



DESIGN HYDRAULIC STUDY

ACKERMAN CREEK BRIDGE AT NORTH STATE STREET

Bridge Number 10C0065

MENDOCINO COUNTY, CALIFORNIA

Final



Design Hydraulic Study
ACKERMAN CREEK BRIDGE AT NORTH STATE STREET

MENDOCINO COUNTY, CALIFORNIA

Bridge #10C0065

JANUARY 26, 2016

PREPARED FOR:
QUICY ENGINEERING, INC.
AND THE MENDOCINO COUNTY
DEPARTMENT OF TRANSPORTATION

Prepared by:

AVILA AND ASSOCIATES
CONSULTING ENGINEERS, INC.



Catherine M.C. Avila
1/28/16

Catherine M.C. Avila, P.E.

Mueller, Mark@DOT

From: Hurlburt, Glenn G@DOT
Sent: Wednesday, March 09, 2016 4:08 PM
To: Mueller, Mark@DOT
Cc: Boese, Timothy L@DOT; Theiss, Suzanne L@DOT; Larsen, Brandon@DOT
Subject: RE: N. State St. over Ackerman Ck- Revised Floodplain Report w/ attachments A&B

I have reviewed the Revised Floodplain Report for the Ackerman Creek overhead on North State St in Ukiah. I checked peaked flow statistics used in structure design and the fish passage "grade control" underneath the structure and found them accurate. I have no additional comments at this time.

*Glenn Hurlburt, PE
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From: Mueller, Mark@DOT
Sent: Thursday, March 03, 2016 3:29 PM
To: Boese, Timothy L@DOT
Cc: Theiss, Suzanne L@DOT; Larsen, Brandon@DOT; Hurlburt, Glenn G@DOT; Manzanera, Fernando@DOT
Subject: RE: N. State St. over Ackerman Ck- Revised Floodplain Report w/ attachments A&B

Tim,

Have you had a chance to assign a hydraulics engineer to review this document?

Best Regards,

Mark E. Mueller
Transportation Engineer, District 1 Local Assistance
PO Box 3700
Eureka CA 95502
Phone: 707-441-3977

From: Mueller, Mark@DOT
Sent: Tuesday, March 01, 2016 11:05 AM
To: Boese, Timothy L@DOT

Cc: Theiss, Suzanne L@DOT; Brandon Larsen (brandon.larsen@dot.ca.gov)

Subject: FW: N. State St. over Ackerman Ck- Revised Floodplain Report w/ attachments A&B

Tim,

Can you have one of your hydraulics engineers review this Location Hydraulic Study Form, Summary Floodplain Encroachment Report and supporting documentation? I have attached a Floodplain reviewers checklist as a guide for reviewing this document. Please let me know who is reviewing this and how long you expect them to take to review this hydraulic report. I had the agency use the correct LHSF and SFER forms as well as correct the location arrow in figure 2 of the LHSF before sending to your group for review.

Thank you,

Mark E. Mueller
Transportation Engineer, District 1 Local Assistance
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Phone: 707-441-3977

From: Jackson Ford (mailto:fordj@co.mendocino.ca.us)

Sent: Tuesday, March 01, 2016 9:33 AM

To: Larsen, Brandon@DOT

Cc: Mueller, Mark@DOT

Subject: N. State St. over Ackerman Ck- Revised Floodplain Report w/ attachments A&B

Brandon and Mark- Please find the revised floodplain report attached, comments received 2/16 have been addressed.

Thanks,
Jackson

JACKSON FORD
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EXECUTIVE SUMMARY

The Ackerman Creek Bridge (bridge) at North State Street in Mendocino County, California is proposed for replacement by Mendocino County in 2017. The proposed bridge will be a single span cast in place pre-stressed concrete box girder bridge. It will be 64-ft wide and will accommodate 2 travel lanes, a middle turn lane, with shoulders and sidewalks on both sides as shown in the attached General Plan (Appendix A). The superstructure will be supported by concrete seat abutments on concrete piles.

Ackerman Creek flows southwesterly through the southeastern part of Mendocino County (County) which drains an approximate 20.6-square mile basin at the bridge. The discharges used for the bridge hydraulic analysis are shown in Table 1.

Hydraulic modeling utilizing a HEC-RAS¹ model was used to estimate the water surface elevation (WSE) for the existing and proposed bridge. With the proposed grading, the water surface elevation at the upstream face of the bridge decreased considerably compared to the existing conditions due to the removal of the existing grade control structure and replacement with a fish friendly streambed restoration. The minimum soffit elevation of the existing bridge is at elevation 625.8 while the proposed bridge will be 6.4-ft lower at elevation 619.4.

Table 1: Estimated discharges and water surface elevations for bridge design

	Design	Base	Overtopping Flood
Frequency (Years)	50	100	> 500
Discharge (Cubic feet per second)	4,800	5,370	7,500
Water Surface Elevation (ft-at upstream face of bridge)	618.0	618.4	623.0

This report follows the Caltrans Final Hydraulic Report Format and has been prepared in accordance with the Caltrans Local Assistance Program Guidelines (5) and Memos to Designers 1-23.

The proposed bridge will replace the existing Ackerman Creek Bridge at the same location as the existing bridge. The bridge will improve the hydraulics through the bridge reach by re-grading the channel and moving the hydraulic jump upstream. In addition, the minimum proposed soffit elevation of 619.4 will provide 1.4 feet of freeboard above the 50-year discharge and 1.0 feet of freeboard above the 100-year discharge. A design exception will be required for providing less than 2 feet of freeboard above the 50-yr discharge.

GENERAL

This design hydraulic study has been prepared for the sole purpose of meeting the requirements of the Caltrans "Local Assistance Program Guidelines." Although potentially useful for other purposes, this analysis has not been prepared for any other purpose. Reuse of information contained in this report for purposes other than for which Avila and Associates Consulting Engineers, Inc. (Avila and Associates) intended and without their written authorization is not endorsed or encouraged and is at the sole risk of the entity reusing the information.

¹ US Army Corps of Engineers Hydraulic Engineering Center River Analysis System which backwater hydraulic model designed to perform one-dimensional hydraulic calculations for a full network of natural and constructed channels.

Avila and Associates was retained to complete the bridge hydrology, hydraulics, and scour analysis for the bridge. The following scope of work has been completed to develop this report.

1. Obtain backup information and field review
2. Estimate Hydrology
3. Create HEC-RAS model
4. Estimate scour, channel bed degradation and bank protection parameters
5. Prepare Draft Report for comment
6. Prepare Final Report
7. Complete Location Hydraulic Study

The existing North State Street Road Bridge over the Ackerman Creek in south eastern Mendocino County is shown in Figure 1. The existing bridge is a 3 span bridge with a 2010 sufficiency rating of 75.1 and is Functionally Obsolete (13). The Mendocino County Public Works Department proposes to replace the existing bridge with a new bridge crossing Ackerman Creek using Highway Bridge Program (HBP) funding.

The datum elevation used for this study is NGVD-29². The proposed bridge will be a single span cast in place pre-stressed concrete box girder bridge 146-feet in length with a full deck width of 64-ft, and will accommodate 2 travel lanes, a middle turn lane, with shoulders and sidewalks on both sides as shown in Figure 2 and in the attached General Plans (Appendix A).

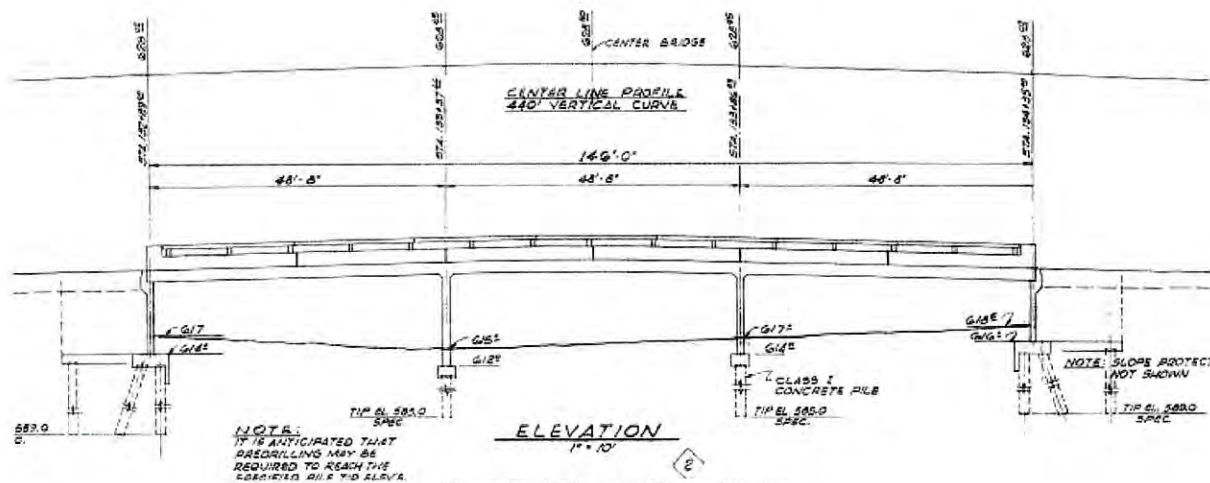
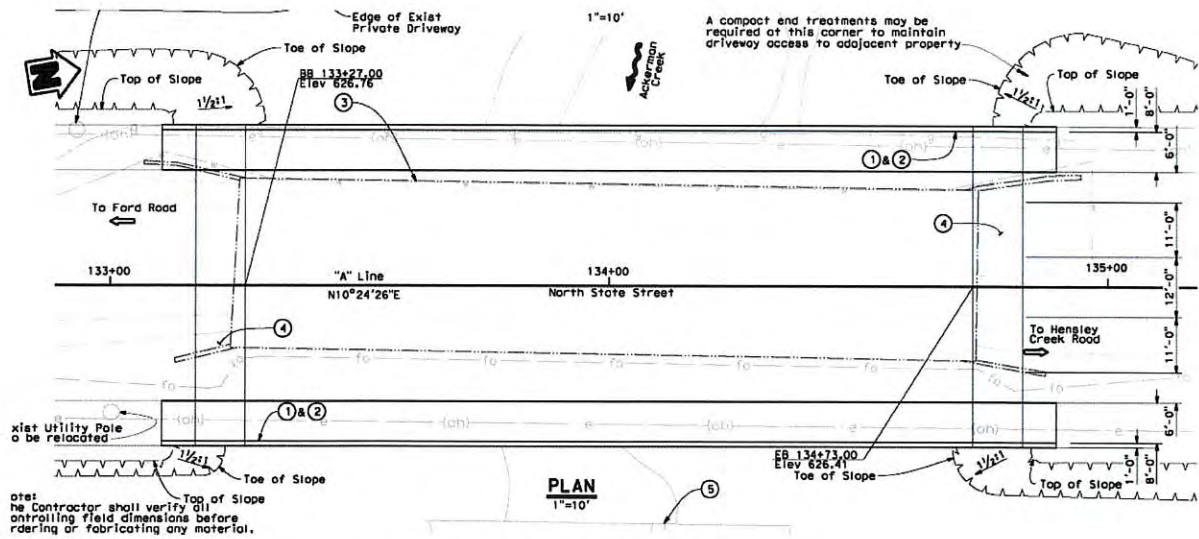


Figure 1: Existing bridge profile view

² Electronic mail August 16, 2011 from Jon Wheat (Quincy Engineering, Inc.) to Jason Jurens (Quincy Engineering, Inc.).



BRIDGE HISTORY

Avila and Associates reviewed the pertinent bridge maintenance records for the adjacent Highway 101 Bridges (Br #10 0199R/L) upstream (13) to review the typical impacts to bridges along this reach. These bridges are shown in Figure 3. Details of the bridges are shown in Table 2.

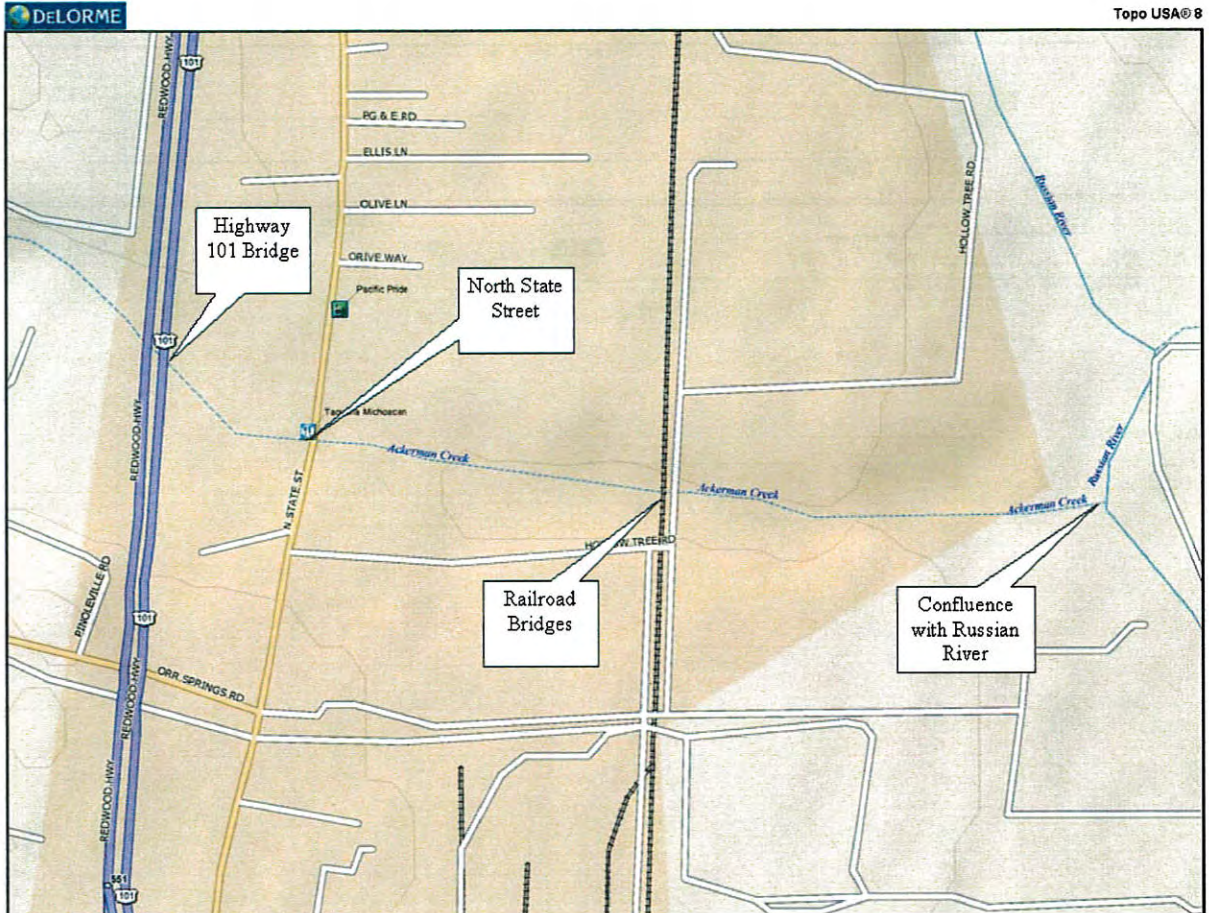


Figure 3: Bridge locations (from Delorme topozone.com)

Table 2: Bridge information from adjacent bridges on the reach

	North State Street	Highway 101
Bridge Number	10C0065	10 0199L
Bridge Length (ft)	148.5	182'
Span Lengths (ft)	3 @ 48'-8"	30-40-40-40-30
Bridge Type	RC Slab	RC "T" girder
Debris Challenges	1974, 1996 (P2 & P3), 2000 (S2), 2002, 2004, 2008 (P3)	Repeatedly, see below ³
Cross Sections Available for	As-built (1966), 1972, 1996	1963, 1994, 1996
NBIS Item 113 (scour) code	5 (2002 not scour critical)	5 (2002 not scour critical)
ELI Flag 361 Condition State	--	--
Pier Type	Pier Walls	Pier Walls
Year Built	1965	1962
Year Widened	--	--
Scour Challenges	Repeated. See below. ⁴	Repeated. See below 1963 ⁵ , 1965, 1974
High Water Data	None	1964 5.8 at N abut

³ Drift: Drift accumulated at Pier 4 (1963) Piers 2 and 3 (1965), recommendation to saw up drift at Pier 3 and 4 which is causing scour. 1981: some drift and trash has accumulated against the end of Piers 3 and 4 on the upstream side. A 4-ft deep scour hole has formed due to this condition. 1982: mounds of drift on the upstream end of Piers 3 and 4 have not been removed. 1984: Remove the drift hung up on Piers 2 and 3. 1985: Drift removed at Piers 2 and 3. 1996: An Accumulation of light debris was found at the left side of Pier 4. This accumulation is causing a minor scour hole at this location, but no exposure of the footing was visible.

