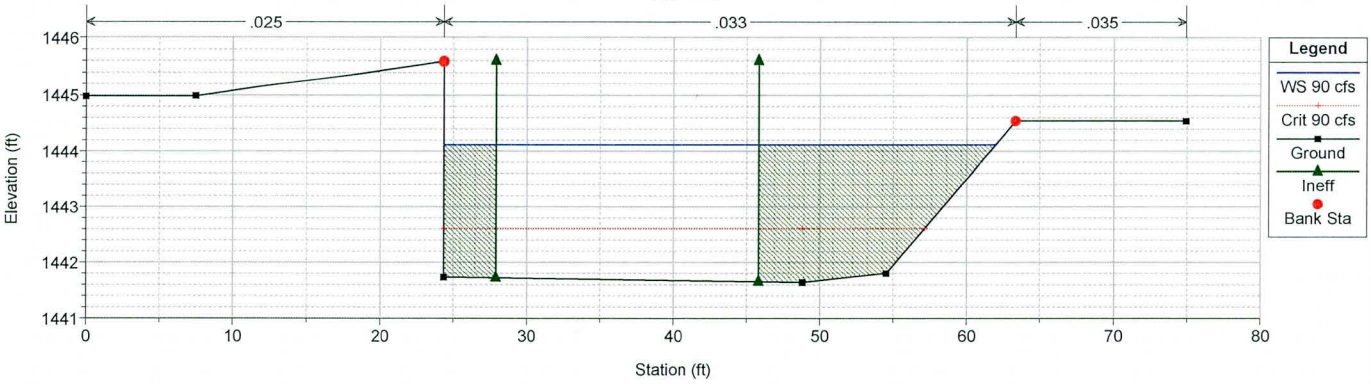
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 998 Culv



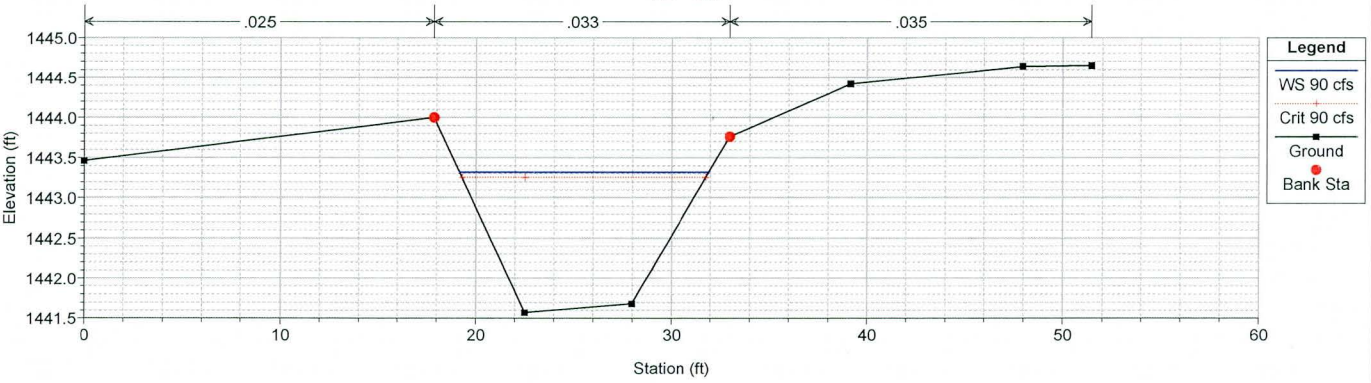
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 998 Culv



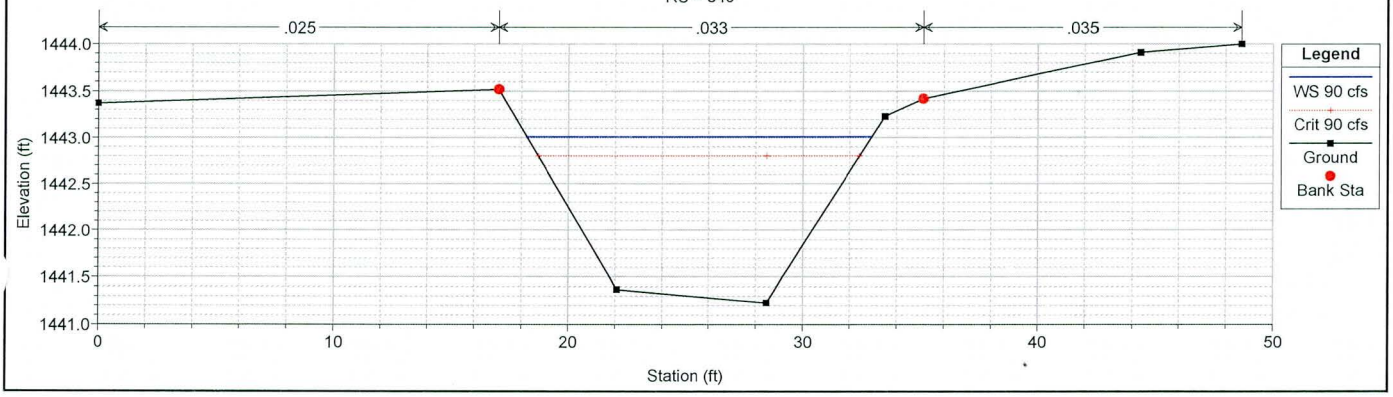
ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 913

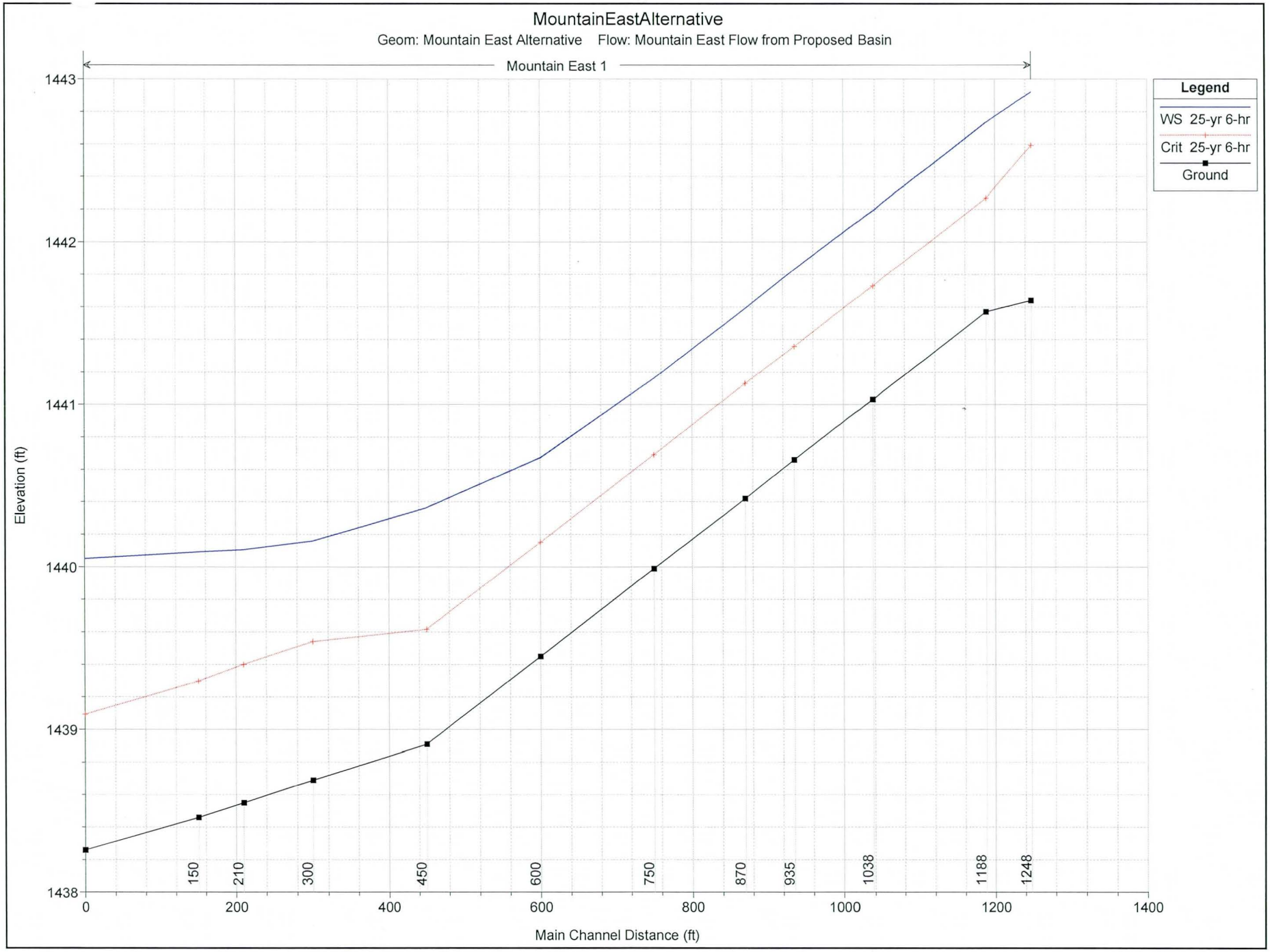


ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 881



ErieChannel
Geom: ErieChannel Flow: Erie Channel
RS = 849




MountainEastAlternative
Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin
Mountain East 1
Legend
WS 25-yr 6-hr
Crit 25-yr 6-hr
Ground
Elevation (ft)
1443
1442
1441
1440
1439
1438
150
210
300
450
600
750
870
935
1038
1188
1248
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)

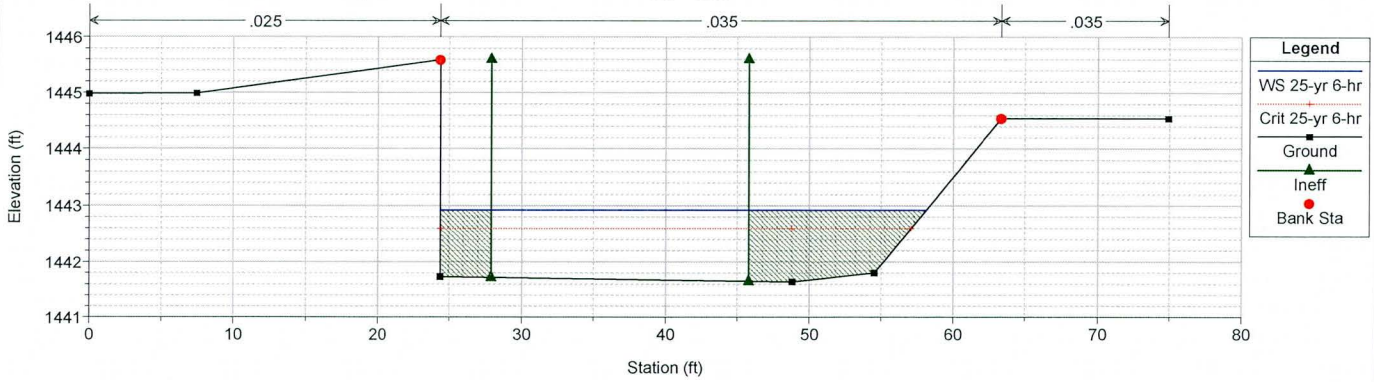
HEC-RAS Plan: East Alt River: Mountain East Reach: 1 Profile: 25-yr 6-hr

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	1248	25-yr 6-hr	88.00	1441.64	1442.92	1442.59	1443.17	0.006625	3.98	22.12	33.78	0.63
1	1188	25-yr 6-hr	88.00	1441.57	1442.74	1442.27	1442.84	0.003601	2.54	34.59	34.37	0.45
1	1038	25-yr 6-hr	88.00	1441.03	1442.19	1441.73	1442.29	0.003643	2.56	34.43	34.27	0.45
1	935	25-yr 6-hr	88.00	1440.66	1441.83	1441.36	1441.93	0.003509	2.51	35.12	35.06	0.44
1	870	25-yr 6-hr	88.00	1440.42	1441.59	1441.13	1441.69	0.003683	2.57	34.30	34.24	0.45
1	750	25-yr 6-hr	88.00	1439.99	1441.16	1440.69	1441.26	0.003528	2.52	34.92	34.66	0.44
1	600	25-yr 6-hr	88.00	1439.45	1440.67	1440.15	1440.76	0.003039	2.40	36.65	34.97	0.41
1	450	25-yr 6-hr	88.00	1438.91	1440.36	1439.62	1440.42	0.001661	1.97	44.76	36.61	0.31
1	300	25-yr 6-hr	116.00	1438.69	1440.16	1439.54	1440.27	0.000699	2.70	42.91	33.44	0.42
1	210	25-yr 6-hr	116.00	1438.55	1440.11	1439.40	1440.21	0.000601	2.63	44.09	31.73	0.39
1	150	25-yr 6-hr	116.00	1438.46	1440.09	1439.30	1440.17	0.000462	2.30	50.51	36.93	0.35
1	0	25-yr 6-hr	116.00	1438.26	1440.05	1439.09	1440.11	0.000313	1.96	59.23	41.17	0.29

MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

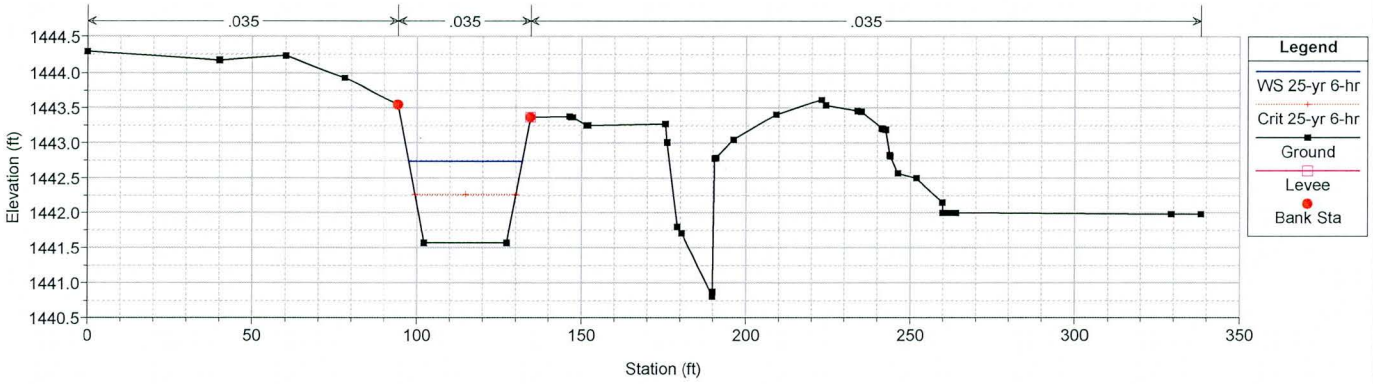
RS = 1248



MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

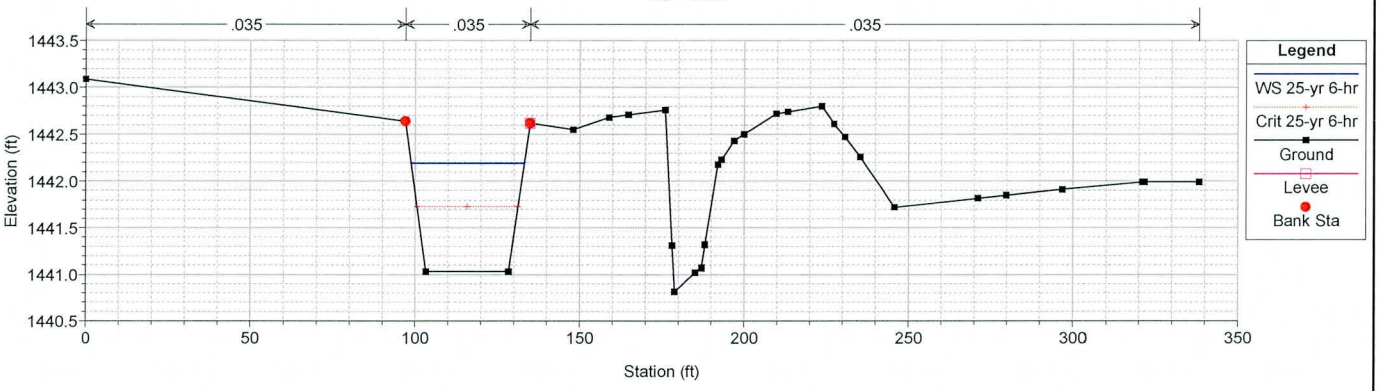
RS = 1188



MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

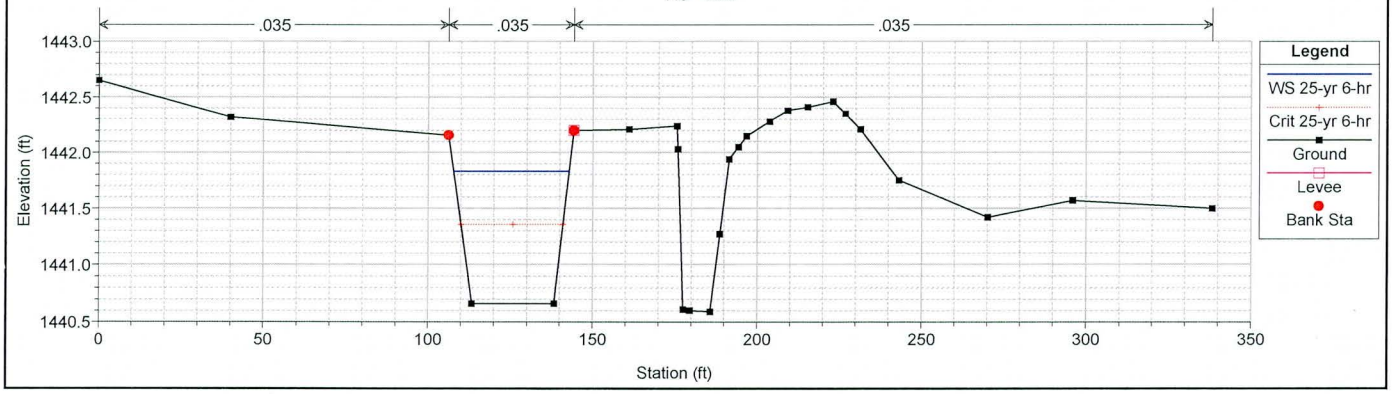
RS = 1038



MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

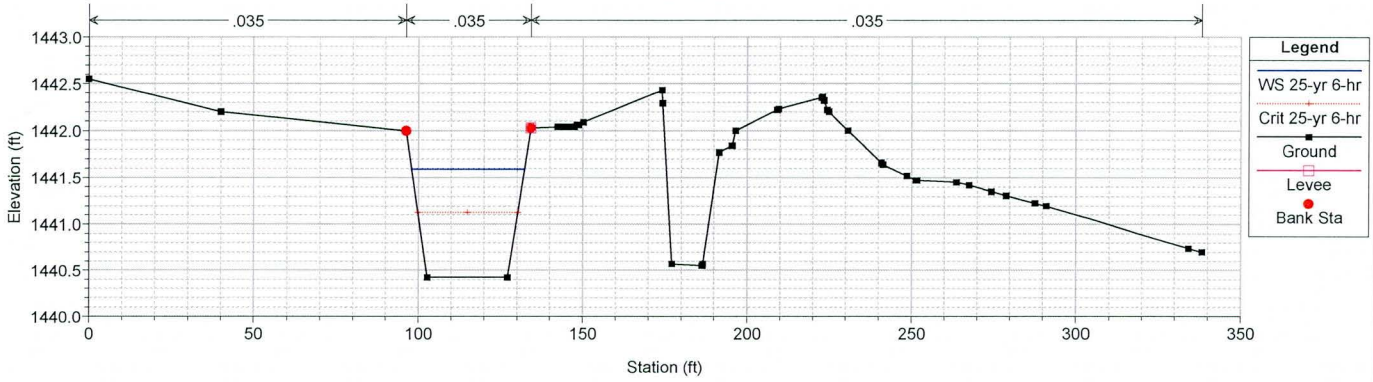
RS = 935



MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

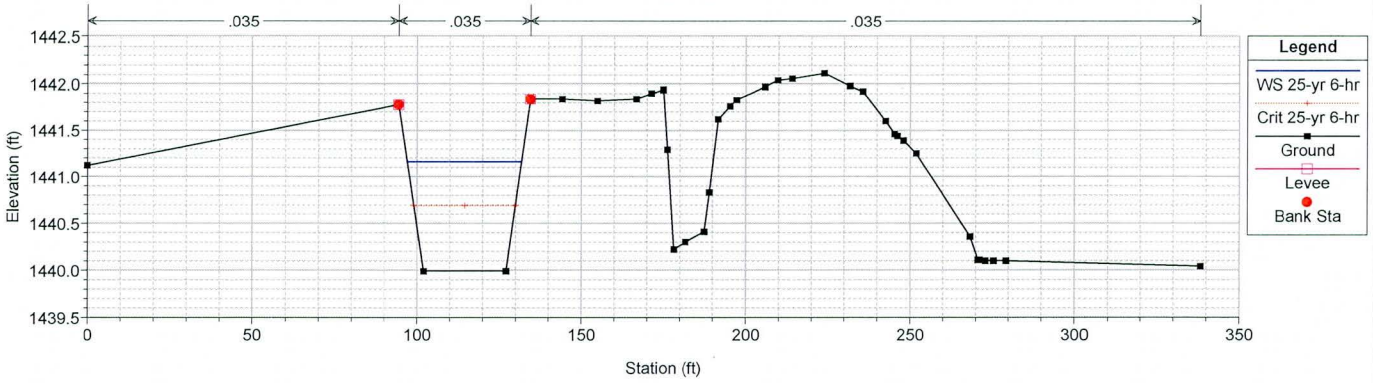
RS = 870



MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

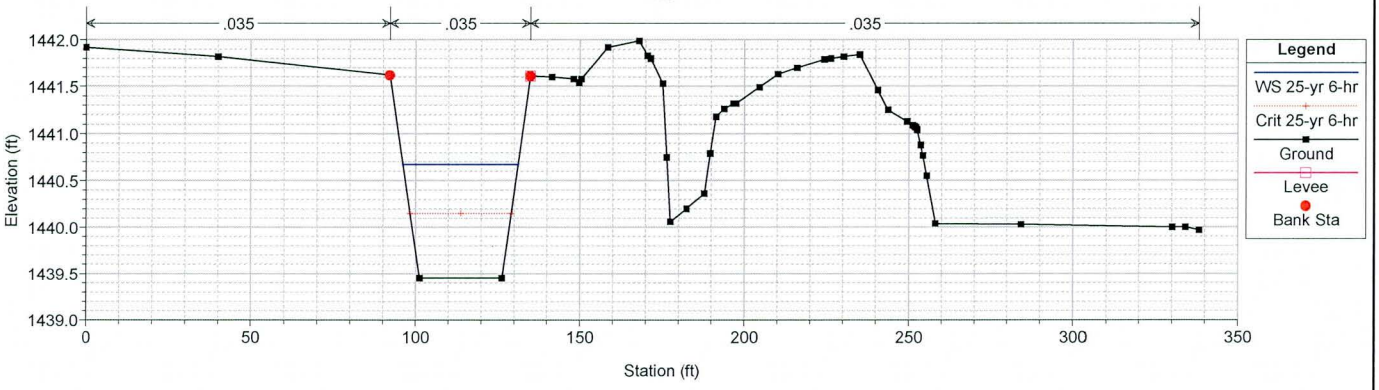
RS = 750



MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

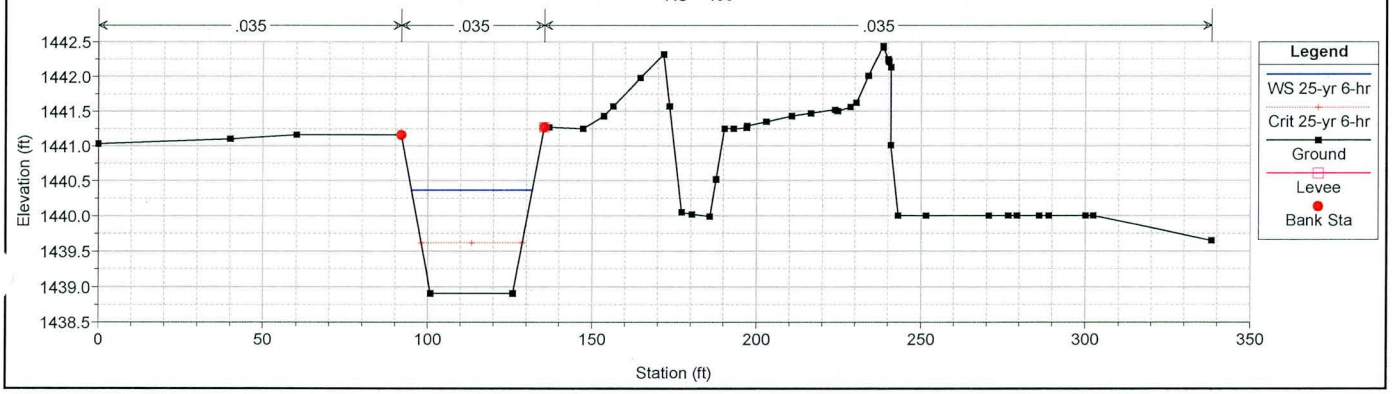
RS = 600

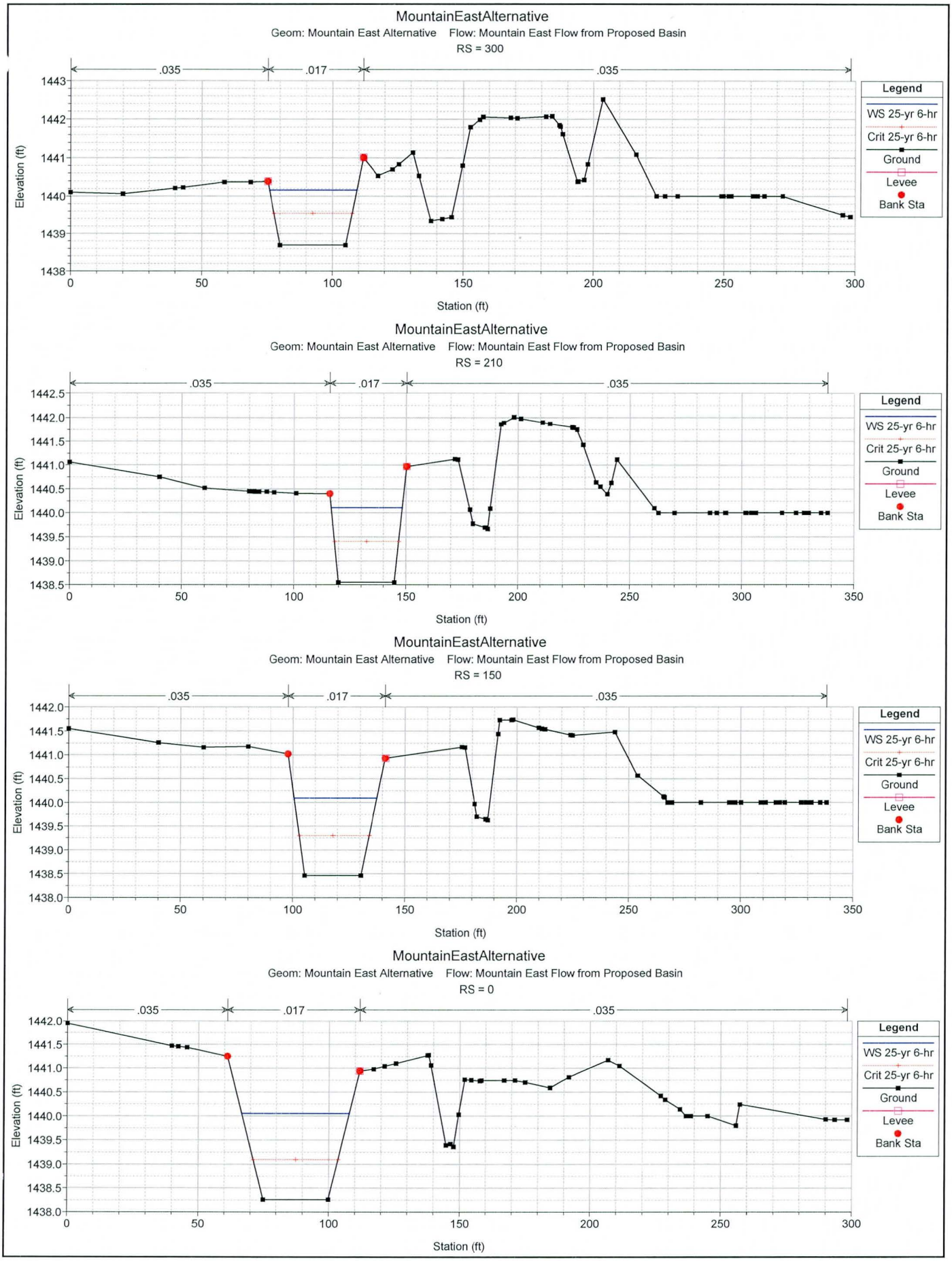


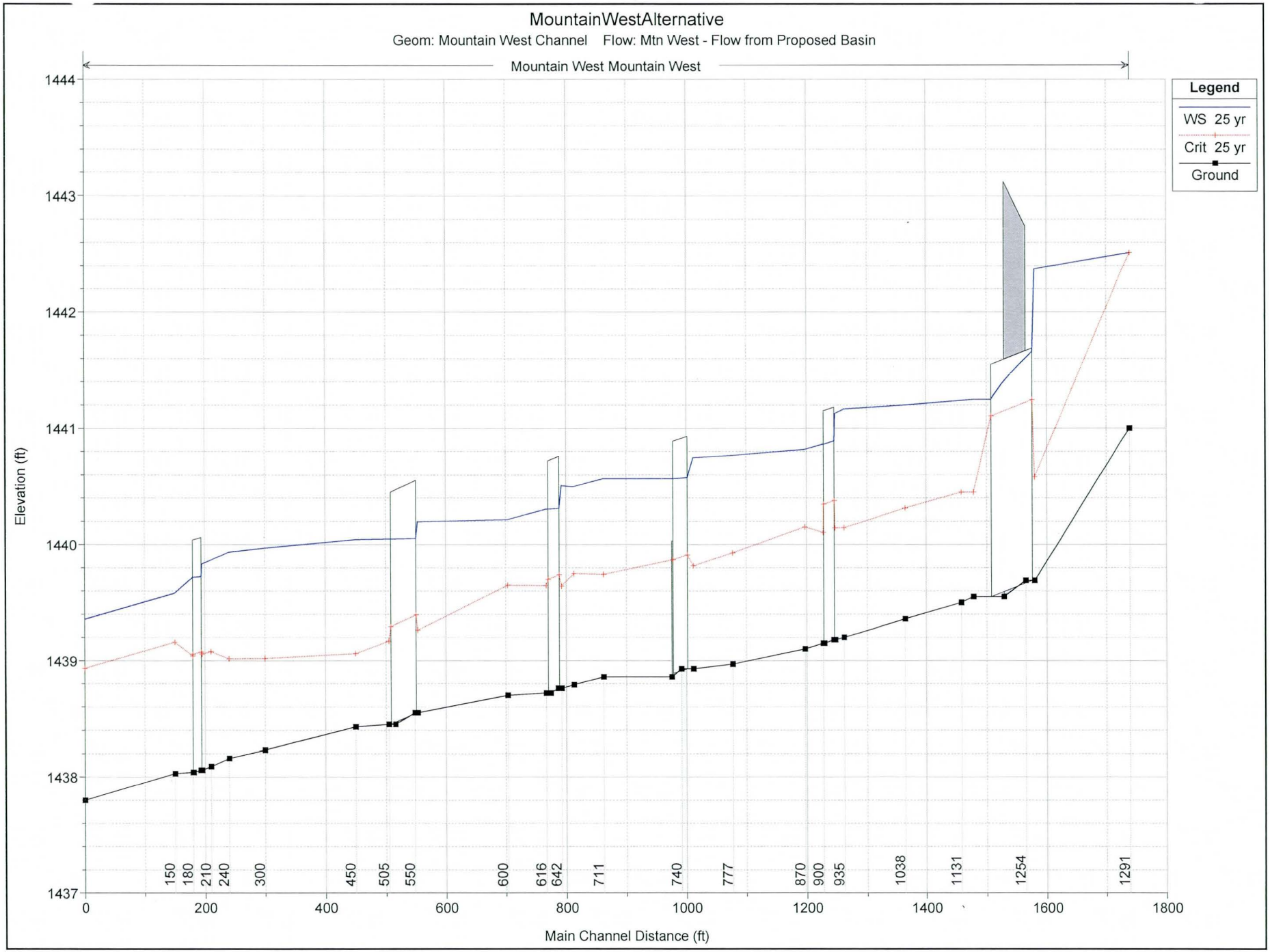
MountainEastAlternative

Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin

RS = 450




MountainEastAlternative
Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin
RS = 300
.035
.017
.035
Elevation (ft)
Station (ft)
Legend
WS 25-yr 6-hr
Crit 25-yr 6-hr
Ground
Levee
Bank Sta
MountainEastAlternative
Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin
RS = 210
.035
.017
.035
Elevation (ft)
Station (ft)
Legend
WS 25-yr 6-hr
Crit 25-yr 6-hr
Ground
Levee
Bank Sta
MountainEastAlternative
Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin
RS = 150
.035
.017
.035
Elevation (ft)
Station (ft)
Legend
WS 25-yr 6-hr
Crit 25-yr 6-hr
Ground
Levee
Bank Sta
MountainEastAlternative
Geom: Mountain East Alternative Flow: Mountain East Flow from Proposed Basin
RS = 0
.035
.017
.035
Elevation (ft)
Station (ft)
Legend
WS 25-yr 6-hr
Crit 25-yr 6-hr
Ground
Levee
Bank Sta


MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
Mountain West Mountain West
Legend
WS 25 yr
Crit 25 yr
Ground
Elevation (ft)
1444
1443
1442
1441
1440
1439
1438
1437
0
200
400
600
800
1000
1200
1400
1600
1800
Main Channel Distance (ft)
150
180
210
240
300
450
505
550
600
616
642
711
740
777
870
900
935
1038
1131
1254
1291

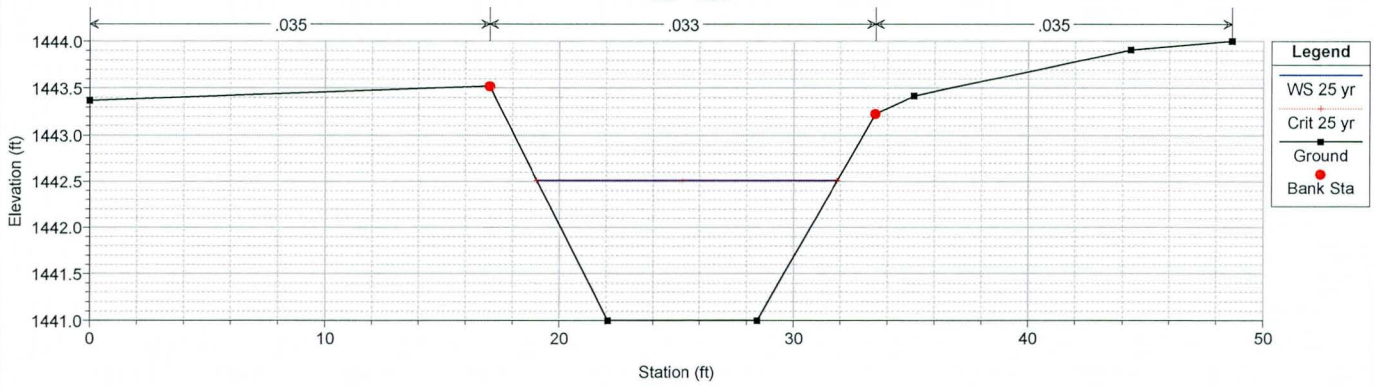
HEC-RAS Plan: West Alt River: Mountain West Reach: Mountain West Profile: 25 yr

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)	
Mountain West	1291	25 yr	88.00	1441.00	1442.51	1442.51	1443.08	0.016470	6.07	14.51	12.81	1.00
Mountain West	1258	25 yr	88.00	1439.69	1442.37	1440.58	1442.42	0.000420	1.78	49.37	40.35	0.19
Mountain West	1254		Culvert									
Mountain West	1183	25 yr	88.00	1439.55	1441.25	1440.45	1441.38	0.000530	2.86	30.73	27.60	0.39
Mountain West	1131	25 yr	88.00	1439.50	1441.24	1440.45	1441.36	0.000603	2.75	32.03	21.08	0.39
Mountain West	1038	25 yr	88.00	1439.36	1441.20	1440.31	1441.30	0.000485	2.55	34.49	21.50	0.35
Mountain West	935	25 yr	88.00	1439.20	1441.17	1440.15	1441.25	0.000387	2.36	37.23	21.89	0.32
Mountain West	920	25 yr	88.00	1439.18	1441.13	1440.14	1441.24	0.000410	2.70	32.56	21.83	0.34
Mountain West	918		Culvert									
Mountain West	900	25 yr	88.00	1439.15	1440.86	1440.10	1441.01	0.000613	3.05	28.82	21.13	0.41
Mountain West	870	25 yr	88.00	1439.10	1440.82	1440.15	1440.98	0.000851	3.22	27.32	17.94	0.46
Mountain West	777	25 yr	88.00	1438.97	1440.77	1439.93	1440.87	0.000529	2.63	33.49	21.29	0.37
Mountain West	750	25 yr	88.00	1438.93	1440.75	1439.82	1440.83	0.000404	2.34	37.67	23.46	0.32
Mountain West	740		Culvert									
Mountain West	711	25 yr	88.00	1438.86	1440.56	1439.74	1440.67	0.000482	2.60	33.90	23.64	0.36
Mountain West	662	25 yr	88.00	1438.79	1440.50	1439.75	1440.63	0.000686	2.93	29.99	19.19	0.41
Mountain West	642	25 yr	88.00	1438.76	1440.51	1439.64	1440.60	0.000451	2.45	35.94	23.25	0.34
Mountain West	638		Culvert									
Mountain West	616	25 yr	88.00	1438.72	1440.30	1439.65	1440.43	0.000705	2.88	30.61	21.75	0.42
Mountain West	600	25 yr	88.00	1438.70	1440.21	1439.65	1440.37	0.000945	3.18	27.65	20.54	0.48
Mountain West	553	25 yr	88.00	1438.55	1440.19	1439.26	1440.25	0.000281	1.88	46.88	32.08	0.27
Mountain West	550		Culvert									
Mountain West	505	25 yr	88.00	1438.45	1440.05	1439.17	1440.11	0.000336	2.03	43.28	29.21	0.29
Mountain West	450	25 yr	88.00	1438.43	1440.04	1439.06	1440.09	0.000226	1.69	52.03	34.56	0.24
Mountain West	300	25 yr	116.00	1438.23	1439.97	1439.02	1440.04	0.000331	2.10	55.17	35.47	0.30
Mountain West	240	25 yr	116.00	1438.16	1439.93	1439.02	1440.01	0.000391	2.30	50.37	31.86	0.32
Mountain West	210	25 yr	116.00	1438.09	1439.87	1439.08	1440.00	0.000621	2.89	40.20	25.29	0.40
Mountain West	195	25 yr	116.00	1438.06	1439.83	1439.06	1439.98	0.000611	3.11	37.34	26.23	0.41
Mountain West	193		Culvert									
Mountain West	180	25 yr	116.00	1438.04	1439.72	1439.04	1439.89	0.000752	3.38	34.36	26.24	0.46
Mountain West	150	25 yr	116.00	1438.03	1439.58	1439.16	1439.84	0.001516	4.08	28.40	20.66	0.61
Mountain West	0	25 yr	116.00	1437.80	1439.35	1438.93	1439.61	0.001500	4.07	28.49	20.66	0.61

MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

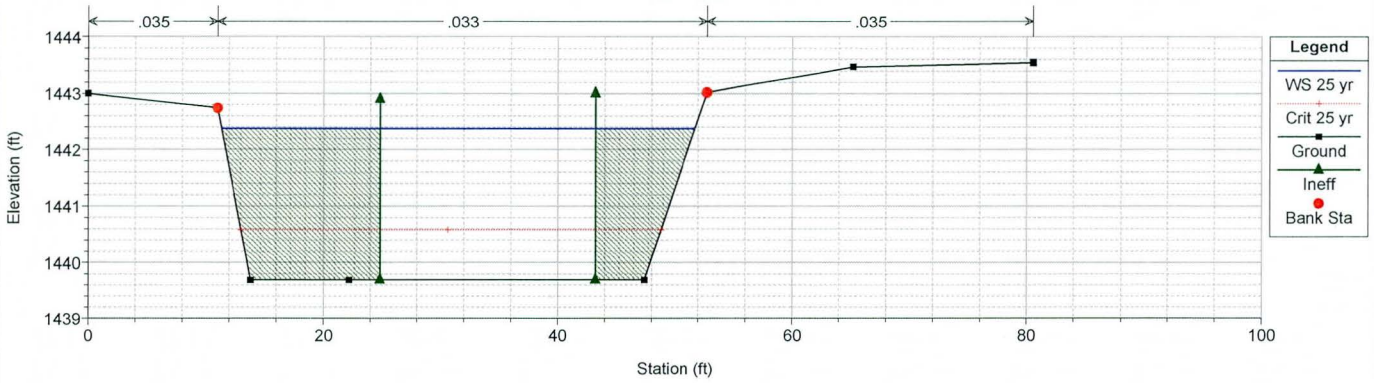
RS = 1291



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

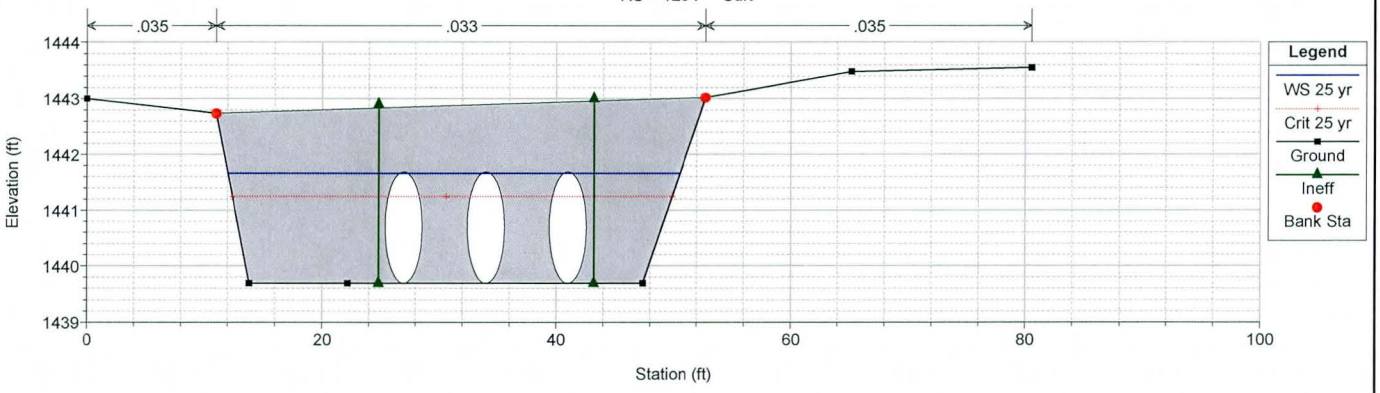
RS = 1258



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

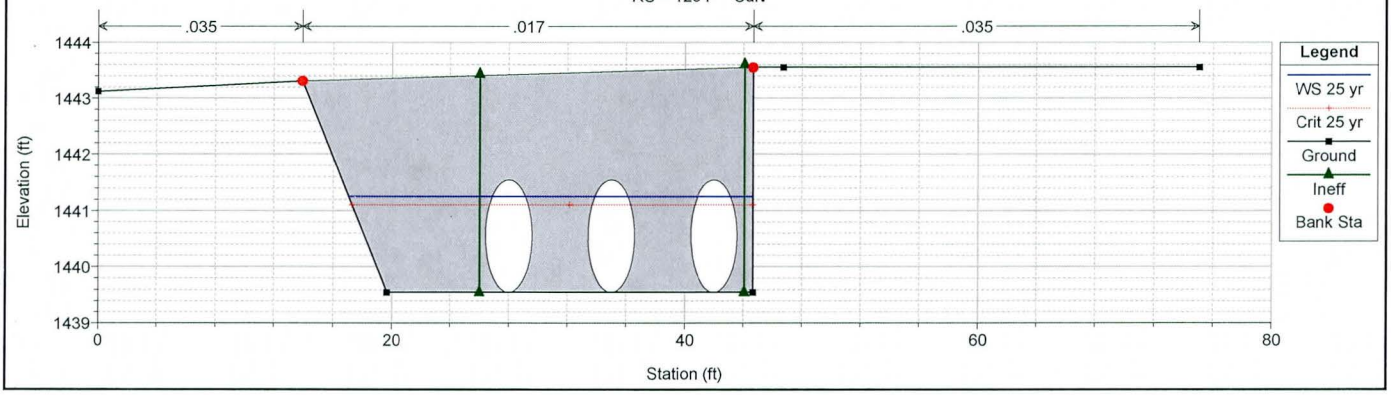
RS = 1254 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

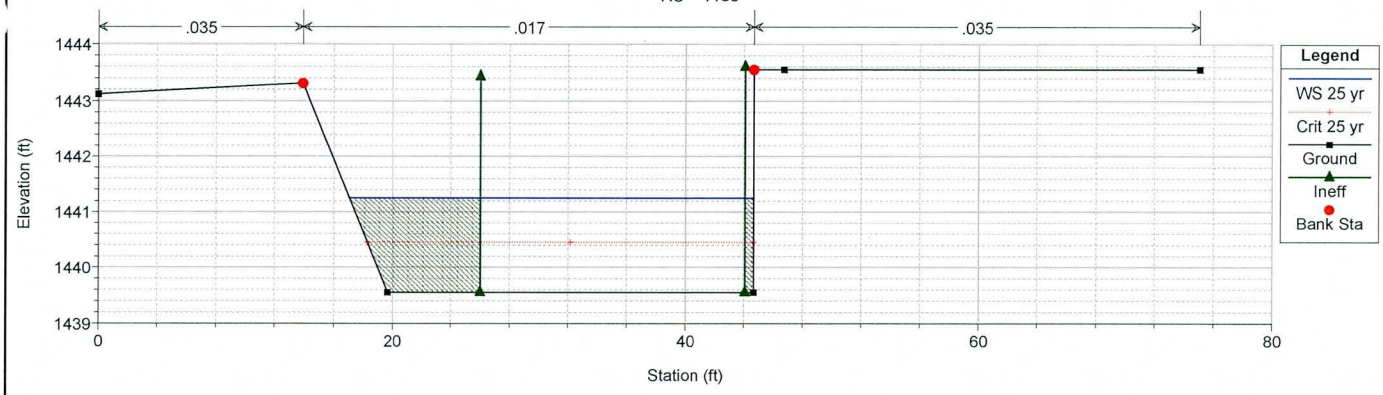
RS = 1254 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