⁴ The 1966 bridge replaces an old state highway structure built in 1913 which was severely damaged by scour in the floods of December, 1964. 1976: Top of footing at the downstream end of pier 3 is exposed. 1978: There is severe degradation of the channel which exposed the bent footings and threatened to undermine them. This condition has been alleviated by a check-dam constructed a short distance downstream from the bridge. 1992: No scour noted. Grade control structure with Raymond Fish ladder are in good condition. (Located 40'-50' downstream from the bridge). 2008: There is a localized scour hole at the upstream side of Pier 3 with approximately 1/2 cubic yard of debris. The footing is exposed the whole length of Pier 3 with 2.5-ft of vertical exposure on the upstream side. The footing is undermined 12" transversely at the left side of Pier 3.

⁵Scour: 1963: Top of footing at Pier 3 and 14" of footing exposed on the Span 2 side. 1965: Scour to 17.5-ft below upstream girder in span 2 at pier 3. 1974: Pier 3 scoured on stream-side (N) and pier 4 scoured on both side. N. side is scoured about 2-ft below average level. 1992: The channel remains very stable as no evidence of scour was found.

BASIN AND DISCHARGE

The headwaters of the Ackerman Creek are at an approximate elevation of 2,200 feet. Average annual rainfall in Mendocino County is 45 inches per year. Ackerman Creek carries flow southeasterly to the bridge site. The watershed draining to the bridge is 20.6 square mile as shown in Figure 4.



Figure 4: Basin contributing to the bridge from Watershed Portal⁶

⁶[http://www.conservation.ca.gov/dlrp/watershedportal/WatershedBrowser/Pages/WatershedBrowser.aspx?idnum=01114.3103&mode=sr&name=Ukiah \(hsa\)&height=undefined&width=undefined](http://www.conservation.ca.gov/dlrp/watershedportal/WatershedBrowser/Pages/WatershedBrowser.aspx?idnum=01114.3103&mode=sr&name=Ukiah%20(hsa)&height=undefined&width=undefined)

Table 3: Discharge estimates for FEMA and Regional Regression analyses on the Ackerman Creek

	Basin size (sq mi)	10-year	Design (50-year)	Base (100-yr)
Regional Regression	20.6	3,000	4,600	5,150
FEMA Analysis	20.6	3,190	4,800	5,370

The FEMA analysis is slightly higher than the Regional Regression and was used as the estimated discharge and is shown in Table 4. See Appendix B for additional information.

Table 4: Discharges used for design

	Design	Base	Overtopping Flood
Frequency (Years)	50	100	> 500
Discharge (Cubic feet per second)	4,800	5,370	> 7,500

HEC-RAS ANALYSIS

Hydraulic parameters (water surface elevations and velocity) were obtained from the U.S. Army Corps of Engineers HEC-RAS (Hydraulic Engineering Center River Analysis System) version 4.1.0 model based on: 1) survey information supplied by Quincy Engineering, Inc., 2) as-built data provided by Mendocino County and Caltrans, and 3) a field investigation by Avila and Associates on July 21, 2011. Cross Sections surveyed for the HEC-RAS model are shown in Figure 5. Interpolated cross sections were used between surveyed sections and blocked areas were used in the overbank areas to model the buildings.



Figure 5: Plan view of HEC-RAS cross section

Existing Conditions

The Manning “n” values of 0.04 for the channel and overbanks at 0.06 were used in the model. These are consistent with the FEMA HEC-2 analysis (8) and field reviews by Avila and Associates as shown in

Figure 6. There is a notation on the as-built plans that the 1964 highwater was at elevation 624.6. Unfortunately, this was for a different bridge with a completely different channel configuration and an unknown discharge. The information was not used to calibrate the existing conditions HEC-RAS model.



Figure 6: Looking downstream at the channel and grade control structure. The overbank areas are heavily vegetated with relatively high manning “n” values

The existing bridge was input into the model as a three span structure with pier widths of 14-inches as shown in Figure 7.

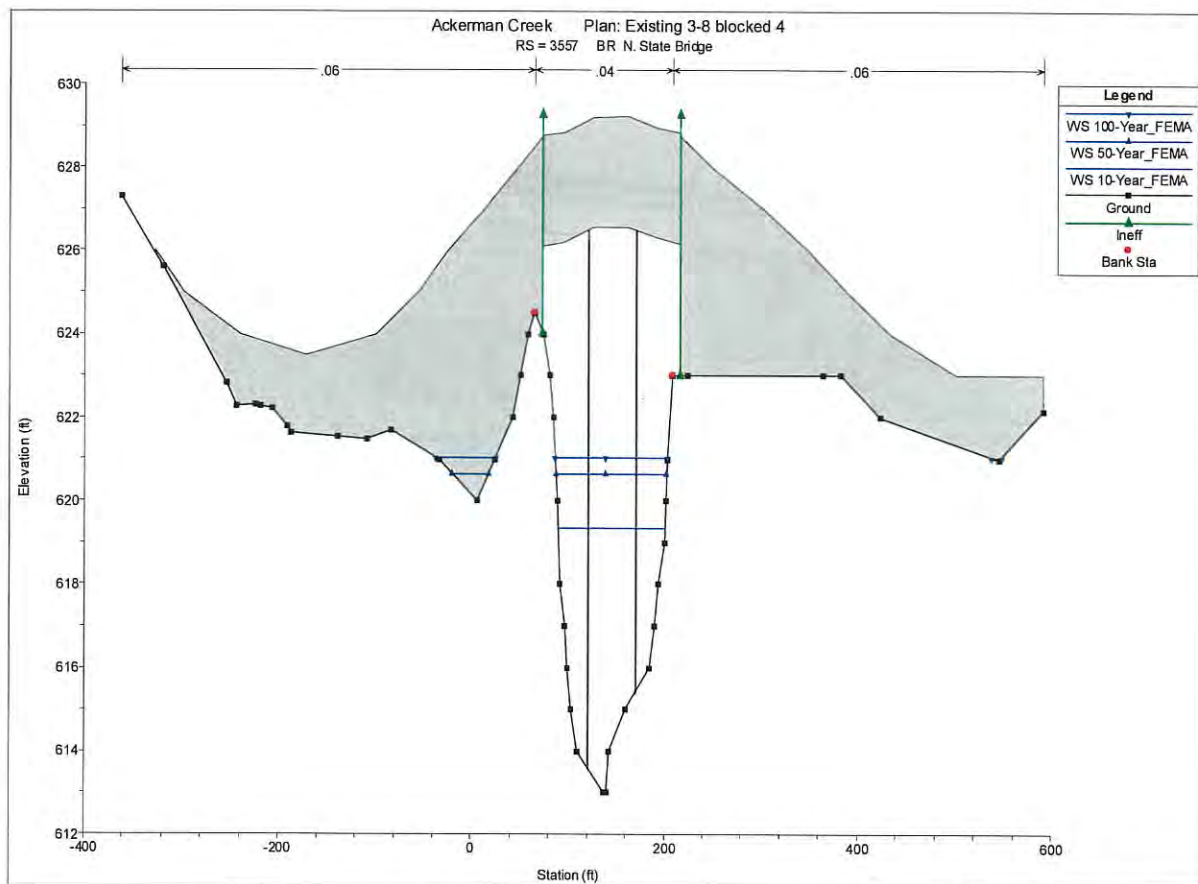


Figure 7: HEC-RAS cross section for the upstream existing conditions for the Flood of Record and 10- 50- 100 year Q 's

Starting Water Surface Elevation

The water surface elevation of the Russian River was used as the starting water surface elevation at the downstream boundary condition at the confluence with the Russian River. Under existing conditions, the water passes through critical depth at station 3485 which is approximately 40-ft downstream from the downstream face of the existing bridge. No changes to the downstream boundary condition would affect the water surface profiles. The water surface profile is shown in Figure 8:

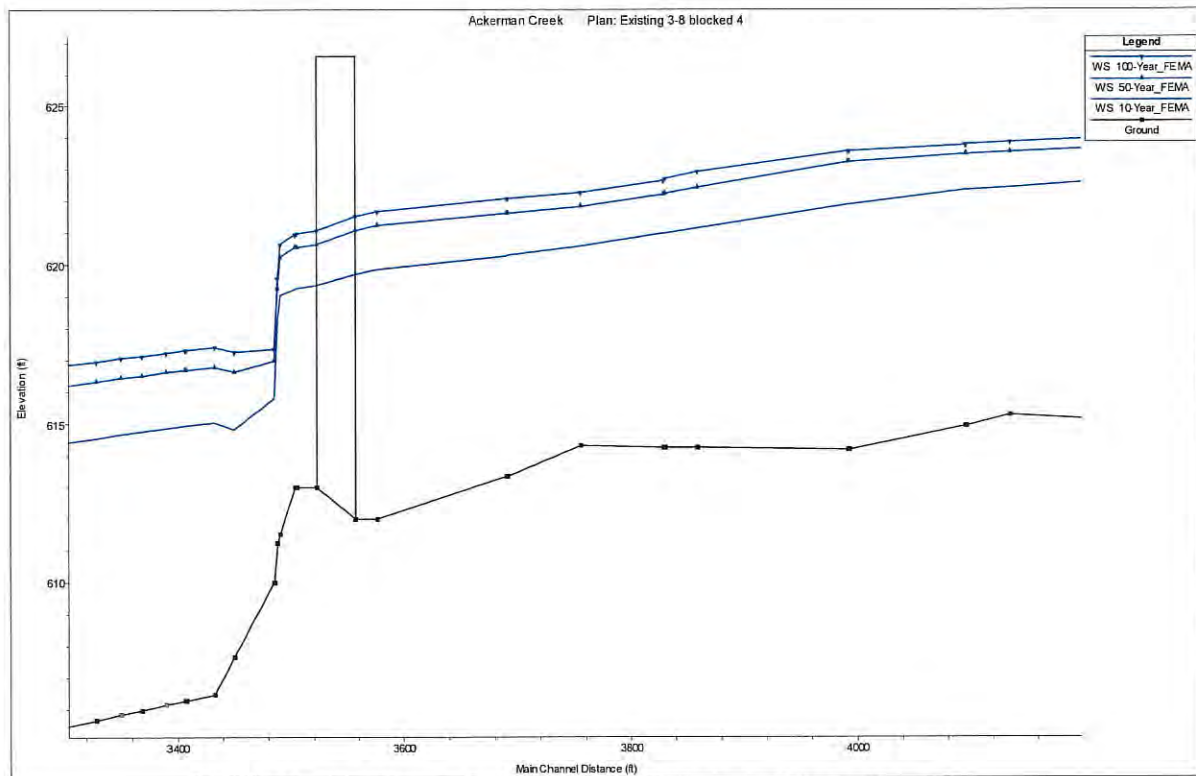


Figure 8: Starting Water Surface Elevation convergence for the 100-year discharge

Proposed Channel Grading and Removal of the Existing Grade Control Structure

As part of the bridge replacement project, the Mendocino County Department of Transportation and multiple resource agencies propose to replace the existing grade control structure since it creates a significant barrier to protected and endangered fish passage. Previous efforts to address this issue with a fish ladder have proven ineffective and have required frequent maintenance by County forces.

Five options were considered by the Mendocino County Department of Transportation including 1) a Step-pool, 2) a Chute and Pool, 3) a Cascade and Pool, 4) a Hybrid System, and 5) a Concrete Structure (Pool and Chute). Based on compatibility with the upstream restoration project, hydraulics, geomorphology, seasonal flows, and fish passage needs, the Step-pool method was chosen as the preferred alternative and its design is included in the bridge replacement.

Avila and Associates modeled the Step-pool option in the HEC-RAS model to account for the channel grading that would occur as part of the proposed project. This grading is shown in Figure 9. See additional information about the fish passage structure in Appendix C.

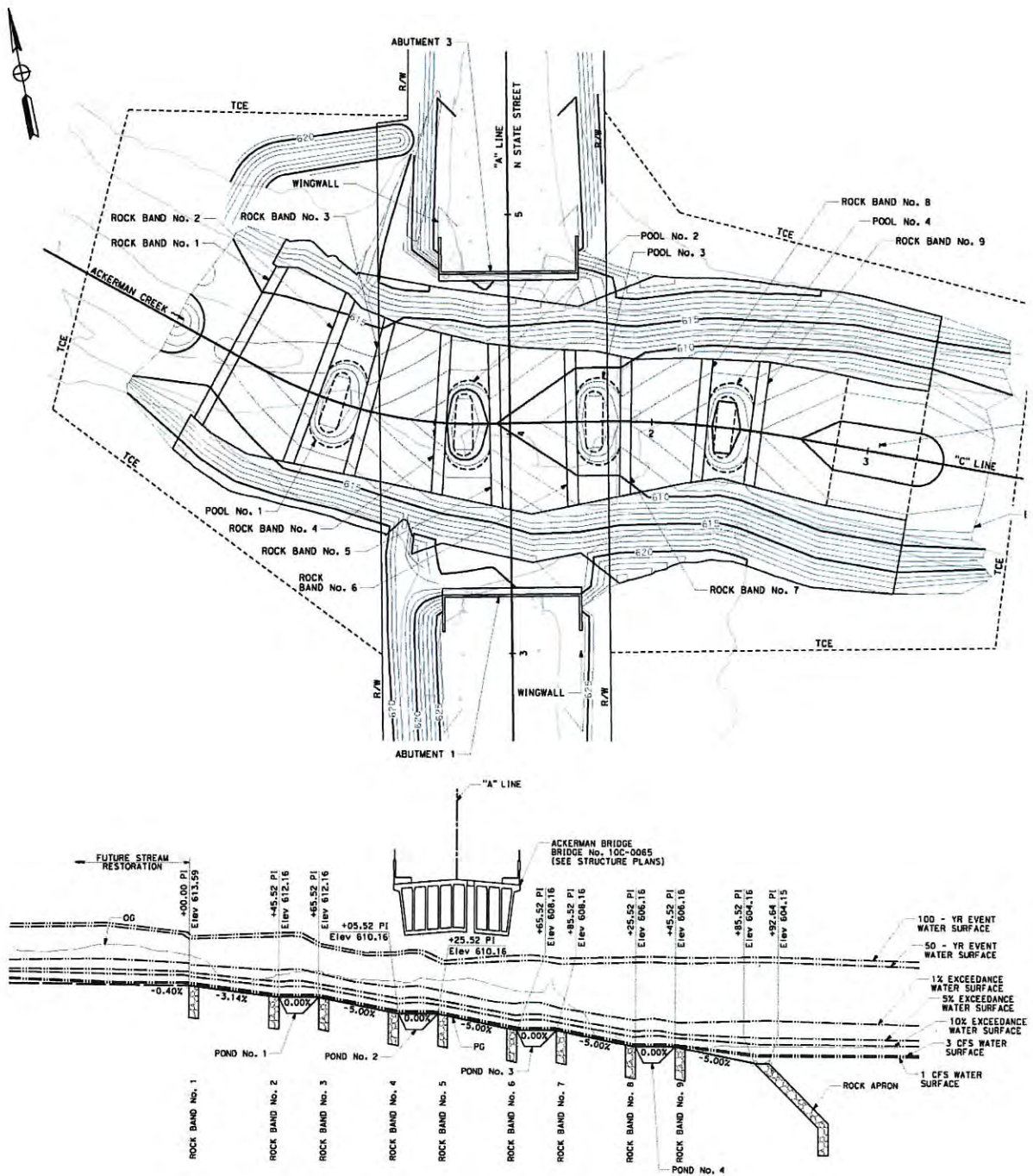


Figure 9: Step-Pool Plan and Profile (from QEI)

Proposed Bridge Model

The HEC-RAS model was revised by replacing the existing contours with the proposed grading plan shown in Figure 9 as well as replacing the existing bridge with the proposed bridge shown in Figure 10. Because there are multiple grade breaks and pools under the bridge with the proposed grading, the bridge was modeled in HEC-RAS using blocked obstructions to represent the bridge abutments.