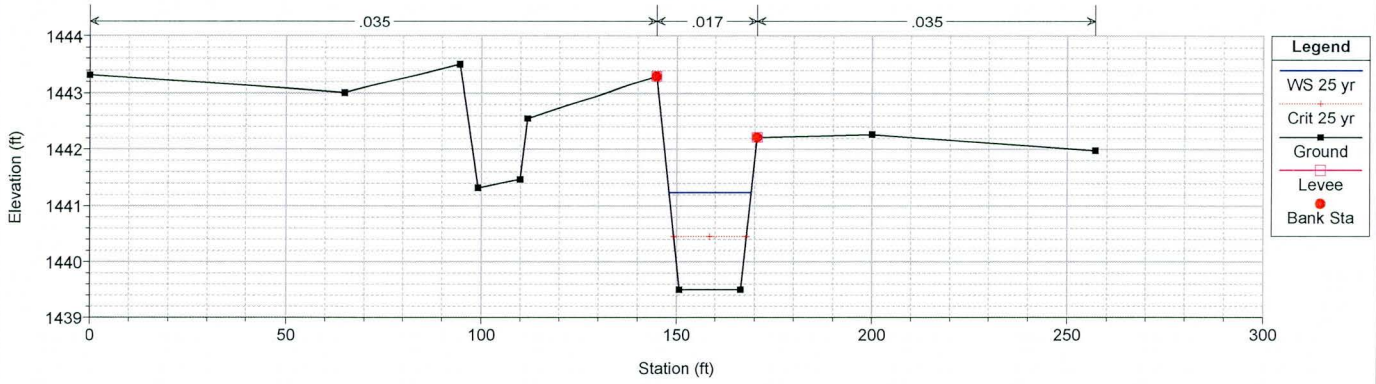
RS = 1183



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

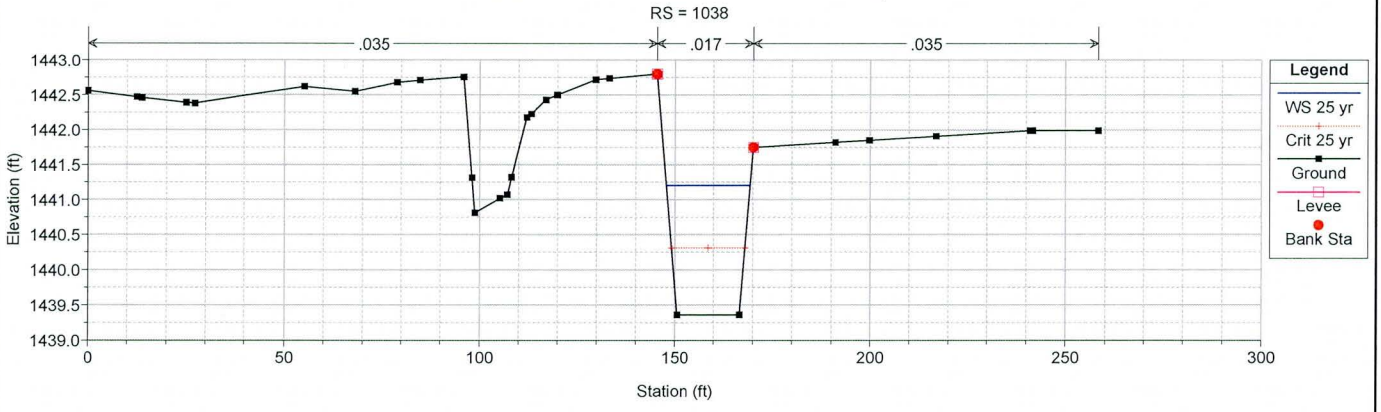
RS = 1131



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

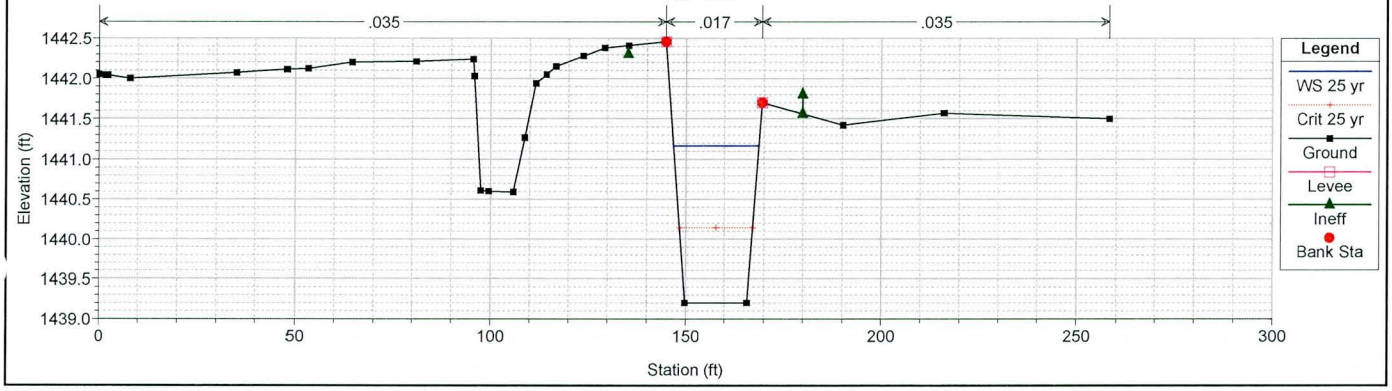
RS = 1038



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

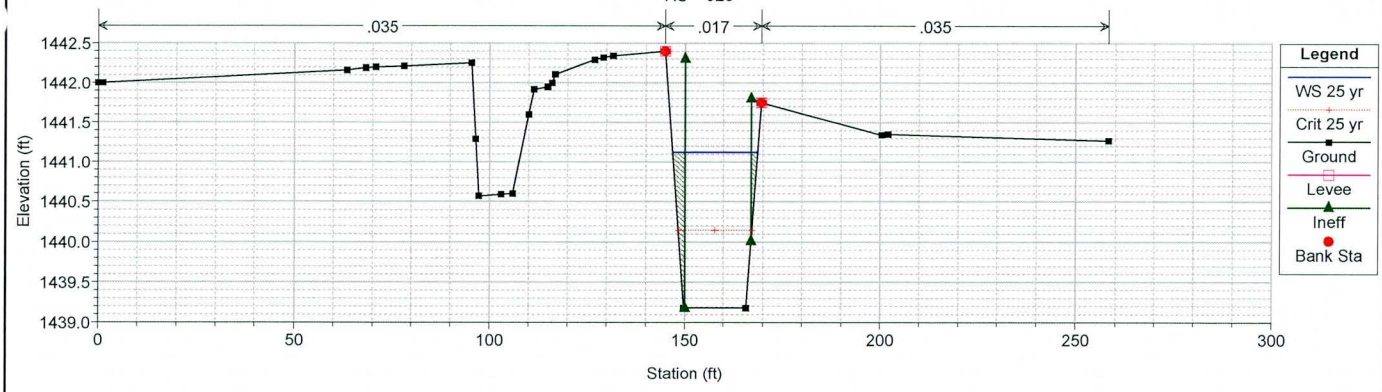
RS = 935



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

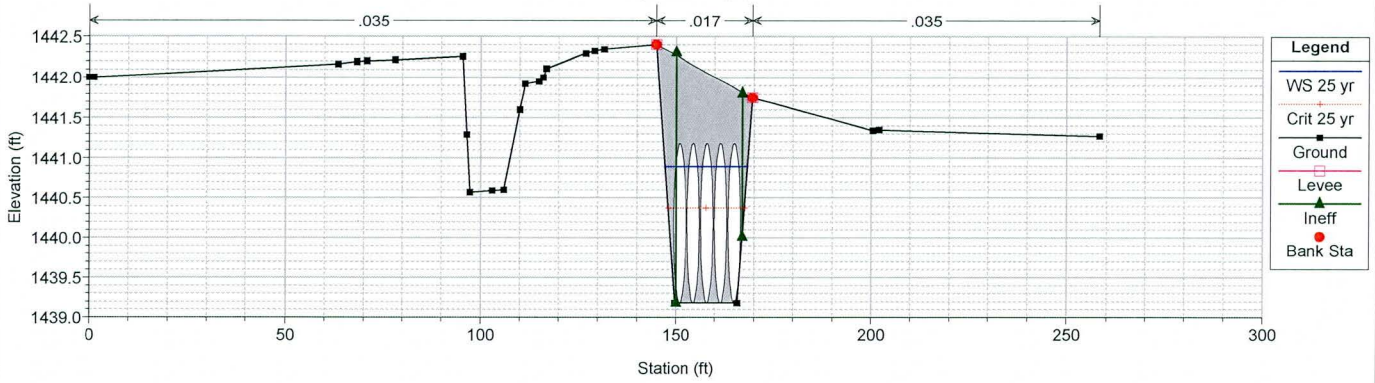
RS = 920



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

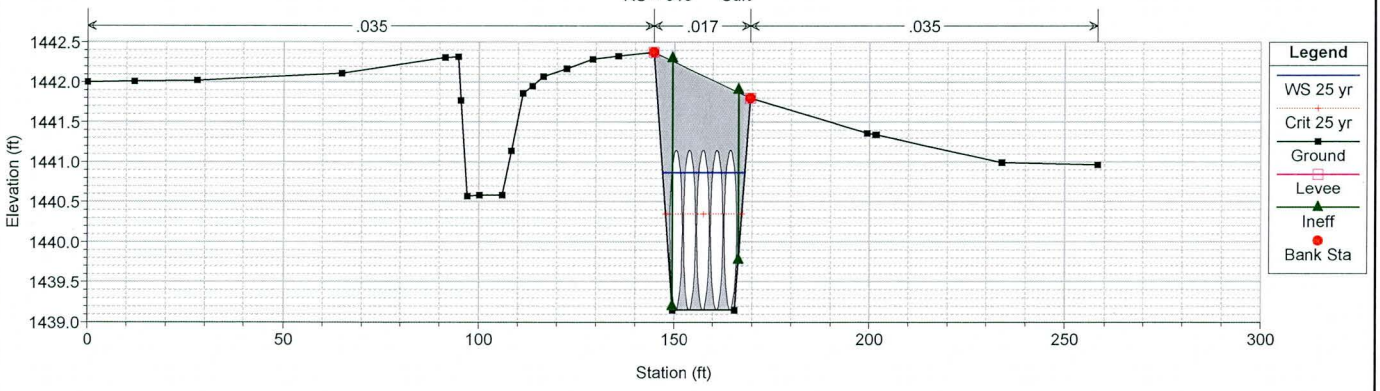
RS = 918 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

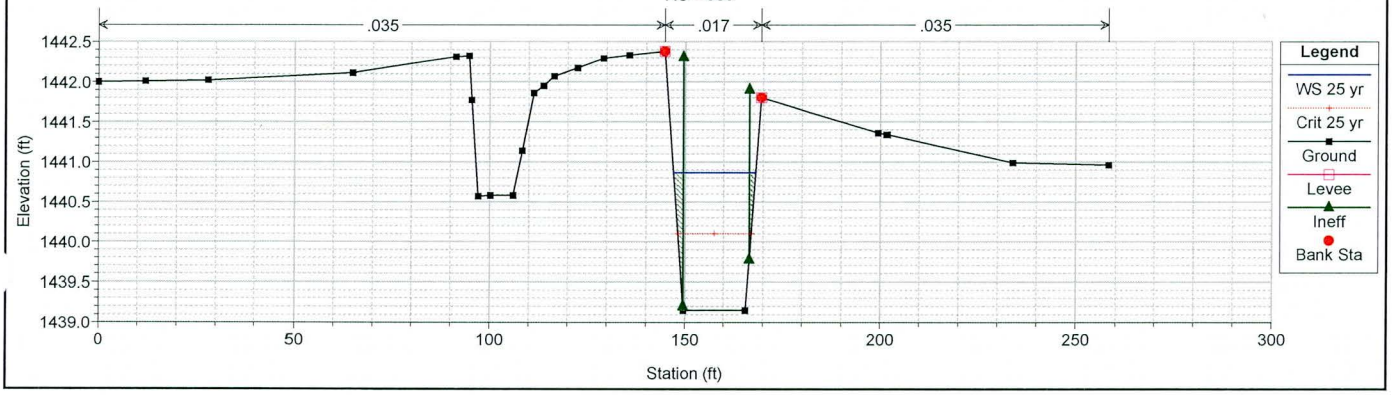
RS = 918 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

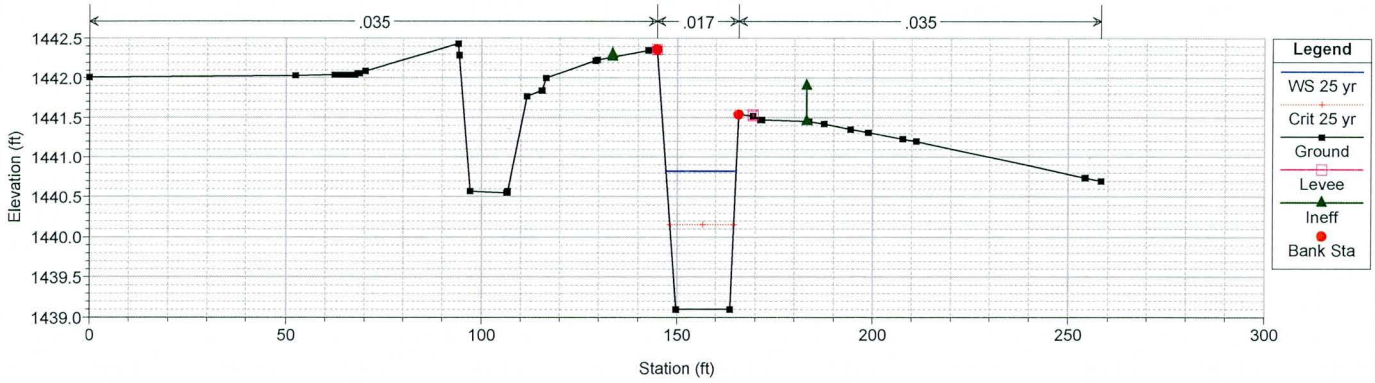
RS = 900



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

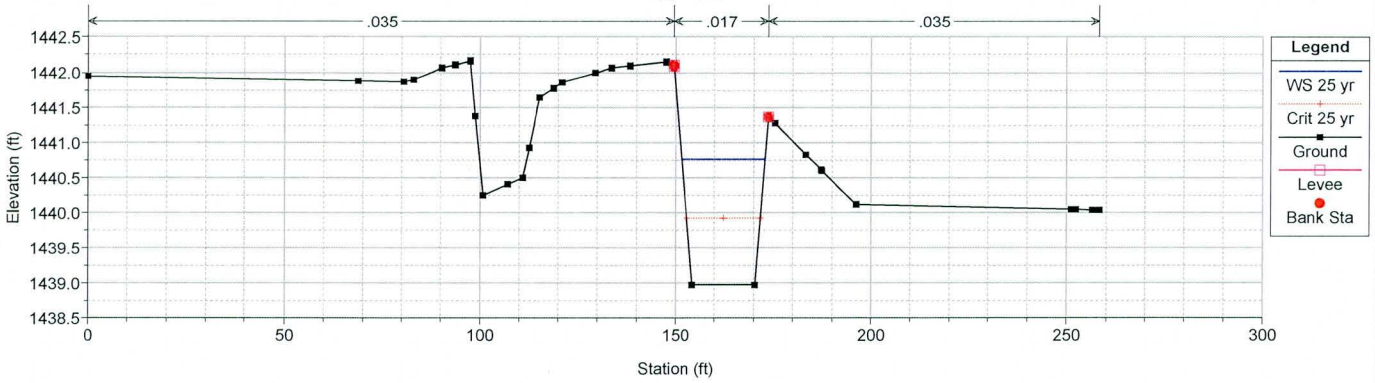
RS = 870



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

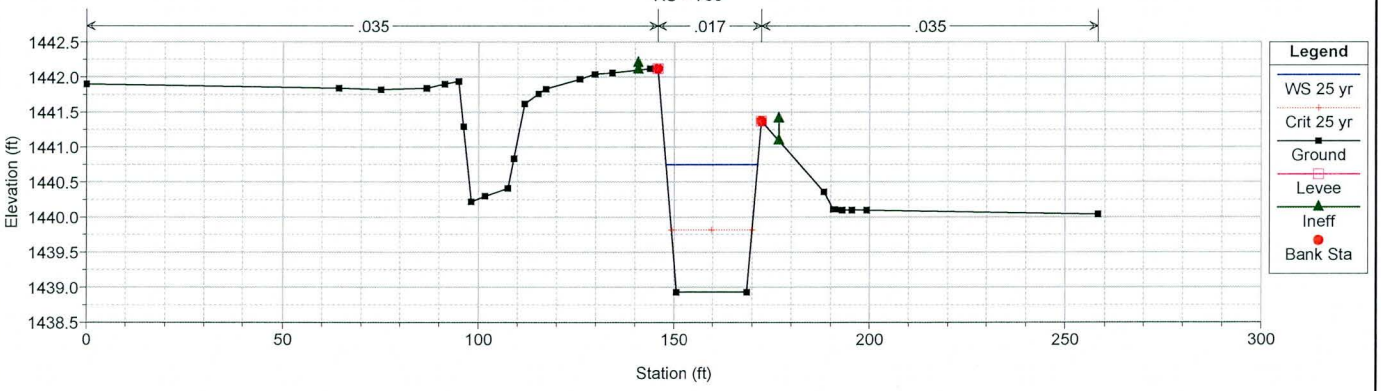
RS = 777



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

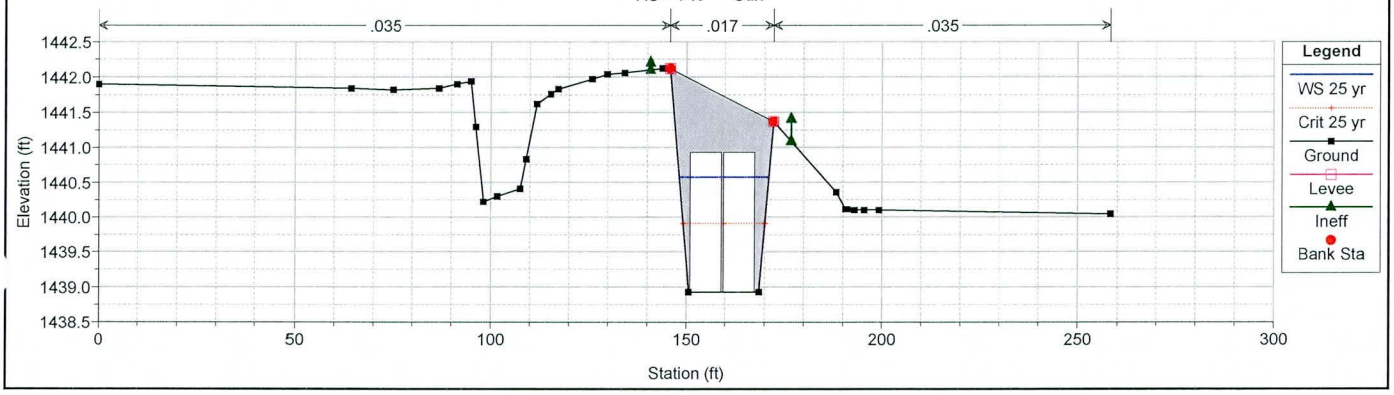
RS = 750

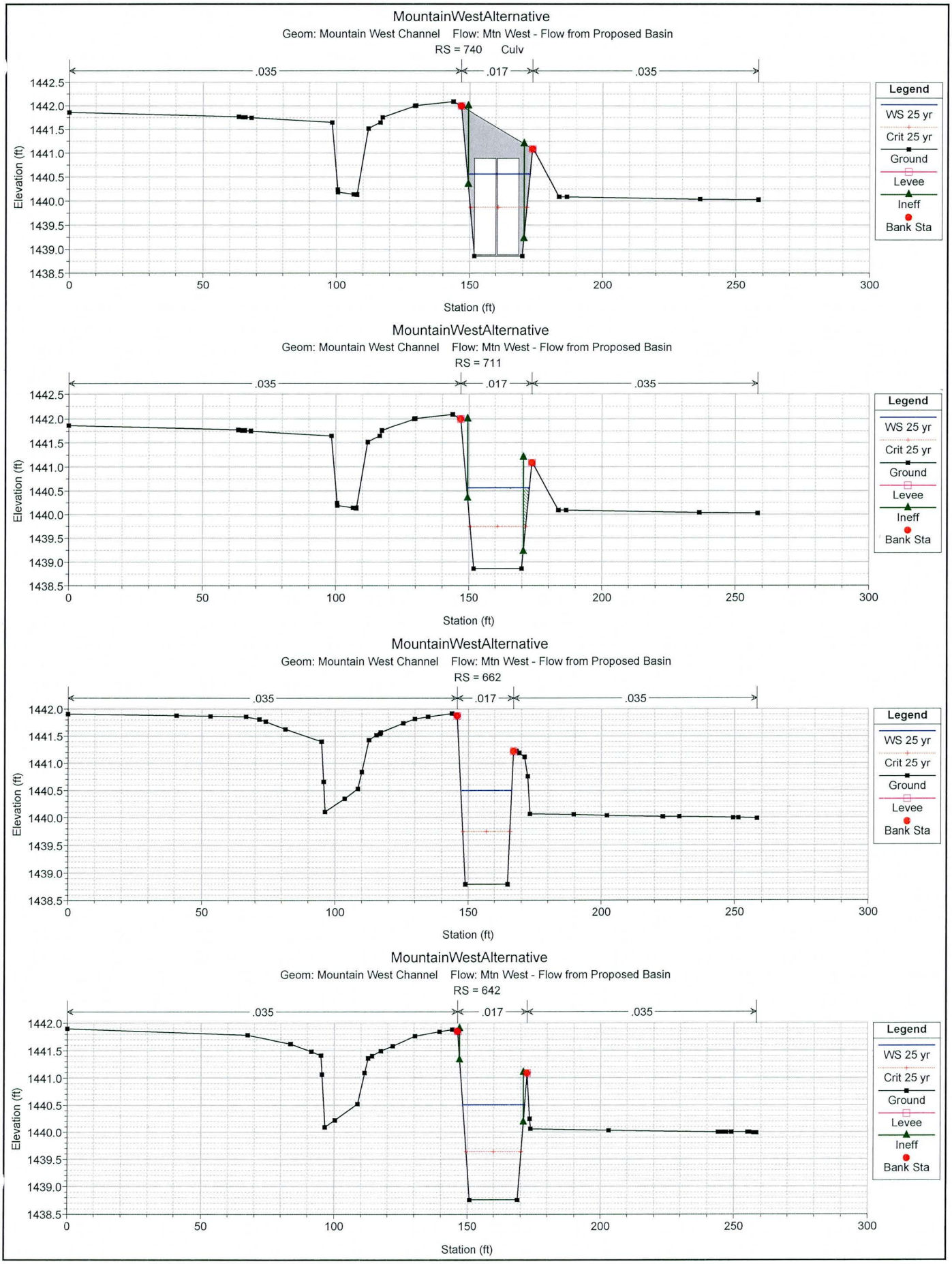


MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

RS = 740 Culv

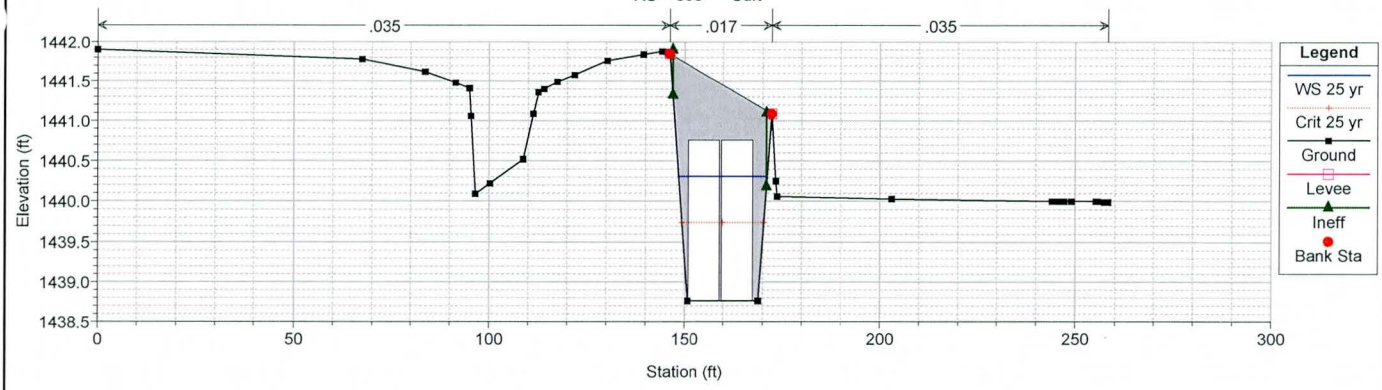



MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
RS = 740 Culv
.035
.017
.035
Elevation (ft)
Station (ft)
Legend
WS 25 yr
Crit 25 yr
Ground
Levee
Ineff
Bank Sta
MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
RS = 711
MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
RS = 662
MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
RS = 642

MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

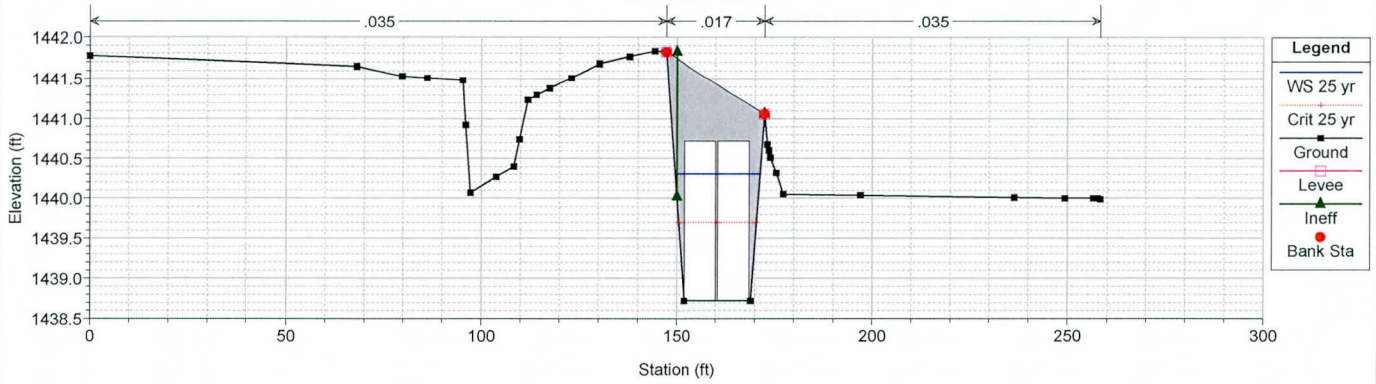
RS = 638 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

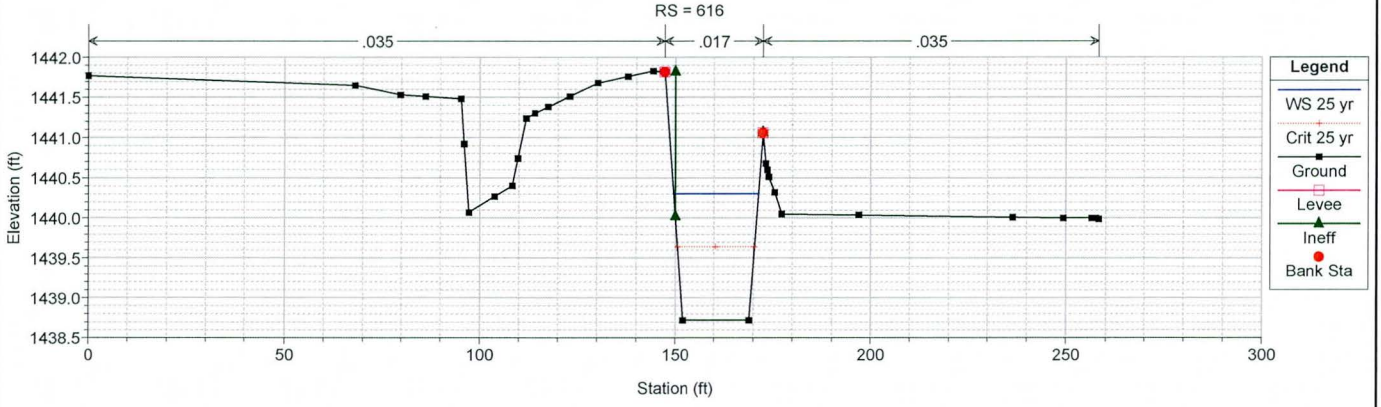
RS = 638 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