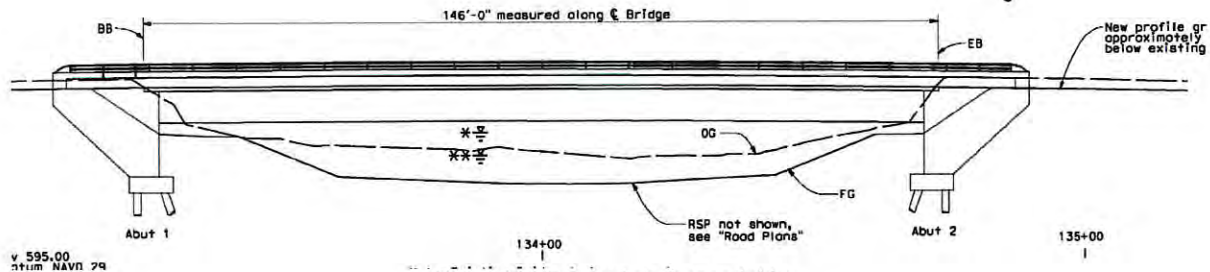


Figure 10: Proposed single span bridge

As shown in Figure 11, except for the small area downstream of the bridge, the proposed bridge and grading does not increase the water surface elevation upstream of the bridge. The downstream water surface elevation increase is a relatively small (approximately 0.25-ft) increase for the 100-year water surface elevation. This increase in water surface elevation is most likely caused by the transition from the proposed channel grading to the existing channel. The profiles converge to existing conditions (within 0.1-ft) approximately 400-ft upstream of the bridge.

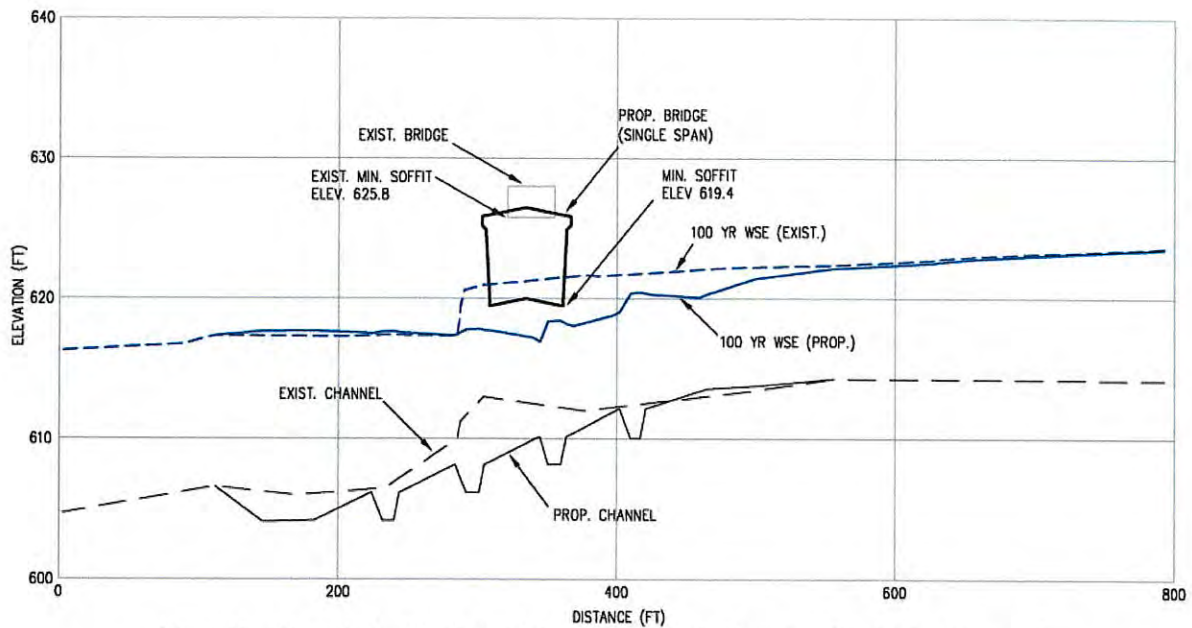


Figure 11: Water Surface Profile for Existing vs. Proposed with new grading for the 100- year Q

HYDRAULIC CRITERIA

Chapter 800 of the Caltrans Highway Design Manual (HDM) delineates the hydraulic design criteria for bridges (6). The basic HDM rule for hydraulic design is that bridges should be designed to pass the Q_{50} with sufficient freeboard and convey the Q_{100} without freeboard, exceptions may also be granted if sufficient evidence is provided. The HDM notes that 2 feet of freeboard is often assumed for preliminary bridge designs but leaves the recommendation for freeboard to the judgment of the hydraulic engineer based primarily upon the debris anticipated at the bridge.



Figure 12: Looking upstream at the existing bridge

Avila and Associates researched the available bridge maintenance records for the existing bridge and upstream Route 101 Bridge to determine if floating debris catches on the bridge or other maintenance issues exist. Based upon the review of the records, drift potential is relatively high with repeated notations of debris mentioned in the Caltrans Bridge Maintenance reports for the existing bridge as well as the upstream Route 101 Bridge as shown in Table 2 above. In addition, the California Department of Fish and Game noted large woody debris carried by the stream which they recommended not to remove (4).

The proposed bridge will improve the hydraulics because it is proposed to be a 1-span structure without any piers which should eliminate debris capture. As shown in Figure 10, the profile of N. State Street will have a crest vertical curve with a high point within the bridge span. The soffit at the high point will be elevation 620.0 feet providing 2.0 feet of freeboard over the 50-yr water surface elevation of 618.0. The soffit elevation at the south abutment will be 619.8 providing 1.8 feet of freeboard over the 50-yr water surface elevation of 618.0. The minimum freeboard available over the 50-yr water surface elevation occurs at the north abutment with a soffit elevation of 619.4. The average freeboard available over the 50-yr water surface elevation across the span is 1.85 feet which does not meet the HDM recommended criteria.

The minimum freeboard available over the 100-yr water surface elevation of 618.4 is 1.0 feet at the north abutment with a soffit elevation of 619.4. At the high point in the span, 1.6 feet of freeboard will be available above the 100-yr water surface elevation.

As mentioned, the recommended freeboard criteria for the 50-yr water surface elevation is not met and a design exception will be required for the project; however, with the elimination of the pier in the channel, the

potential for drift accumulation is greatly reduced. The recommended freeboard requirement is met for the 100-yr discharge. Raising the roadway profile any further will have a negative impact on adjacent properties.

Details for the overtopping flood are shown in Appendix D.

SCOUR

The North State Street Bridge's item National Bridge Inventory System (NBIS) Item 113 was rated a "5" meaning "bridge foundations determined to be stable for calculated scour. Scour is within the limits of the footings or the piles" by Caltrans (13). No backup information is available in the bridge maintenance records to justify the rating.

Pier Scour: The proposed bridge will be a one-span bridge so there will be no piers in the channel and thus no pier scour.

Contraction Scour: The channel is not contracted at the proposed bridge, therefore the contraction scour will be negligible.

Degradation: The channel beneath the existing bridge has experienced some channel bed degradation over the life of the bridge as shown in Figure 17. Additional cross sections for the Talmage Road Bridge over the Russian River Cross sections are shown in Appendix E.

A log and rock grade control structure with steel piles was constructed approximately 50-ft downstream from the bridge in 1951. The previous bridge was in place at that time and it appears that the grade control structure was not removed when the current bridge was constructed in 1965. The grade control structure is shown in Figure 13. The depth of the piles is not delineated on the 1951 as-built drawing as shown in Figure 14.

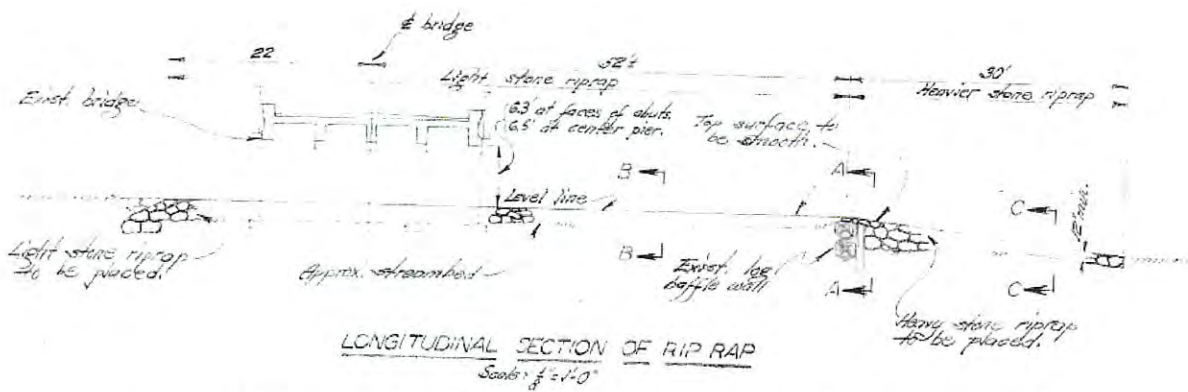


Figure 13: Longitudinal Section of Riprap (from 1951 As-Built plans for scour countermeasure)

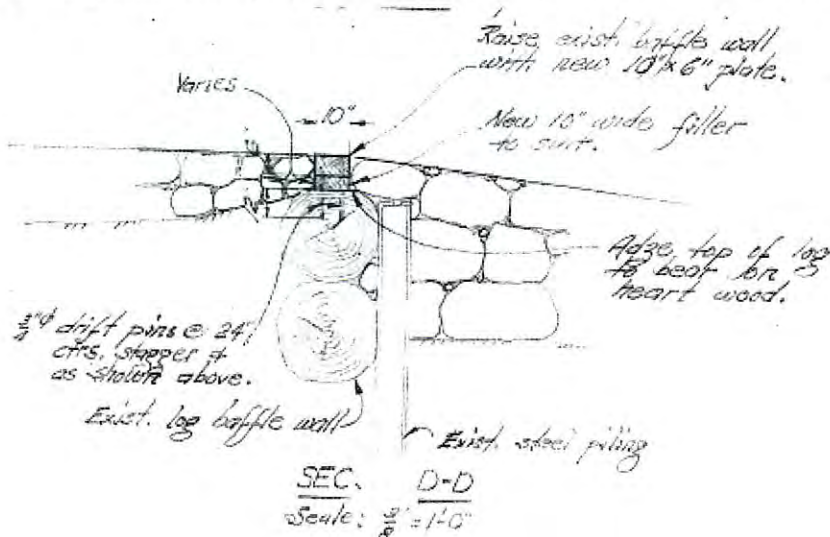


Figure 14: Section DD showing the grade control structure cross section

As a result of the grade control structure, the degradation at the bridge has been limited to approximately 4-ft between when the bridge was constructed and today (from elevation 616 in 1965 to elevation 612 today). The check dam, however, has deteriorated over time and the timber plate and light riprap is missing and a baffle log may have washed out as well as shown in Figure 14 is gone as shown in Figure 15.



Figure 15: Looking at the grade control structure during the July 21, 2011 Field Review (photo by Avila)

Downstream of the grade control structure there is an approximate 6-ft drop between the upstream portions of the grade control structure (elevation 612) to the downstream end of the structure (elevation 606). This significant drop necessitated the construction of a Denil fish ladder in 1983 by the Department of Fish and Game.

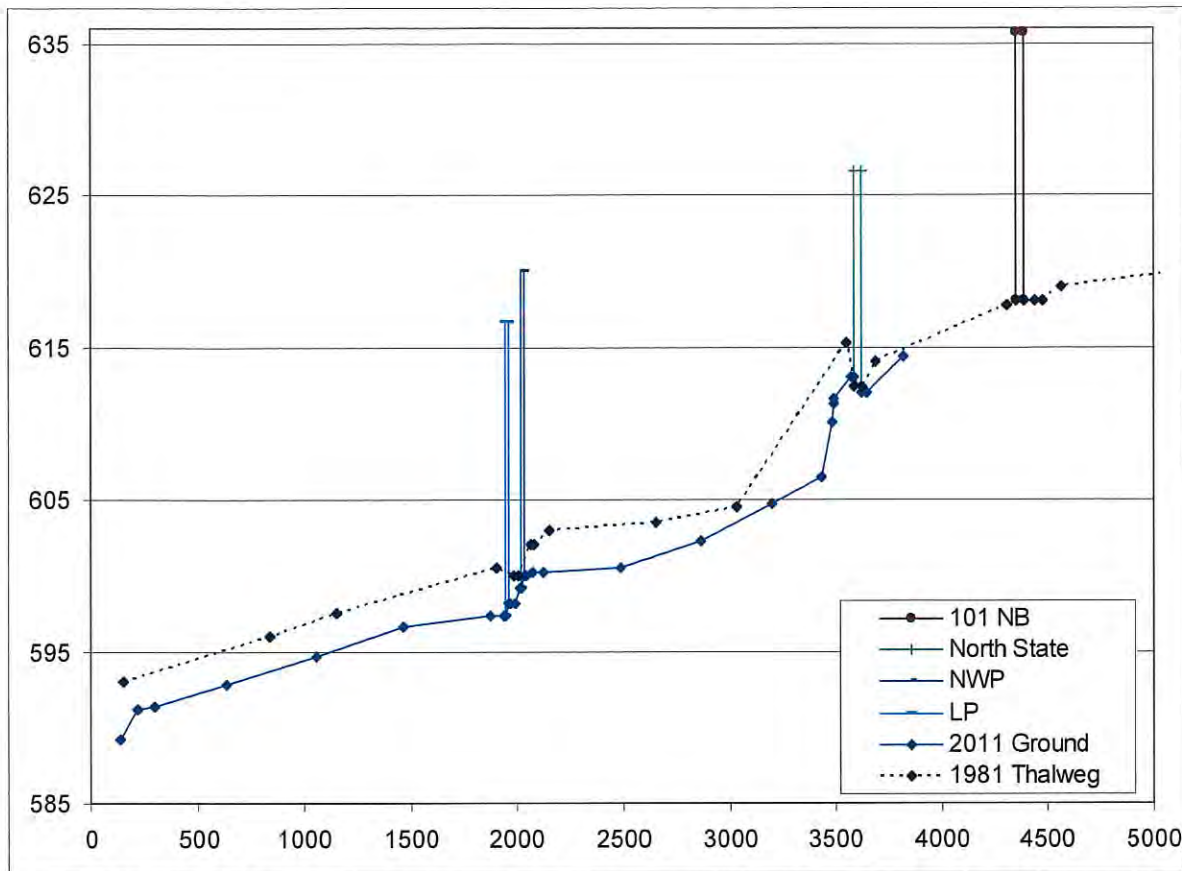


Figure 16: Longitudinal Profile comparing the thalweg elevation from the 1979 FEMA survey and current channel thalweg from QEI survey data

According to Philip Williams and Associates (PWA) (11), the gravel extraction in the Russian River downstream of Ackerman Creek began in the 1940's. By the 1950's, the Russian River channel supplied Sonoma County with aggregate to meet their construction needs. PWA concluded that the Russian River channel bed degradation was caused primarily by gravel extraction, flood control and channel stabilization, cultivation, logging and water diversion and storage. The Russian River thalweg lowered a maximum of 18-ft in the Ukiah Valley. A sediment budget indicated a net deficit of sediment in the Russian River system indicating that the river will continue to degrade if current management practices are continued into the future. In addition to thalweg lowering in the Russian River, the tributaries are also incising as they erode their beds to meet the lower base level in the main stem of the Russian River.

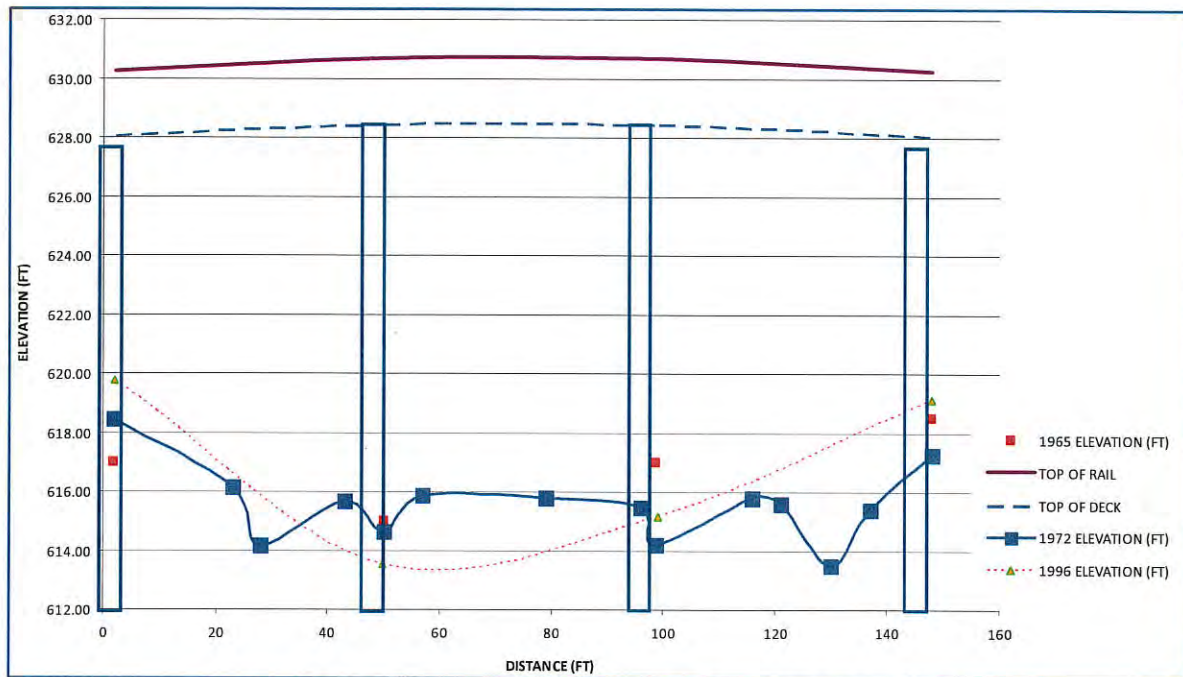


Figure 17: Face of Bridge profile for sections taken in 1965, 1972 and 1996

Abutment Design

If the channel improvements are unsuccessful, the channel could degrade to elevation 606 (the downstream thalweg). Should this occur, the 16" wide pipe piles would produce approximately 3-ft of local "pier" scour to elevation 603. This possible scour elevation represents the worst case scenario from an Extreme State hydraulic event. It is expected such an event would require inspection and repairs to the bridge / channel prior to re-opening the bridge to vehicle traffic loading.

FOUNDATION PLAN TABLES

The following Hydrologic Summary and Scour Data Tables are provided for your use for placement on the Foundation Plan:

Hydrologic Summary Table:

Drainage Area: 20.6 Square miles

	Design	Base	Overtopping
Frequency (Years)	50	100	> 500
Discharge (Cubic feet per second)	4,800	5,370	7,500
Water Surface (Elevation at u/s face of Bridge)	618.0	618.4	623.0

Flood plain data are based upon information available when the plans were prepared and are shown to meet Federal requirements. The accuracy of said information is not warranted by the City and interested or affected parties should make their own investigation.

Scour Data Table:

Support No.	Long Term (Degradation and Contraction) Scour elevation (ft)	Short Term (Local) Abutment Scour Elevation (ft)
Abut 1	n/a	603
Abut 2	n/a	603

STREAMBED/BANK PROTECTION

According to the Foundation Report (Blackburn, 2015), the channel is composed of bedload deposits including loose sand and gravel approximately 5-10 feet below the channel bottom and subject to channel migration. Average velocities range from 4 to 6 feet per second (fps) in the vicinity of the bridge.

Based on the California Bank and Shore (CABS) Protection Methodology (12), if parallel flow and an approximate 2:1 slope are assumed, then minimal rock slope protection is needed. If impinging flow is assume, 75 pound rock is needed. Using the FHWA HEC-11 methods, 75 pound rock is needed. Since ¼ ton rock is being used for the fishway, it could also be used for any needed bank protection.

See Appendix F for bank protection calculations.

The location Hydraulic Study (LHS) Form is included as Appendix G and Summary Floodplain Encroachment Report (FPE) as Appendix H to the report as outlined in 44 CFR Part 65.6 (a) (2) and 23 CFR 650A, Section 650.111 (b) (c) (d). This report provides the documentation for the LHS and FPE.

REFERENCES

1. Arneson, L.A., Zevenbergen, L.W., Lagasse, P.F., and Clopper, P.E. 2012. *Evaluating Scour at Bridges. Fifth Edition*. Hydraulic Engineering Circular No. 18. Federal Highway Administration Publication No. FHWA HIF-12-003, Washington, D.C. April.
2. Blackburn Consulting, "Draft Foundation Report – Draft, N. State Street Bridge at Ackerman Creek" April, 2015.
3. Brown, Scott A. and Clyde, Eric S., "Design of Riprap Revetment" FHWA Report No. FHWA-IP-89-016 HEC-11, March 1989.
4. California Department of Fish and Game "Stream Inventory Report for Ackerman Creek", April 14, 2006.
5. California Department of Transportation (Caltrans), February, 1998 "Local Assistance Procedures Manual, Processing Procedures for Implementing Federal and/or State Funded local Public Transportation Projects"
6. California Department of Transportation (Caltrans), May, 2001 "Highway Design Manual Chapter 800".
7. California Department of Transportation (Caltrans) Maintenance Records and As-Built Plans for 10C0065.
8. Federal Emergency Management Agency (FEMA) HEC-2 model for the Flood Insurance Study for Mendocino County, California, Unincorporated Areas, Community Number 060183 February 2, 1981.
9. Federal Emergency Management Agency (FEMA) Flood Insurance Study for Mendocino County, California, Unincorporated Areas, Community Number 060183 Revised June 16, 1992.
10. Federal Highway Administration, "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges". Report No. FHWA-RD-96-0001, December 1995.
11. Philip Williams and Associates, Ltd., "Geomorphic and Hydrology Conditions in the Russian River, California: Historic Trends and Existing Conditions" May 1995.
12. Racin, J.A., Hoover, T.P., Crossett Avila, C.M., "California Bank and Shore Rock Slope Protection Design," FHWA-CA-TL-10, California Department of Transportation, Office of New Technology and research, Sacramento, CA 1997.
13. Mendocino County, Maintenance Records and As-Built Plans for the North State Street (Br #10C0065).
14. US. Department of the Interior, Geological Survey "Guidelines for Determining Flood Flow Frequency, Bulletin #17B of the Hydrology Subcommittee" Revised September 1981.
15. United States Geologic Survey website accessed 6/26/2010 at <http://pubs.usgs.gov/wri/wri934076/stations/11209900.html>.

APPENDICES

Appendix A – General Plans

Appendix B – Hydrology

Appendix C – Fishway Report

Appendix D – Overtopping

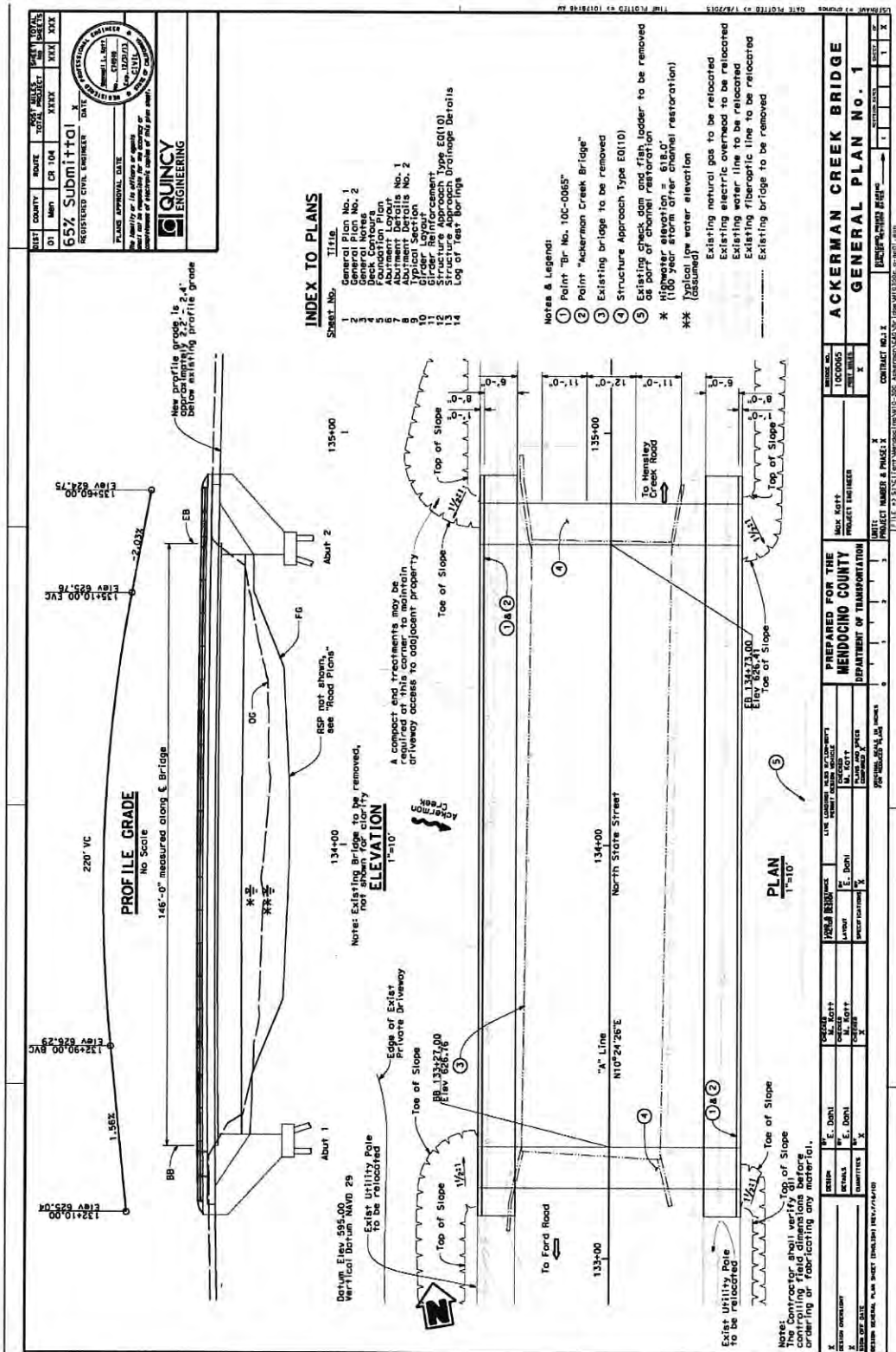
Appendix E – Channel Cross Sections (degradation)

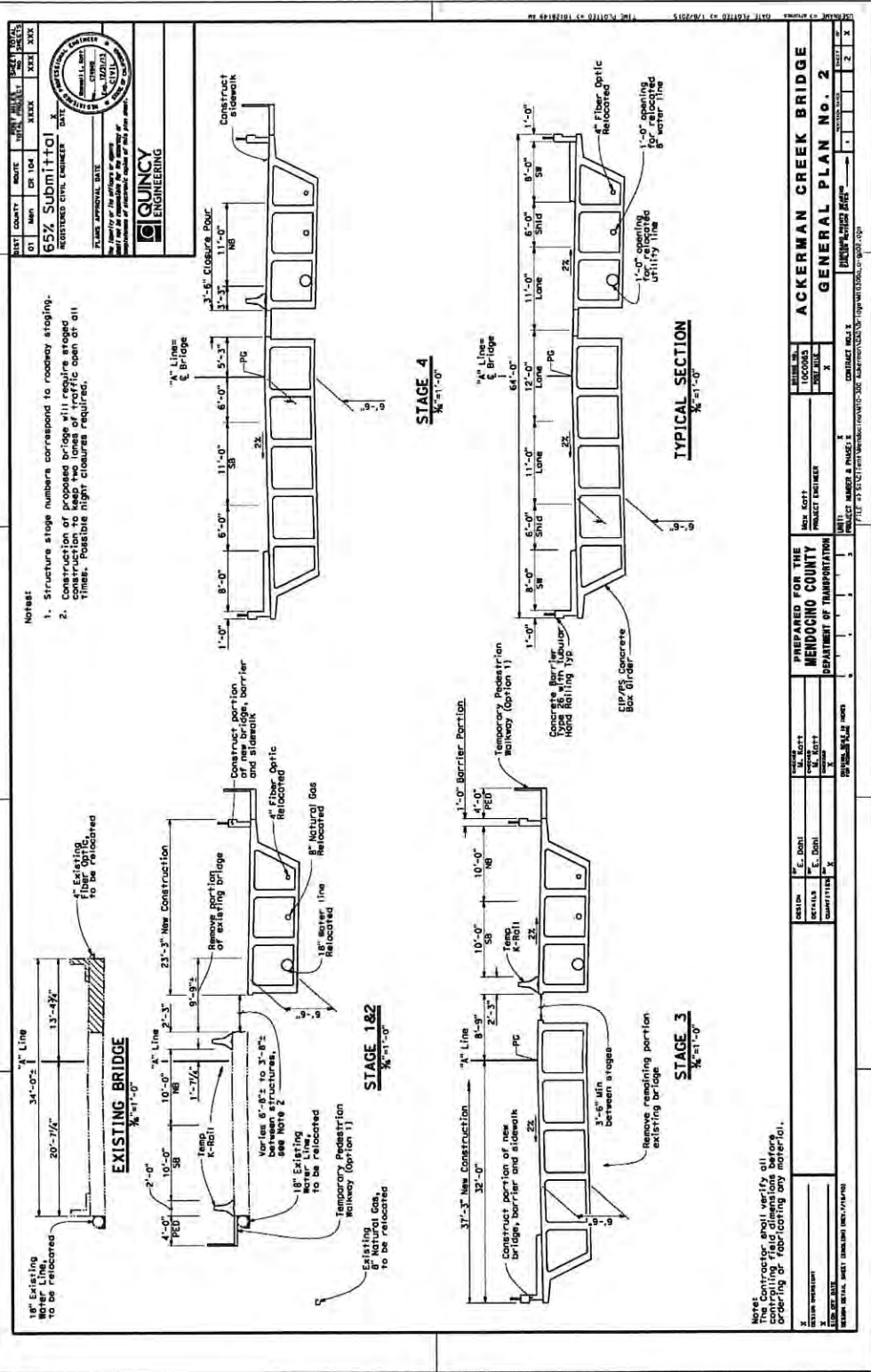
Appendix F – Bank Protection Estimates

Appendix G – Location Hydraulic Study

Appendix H – Summary Floodplain Encroachment Report

Appendix I – HEC-RAS output files





APPENDIX B - HYDROLOGY

Regression Equation:

A 20.6
P 45
H 1.1

North Coast

	coeff	A	P	H	
2	3.52	0.9	0.89	-0.47	1516.80
5	5.04	0.89	0.91	-0.35	2299.90
10	6.21	0.88	0.93	-0.27	2989.55
25	7.64	0.87	0.94	-0.17	3742.32
50	8.57	0.87	0.96	-0.08	4568.97
100	9.23	0.87	0.97		5150.89

The FEMA estimates for Ackerman Creek show relatively good agreement to the regression analysis shown above:

Table 4. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second)			
		10-Year	50-Year	100-Year	500-Year
Forsythe Creek					
At Confluence With the Russian River	49.7	6,940	10,500	11,900	15,200
Upstream of Confluence With Seward Creek	34.6	5,120	7,900	8,960	11,600
Upstream of Confluence With Bakers Creek	32.5	4,810	7,460	8,480	11,000
Upstream of Confluence With Mill Creek (at Redwood Valley)	18.7	3,070	4,790	5,450	7,060
Mill Creek (at Redwood Valley)					
At Confluence With Forsythe Creek	11.4	1,950	3,100	3,540	4,640
2.9 Miles Upstream From Mouth	9.0	1,570	2,580	2,990	4,020
York Creek					
At Confluence With the Russian River	12.0	1,920	2,920	3,290	4,170
2.1 Miles Upstream of U.S. Highway 101	8.0	1,270	2,080	2,410	3,220
Hensley Creek					
At Confluence With the Russian River	7.6	1,290	1,970	2,210	2,790
2.1 Miles Upstream of U.S. Highway 101	3.7	661	1,070	1,230	1,630
Ackerman Creek					
At Confluence With the Russian River	20.6	3,190	4,800	5,370	7,000
At Orrs Springs Road	19.0	3,060	4,700	5,320	6,600

APPENDIX C – FISHWAY REPORT

Date: April 29, 2014**To:** David White, Southwest Region NOAA Fisheries

Tom Daugherty, NMFS

CC: Scott Harris, CA DFW

Scott Heegler, Mendocino County

From: Jason Jurens P.E., Project Manager, Quincy Engineering Inc.
Nicholas Clark P.E., Design Engineer, Quincy Engineering Inc.**Subject:** Basis of design for roughened channel to provide grade control and fish passage under a replacement bridge at North State Street on Ackerman Creek

1 PURPOSE

This memorandum is intended to provide reviewers of the current design plans for the channel work at the North State Street crossing of Ackerman Creek (provided in attachment 1) and a brief description of the proposed project and the basis of decisions that guided the design development for the roughened channel fish passage.

2 BACKGROUND

The County of Mendocino Department of Transportation is proposing to replace the North State Street Bridge (Br. No. 10C0065) at Ackerman Creek. This project will improve traffic operations and public safety by completing a widening of the existing roadway segment which crosses over Ackerman Creek. The County has already completed improvements (in 2010) on North State Street to the north and south of the existing bridge including a new center turning lane, bicycle lanes, and sidewalk in select locations. It is expected that these improvements will reduce the relatively high accident rate along the corridor segment.

Ackerman Creek is a major tributary to the Russian River, which drains into the Pacific Ocean at Jenner in Sonoma County. Ackerman Creek supports populations of anadromous salmonids, which are listed as threatened under the Federal Endangered Species Act.

North State Street crosses Ackerman Creek approximately 1 mile north of the City of Ukiah. The crossing is in a commercial region and was constructed in 1965 after the previous structure was washed out during a high flow event. The existing bridge is a two-lane, 146-foot long, 34-foot wide, three-span, reinforced concrete (RC) slab supported on RC pier walls and RC high cantilever seat style abutments. The pier walls and abutments are founded on driven piles. Immediately downstream of the existing bridge is a check dam. The check dam is constructed out of large timbers and H-piles and spans the width of the creek. Large diameter rocks have been placed on the downstream face of the check dam to provide addition support to the structure and protect against scour. According to available records, this channel stabilization structure was originally completed in 1951 and was required due to long term degradation and head cutting in

Ackerman Creek caused by downstream gravel extraction activities. This head cutting was a threat to the stability of the previous bridge which was founded on shallow foundations. When the existing bridge was constructed as a replacement to the washed out bridge the downstream stabilization structure was preserved to help protect against further head cutting and degradation. Based on the practices of previous downstream mining activities, it is believed that head cutting is still occurring on this reach of Ackerman Creek.

This check dam was a noted barrier to nine miles of fish spawning habitat and in 1983 a Denil fish ladder was installed under contract with DFG to aid in fish passage. Later the ladder was reinforced to provide low flow access again under contract with DFG. The stream channel drops approximately 7 feet over the length of the fish ladder. There is currently an upstream restoration project sponsored by the Pomo Indian Tribe to enhance fish habitat while revegetating and stabilizing the eroding banks.

Currently, Granite Construction Company (Granite) has submitted an application to obtain approval of a use permit and mining and reclamation plan pursuant to the California Surface Mining and Reclamation Act (SMARA), and the Mendocino County Surface Mining and Reclamation Ordinance to excavate approximately 30.3 acres near the confluence of Ackerman Creek and the Russian River. The Final Environmental Impact Report (EIR) for the Kunzler Terrace Mine Project was submitted to Mendocino County in May 2010. This site is approximately 0.3 mile downstream of the Ackerman Creek Bridge on North State Street and borders Ackerman Creek to the south. Mining activities will also include stream bank enhancements and restoration work on Ackerman Creek and a portion of the Russian River. While it is currently envisioned that mining activities will be managed as to not cause or aggravate channel degradation, the potential for future head cutting from such large scale and long ranging activities exists in the future.

The existing Denil fish ladder is poorly suited for providing adult fish passage at typical migration flows. At migration flows the hydraulic capacity of the steel fish ladder is overwhelmed, and there is inadequate attraction flow for fish to find the outlet. At lower flows there is inadequate depth in the ladder for adult fish to swim through. Additionally, the ladder does not provide passage for juvenile salmonids and is highly susceptible to plugging by debris.

Based on comments received by the National Fisheries Marine Service (NMFS) following review of the pool-and-weir fish way alternative, Mendocino County have requested Quincy Engineering to develop a nature-like fish passage alternative that involves rebuilding the channel to create a rock-lined roughened channel that would provide fish passage at the site.

2.1 AGENCY REVIEW MEETING

On November 8, 2011 an environmental coordination meeting was held at the project site to discuss the preliminary channel design, hydraulic model results, project constraints and agency comments. Staff from Quincy Engineering, Mendocino County Department of Transportation (MCDOT), Pinoleville Pomo Nation, NMFS, CA DFG, North State Resources, Bioengineering Associates, and Caltrans attended the site meeting. The meeting was summarized in a memo by Quincy Engineering.

A primary conclusion of the meeting was that a roughened channel consisting of pools and chutes was most desirable from maintenance as well as a fish passage perspective. CA DFG and NMFS agreed to work with the project team since not all of the standards for fish passage would be attainable.

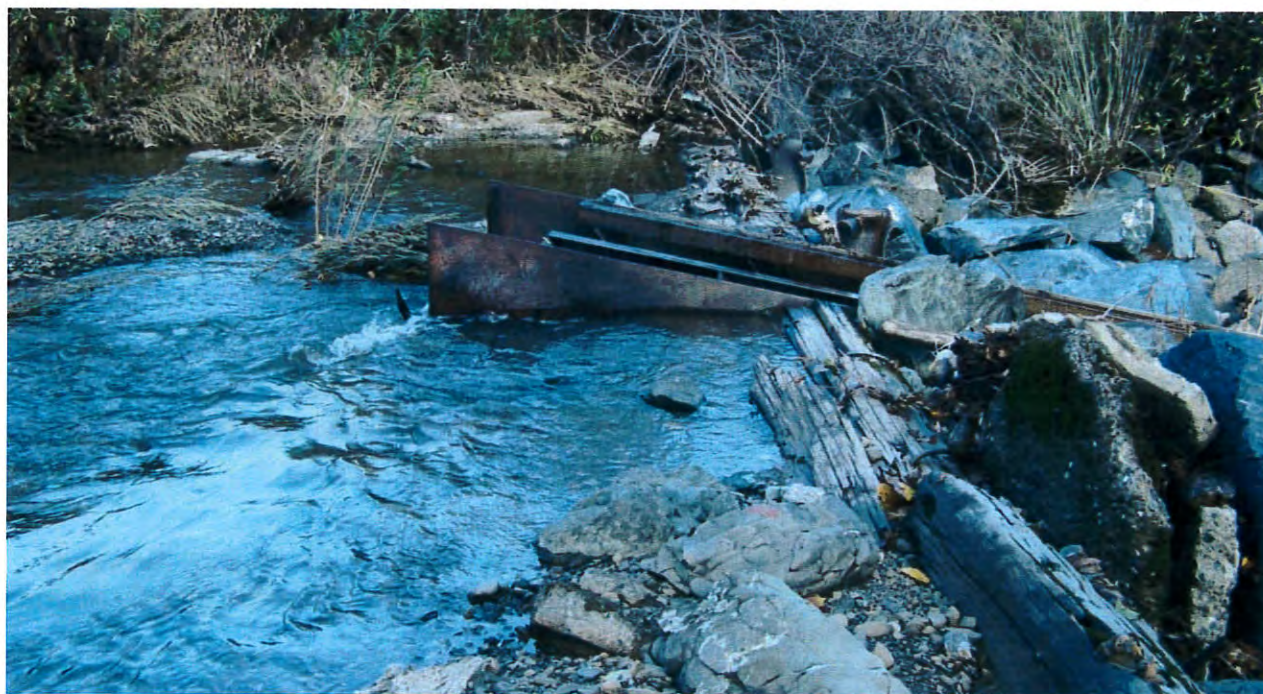


Figure 1: (top) Picture facing east looking down the existing steel fish ladder and (bottom) picture looking north showing the timber weir and steel fish ladder.



Figure 2: (top) Picture facing west looking upstream at one of the existing bridge piers.

3 FISH PASSAGE OBJECTIVES AND CONSTRAINTS

3.1 FISH PASSAGE

The primary objective of the project is to improve upstream passage conditions for juvenile and adult anadromous salmonids across a reasonable range of flows. NMFS and the California Department of Fish and Wildlife (CDFW) have requested that the overall slope of the roughened channel not exceed 4 percent to accommodate upstream passage of juvenile salmonids.

3.2 FLOODING

The project must not increase the 100-year water surface elevation. Analysis performed by Avila and Associates shows that replacing the existing check dam and fish ladder with a more fish friendly alternative significantly lowers the 100-year flood water surface elevation.

3.3 UTILITY LINE CROSSING

Approximately 10' west of the western edge of the bridge deck a PG&E gas transmission line crosses under the existing channel. The proposed channel improvements will require that the gas line to be relocated. As the project progresses it will be determined if that relocation will occur prior to the construction starting or if it will be relocated during construction.

3.4 STRUCTURAL

The proposed bridge will be a single span bridge 146' long cast-in-place, prestressed concrete box girder. The bridge will be 64' wide to accommodate two 11' wide traffic lanes, a 12' wide left turn lane, 6' wide shoulders and 8' wide sidewalks on both sides.

The bridge is being lowered in order to reduce the severity of the existing vertical curve and therefore improving sight distance across the bridge.

3.5 RIPARIAN VEGETATION

The project will mitigate for trees that are removed as part of the channel restoration. Trees will be planted in the rock slope protection on each of the channel banks.

4 FISH PASSAGE DESIGN CRITERIA

NMFS and CDFW classify roughened channels under the hydraulic design approach, which requires providing a hydraulic environment within the fishway that does not challenge the swimming and leaping abilities of the target fishes at specific flows. The target fish for this project are juvenile and adult anadromous salmonids.

Both agencies have hydraulic design guidelines and criteria for juvenile and adult salmonid passage at road-stream crossings (CDFW, 2002; NMFS, 2001) that were used to guide this design. The guidelines were written jointly and are intended to be functionally equivalent. The guidelines recognize meeting the hydraulic design criteria should be "a goal for improvement and not the required design threshold".

4.1 FISH PASSAGE FLOWS

The low and high fish passage design flows define the range of flows for which passage should be provided. Both NMFS and CDFW have recommended fish passage design flow criteria that are based on annual exceedance flows (Table 1). The low and high fish passage flows for juvenile and adult anadromous salmonids are estimated from exceedance flows for the site. Because Ackerman Creek at North State Street is not gaged, exceedance flows from Adobe Creek (USGS gage No. 11448500) near Kelseyville in Lake County will be used.

Adobe Creek has very similar flow characteristics and drainage area of 6.36 square miles. Exceedance flows for the two streams were scaled by drainage area to develop a flow duration curve for the project site Figure 3. From the flow duration curves, fish passage design flows were obtained (Table 1).

Figure 3: Flow Duration Curve for Ackerman Creek.