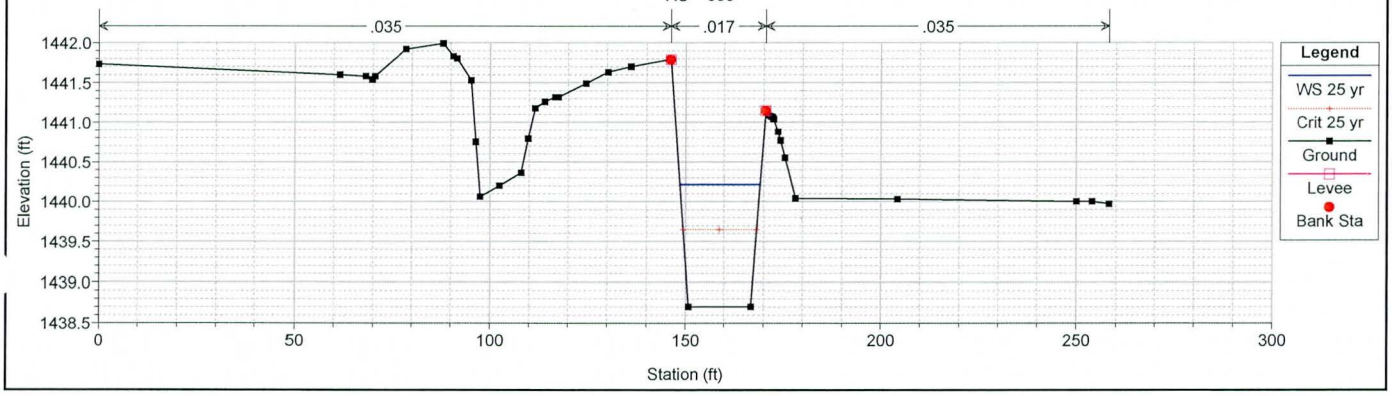
RS = 616



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

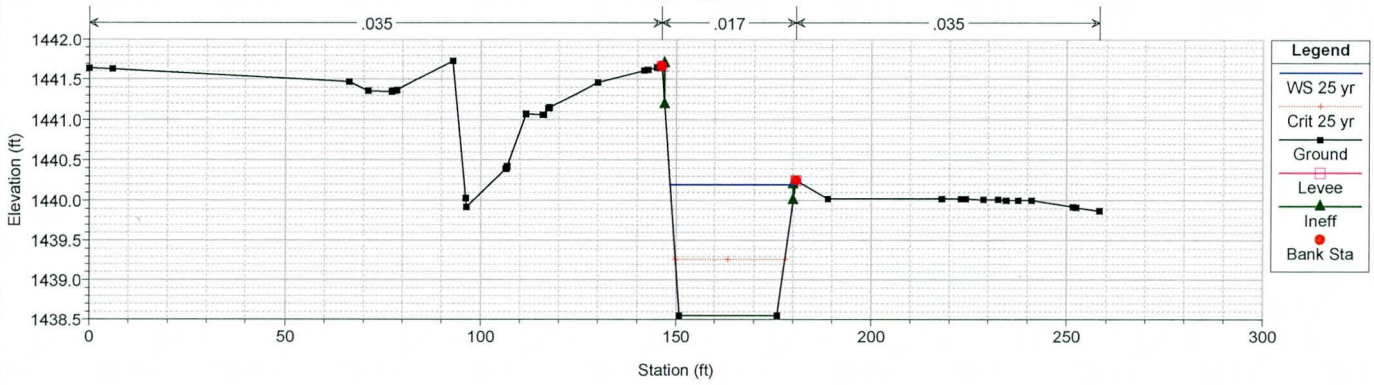
RS = 600



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

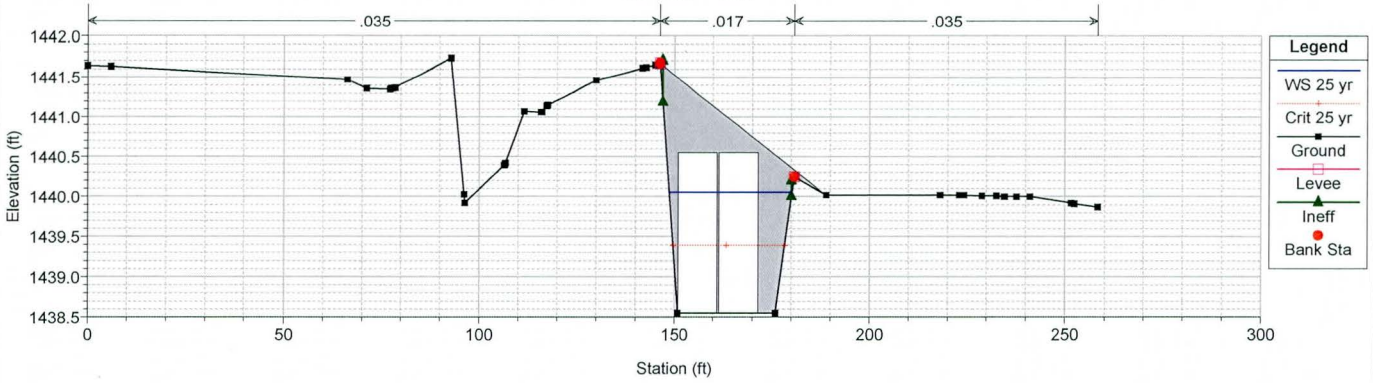
RS = 553



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

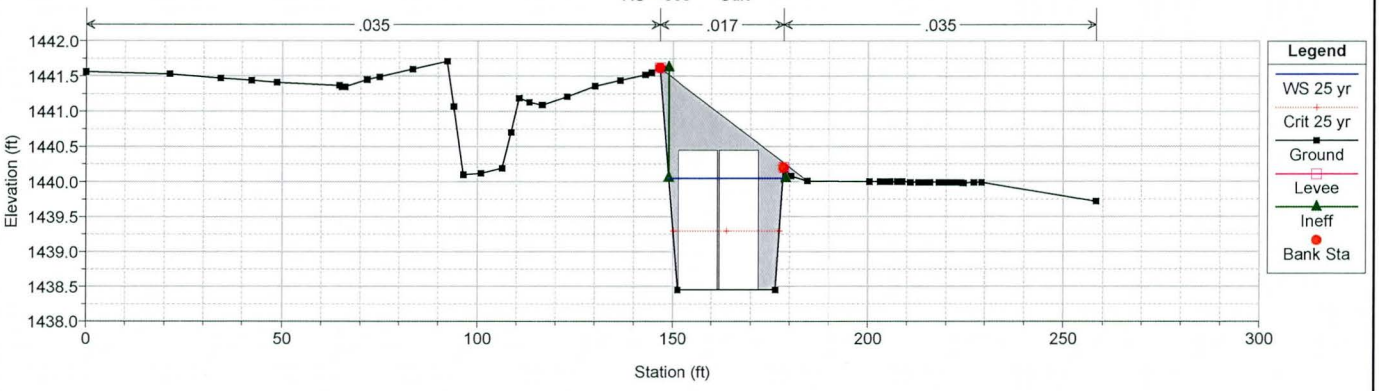
RS = 550 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

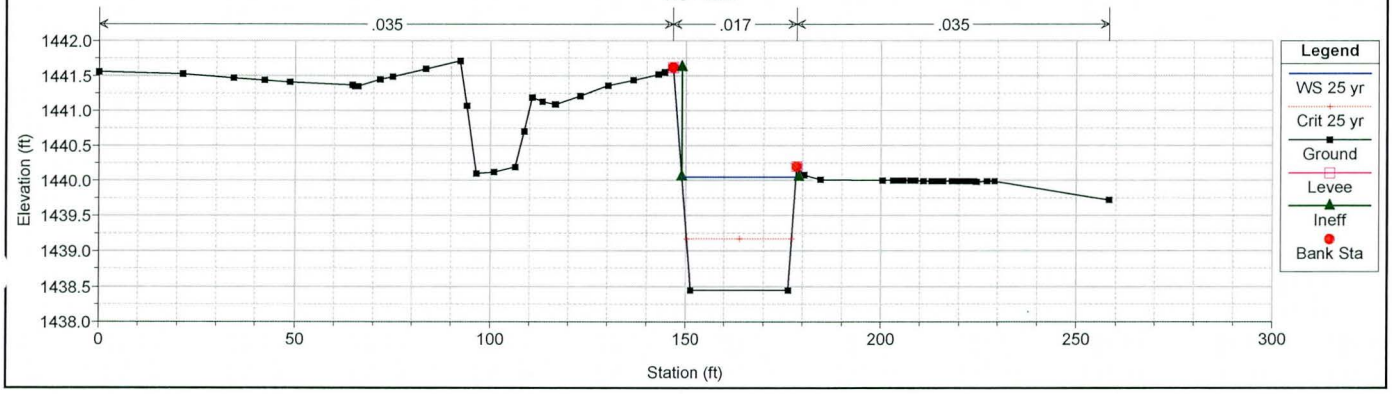
RS = 550 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

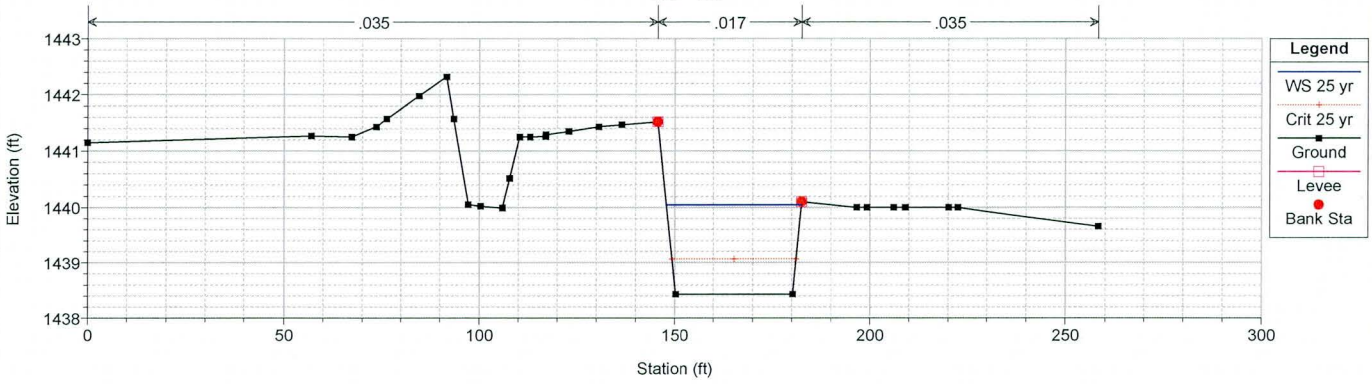
RS = 505



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

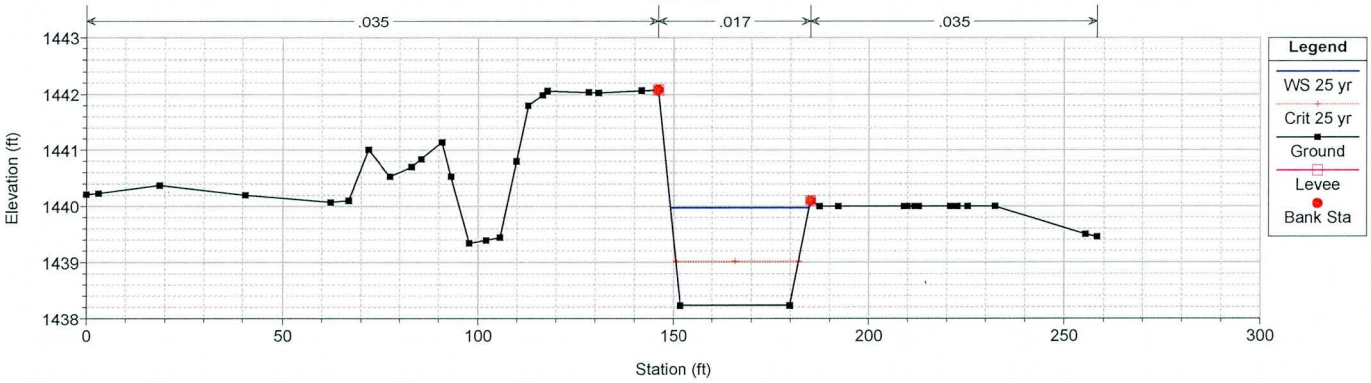
RS = 450



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

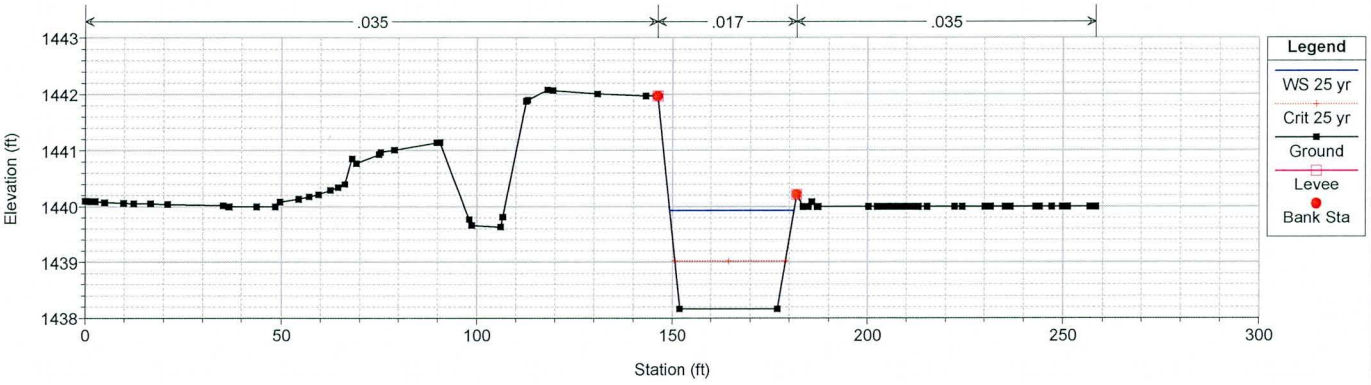
RS = 300



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

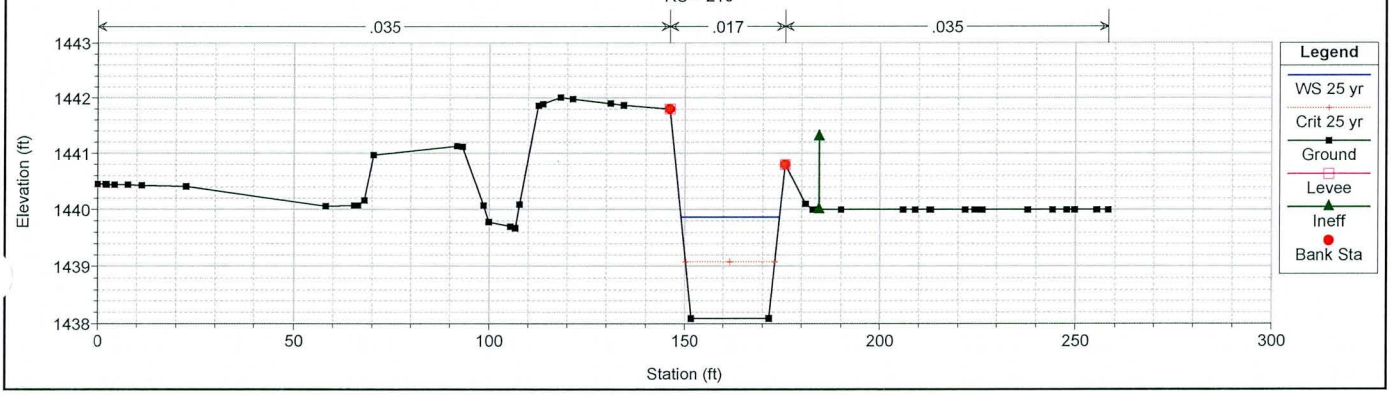
RS = 240



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

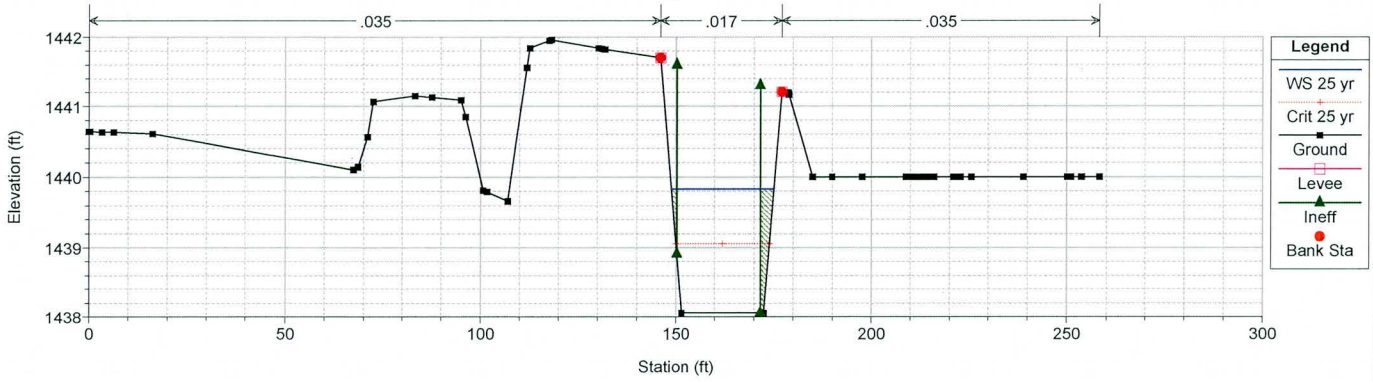
RS = 210



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

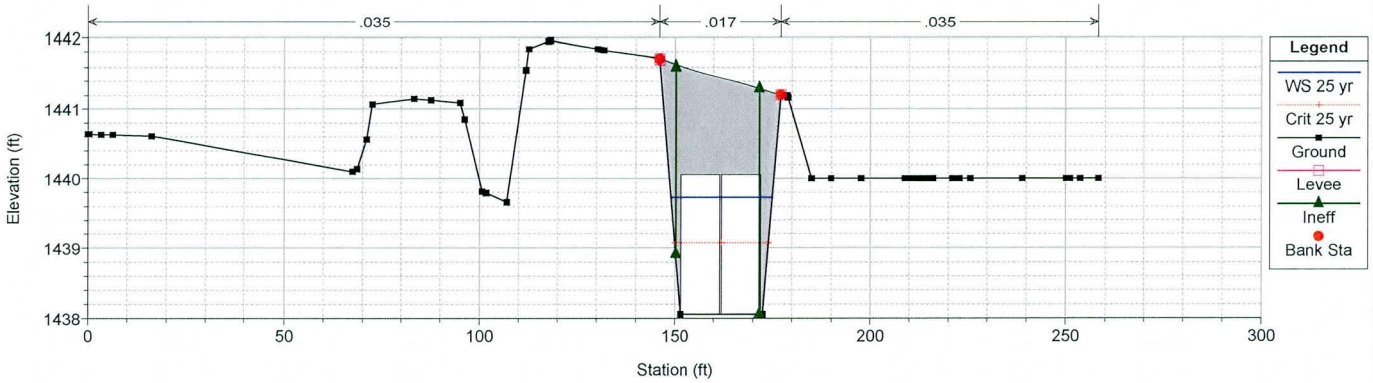
RS = 195



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

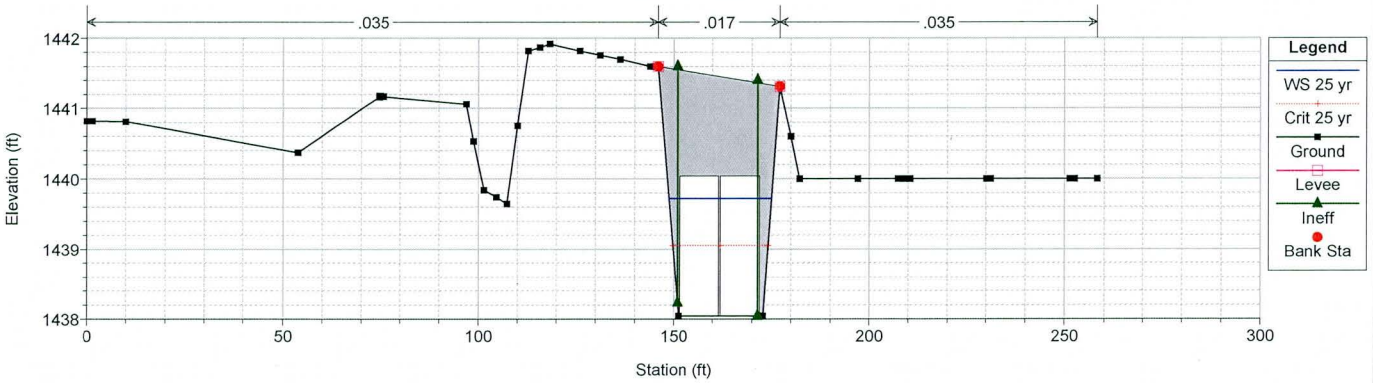
RS = 193 Culv



MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

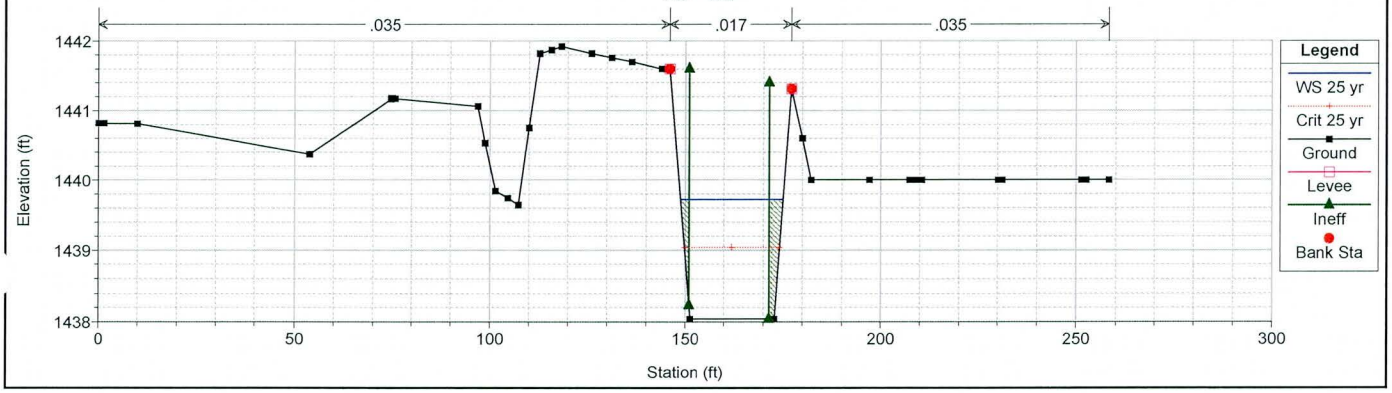
RS = 193 Culv

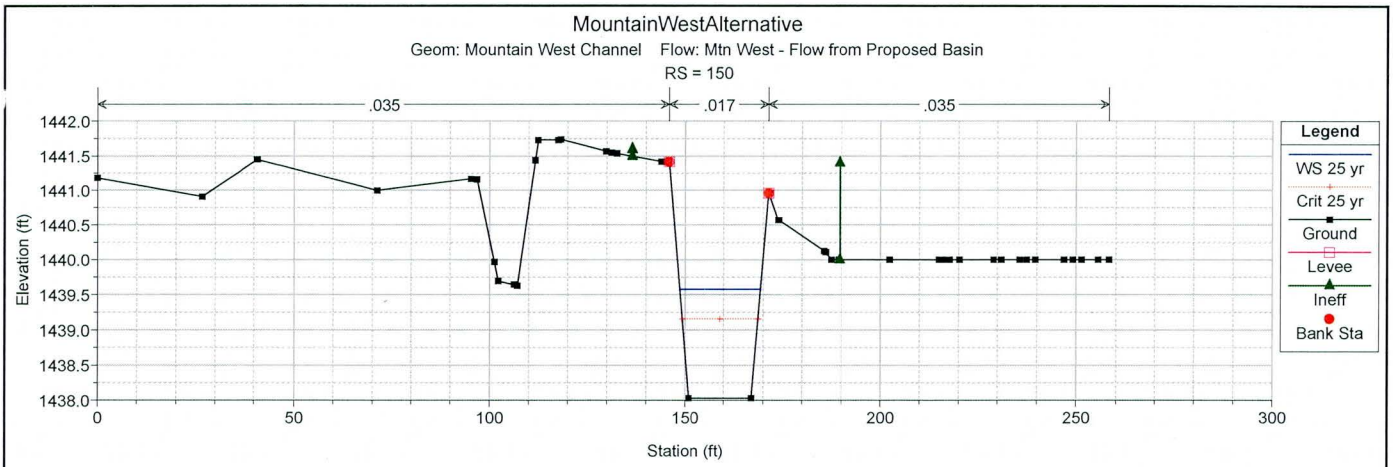


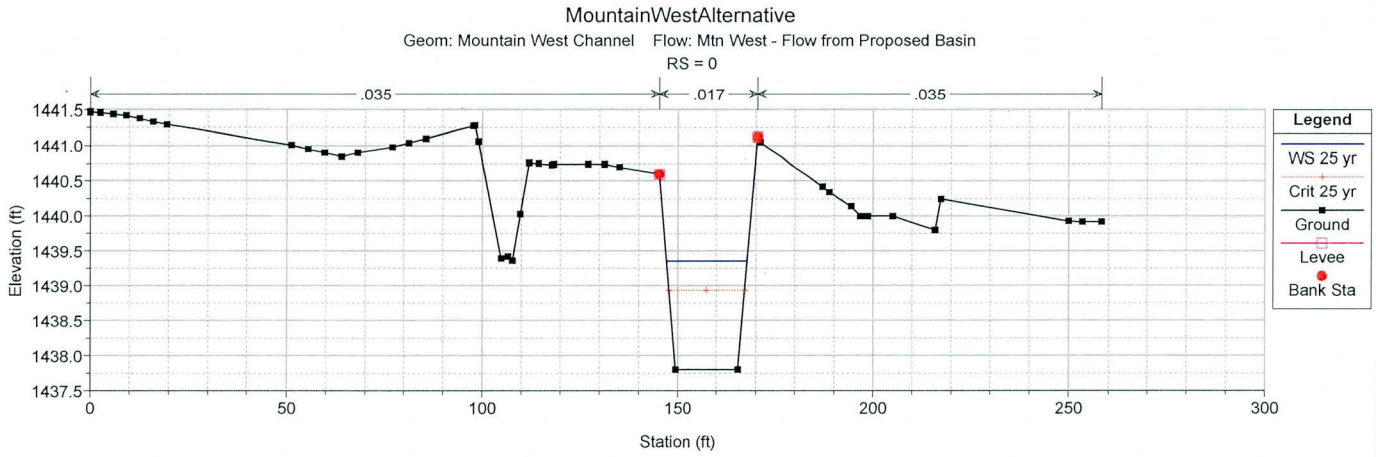
MountainWestAlternative

Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin

RS = 180




MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
RS = 150
.035
.017
.035
Elevation (ft)
1442.0
1441.5
1441.0
1440.5
1440.0
1439.5
1439.0
1438.5
1438.0
0
50
100
150
200
250
300
Station (ft)
Legend
WS 25 yr
Crit 25 yr
Ground
Levee
Ineff
Bank Sta


MountainWestAlternative
Geom: Mountain West Channel Flow: Mtn West - Flow from Proposed Basin
RS = 0
.035
.017
.035
Elevation (ft)
1441.5
1441.0
1440.5
1440.0
1439.5
1439.0
1438.5
1438.0
1437.5
0
50
100
150
200
250
300
Station (ft)
Legend
WS 25 yr
Crit 25 yr
Ground
Levee
Bank Sta

Kimley»Horn

Appendix D. Alternatives Opinions of Probable Cost

Preliminary Alternative OPCs

Kimley»Horn

Project: ***Mountain and Erie DCR***
Subject: **Opinion of Probable Cost for Erie Street Basin**
Designed by: **AJV** Date: 3/26/2015 KHA Project No: 091131026
Checked by: **AOM** Date: 4/9/2015 District Project No: 2014C001

Retention Basin and Outlet Works for Erie Street

MAG Item Number	Description	Qty	Unit	Unit Price	Cost
Construction Items					
215.01510	Earthwork for Retention Basin - Erie Street	57,621	CY	$ 6	$ 345,800
523.10148	Headwall, 6 - 24" RCP	2	EACH	$ 5,520	$ 11,100
525.03217	Reinforced Concrete Channel, 6" Thick	66	CY	$ 300	$ 19,800
215.01100	Channel Excavation	30	CY	$ 6	$ 200
220.10300	Riprap, D50=12"	271	CY	$ 80	$ 21,700
220.10150	Riprap, D50=6"	152	CY	$ 80	$ 12,200
618.20324	24" RGRCP, Class III	480	LF	$ 80	$ 38,400
				Construction Subtotal	**$ 449,200**
	Right of Way Cost	13	AC	$ 125,000	$ 1,637,500
	Design Cost (10% of Construction Cost)				$ 44,900
	Construction Admin and Contingency (20% of Construction Cost)				$ 89,800
				Alternative 1 Total	**$ 2,221,000**

Notes: Construction costs were determined from ADOT Estimated Engineering Construction Cost E2C2.
Utility relocation estimates based on typical relocation costs.
Headwall costs based on $60/sf for cross sectional area

Kimley»Horn

Project: ***Mountain and Erie DCR***
Subject: **Opinion of Probable Cost for Channel East of Mountain Road Alternative**
Designed by: **AJV** Date: 3/26/2015 KHA Project No: 091131026
Checked by: **AOM** Date: 4/9/2015 District Project No: 2014C001

Channel East of Mountain Road Alternative

MAG Item Number	Description	Qty	Unit	Unit Price	Cost
Construction Items					
215.01100	Channel Excavation	3,165	CY	$ 6	$ 19,000
525.03217	Reinforced Concrete Channel, 6" Thick	328	CY	$ 300	$ 98,400
	Headwall, 4 - 38"x24" RCP Crossing	2	EACH	$ 5,760	$ 11,600
	38"x24" Elliptical RCP, Class IV	320	LF	$ 160	$ 51,200
				Construction Subtotal	**$ 180,200**
	Right of Way Cost	2.1	AC	$ 125,000	$ 262,500
	Design Cost (10% of Construction Cost)				$ 18,000
	Construction Admin and Contingency (20% of Construction Cost)				$ 36,000
				Alternative 2 Total	**$ 497,000**

Notes: Construction costs were determined from ADOT Estimated Engineering Construction Cost E2C2.
Utility relocation estimates based on typical relocation costs.
Headwall costs based on $60/sf for cross sectional area
Elliptical RCP costs based on estimate from Rinker

Kimley»Horn

Project: ***Mountain and Erie DCR***
Subject: **Opinion of Probable Cost Channel West of Mountain Road Alternative**
Designed by: **AJV** Date: 3/26/2015 KHA Project No: 091131026
Checked by: **AOM** Date: 4/9/2015 District Project No: 2014C001

Channel West of Mountain Road Alternative

MAG Item Number	Description	Qty	Unit	Unit Price	Cost
Construction Items					
215.01100	Channel Excavation	3,025	CY	$ 6	$ 18,200
525.03217	Reinforced Concrete Channel, 6" Thick	631	CY	$ 300	$ 189,300
	Headwall, 3 - 38"x24" Elliptical RCP	2	EACH	$ 4,800	$ 9,600
	38"x24" Elliptical RCP, Class IV	204	LF	$ 160	$ 32,700
	Headwall, 5 - 38"x24" Elliptical RCP	2	EACH	$ 6,780	$ 13,600
	38"x24" Elliptical RCP, Class IV	90	LF	$ 160	$ 14,400
	Headwall, 2 - 8'x2' box culvert crossings	4	EACH	$ 6,000	$ 24,000
	Jensen Pre-cast 2 - 8'x2' Culvert, 24' long	1	EACH	$ 32,144	$ 32,200
	Jensen Pre-cast 2 - 8'x2' Culvert, 18' long	1	EACH	$ 28,719	$ 28,800
	Headwall, 2 - 10'x2' box culvert crossings	4	EACH	$ 6,960	$ 27,900
	Jensen Pre-cast 2 - 10'x2' Culvert, 42' long	1	EACH	$ 60,785	$ 60,800
	Jensen Pre-cast 2 - 10'x2' Culvert, 14' long	1	EACH	$ 22,269	$ 22,300
				Construction Subtotal	**$ 473,800**
Potential Utility Relocation					
	Electric Line Relocation	5	EACH	$ 5,000	$ 25,000
	Communications Line Relocation	0	EACH		$ -
				Potential Utility Relocation Subtotal	**$ 25,000**
	Right of Way Cost	0.6	AC	$ 125,000	$ 75,000
	Design Cost (10% of Construction Cost)				$ 47,380
	Construction Admin and Contingency (20% of Construction Cost)				$ 94,760
				Alternative 3 Total	**$ 716,000**

Notes: Construction costs were determined from ADOT Estimated Engineering Construction Cost E2C2.
Utility relocation estimates based on typical relocation costs.
Communication line relocation by others
Headwall costs based on $60/sf for cross sectional area
Elliptical RCP costs based on estimate from Rinker

Kimley»Horn

Appendix E. Recommended Alternative Refinement

HEC-1 Model Output
HEC-RAS Model Output
OPC

```
1*****************************************
*                                       *
*     FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*                JUN   1998             *
*             VERSION 4.1               *
*                                       *
*  RUN DATE   03JUN15  TIME  17:01:30   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
      LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

        1           ID    Mountain and Erie Channel and Basin Design Concept Report
        2           ID    DCR System Model
        3           ID    Existing Conditions with Recommended Alternative
        4           ID
        5           ID    Prepared for Flood Control District of Maricopa County (District)
        6           ID    District Project Number FCD 2014C001
        7           ID
        8           ID    Prepared by Kimley-Horn and Associates, Inc
        9           ID    Kimley-Horn Project Number 091131026-3
       10           ID    June 2015
       11           ID
       12           ID    Model based on the East Mesa Area Drainage Master Plan Update (EMADPU)
       13           ID    existing conditions model prepared by the District.
       14           ID    The model was revised to include only those areas contributing to
       15           ID    Erie Channel and the Mountain Road proposed channels.
       16           ID
       17           ID    List of Changes:
       18           ID    - Changed precipitation data to create model for 25-yr, 6-hour storm.
       19           ID    - Subbasin E12 was subdivided into Subbasins E12A and E12B because it
       20           ID      was determined portions of the subbasin flow west and south,
       21           ID      respectively.
       22           ID    - Area was taken from Subbasin E19 and added to Subbasin E12A to
       23           ID      reflect portions of the subbasin flowing south.
       24           ID    - This model DOES NOT include a detention basin below Subbasin E12 as
       25           ID      initally analyzed for other alternatives.
       26           ID    - Subbasin E19 was subdivided into Subbasins E19A, E19B, and E19C to
       27           ID      reflect portions of the subbasin either crossing Mountain Road or
       28           ID      staying south of Erie Street.
       29           ID    - Routing reach E12E19 was revised and E19AB was added to account for
       30           ID      different inflow points into the Erie St Channel.
       31           ID    - Routing reache E19E20 was added to model the proposed channel
       32           ID      alternatives east or west of Mountain Road.
       33           ID
       34           ID
       35           ID
       36           ID        Flood Control District of Maricopa County
       37           ID        MNTERIE_25YR_6HR
       38           ID        25 YEAR
       39           ID        6 Hour  Storm
       40           ID        Unit Hydrograph: S-Graph
       41           ID        Storm: Multiple
       42           ID        06/03/2015
                   *DIAGRAM
       43           IT       5  1JAN99       0    2000
       44           IO       5
       45           IN      15
                    *
                    *  PRECIPITATION DATA CHANGED TO MODEL 25-YEAR, 6-HOUR STORM
       46           JD   2.025  0.0001
       47           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
       48           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
       49           PC   0.962   0.972   0.983   0.991   1.000
       50           JD   2.013  0.5000
       51           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
       52           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
```

1 HEC-1 INPUT PAGE 2

```
      LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
 53          PC   0.962   0.972   0.983   0.991   1.000
 54          JD   1.974     2.8
 55          PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 56          PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 57          PC   0.950   0.963   0.975   0.988   1.000
 58          JD   1.867    16.0
 59          PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 60          PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 61          PC   0.946   0.960   0.973   0.987   1.000
             *

 62          KK      E1   BASIN
 63          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 64          BA   0.886
 65          LG    0.35    0.35    3.99    0.47       0
 66          UI       0      55      55     115     203     259     301     338     392     455
 67          UI     596     700     574     488     430     369     320     273     228     162
 68          UI      96      92      88      55      55      34      17      17      17      17
 69          UI      17      17      17       0       0       0       0       0       0       0
 70          UI       0       0       0       0       0       0       0       0       0       0
             *

 71          KK    DE1S  DIVERT
 72          KM   FLOW DIVERTED FROM E1 TO E2. NO CHANGE FROM FCD 2011 EXIST MODEL
 73          DT    DRE2      0.0     0.0
 74          DI     0.0    88.0   176.0   264.0   352.0   440.0   528.0     0.0     0.0     0.0
 75          DQ     0.0    58.0   126.0   201.0   277.0   355.0   434.0     0.0     0.0     0.0
             *
 76          KM

 77          KK    DE1SRETRIEVE
 78          KM   FLOW RETRIEVED FROM DE1S DIVERT. NO CHANGE FROM FCD 2011 EXIST MODEL
 79          DR    DRE2
             *

 80          KK  RTE1E2   ROUTE
 81          KM   NO CHANGE FROM FCD 2011 EXISTING MODEL
 82          RS       1    FLOW
 83          RC   0.035   0.030   0.025    4100  0.0035    6.00
 84          RX    0.00  100.00  700.00 1050.00 1090.00 1110.00 1140.00 1240.00
 85          RY    6.00    6.00    4.00    1.00    1.00    5.00    6.00    6.00
             *

 86          KK      E2   BASIN
 87          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 88          BA   0.779
 89          LG    0.35    0.35    4.22    0.41       0
 90          UI       0      45      45      77     159     202     234     263     298     342
 91          UI     412     536     556     456     394     352     304     267     228     196
 92          UI     145      95      78      74      58      45      45      19      14      14
 93          UI      14      14      14      14      14       0       0       0       0       0
 94          UI       0       0       0       0       0       0       0       0       0       0
             *
1                                    HEC-1 INPUT                                    PAGE  3

       LINE  ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 95          KK    CPE2 COMBINE
 96          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 97          HC       2    1.67
             *

 98          KK    DE2S  DIVERT
 99          KM    FLOW DIVERTED FROM E2 TO E3. NO CHANGE FROM FCD 2011 EXIST MODEL
100          DT    DRE3      0.0     0.0
101          DI     0.0   135.0   279.0   431.0   583.0   738.0   894.0     0.0     0.0     0.0
102          DQ     0.0    15.0   121.0   243.0   370.0   504.0   636.0     0.0     0.0     0.0
             *

103          KK    DE2SRETRIEVE
104          KM    FLOW RETRIEVED FROM DE2S DIVERT. NO CHANGE FROM FCD 2011 EXIST MODEL
105          DR    DRE3
             *

106          KK  RTE2E3   ROUTE
107          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
108          RS       1    FLOW
109          RC   0.035   0.030   0.025    3678  0.0035    6.00
110          RX    0.00  100.00  700.00 1050.00 1090.00 1110.00 1140.00 1240.00
111          RY    6.00    6.00    4.00    1.00    1.00    5.00    6.00    6.00
             *

112          KK      E3   BASIN
113          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
114          BA   2.234
115          LG    0.35    0.35    4.65    0.32       0
116          UI       0      91      91      91     136     303     356     427     467     510
117          UI     552     605     672     731     857    1035    1206    1075     936     840
118          UI     769     712     638     576     531     468     432     369     285     220
119          UI     162     158     150     150      92      91      91      79      28      28
120          UI      28      28      28      28      28      28      28      28      28      28
121          UI       0       0       0       0       0       0       0       0       0       0
             *
```

```
 122          KK   E2SE3 COMBINE
 123          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 124          HC       2     3.9
              *

 125          KK    DE3S  DIVERT
 126          KM   NO CHANGE FROM FCD 2011 EXIST MODEL
 127          DT   DRE4N      0.0      0.0
 128          DI     0.0    192.0    476.0    774.0   1079.0   1390.0   1699.0      0.0      0.0      0.0
 129          DQ     0.0      5.0    197.0    415.0    656.0    912.0   1175.0      0.0      0.0      0.0
              *
1                                        HEC-1 INPUT                                          PAGE  4

       LINE   ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 130          KK   E3E12   ROUTE
 131          KM   FLOW ROUTED FROM E3 TO CPE12A. NO CHANGE FROM 2011 EXIST MODEL
 132          RS       1    FLOW
 133          RC   0.060   0.050   0.060    4852  0.0054    5.50
 134          RX    0.00  500.00  980.00 1003.00 1007.00 1031.00 1511.00 2011.00
 135          RY    5.50    4.50    4.00    1.00    1.00    4.00    4.50    5.50
              *

 136          KK    E12A   BASIN
 137          KM   ADDED SUBBASIN. NORTH PORTION OF E12 IN FCD 2011 EXIST MODEL, WHICH FLOWS
 138          KM   TO CPE12A
 139          BA   0.465
 140          LG    0.35    0.34    4.12    0.43       1
 141          UI       0      24      24      24      76      95     113     129     141     158
 142          UI     179     206     261     308     266     228     202     183     161     143
 143          UI     125     112      90      67      42      41      39      32      24      24
 144          UI      16       7       7       7       7       7       7       7       7       7
 145          UI       0       0       0       0       0       0       0       0       0       0
              *

 146          KK  CPE12A COMBINE
 147          KM   COMBINE E3E12 AND E12A
 148          HC       2
              *
              * Following detention basin removed per discussion with the District and MCDOT
              * KKDET12A STORAGE
              * KM ADDED PROPOSED DETENION BASIN FOR FLOWS FROM CPE12A (NOW REMOVED)
              * KO
              * RS      1    STOR
              * SV           2.54    9.02   17.51      21      25
              * SQ             18      51      95     150     350
              * SE1449.5 1450.60 1451.60 1452.60 1453.00 1453.50
              *

 149          KK    E12B   BASIN
 150          KM   ADDED SUBBASIN. SOUTH PORTION OF E12 IN FCD 2011 EXIST MODEL, WHICH FLOWS
 151          KM   TO CPE12B
 152          BA   0.134
 153          LG    0.35    0.35    4.17    0.42       0
 154          UI       0      12      20      48      64      77      96     138     141     108
 155          UI      89      71      56      36      21      19      12       8       4       4
 156          UI       4       4       4       0       0       0       0       0       0       0
 157          UI       0       0       0       0       0       0       0       0       0       0
 158          UI       0       0       0       0       0       0       0       0       0       0
              *

 159          KK  CPE12B COMBINE
 160          KM   COMBINE FLOWS FROM CPE12A AND E12B
 161          HC       2
              *
1                                        HEC-1 INPUT                                          PAGE  5

       LINE   ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 162          KK  E12E19   ROUTE
 163          KM   MODIFIED ROUTE TO REPRESENT UPSTREAM REACH OF EXISTING CHANNEL NORTH OF
 164          KM   ERIE ST
 165          RS       1    FLOW
 166          RC   0.040   0.035   0.040    1261  0.0038    0.00
 167          RX    0.00   20.00   40.00   47.50   57.50   65.00   85.00  105.00
 168          RY    4.50    3.50    3.00    0.00    0.00    3.00    3.50    4.50
              *

 169          KK    E19B   BASIN
 170          KM   ADDED SUBBASIN. SUBDIVIDED E19 IN FCD 2011 EXIST MODEL. E19B IS THE PORTION
 171          KM   OF E19 THAT FLOWS IN THE ERIE ST CHANNEL
 172          BA   0.042
 173          LG    0.30    0.15    8.36    0.09      15
 174          UI       0     114     184      24       0       0       0       0       0       0
 175          UI       0       0       0       0       0       0       0       0       0       0
 176          UI       0       0       0       0       0       0       0       0       0       0
 177          UI       0       0       0       0       0       0       0       0       0       0
 178          UI       0       0       0       0       0       0       0       0       0       0
              *

 179          KK  CPE19B COMBINE
 180          KM   COMBINE FLOWS FROM E19B AND E12E19
 181          HC       2
              *
```

```
          182          KK   E19AB   ROUTE
          183          KM   ADDED ROUTE. DOWNSTREAM REACH OF THE ERIE CHANNEL
          184          RS       1    FLOW
          185          RC   0.040   0.035   0.040     832  0.0038    0.00
          186          RX    0.00   20.00   40.00   47.50   57.50   65.00   85.00  105.00
          187          RY    4.50    3.50    3.00    0.00    0.00    3.00    3.50    4.50
                       *

          188          KK    E19C   BASIN
          189          KM   ADDED SUBBASIN. SUBDIVIDED E19 IN FCD 2011 EXIST MODEL. E19C IS THE PORTION
          190          KM   OF E19 THAT FLOWS ALONG THE SOUTH OF ERIE STREET.
          191          BA   0.017
          192          LG    0.30    0.25    6.00    0.22      15
          193          UI       0      63      62       6       0       0       0       0       0       0
          194          UI       0       0       0       0       0       0       0       0       0       0
          195          UI       0       0       0       0       0       0       0       0       0       0
          196          UI       0       0       0       0       0       0       0       0       0       0
          197          UI       0       0       0       0       0       0       0       0       0       0
                       *

          198          KK  CPE19C COMBINE
          199          KM   ADDED COMBINE. COMBINE FLOW FROM E19AB AND E19C, AT THE INTERSECTION OF
          200          KM   MOUNTAIN ROAD AND ERIE STREET.
          201          HC       2
                       *
1                                                  HEC-1 INPUT                                                  PAGE  6

        LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          202          KK  E19E20   ROUTE
          203          KM   ADDED ROUTE. REPRESENTS PROPOSED CHANNEL ALONG MOUNTAIN ROAD
          204          RS       1    FLOW
          205          RC   0.040   0.035   0.040    1342  0.0026    0.00
          206          RX    0.00   10.00   25.00   35.00   55.00   65.00   75.00   85.00
          207          RY    4.00    3.00   25.00    0.00    0.00    2.50    3.00    4.00
                       *

          208          KK     E20   BASIN
          209          KM   NO CHANGE FROM FCD 2011 EXISTING MODEL
          210          BA   0.169
          211          LG    0.32    0.28    4.51    0.40      10
          212          UI       0      17      33      72      93     115     153     206     161     129
          213          UI     102      79      50      29      24      17       8       5       5       5
          214          UI       5       0       0       0       0       0       0       0       0       0
          215          UI       0       0       0       0       0       0       0       0       0       0
          216          UI       0       0       0       0       0       0       0       0       0       0
                       *

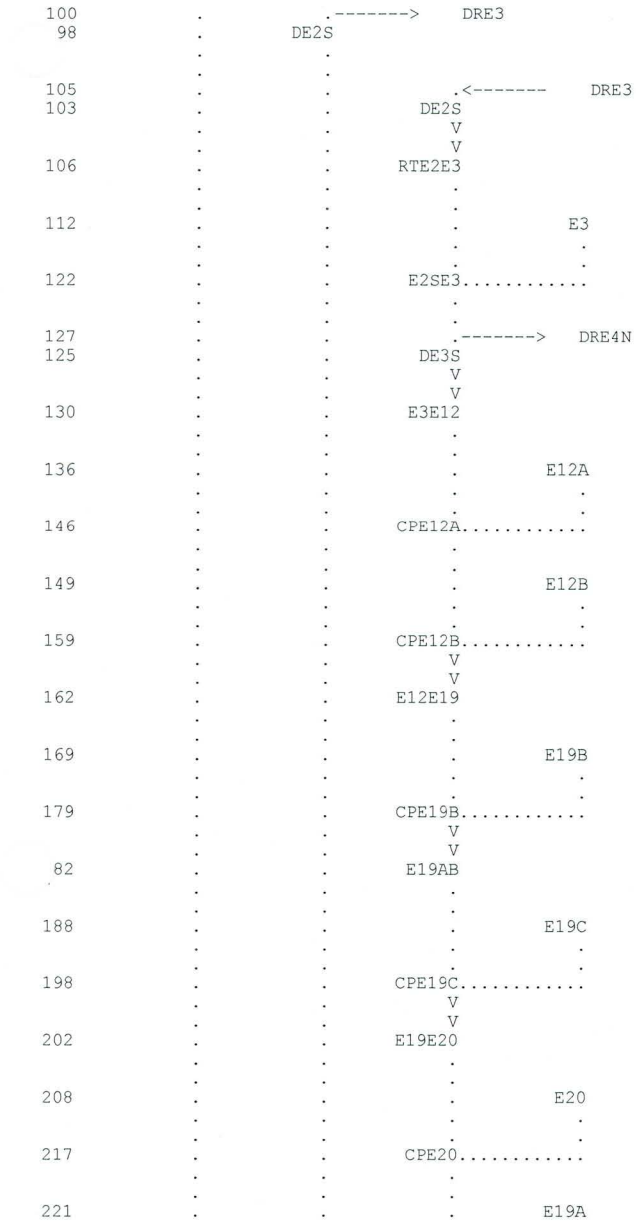
          217          KK   CPE20 COMBINE
          218          KM   ADDED COMBINE. COMBINE FLOWS FROM E20 AND E19E20, AT THE INTERSECTION OF
          219          KM   MOUNTAIN ROAD AND WILLIAMS FIELD ROAD.
          220          HC       2
                       *

          221          KK    E19A   BASIN
          222          KM   ADDED SUBBASIN. SUBDIVIDED E19 IN FCD 2011 EXIST MODEL. E19A IS THE PORTION
          223          KM   OF E19 THAT FLOWS WEST ACROSS MOUNTAIN ROAD (AND DOES NOT REACH THE PROPOSED
          224          KM   MOUNTAIN ROAD CHANNEL).
          225          BA   0.050
          226          LG    0.30    0.15    8.85    0.08      15
          227          UI       0      34     101     147      72      22       6       0       0       0
          228          UI       0       0       0       0       0       0       0       0       0       0
          229          UI       0       0       0       0       0       0       0       0       0       0
          230          UI       0       0       0       0       0       0       0       0       0       0
          231          UI       0       0       0       0       0       0       0       0       0       0
                       *
          232          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    62            E1
                   .
                   .
    73             .-------->    DRE2
    71          DE1S
                   .
                   .
    79             .          .<-------    DRE2
    77             .        DE1S
                   .          V
                   .          V
    80             .      RTE1E2
                   .          .
                   .          .
    86             .          .          E2
                   .          .           .
                   .          .           .
    95             .        CPE2.............
                   .          .
                   .          .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   03JUN15  TIME  17:01:30   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Mountain and Erie Channel and Basin Design Concept Report
DCR System Model
Existing Conditions with Recommended Alternative

Prepared for Flood Control District of Maricopa County (District)
District Project Number FCD 2014C001

Prepared by Kimley-Horn and Associates, Inc
Kimley-Horn Project Number 091131026-3
June 2015

Model based on the East Mesa Area Drainage Master Plan Update (EMADPU)
existing conditions model prepared by the District.
The model was revised to include only those areas contributing to
Erie Channel and the Mountain Road proposed channels.