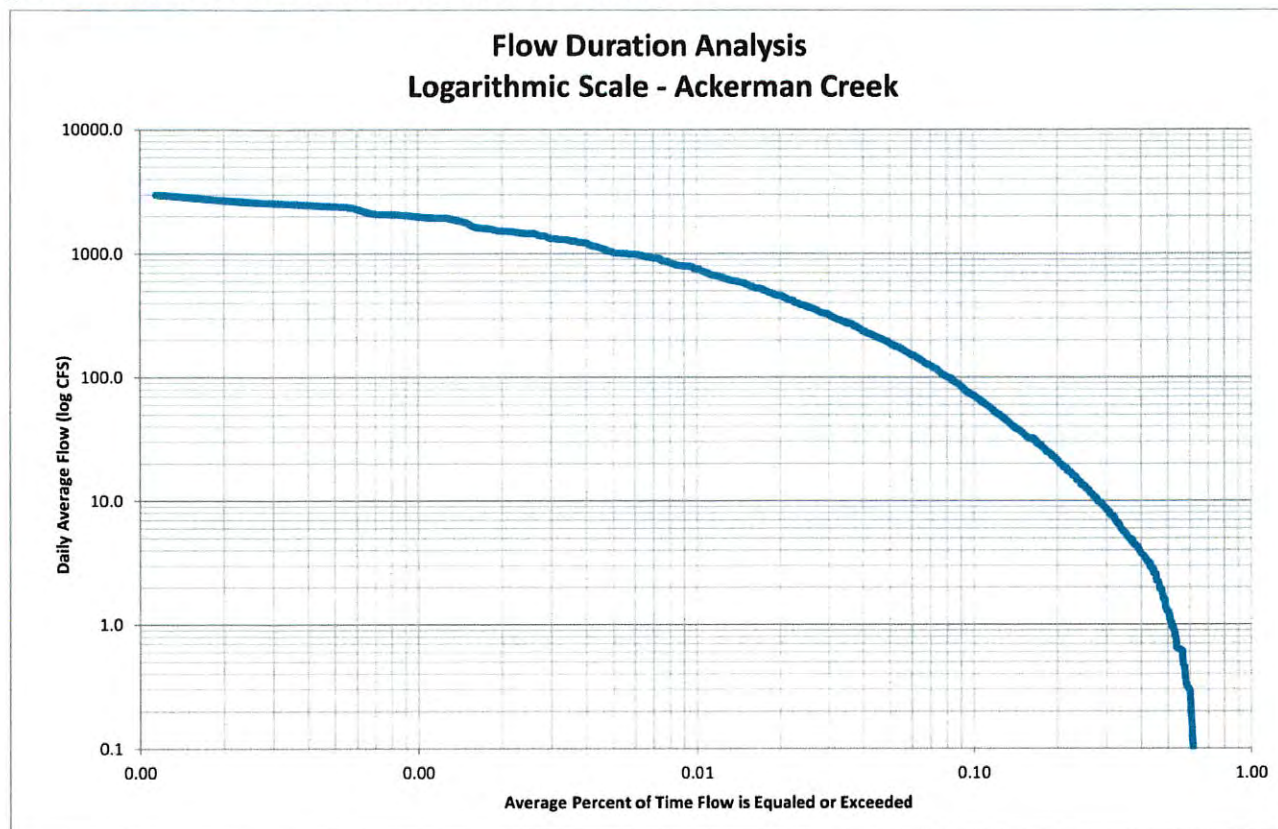


Table 1: Estimated fish passage design flow for Ackerman Creek at North State Street, based on CDFW (2002) and NMFS (2001) criteria.

Species and Lifestage	<u>Low Passage Flow</u>		<u>High Passage Flow</u>	
	Criteria	Flow	Criteria	Flow
Juvenile Anadromous Salmonids	Greater of 95% Exceedance Flow of 1 cfs	1 cfs	10% Exceedance Flow	71 cfs
Adult Anadromous Salmonids	Greater of 50% Exceedance Flow of 3 cfs	3 cfs	1% Exceedance Flow	751 cfs

4.2 HYDRAULIC DESIGN CRITERIA

For hydraulic design of roughened channel fishways, CDFW (2002), NMFS (2001), and CDFW (2009) provide the following criteria:

Maximum water surface drop over weirs

Juvenile Salmonids:	6 inches
Adult Salmonids:	12 inches

Maximum Cross-Sectional Average Water Velocity (less than 60 feet between resting pools)

Juvenile Salmonids:	1 foot per second
Adult Salmonids:	6 foot per second

Maximum Turbulence/Energy Dissipation Factor (EDF)

Adult Salmonids:	7.0 foot-pounds/second/cubic foot
------------------	-----------------------------------

Minimum Pool Depth

Adult Salmonids:	2.0 feet
------------------	----------

5 DEVELOPMENT OF ROUGENED CHANNEL DESIGN

5.1 EVALUATION OF VARIOUS ROUGHENED CHANNEL TYPES

Five options were considered for the replacement of the existing check dam and fish ladder. See Technical Memorandum by BioEngineering Associates dated February 22, 2012. The following table summarizes the advantages and disadvantages.

Table 2: Alternative Analysis Summary Table

Type of Structure	Advantage	Disadvantage
Step Pool	Relatively simple and easy to construct	Shaping channel in plan between large pools may be challenging. Use of pocket pools may inhibit flushing of sediment. Needs downstream apron to minimize effects of bed lowering in creek.
Chute and Pool	Steeper gradient with engineered streambed material.	Expensive in large rock. Length of structure will be about 350 feet. Needs downstream apron to minimize effects of bed lowering in creek.

Type of Structure	Advantage	Disadvantage
		Ratio of width to depth is probably too low for this location.
Cascade and Pool	Cascades allow the steepest gradients.	Expensive in large rock. Length of the structure will be about 350 feet. Needs downstream apron to minimize effects of bed lowering in creek.
Hybrid System	Easy to construct provided care is taken in placement of larger rocks. Best for fish passage.	Expensive in large rock. Length of structure will be about 350 feet. Needs downstream apron to minimize effects of bed lowering in creek.
Concrete Structure (pool-and-chute)	Can be drawn, detailed and specified exactly.	Not widely used/evaluated biologically. Uncertain hydraulics. No continuity with hyporheic zone. Corners will trap debris. Inflexible with respect to downstream bed lowering.

5.2 PREFERRED ROUGHENED CHANNEL TYPE

A chutes-and-pools morphology was found to be best suited for the roughened channel fishway at the North State Street crossing. This type of fishway consists of a repeating bedform of a steep chute or rapid followed by a pool. The chutes often have several bands of large boulders embedded in a mix of smaller "engineered streambed material" (ESM). Both the bands and the coarser material in the ESM create hydraulic roughness and diversity that supports fish passage and dissipates the flow's energy. The drop across the chute is commonly limited to two feet, followed by a large pool that dissipates the kinetic energy of the incoming flow and provides resting and holding areas for fish.

For the North State Street crossing, the chutes were found capable of providing suitable fish passage hydraulics at low and moderate fish passage flows; although they would slightly exceed design criteria at higher passage flows for both the juvenile and adult anadromous salmonid.

The following sections describe the basis of design and anticipated fish passage performance for the proposed roughened channel alternative.

5.3 ROUGHENED CHANNEL LAYOUT AND PROFILE

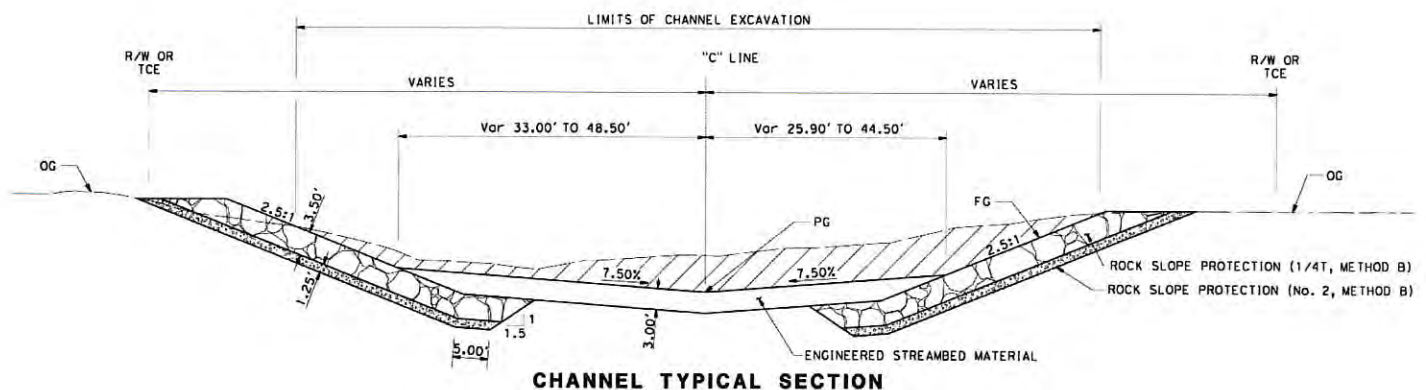
The design for the roughened channel alternative consists of five cycles of chute and pool. The chutes have a slope of 5 percent, and when a combined with the pools the overall slope does not exceed 4 percent. The drop across the chutes does not exceed 2 feet and the pools have a residual depth of 2 feet. The new channel is divided into three sections; the upper chute, the middle chutes under the bridge, and the transition back into the native channel. A series of boulder bands occurs on the upstream and downstream sides of the pools to create hydraulic roughness and structural stability. They are embedded into engineered streambed material (ESM) that is 3 feet thick. The cross sectional shape of the chutes (Figure 4) is designed to provide good hydraulic conditions for passage of both adult and juvenile salmonids at both summer low-flows and during frequently occurring higher flows.

The upstream end of the roughened channel (fishway exit) is located at approximately 100 feet west of the bridge. The existing channel upstream of the project has a slope of approximately 4%. The entrance elevation is based on the lowest elevation in the current channel at that location. The first chute is approximately 46' long, with a slope of 3.1% and drops 1.51 feet across the chute. The upstream end of the new channel will have rock bank lines that tie into the existing banks, and will help direct lower flows into the roughened channel. The upper chute flows into a 20-foot long pool armored with ESM.

The middle chute region is comprised of three identical cycles of chute and pool. The chute is 40' long, with a slope of 5.00% and drops 2.00 feet across the chute. The middle chutes flow into a 20-foot long pool armored with ESM.

The transition back to the native channel is comprised of a chute that is 40' long, with a slope of 5.00% and drops 2.00 feet along the chute. At the end of the chute is a stone curtain wall 11.5 feet high. The entire transition is buried to mitigate any future downstream incision. The chute contains rock bank lines that tie into the existing banks. The channel downstream of the project has a slope less than 1%.

Figure 4: Ackerman Creek typical roughened channel section.



5.4 HYDRAULIC MODELING OF ROUGHENED CHANNEL

A spreadsheet model was developed for estimating stable rock sizes and analyzing fish passage hydraulics for a variety of channel configurations at various flows. The hydraulic conditions were estimated assuming uniform flow. Roughness coefficients were estimated using depth-dependent methods, as described in CDFW (2009).

From the Design Hydraulic Study prepared for the project by Avila and Associates dated on January 3, 2014 defines the channel flow design parameters as follows:

Table 3: Design Flood Information Table

	Design	Base	Overtopping Flood
Frequency (years)	50	100	>500
Discharge (cubic feet per second)	4,800	5,370	7,500
Velocity Upstream (feet per second)	11.8	12.1	N/A
Velocity Downstream (feet per second)	8.5	8.4	N/A

5.4.1 Preliminary Rock Sizing

A preliminary estimate of the stable rock size for the roughened channel at the “stable bed design flow” was made using methods outlined in CDFW (2009). With this, the gradation of the engineered streambed material (ESM) was developed. The ESM contains a wide gradation of rock sizes, ranging from large boulders to fine sand and silt. The larger half of the material forms the stable framework and the smaller material fills the voids to control subsurface flow.

Typically, the stable bed design flow for roughened channel design is the 100-year return period flow. Avila and Associates preliminary bridge sizing calculations are based on a 100-year design flow of 5,370 cfs, which was used for this stability calculation and rock size.

Initial bridge hydraulics at the design flow of 5,370 cfs was provided by Avila and Associates. Information included the water surface slope, depth and velocity at various cross section locations along the new channel. A portion of the total discharge conveyed in the 80-foot wide active channel was calculated using the average velocity and cross sectional area of flow. A unit discharge was estimated and used to develop and initial estimate of stable rock size.

A range of water surface slopes were predicted by Avila and Associates along the project reach at the 100-year design flow. The steepest water surface slope of 0.034 ft/ft was used for the stability calculations. The preliminary stability calculation yields a D_{84} rock size of 2.9 feet for the chutes within the roughened channel. Using methods described by in the CDFW (2009) the following rock sizes were calculated:

Table 4: Engineered Streambed Material Table

Particle Distribution of Engineered Streambed Material

Percentile	8	16	50	84	100
Diameter	Coarse Gravel	Large Cobbels	1.17 ft	2.9 ft (~1 ton)	7.3 ft (~15 ton)

The largest rock (D_{84} to D_{100}) will be used to form the rock bands in the chutes. The remaining material will be used for the engineered streambed material (ESM) between the rock bands and armoring the pools. Even though a 15 ton rock is required per the calculations it is not practical to place large numbers of these size rocks in the creek. Transporting rocks of that size to the site would be impractical and become cost prohibitive. Evaluating transportation and construction constraints it was determined the largest practical rock size is approximately 8 tons.

Rock sizing will be revised using results from flood flow modeling to be conducted by Avila and Associates. Final model results will better define the water surface slope and the unit discharge within the roughened channel at the stable bed design flow.

5.4.2 Fish Passage Hydraulics

To predict the hydraulic conditions at fish passage flows the roughened channel was modeled assuming uniform flow conditions in each of the 5 percent sloping chutes. Manning's roughness coefficient was based on the depth-dependent method developed by Mussetter (1989).

Table 5 summarizes the hydraulic conditions at the low fish passage design flow for each target fish life stage. Water depth and velocities satisfy design criteria for all of the salmonid life stages, with one exception. The depth at the adult anadromous salmonid low design flow of 3 cfs is only 0.7 foot, which falls slightly short of the 1.0 foot depth criterion. Water depth reaches 1.0 foot at 8.5 cfs.

The high fish passage design flow for Ackerman Creek is relatively large in magnitude. After exploring numerous roughened channel configurations, it became apparent that the roughened channel would not be able to meet passage criteria at the CDFW and NMFS recommended high passage design flows for juvenile and adult salmonids. Instead, a somewhat smaller range of operational flows would be provided by the roughened channel.

The upper operational flows and corresponding hydraulic conditions for the proposed roughened channel alternative are provided in Table 6. For juvenile salmonid, the water velocity exceeds 1 ft/s at 28 cfs, which is above the high passage flow for juveniles. For adult steelhead, the EDF exceeds the recommended threshold of 7 ft-lb/sec/ft³ at 692 cfs, which is approximately the 2 percent exceedance flow. Areas of lower velocity and turbulence along the margins of the wetted channel may allow some fish to migrate through the fishway at higher flows.

Table 5: Predicted hydraulic conditions at the low passage design flow for the North State Street chute and pool roughened channel fishway alternative.

Low Passage Design Flow	Flow	Velocity	Depth	EDF
Juvenile Anadromous Salmonids	1 cfs	0.30 ft/s	0.5 ft	0.9 ft-lb/s/ft ³
Adult Anadromous Salmonids	3 cfs	0.44 ft/s	0.7 ft	1.4 ft-lb/s/ft ³

Table 6: Predicted hydraulic conditions at the upper operational flow for the North State Street chute and pool roughened channel fishway alternative

Upper Operational Flow ¹	Flow	Approximate Annual Exceedance	Velocity	Depth	EDF
Juvenile Anadromous Salmonids	71 cfs	10%	1.41 ft/s	2.0 ft	3.0 ft-lb/s/ft ³
Adult Anadromous Salmonids	751 cfs	1%	3.41 ft/s	3.7 ft	7.2 ft-lb/s/ft ³

¹ Upper Operational Flows are defined by hydraulic conditions within the chute.

6 CONCLUSIONS

While the proposed chutes and pools roughened channel fishway does not meet all of the CDFW and NMFS design criteria for passage of anadromous salmonid, it represents a vast improvement to the existing condition. The proposed design utilizes the maximum accepted dimensions to meet the physical site constraints and criteria.

7 REFERENCES

California Department of Fish and Wildlife (CDFW). 2002. *Culvert criteria for fish passage*. 17 pages.

California Department of Fish and Wildlife (CDFW). 2009. *Fish passage design and implementation*. 188 pages.

Mussetter, R. 1989. *Dynamics of Mountain Streams*. Ph.D. Dissertation. Colorado State University, Fort Collins, Colorado.

National Marine Fisheries Service (NMFS). 2001. *Guidelines for salmonids passage at stream crossings*. NMFS SW Region. 14 pages.