```
                        List of Changes:
                        - Changed precipitation data to create model for 25-yr, 6-hour storm.
                        - Subbasin E12 was subdivided into Subbasins E12A and E12B because it
                          was determined portions of the subbasin flow west and south,
                          respectively.
                        - Area was taken from Subbasin E19 and added to Subbasin E12A to
                          reflect portions of the subbasin flowing south.
                        - This model DOES NOT include a detention basin below Subbasin E12 as
                          initally analyzed for other alternatives.
                        - Subbasin E19 was subdivided into Subbasins E19A, E19B, and E19C to
                          reflect portions of the subbasin either crossing Mountain Road or
                          staying south of Erie Street.
                        - Routing reach E12E19 was revised and E19AB was added to account for
                          different inflow points into the Erie St Channel.
                        - Routing reache E19E20 was added to model the proposed channel
                          alternatives east or west of Mountain Road.


                        Flood Control District of Maricopa County
                        MNTERIE_25YR_6HR
                        25 YEAR
                        6 Hour  Storm
                        Unit Hydrograph: S-Graph
                        Storm: Multiple
                        06/03/2015

44 IO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                   NMIN          5  MINUTES IN COMPUTATION INTERVAL
                   IDATE     1JAN99  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     7JAN99  ENDING DATE
                  NDTIME       2235  ENDING TIME
                  ICENT          19  CENTURY MARK

             COMPUTATION INTERVAL     .08 HOURS
                  TOTAL TIME BASE  166.58 HOURS

       ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT

46 JD          INDEX STORM NO. 1
                   STRM        2.03  PRECIPITATION DEPTH
                   TRDA         .00  TRANSPOSITION DRAINAGE AREA

47 PI            PRECIPITATION PATTERN
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .01       .01       .01       .01       .01       .01       .03
                   .03       .03       .05       .05       .05       .15       .15       .15       .03       .03
                   .03       .01       .01       .01       .01       .01       .01       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00

50 JD          INDEX STORM NO. 2
                   STRM        2.01  PRECIPITATION DEPTH
                   TRDA         .50  TRANSPOSITION DRAINAGE AREA

51 PI            PRECIPITATION PATTERN
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .01       .01       .01       .01       .01       .01       .03
                   .03       .03       .05       .05       .05       .15       .15       .15       .03       .03
                   .03       .01       .01       .01       .01       .01       .01       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00

54 JD          INDEX STORM NO. 3
                   STRM        1.97  PRECIPITATION DEPTH
                   TRDA        2.80  TRANSPOSITION DRAINAGE AREA

55 PI            PRECIPITATION PATTERN
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .01       .01       .01       .01       .01       .01       .03
                   .03       .03       .07       .07       .07       .08       .08       .08       .05       .05
                   .05       .02       .02       .02       .01       .01       .01       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00

58 JD          INDEX STORM NO. 4
```

STRM 1.87 PRECIPITATION DEPTH
TRDA 16.00 TRANSPOSITION DRAINAGE AREA

59 PI PRECIPITATION PATTERN

.01	.01	.00	.00	.00	.00	.00	.00	.00	.01
.01	.01	.00	.01	.00	.00	.00	.00	.00	.00
.00	.00	.01	.00	.00	.00	.00	.01	.01	.01
.01	.01	.01	.01	.01	.01	.02	.02	.02	.03
.03	.03	.06	.06	.06	.07	.07	.07	.04	.04
.04	.02	.02	.02	.01	.01	.01	.01	.01	.01
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00								

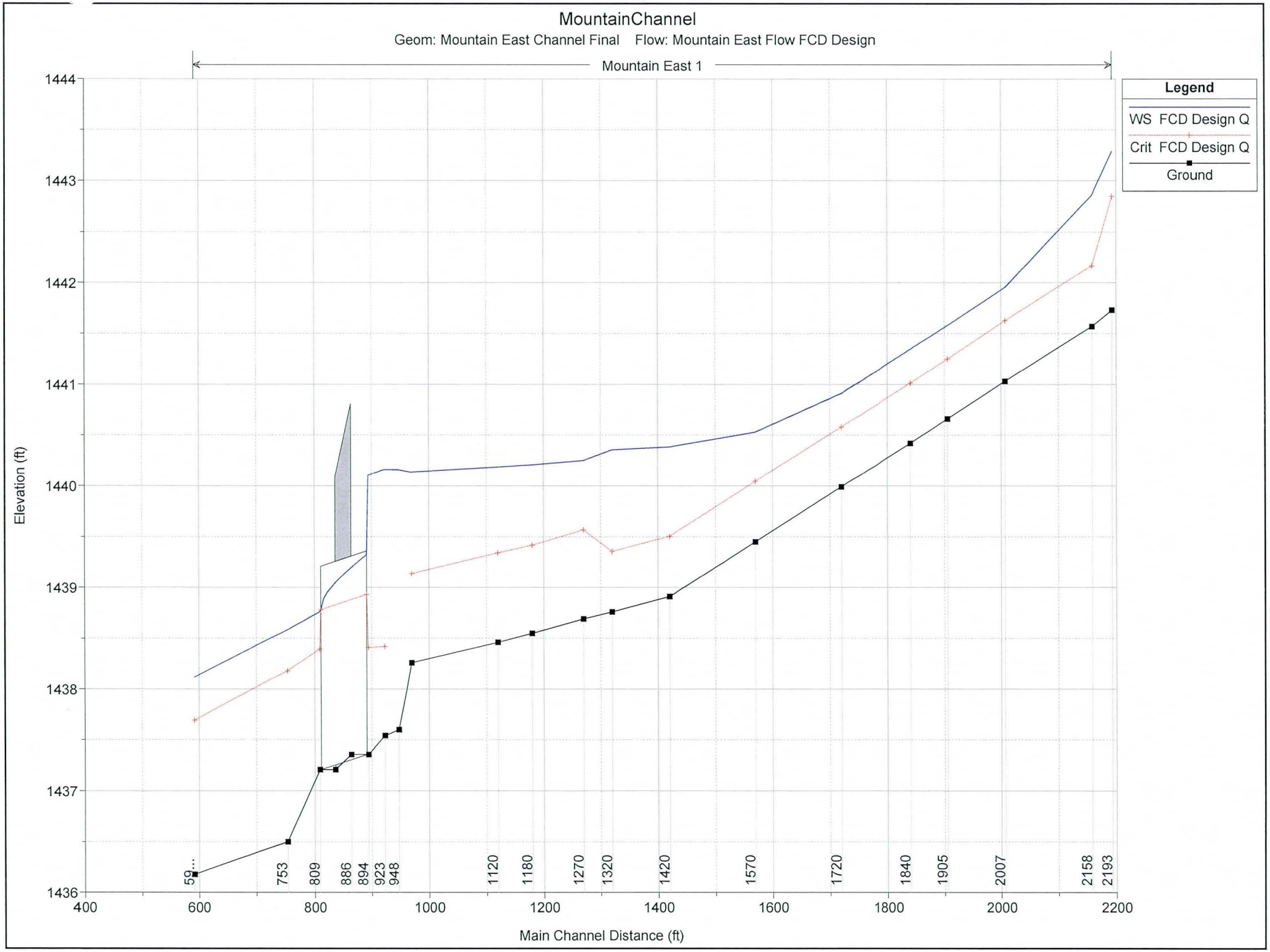
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
	HYDROGRAPH AT	E1	249.	4.83	38.	9.	3.	.89		
+	DIVERSION TO	DRE2	191.	4.83	27.	7.	2.	.89		
+	HYDROGRAPH AT	DE1S	58.	4.83	11.	3.	1.	.89		
+	HYDROGRAPH AT	DE1S	191.	4.83	27.	7.	2.	.89		
+	ROUTED TO	RTE1E2	115.	5.17	27.	7.	2.	.89		
+	HYDROGRAPH AT	E2	239.	4.92	39.	10.	3.	.78		
+	2 COMBINED AT	CPE2	207.	4.92	42.	11.	4.	1.67		
+	DIVERSION TO	DRE3	80.	4.92	11.	3.	1.	1.67		
	HYDROGRAPH AT	DE2S	126.	4.92	31.	8.	3.	1.67		
+	HYDROGRAPH AT	DE2S	80.	4.92	11.	3.	1.	1.67		
+	ROUTED TO	RTE2E3	49.	5.33	11.	3.	1.	1.67		
+	HYDROGRAPH AT	E3	331.	5.25	77.	19.	6.	2.23		
+	2 COMBINED AT	E2SE3	255.	5.33	61.	15.	5.	3.90		
+	DIVERSION TO	DRE4N	57.	5.33	5.	1.	0.	3.90		
+	HYDROGRAPH AT	DE3S	198.	5.33	55.	14.	5.	3.90		
+	ROUTED TO	E3E12	170.	5.75	55.	14.	5.	3.90		
+	HYDROGRAPH AT	E12A	157.	5.00	28.	7.	2.	.47		
+	2 COMBINED AT	CPE12A	182.	5.58	60.	15.	5.	4.37		
+	HYDROGRAPH AT	E12B	72.	4.58	8.	2.	1.	.13		
+	2 COMBINED AT	CPE12B	182.	5.58	62.	16.	5.	4.50		
+	ROUTED TO	E12E19	180.	5.67	62.	16.	5.	4.50		
+	HYDROGRAPH AT	E19B	90.	4.08	5.	1.	0.	.04		
	2 COMBINED AT	CPE19B	180.	5.67	65.	17.	6.	4.54		
+	ROUTED TO	E19AB	180.	5.67	65.	17.	6.	4.54		
+	HYDROGRAPH AT	E19C	33.	4.08	2.	0.	0.	.02		

	2 COMBINED AT						
	CPE19C	180.	5.67	66.	17.	6.	4.56
	ROUTED TO						
+	E19E20	178.	5.75	66.	17.	6.	4.56
	HYDROGRAPH AT						
+	E20	116.	4.50	14.	3.	1.	.17
	2 COMBINED AT						
+	CPE20	178.	5.75	72.	19.	6.	4.73
	HYDROGRAPH AT						
+	E19A	92.	4.17	6.	2.	1.	.05

*** NORMAL END OF HEC-1 ***


MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
Mountain East 1
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Elevation (ft)
Main Channel Distance (ft)
1444
1443
1442
1441
1440
1439
1438
1437
1436
400
600
800
1000
1200
1400
1600
1800
2000
2200
59...
753
809
886
894
923
948
1120
1180
1270
1320
1420
1570
1720
1840
1905
2007
2158
2193

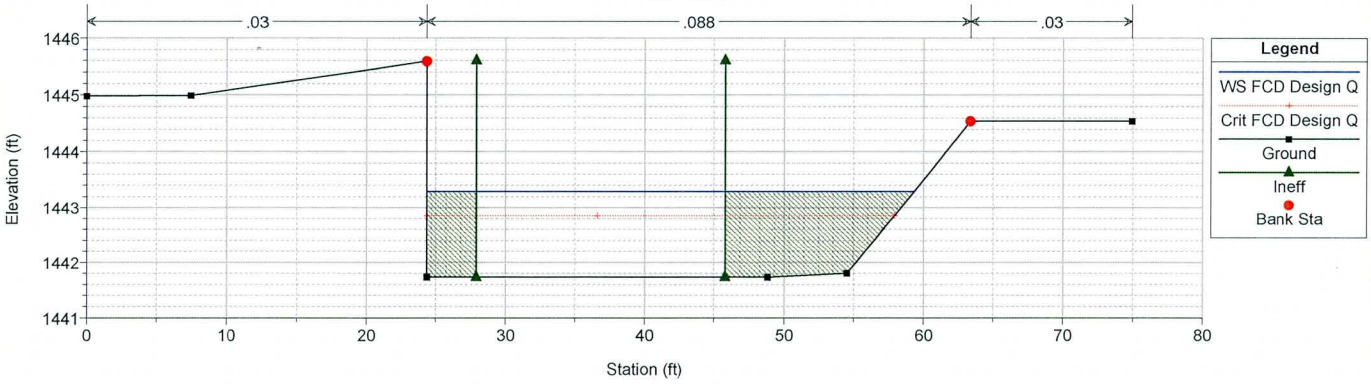
HEC-RAS Plan: East Final River: Mountain East Reach: 1 Profile: FCD Design Q

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	2193	FCD Design Q	120.00	1441.73	1443.29	1442.85	1443.58	0.035786	4.30	27.93	34.97	0.61
1	2158	FCD Design Q	120.00	1441.57	1442.86	1442.17	1442.91	0.009859	1.85	64.72	55.32	0.30
1	2007	FCD Design Q	120.00	1441.03	1441.95	1441.63	1442.06	0.003599	2.67	44.89	52.38	0.51
1	1905	FCD Design Q	120.00	1440.66	1441.58	1441.25	1441.69	0.003654	2.69	44.67	52.33	0.51
1	1840	FCD Design Q	120.00	1440.42	1441.35	1441.01	1441.46	0.003550	2.66	45.08	52.41	0.51
1	1720	FCD Design Q	120.00	1439.99	1440.91	1440.58	1441.02	0.003639	2.68	44.73	52.35	0.51
1	1570	FCD Design Q	120.00	1439.45	1440.53	1440.05	1440.61	0.002103	2.25	53.35	53.89	0.40
1	1420	FCD Design Q	120.00	1438.91	1440.38	1439.50	1440.42	0.000728	1.60	74.96	56.78	0.25
1	1320	FCD Design Q	120.00	1438.76	1440.36	1439.36	1440.39	0.000180	1.48	81.05	56.63	0.22
1	1270	FCD Design Q	120.00	1438.69	1440.25	1439.57	1440.37	0.000644	2.74	43.83	31.24	0.41
1	1180	FCD Design Q	120.00	1438.55	1440.21	1439.42	1440.31	0.000523	2.56	46.92	31.63	0.37
1	1120	FCD Design Q	120.00	1438.46	1440.18	1439.34	1440.28	0.000457	2.45	49.04	31.90	0.35
1	970	FCD Design Q	120.00	1438.26	1440.14	1439.14	1440.21	0.000342	2.22	53.95	32.50	0.30
1	948	FCD Design Q	120.00	1437.60	1440.16		1440.20	0.000117	1.56	77.08	35.24	0.19
1	923	FCD Design Q	120.00	1437.54	1440.16	1438.42	1440.19	0.000101	1.43	83.82	39.40	0.17
1	894	FCD Design Q	120.00	1437.36	1440.10	1438.41	1440.18	0.000169	2.20	54.45	36.59	0.24
1	886		Culvert									
1	809	FCD Design Q	120.00	1437.21	1438.76	1438.39	1439.10	0.001606	4.67	25.69	19.45	0.66
1	753	FCD Design Q	120.00	1436.50	1438.58	1438.18	1438.98	0.001996	5.06	23.73	14.39	0.69
1	592	FCD Design Q	120.00	1436.18	1438.12	1437.69	1438.45	0.005410	4.64	25.88	17.05	0.66

MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

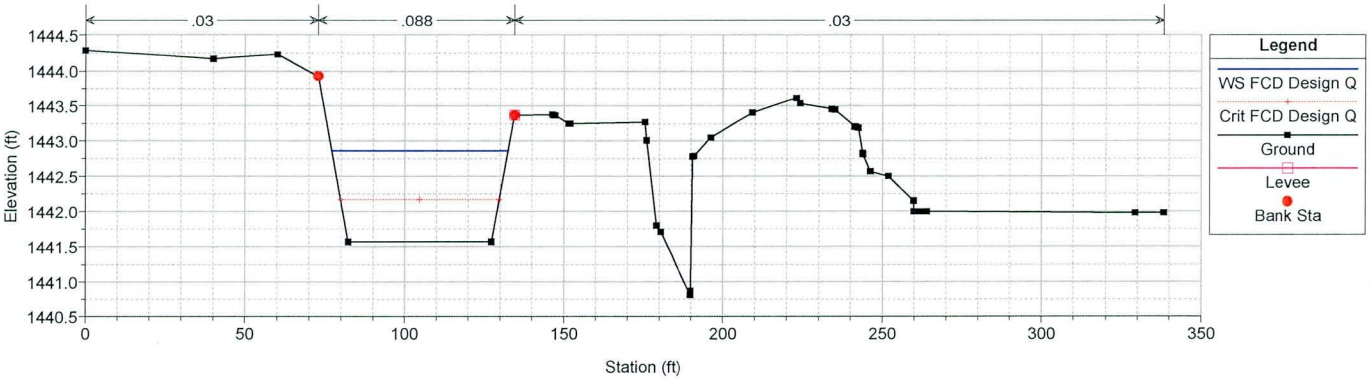
RS = 2193



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

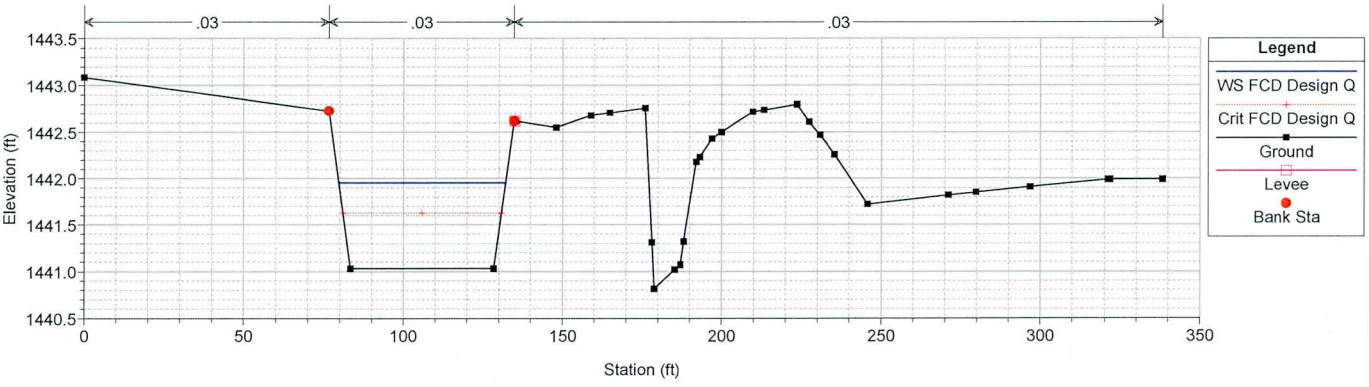
RS = 2158



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

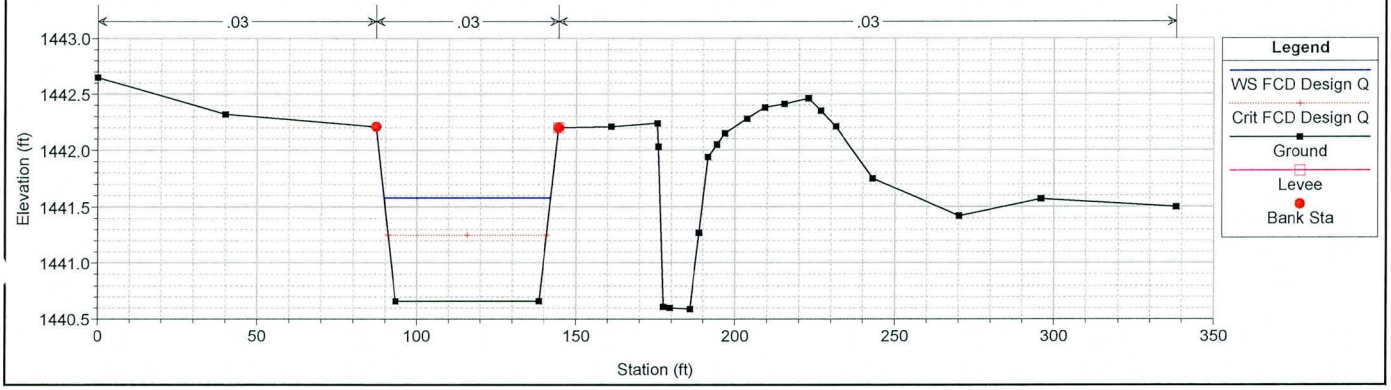
RS = 2007



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

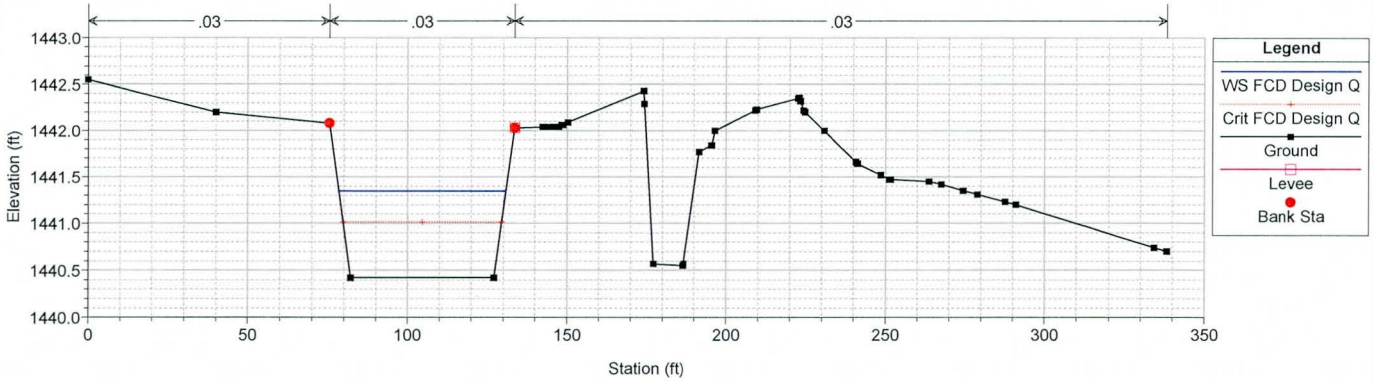
RS = 1905



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

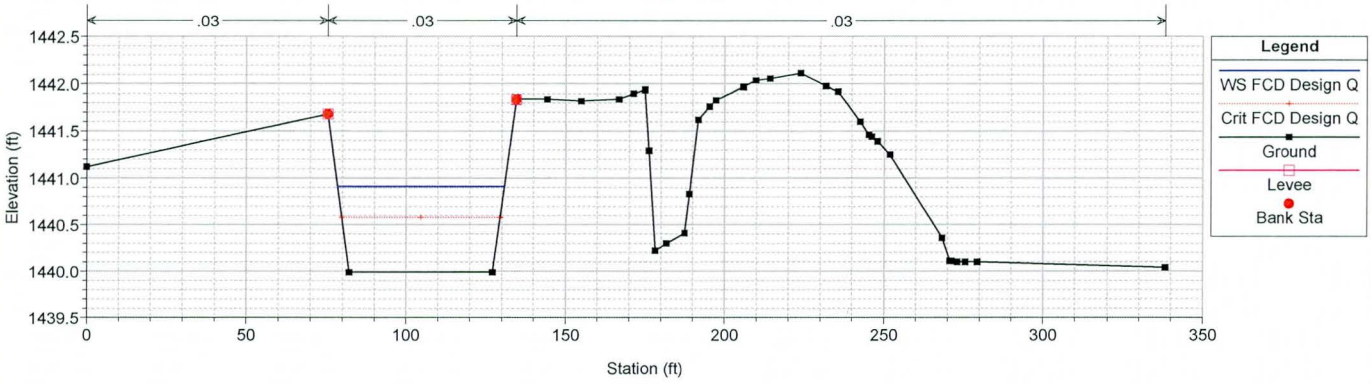
RS = 1840



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

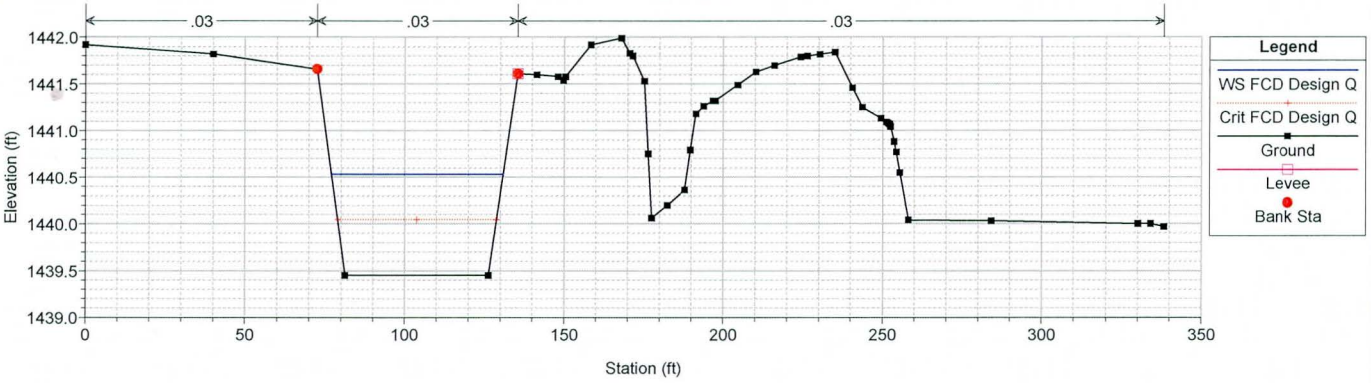
RS = 1720



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

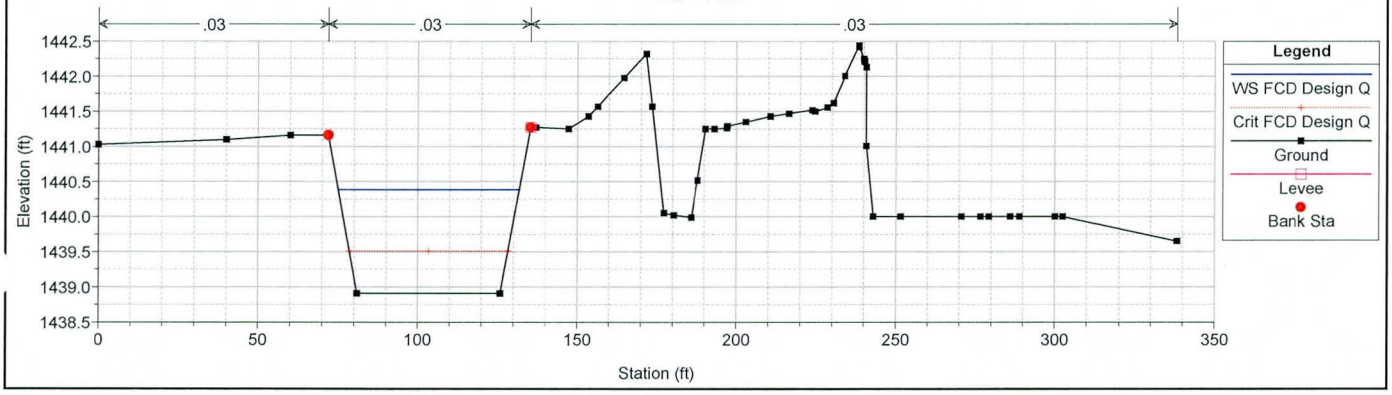
RS = 1570

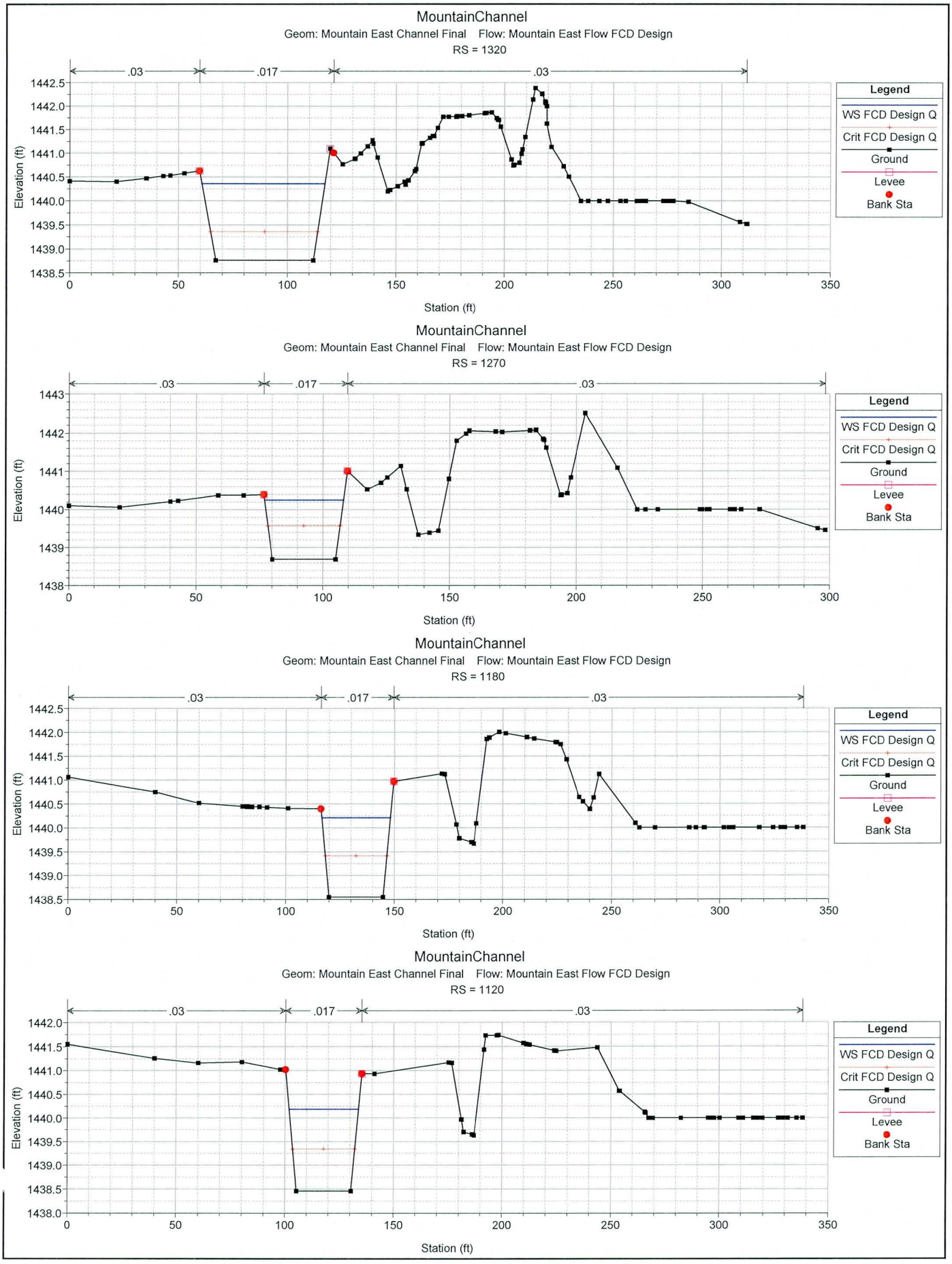


MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

RS = 1420

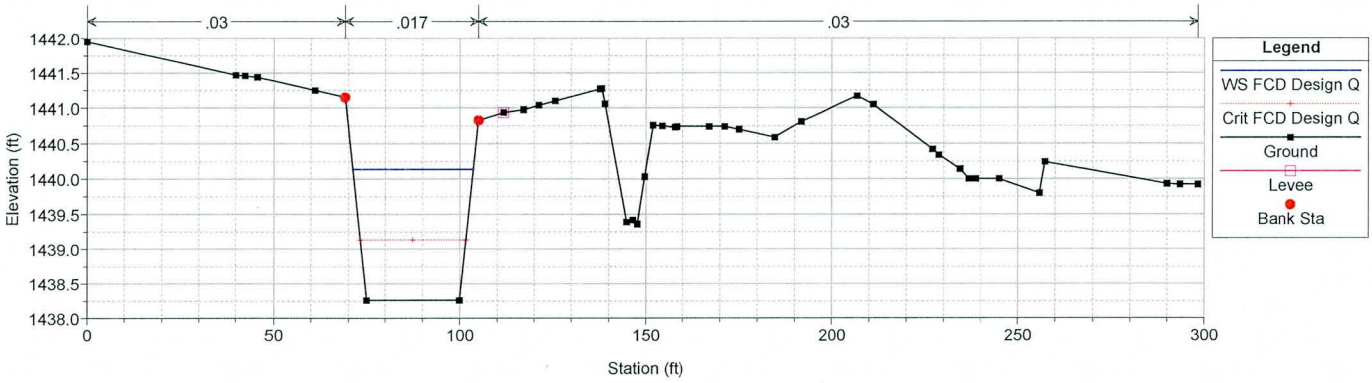



MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
RS = 1320
.03
.017
.03
Elevation (ft)
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Levee
Bank Sta
MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
RS = 1270
.03
.017
.03
Elevation (ft)
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Levee
Bank Sta
MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
RS = 1180
.03
.017
.03
Elevation (ft)
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Levee
Bank Sta
MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
RS = 1120
.03
.017
.03
Elevation (ft)
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Levee
Bank Sta

MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

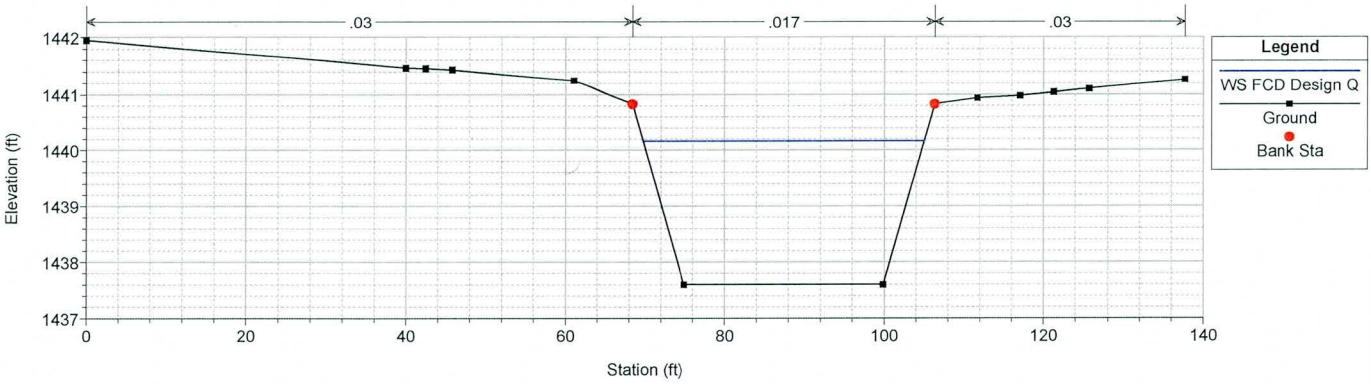
RS = 970



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

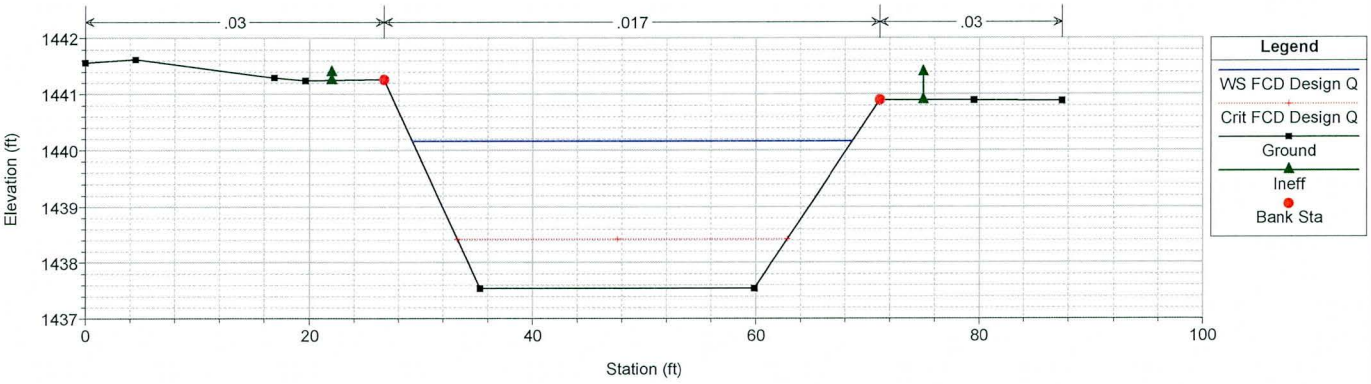
RS = 948



MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

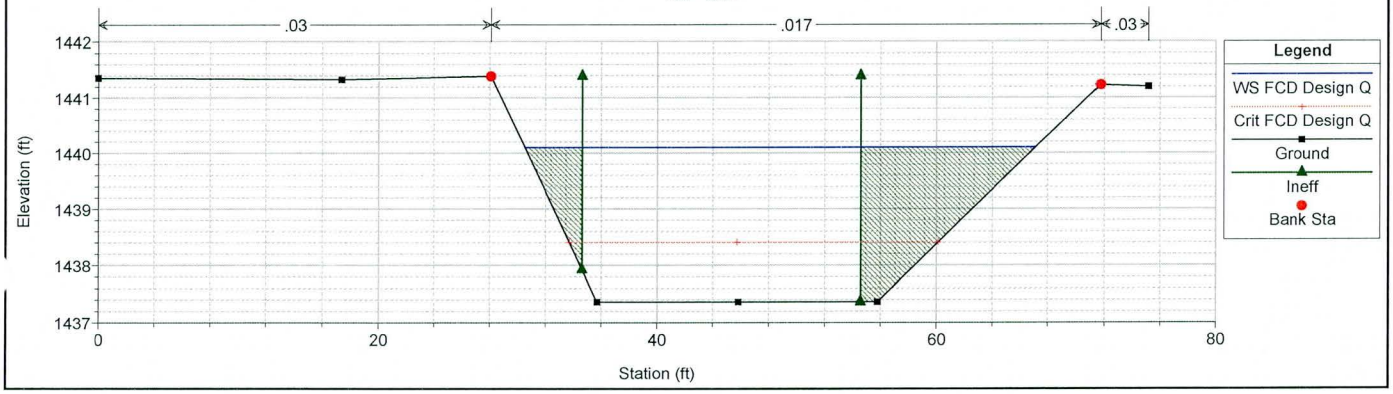
RS = 923

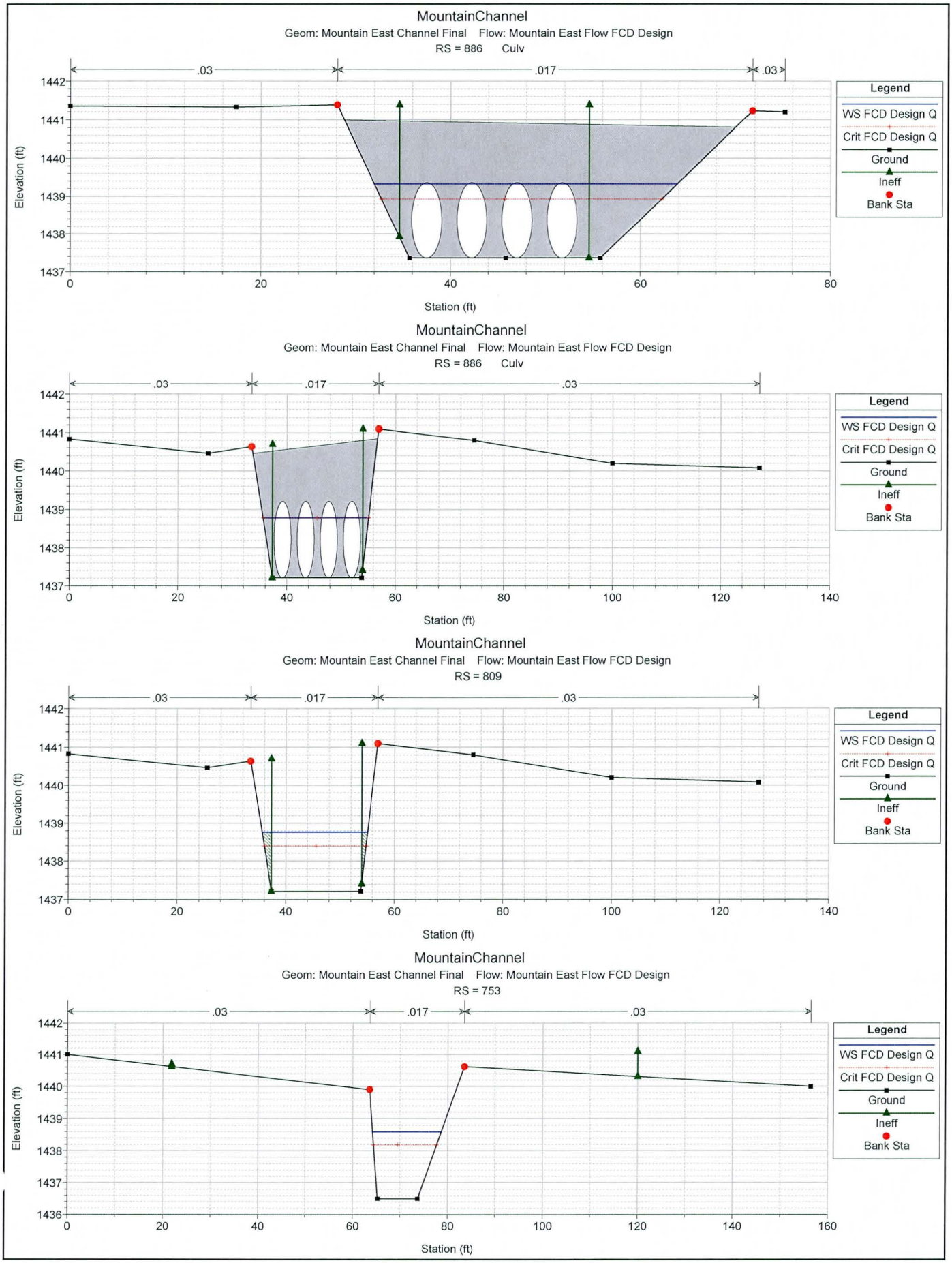


MountainChannel

Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design

RS = 894




MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
RS = 886 Culv
.03
.017
.03
Elevation (ft)
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Ineff
Bank Sta
MountainChannel
Geom: Mountain East Channel Final Flow: Mountain East Flow FCD Design
RS = 886 Culv
.03
.017
.03
Elevation (ft)
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Ineff
Bank Sta
MountainChannel
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.03
Elevation (ft)
Station (ft)
Legend
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Crit FCD Design Q
Ground
Ineff
Bank Sta
MountainChannel
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Station (ft)
Legend
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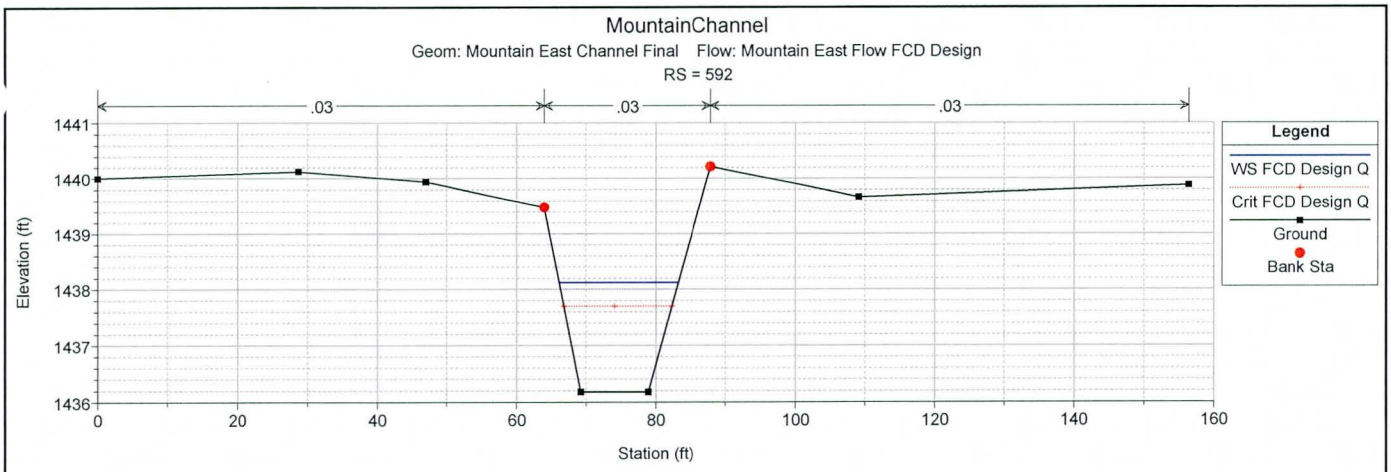