ATTACHMENTS: Project plan sheets (9 sheets)

MENDOCINO COUNTY - DEPARTMENT OF TRANSPORTATION		CONSULTANT FUNCTIONAL SUPERVISOR	JIM FOSTER	CHECKED BY	N. CLARK	DATE REVISID	MO
		CALCULATED-			J. JURENS	DATE REVISID	

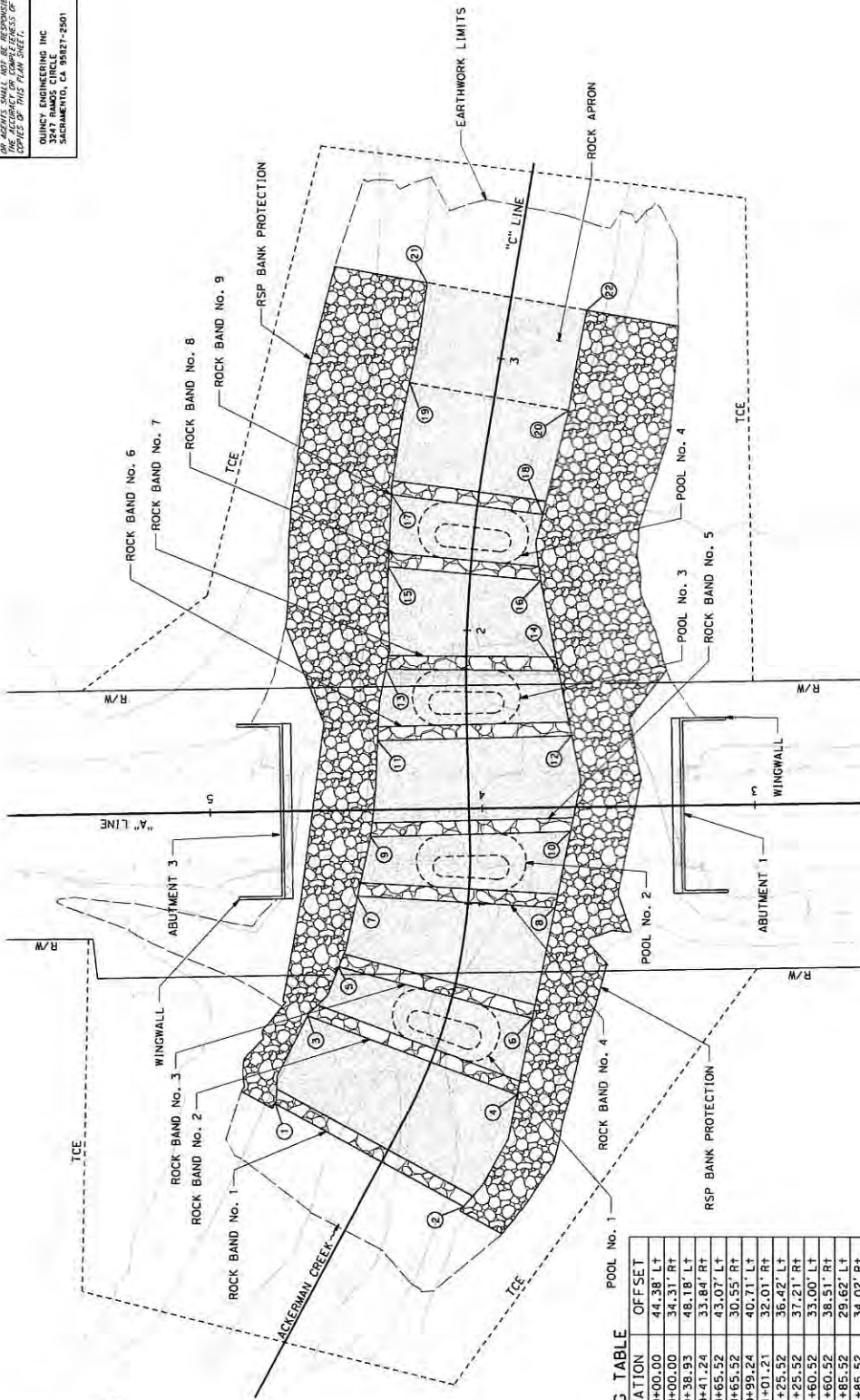
NOTES:
1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA,
SEE RIGHT OF WAY RECORD MAPS AT THE COUNTY OFFICE.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL SHEETS
01	MCN	C.R.		2

REGISTERED CIVIL ENGINEER	DATE
65% SUBMITTAL	
PLANS APPROVAL DATE	

THE STATE OF CALIFORNIA OR ITS OFFICIALS
DO NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF SCANNED
COPIES OF THIS PLAN SHEET.

QUINCY ENGINEERING INC
3247 RAMOS CIRCLE
SACRAMENTO, CA 95827-2501



No.	LINE	STATION	OFFSET
1	"C"	50+00.00	44.38' L+
2	"C"	50+00.00	34.31' R+
3	"C"	50+38.93	48.18' L+
4	"C"	50+41.24	33.84' R+
5	"C"	50+65.52	43.07' L+
6	"C"	50+65.52	30.55' R+
7	"C"	50+99.24	40.71' L+
8	"C"	51+01.21	32.01' R+
9	"C"	51+25.52	36.42' L+
10	"C"	51+25.52	37.21' R+
11	"C"	51+60.52	33.00' L+
12	"C"	51+60.52	38.51' R+
13	"C"	51+85.52	29.62' L+
14	"C"	51+85.52	34.02' R+
15	"C"	52+20.81	30.32' L+
16	"C"	52+20.81	26.08' R+
17	"C"	52+45.52	31.92' L+
18	"C"	52+45.52	24.36' R+
19	"C"	52+85.52	31.79' L+
20	"C"	52+85.52	27.80' R+
21	"C"	53+22.64	31.54' L+
22	"C"	53+22.64	28.13' R+

CONSTRUCTION DETAILS
SCALE: 1"=20'

PROJECT NUMBER & PHASE

UNIT 0000

RELATIVE BORDER SCALE
15' IN INCHES

USERNAME: J. JURENS
JOB FILE: J:\C11\ent\mndoc\Roadway\MI6300-gd01.dgn

BORDER LAST REVISED 7/2/2010

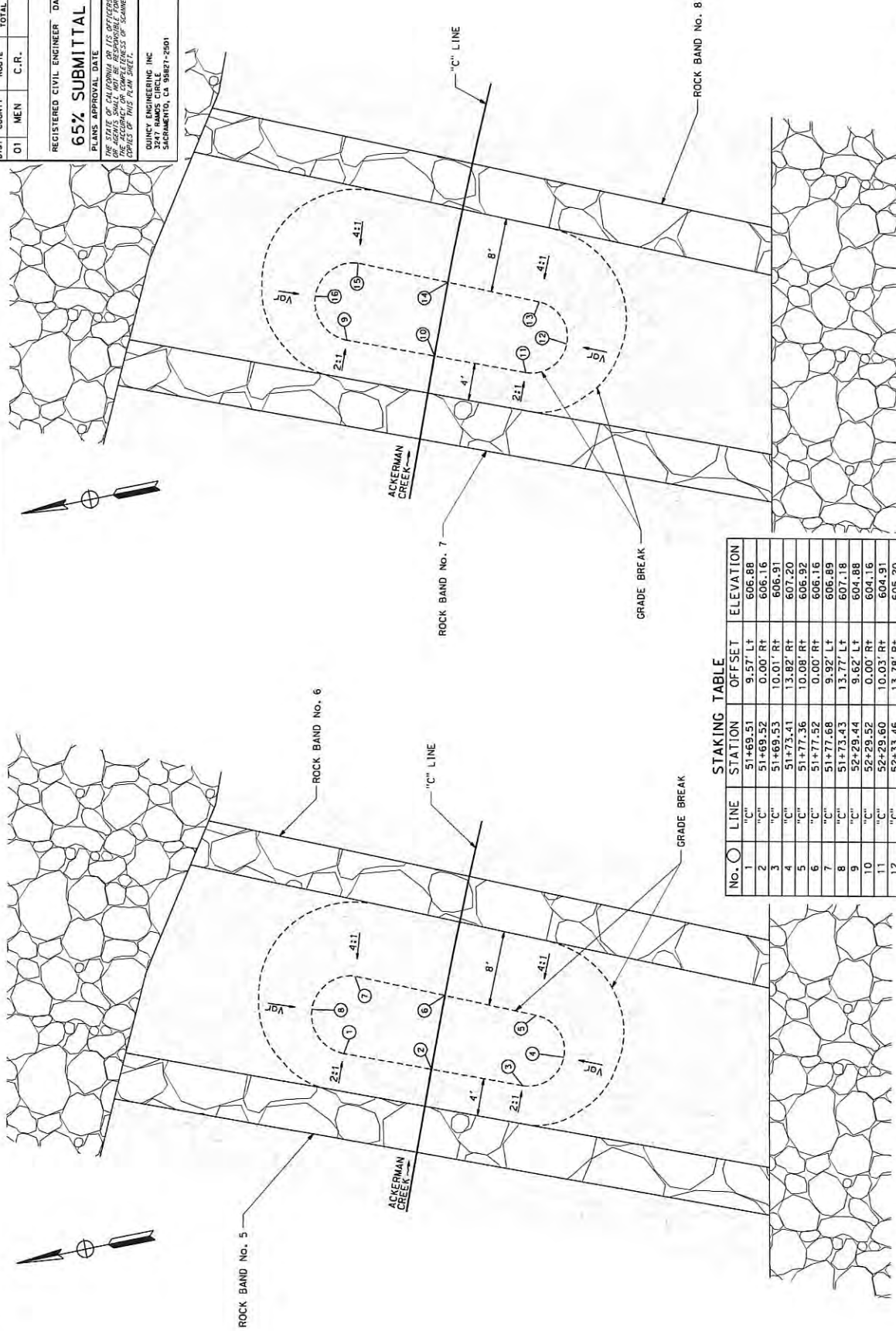
BY	MO		
USED			

REGISTERED CIVIL ENGINEER DATE _____

65% SUBMITTAL

PLANS APPROVAL DATE _____

THE STATE OF CALIFORNIA OR ITS OFFICERS
OR AGENTS SHALL NOT BE RESPONSIBLE FOR
THE ACCURACY OR COMPLETENESS OF SCANNED
COPIES OF THIS PLAN SHEET.



No. ○	LINE	STARTING	OFFSET	ELEVATION
1	"C"	51+69.51	9.57' Lt	606.88
2	"C"	51+69.52	0.00' Rt	606.16
3	"C"	51+69.53	10.01' Rt	606.91
4	"C"	51+73.41	13.82' Rt	607.20
5	"C"	51+77.36	10.09' Rt	606.92
6	"C"	51+77.52	0.00' Rt	606.16
7	"C"	51+77.68	9.92' Lt	606.89
8	"C"	51+79.43	13.77' Lt	607.18
9	"C"	52+29.44	9.62' Lt	604.88
10	"C"	52+29.52	0.00' Rt	604.16
11	"C"	52+29.60	10.03' Rt	604.91
12	"C"	52+33.36	13.78' Rt	605.20
13	"C"	52+37.36	10.06' Rt	604.92
14	"C"	52+37.52	0.00' Rt	604.16
15	"C"	52+37.68	9.92' Lt	604.91
16	"C"	52+33.41	14.20' Lt	605.23

POOL No. 4

POOL No. 3

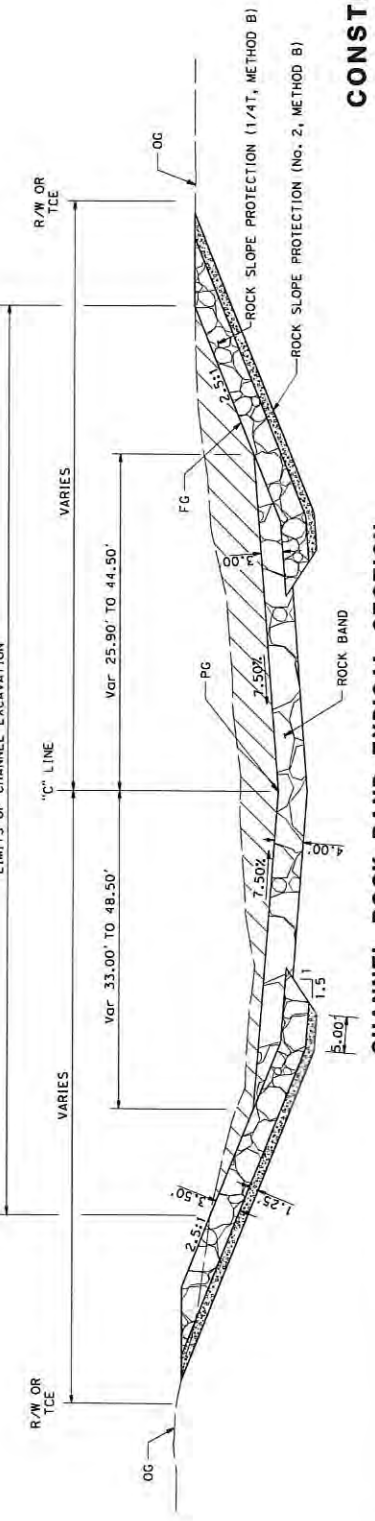
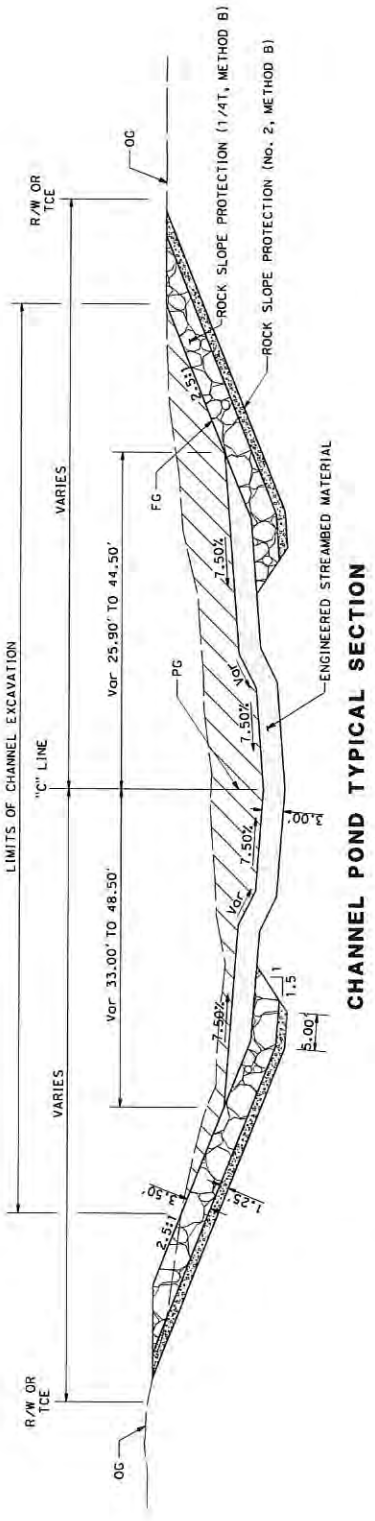
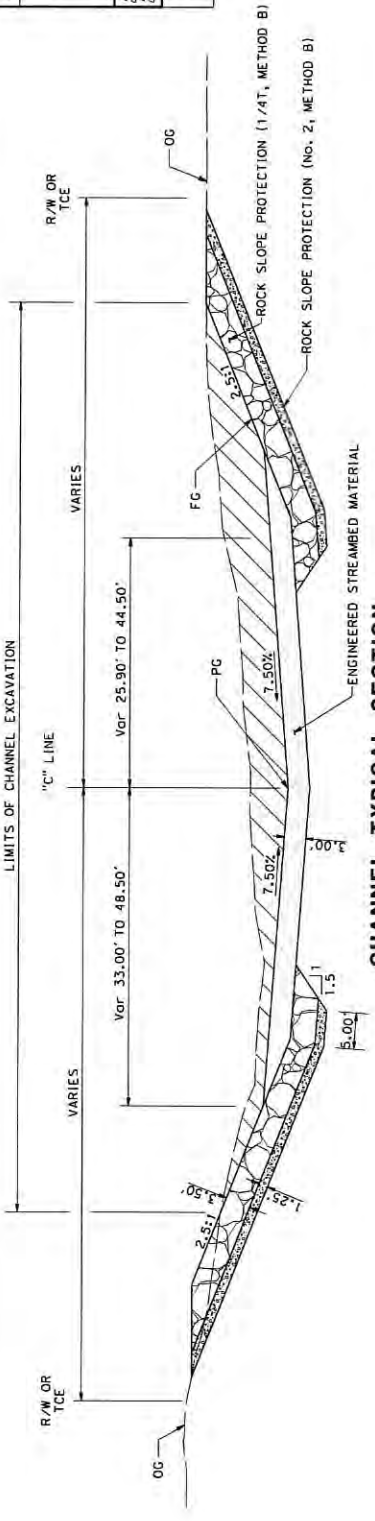
WENDUCCO COUNTY - DEPARTMENT OF TRANSPORTATION	CONSULTANT FUNCTIONAL SUPERVISOR	JIM FOSTER	CHECKED BY	J. JURENS	DATE REVISD	NO
	DESIGNED BY	N. CLARK	REVISD BY			

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL NO. SHEETS
				2

REGISTERED CIVIL ENGINEER	DATE
65% SUBMITTAL	

THE STATE OF CALIFORNIA OR ITS OFFICERS
 HAVE REVIEWED THIS PLAN SHEET FOR
 THE ACCURACY OF THE INFORMATION
 CONTAINED HEREIN.