Crit FCD Design Q
Ground
Ineff
Bank Sta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.03
.03
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1439
1438
1437
1436
0
20
40
60
80
100
120
140
160
Station (ft)
Legend
WS FCD Design Q
Crit FCD Design Q
Ground
Bank Sta

Kimley»Horn

Project: ***Mountain and Erie DCR***
Subject: **Opinion of Probable Cost for Recommended Alternative**
Designed by: **AJV** Date: 6/22/2015 KHA Project No: 091131026
Checked by: **LSM** Date: 6/23/2015 District Project No: 2014C001

Channel East of Mountain Road Alternative

MAG Item Number	Description	Qty	Unit	Unit Price	Cost
Construction Items					
215.01100	Channel Excavation	4,251	CY	$ 6	$ 25,600
525.03217	Reinforced Concrete Channel, 6" Thick	391	CY	$ 300	$ 117,300
220.10300	Riprap, D50=12"	164	CY	$ 80	$ 13,200
350.01124	Remove Pipe, Backfill & Compact, D=24"	80	LF	$ 20	$ 1,600
350.01500	Remove Headwall	3	EACH	$ 800	$ 2,400
520.01035	Safety Rail (Height = 3'-6") MAG Det. 145	102	LF	$ 100	$ 10,200
	Headwall, partial for existing Erie St culvert	1	EACH	$ 1,920	$ 2,000
	Headwall, 4 - 38"x24" RCP Crossing	2	EACH	$ 5,760	$ 11,600
	38"x24" Elliptical RCP, Class IV	329	LF	$ 160	$ 52,700
				Construction Subtotal	**$ 236,600**
	Right of Way Cost	3.8	AC	$ 125,000	$ 475,000
	Misc. property damages (20% of R/W Cost)				$ 95,000
	Design Cost (10% of Construction Cost)				$ 23,700
	Construction Admin and Contingency (20% of Construction Cost)				$ 47,300
				Recommended Alternative Total	**$ 878,000**

Notes: Construction costs were determined from ADOT Estimated Engineering Construction Cost E2C2.
Headwall costs based on $60/sf for cross sectional area
Elliptical RCP costs based on estimate from Rinker

Kimley»Horn

Appendix F. Conceptual Plans

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY AND THE MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

IN COOPERATION WITH KIMLEY-HORN

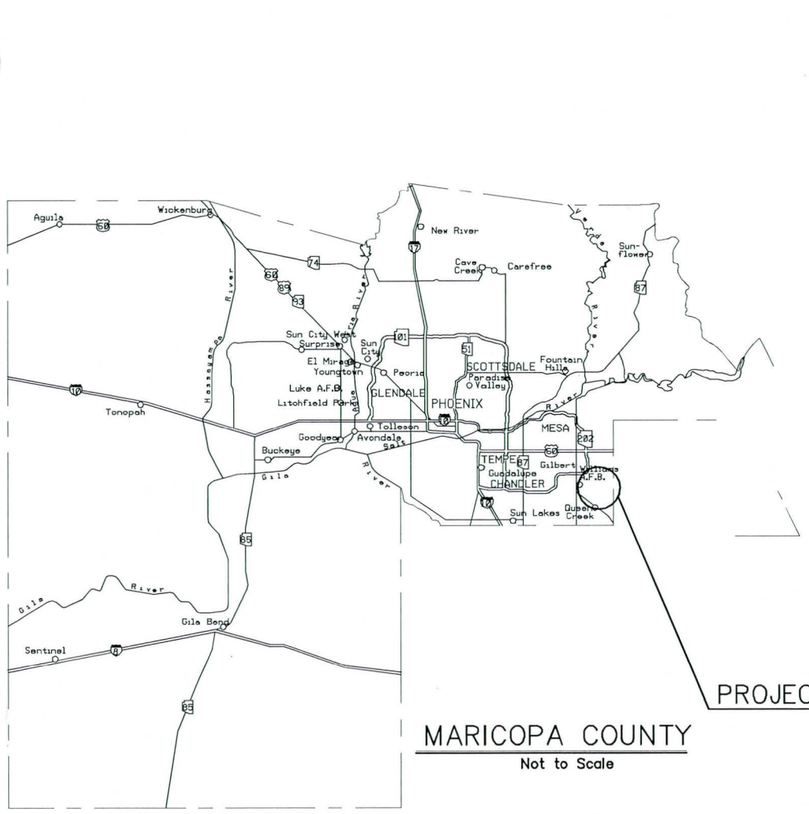
CONCEPTUAL PLANS FOR THE CONSTRUCTION OF

MOUNTAIN ROAD AND ERIE STREET DRAINAGE IMPROVEMENTS

PCN 442.03.20

FCD CONTRACT NO. 2014C001-3

INDEX OF SHEETS



MARICOPA COUNTY

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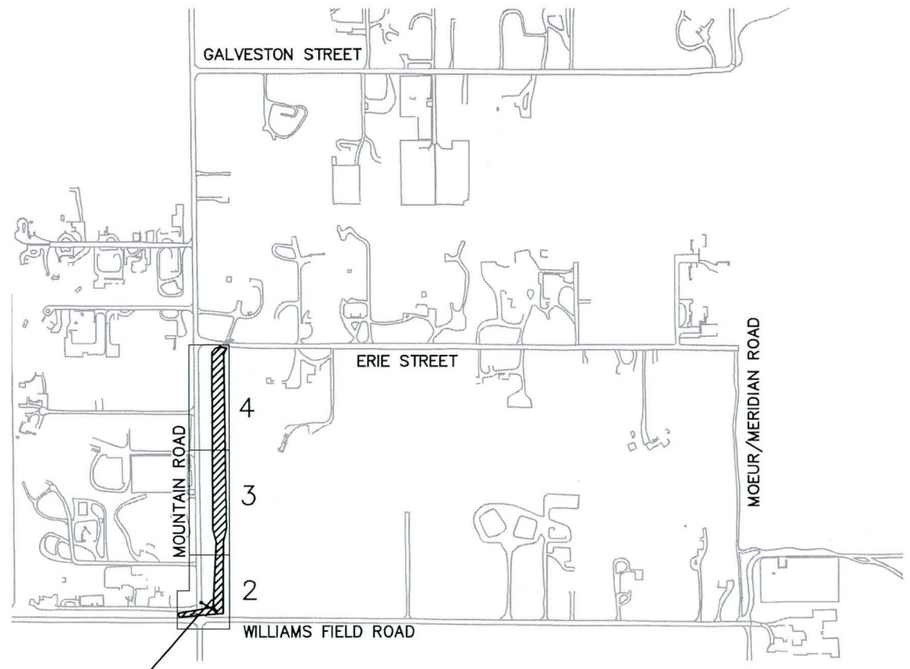


VICINITY MAP

Not to Scale

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ISSUE RECOMMENDED BY:

PROJECT MANAGER DATE

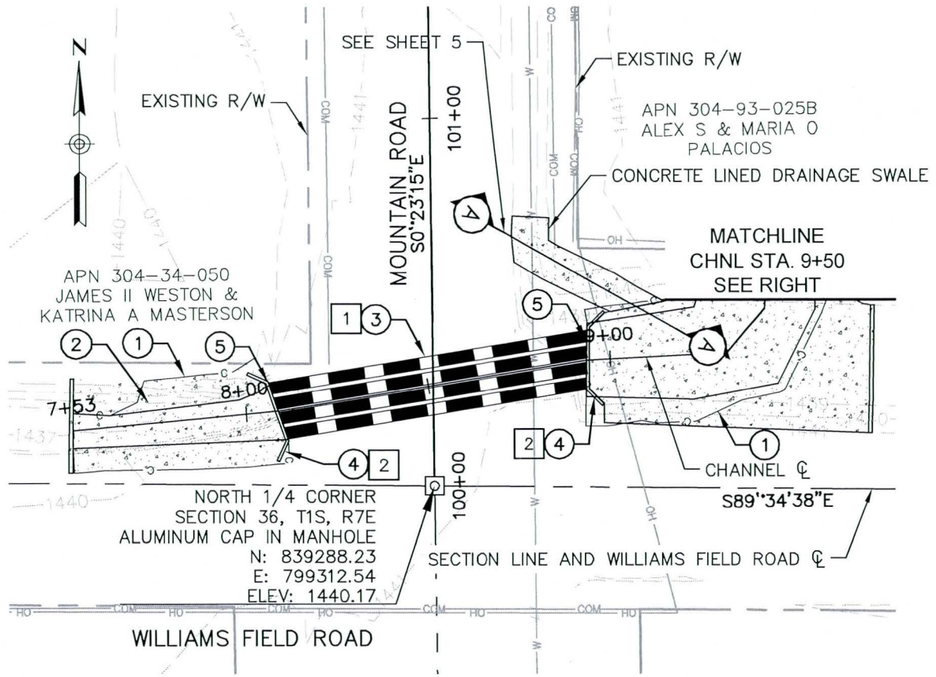
ISSUED FOR PUBLIC BIDDING BY:

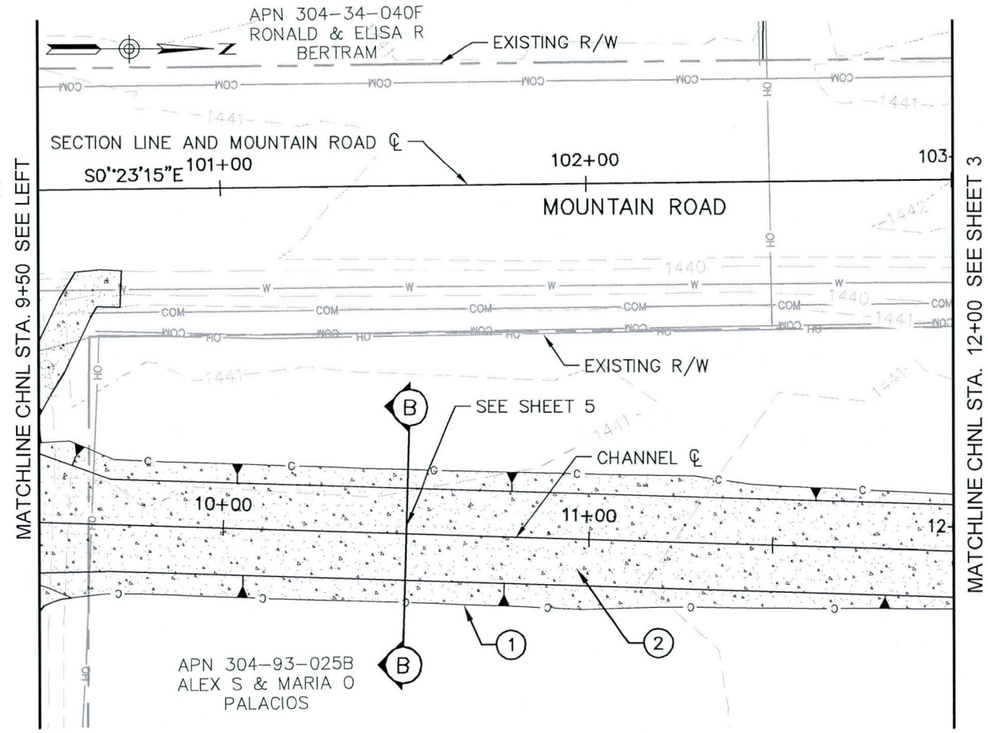
CHIEF ENGINEER & GENERAL MANAGER DATE

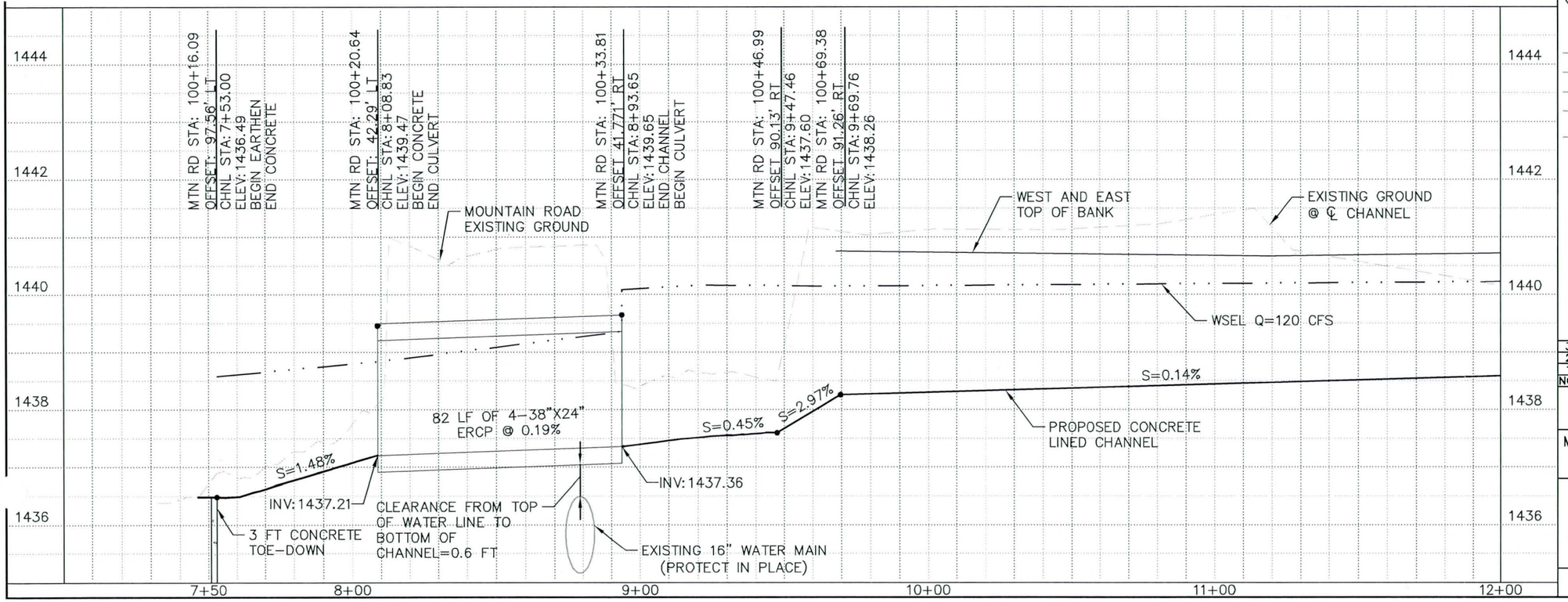
BOARD OF DIRECTORS OF THE FLOOD CONTROL DISTRICT

DENNY BARNEY - CHAIRMAN

DISTRICT 1	DENNY BARNEY
DISTRICT 2	STEVE CHUCRI
DISTRICT 3	ANDY KUNASEK
DISTRICT 4	CLINT HICKMAN
DISTRICT 5	STEVE GALLARDO







☐ REMOVE ☐

NO	DESCRIPTION	QTY	UNIT
1	REMOVE EXISTING 24" CULVERT	80	LF
2	REMOVE EXISTING HEADWALL	2	EA

○ CONSTRUCT ○

NO	DESCRIPTION	QTY	UNIT
1	CHANNEL EXCAVATION	852	CY
2	REINFORCED CONCRETE	290	CY
3	38"X24" ERCP	329	LF
4	HEADWALL	2	EA
5	SAFETY RAIL	56	LF

CALL FOR LOCATION 2 DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

UTILITY LEGEND

- W — WATER
- UG — UNDERGROUND ELECTRIC
- E — OVERHEAD ELECTRIC
- OH — OVERHEAD COMMUNICATIONS
- COM — UNDERGROUND COMMUNICATIONS

DETAILED SURVEY PERFORMED BY:
WHPACIFIC INC. FEBURARY 2015
VERTICAL DATUM: NAVD88

GRAPHIC SCALE
2 1 0.5 0
20 0 10 20 40
1 INCH = 40 FEET

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

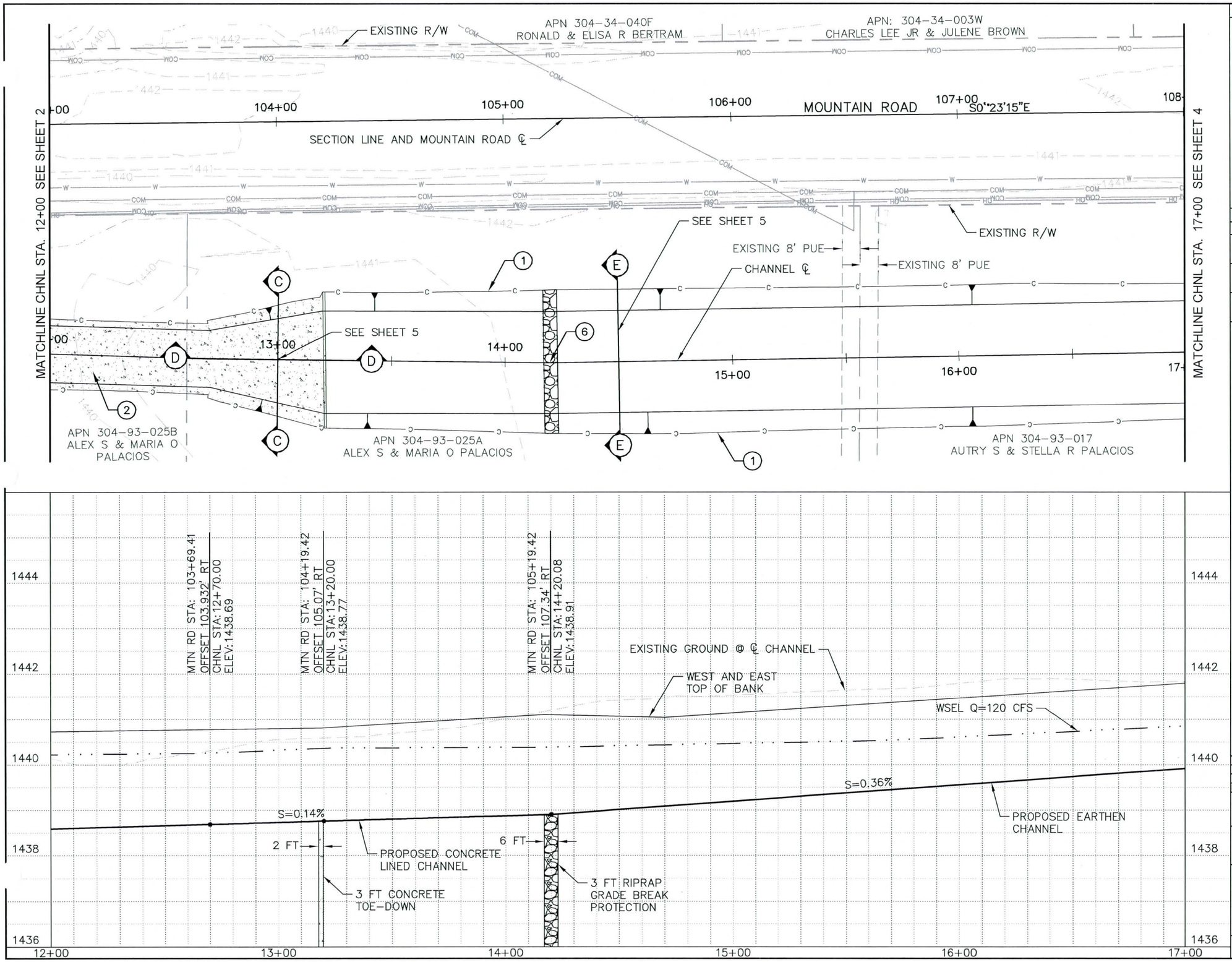
MOUNTAIN AND ERIE DRAINAGE IMPROVEMENTS
442.03.20
2014C001-3

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DES:	AJV	6/15
DR:	NAS	6/15
CK:	AOM	6/15

Kimley»Horn

DRAWING NO.		SHEET OF
DR01	PLAN AND PROFILE CHNL STA. 7+50 TO 12+00	2 5



☐ REMOVE ☐

○ CONSTRUCT ○

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2	REINFORCED CONCRETE	101	CY
6	RIPRAP, D50=12"	28	CY

CALL TWO WORKING DAYS BEFORE YOU DIG
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(OUTSIDE MARICOPA COUNTY)

UTILITY LEGEND

- W — WATER
- UG — UNDERGROUND ELECTRIC
- E — OVERHEAD ELECTRIC
- OH — OVERHEAD COMMUNICATIONS
- COM — UNDERGROUND COMMUNICATIONS

DETAILED SURVEY PERFORMED BY:
WHPACIFIC INC. FEBURARY 2015
VERTICAL DATUM: NAVD88

GRAPHIC SCALE
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1 INCH = 40 FEET

NO.	REVISION	BY	DATE
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2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

MOUNTAIN AND ERIE DRAINAGE IMPROVEMENTS
442.03.20
2014C001-3

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
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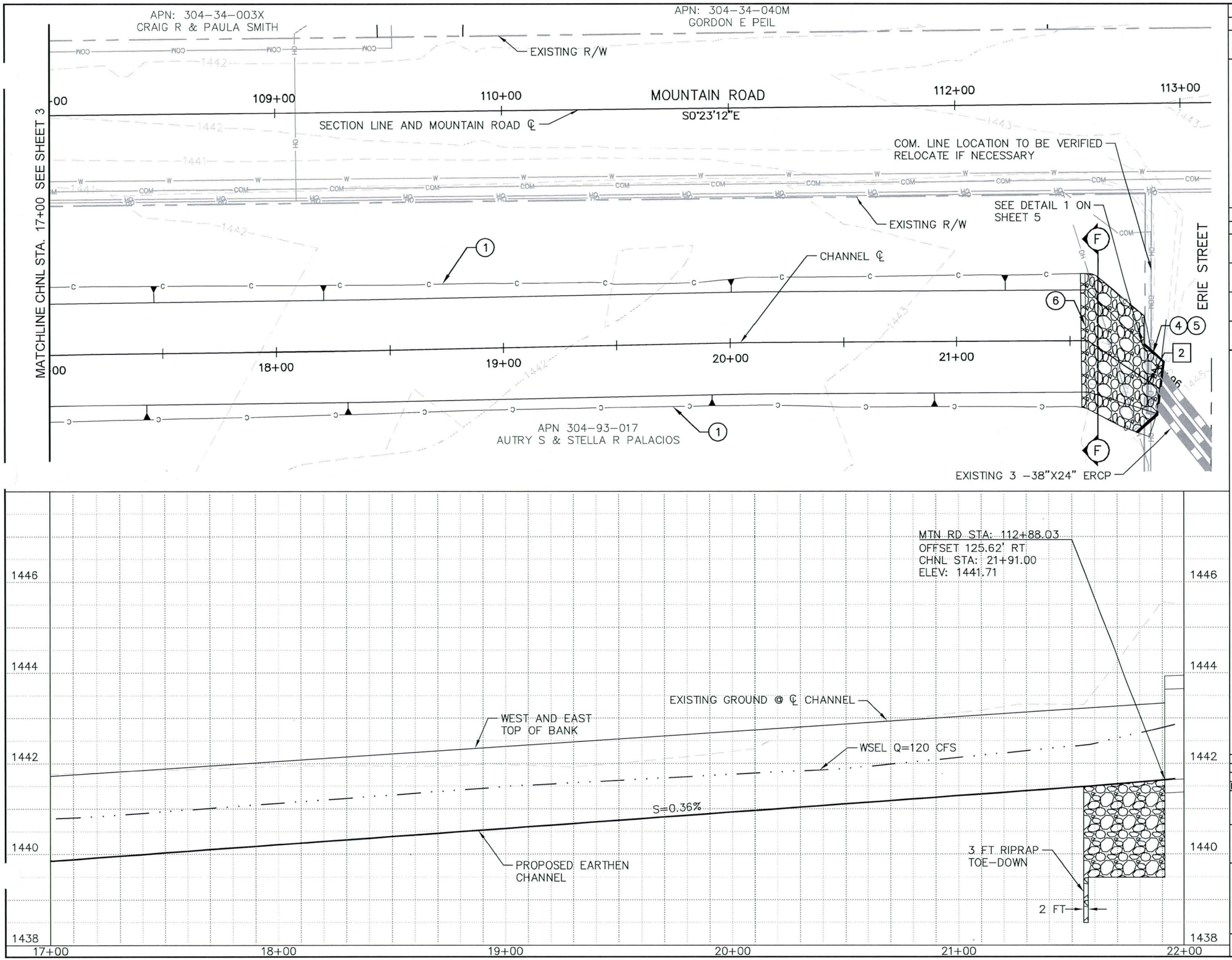
DR:	NAS	6/15
CK:	AOM	6/15

Kimley»Horn

DRAWING NO. DR02

PLAN AND PROFILE
CHNL STA. 12+00 TO 17+00

SHEET OF 3 5



☐ REMOVE ☐

NO	DESCRIPTION	QTY	UNIT
2	PARTIAL HEADWALL REMOVAL	1	EA

○ CONSTRUCT ○

NO	DESCRIPTION	QTY	UNIT
1	CHANNEL EXCAVATION	1548	CY
4	HEADWALL	1	EA
5	SAFETY RAIL	46	LF
6	RIPRAP, D_{50}=12"	136	CY

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

UTILITY LEGEND

- W — WATER
- UG — UNDERGROUND ELECTRIC
- E — OVERHEAD ELECTRIC
- OH — OVERHEAD COMMUNICATIONS
- COM — UNDERGROUND COMMUNICATIONS

DETAILED SURVEY PERFORMED BY:
WHPACIFIC INC. FEBURARY 2015
VERTICAL DATUM: NAVD88

GRAPHIC SCALE
20 0 10 20 40
1 INCH = 40 FEET

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

MOUNTAIN AND ERIE DRAINAGE IMPROVEMENTS
442.03.20
2014C001-3

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DES:	AJV	6/15
DR:	NAS	6/15
CK:	AOM	6/15

Kimley»Horn

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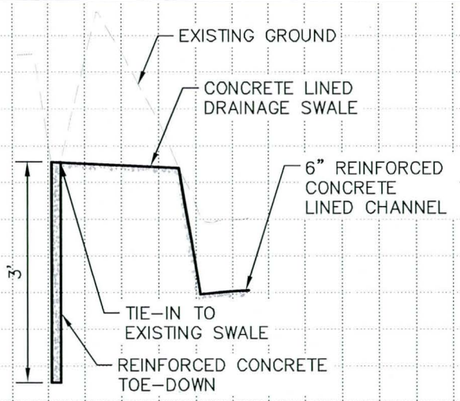
DR03		4 5



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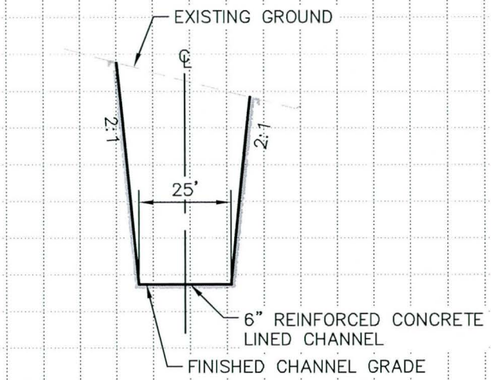

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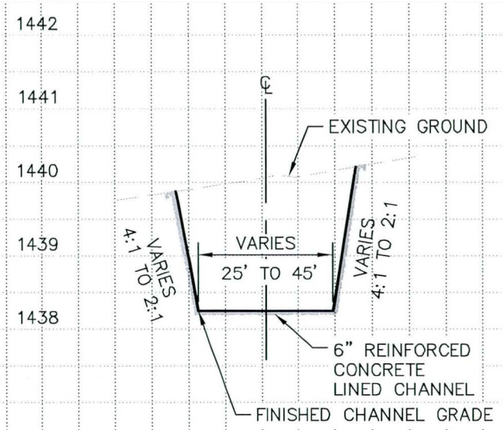

C–C: CONCRETE TRANSITION SECTION
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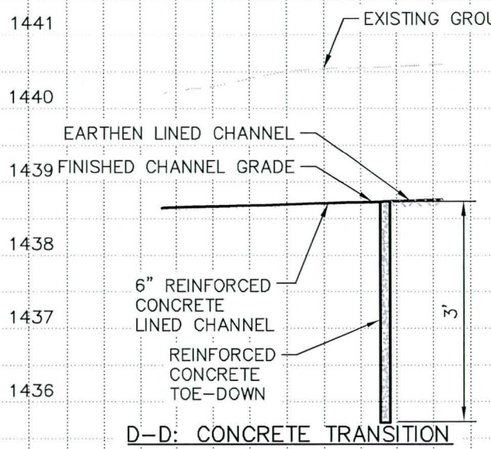

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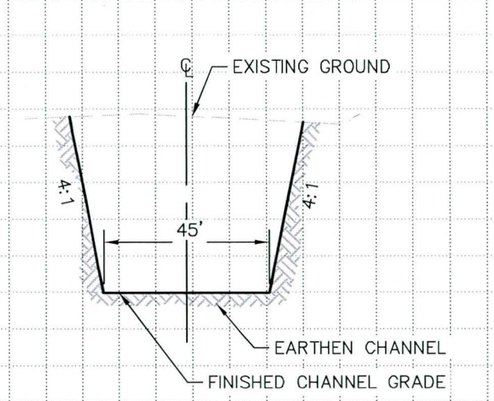

E–E: EARTHEN SECTION
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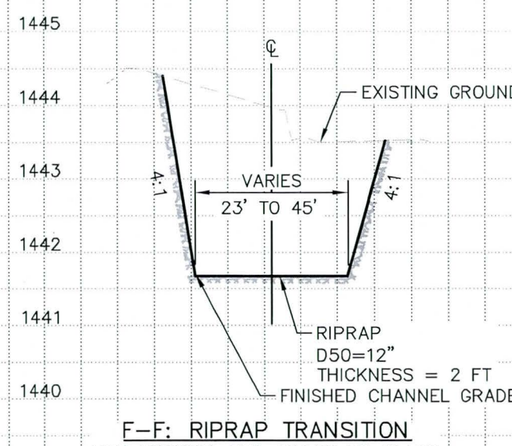
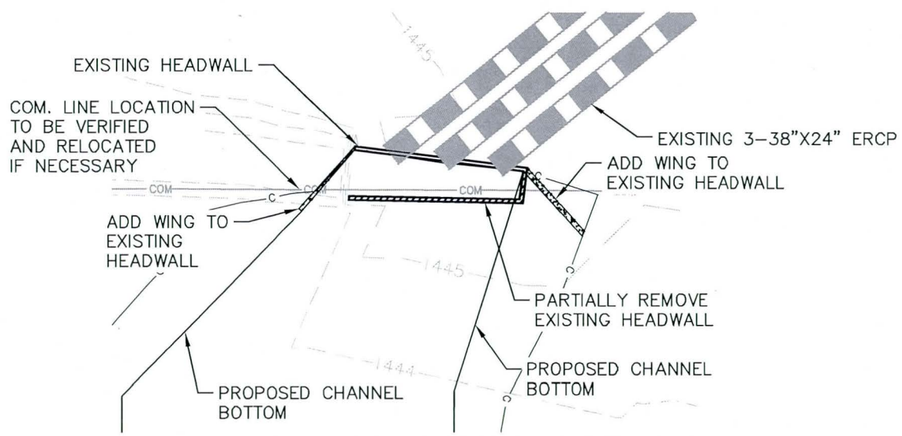


F–F: RIPRAP TRANSITION
MTN CHANNEL STA. 21+55 TO 21+96



ERIE STREET CULVERT CROSSING – DETAIL 1
NTS

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CALL TWO WORKING DAYS BEFORE YOU DIG
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(OUTSIDE MARICOPA COUNTY)

DETAILED SURVEY PERFORMED BY:
WHPACIFIC INC. FEBURARY 2015
VERTICAL DATUM: NAVD88

GRAPHIC SCALE
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1 INCH = 40 FEET

NO.	REVISION	BY	DATE
3			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

MOUNTAIN AND ERIE DRAINAGE IMPROVEMENTS
442.03.20
2014C001–3

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DES:	AJV	6/15
DR:	NAS	6/15
CK:	AOM	6/15

Kimley»Horn

DRAWING NO. DR04

TYPICAL SECTIONS

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