QUINCY ENGINEERING INC
 3247 RAMOS CIRCLE
 SACRAMENTO, CA 95827-2501



CONSTRUCTION DETAILS

NO SCALE

C-5

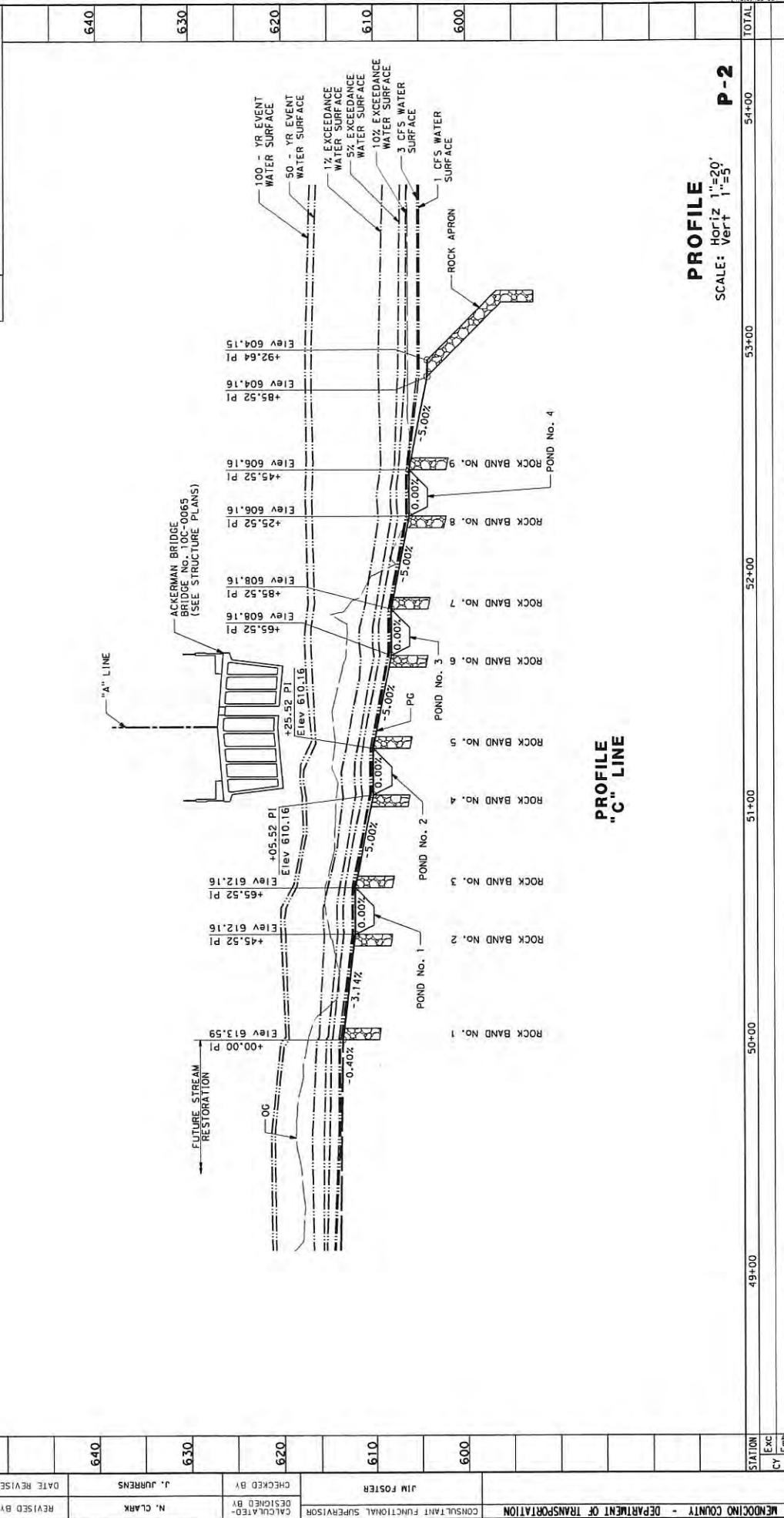
PROJECT NUMBER & PHASE: UNIT 0000

BORDER LAST REVISED 7/22/2010

000000000001

DIST	COUNTY	ROUTE	SHEET NO.	TOTAL SHEETS
01	MEN	C.R.	4	X

REGISTERED CIVIL ENGINEER	DATE
65% SUBMITTAL	
PLANS APPROVAL DATE: 09/30/14 THE STATE OF CALIFORNIA PUBLIC OFFICIALS HAVE REVIEWED THIS PLAN SHEET FOR THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND HAVE FOUND IT TO BE TRUE AND CORRECT.	
QUINCY ENGINEERING INC. 3247 RAMOS CIRCLE SACRAMENTO, CA 95827-2501	



DATE PLOTTED: 9/29/2014	TIME PLOTTED: 9:29:07 AM
PROJECT NUMBER & PHASE	0000000001
UNIT	0000
RELATIVE BORDER SCALE	1/8" IN INCHES
USER NAME: J. JURENS	DOX FILE: J:\Projects\10C-0065\10C-0065.dgn
BORDER LAST REVISED: 7/2/2010	

DIST	COUNTY	ROUTE	TOTAL PROJECT	TOTAL SHEETS
01	Men	CR 104	XXXX	XXX XXX

65% Submittal

REGISTERED CIVIL ENGINEER _____ DATE _____

PLANS APPROVAL DATE _____

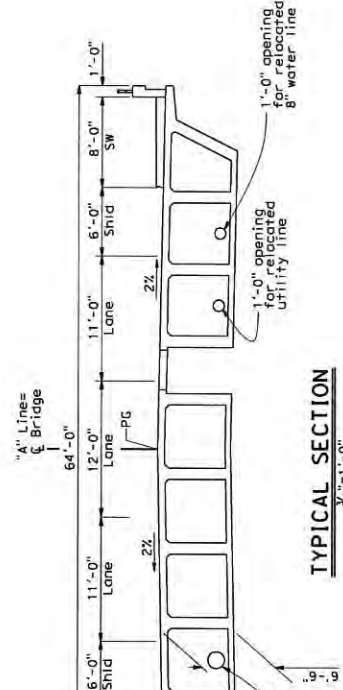
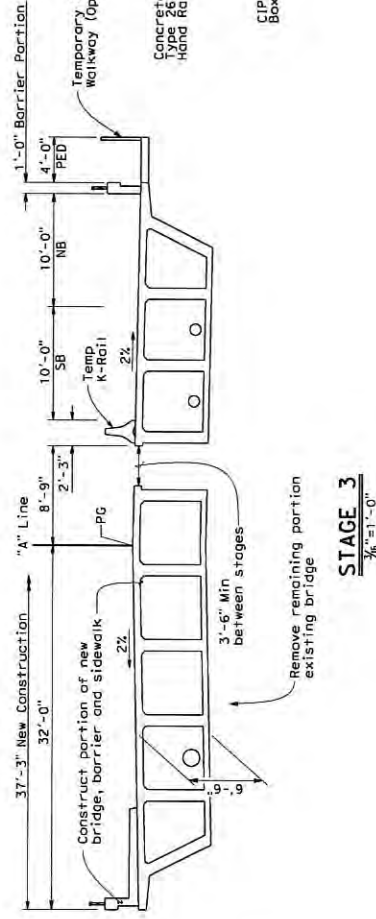
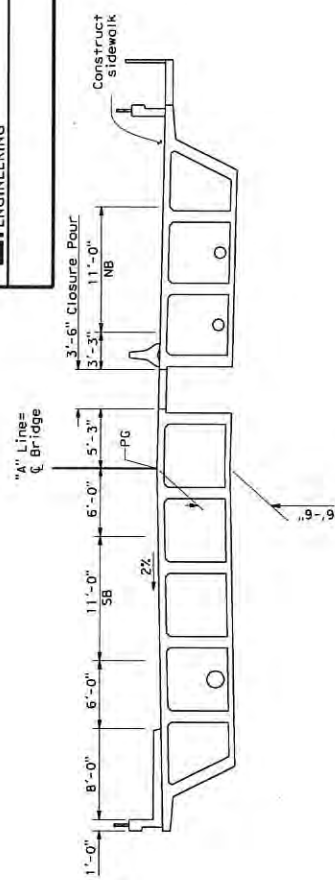
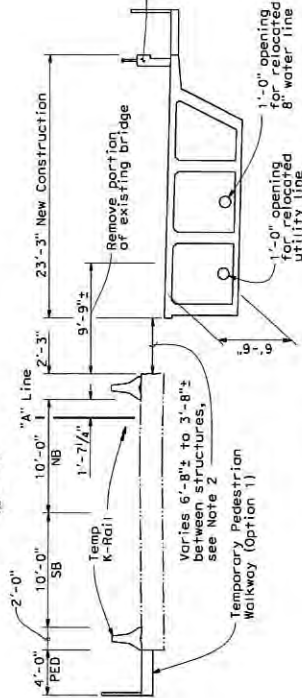
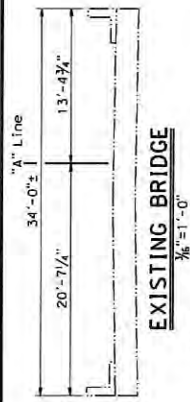
The Engineer or his officers or agent shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

 **QUINCY**
ENGINEERING



Notes:

1. Structure stage numbers correspond to roadway staging.
2. Construction of proposed bridge will require staged construction to keep two lanes of traffic open at all times. Possible night closures required.

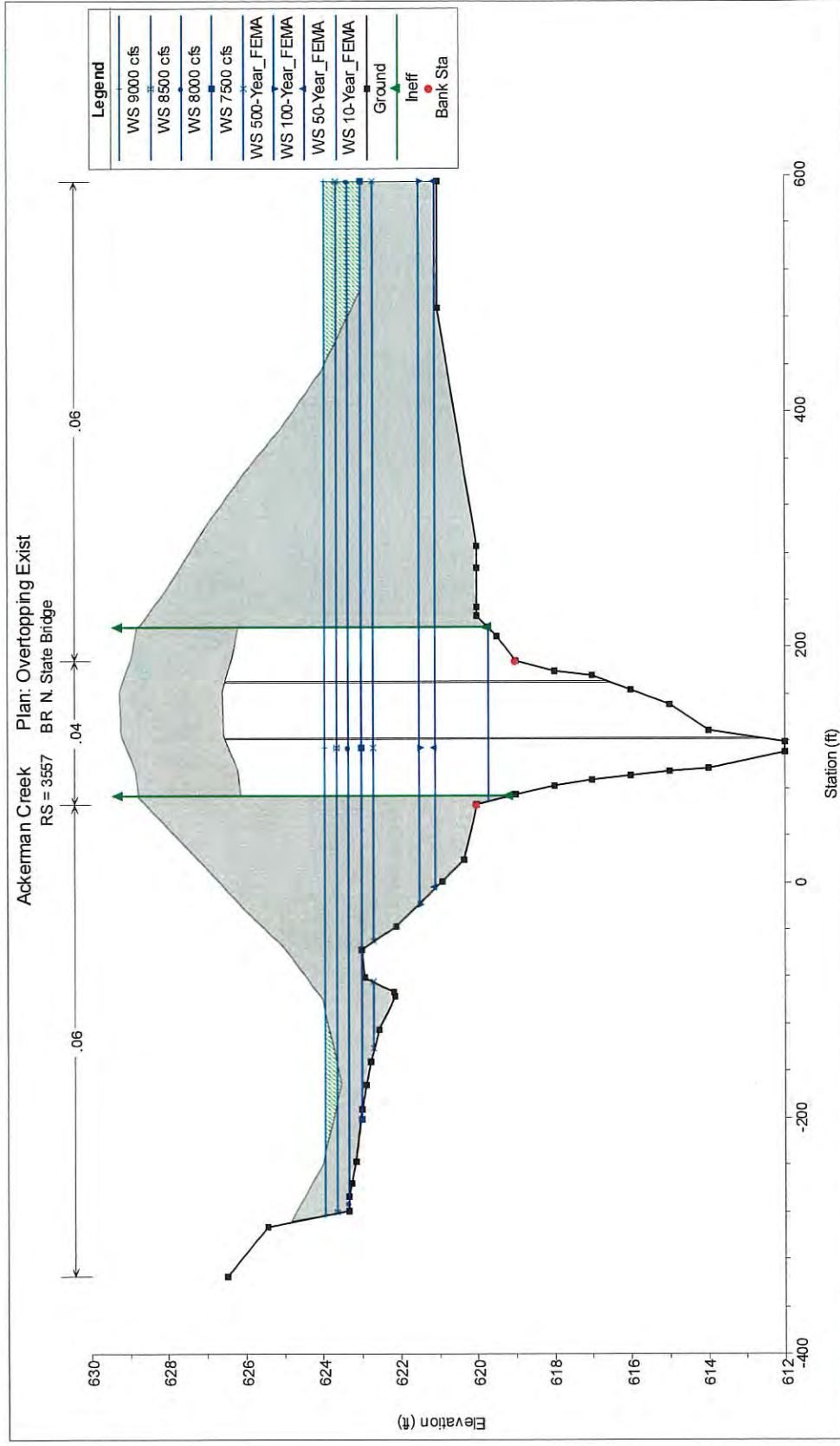


Note:
The Contractor shall verify all
controlling field dimensions before
ordering or fabricating any material.

[illegible]

APPENDIX D – OVERTOPPING

A series of discharges from 7,000 (the 500-year flood) to 9,000 cfs were input into the HEC-RAS model. Discharges above 7,500 cfs begin to overtop the roadway embankment south of the bridge and will be considered the overtopping flood. This discharge is slightly larger than the 500-year discharge of 7,000 cfs.



APPENDIX E – CHANNEL CROSS SECTIONS

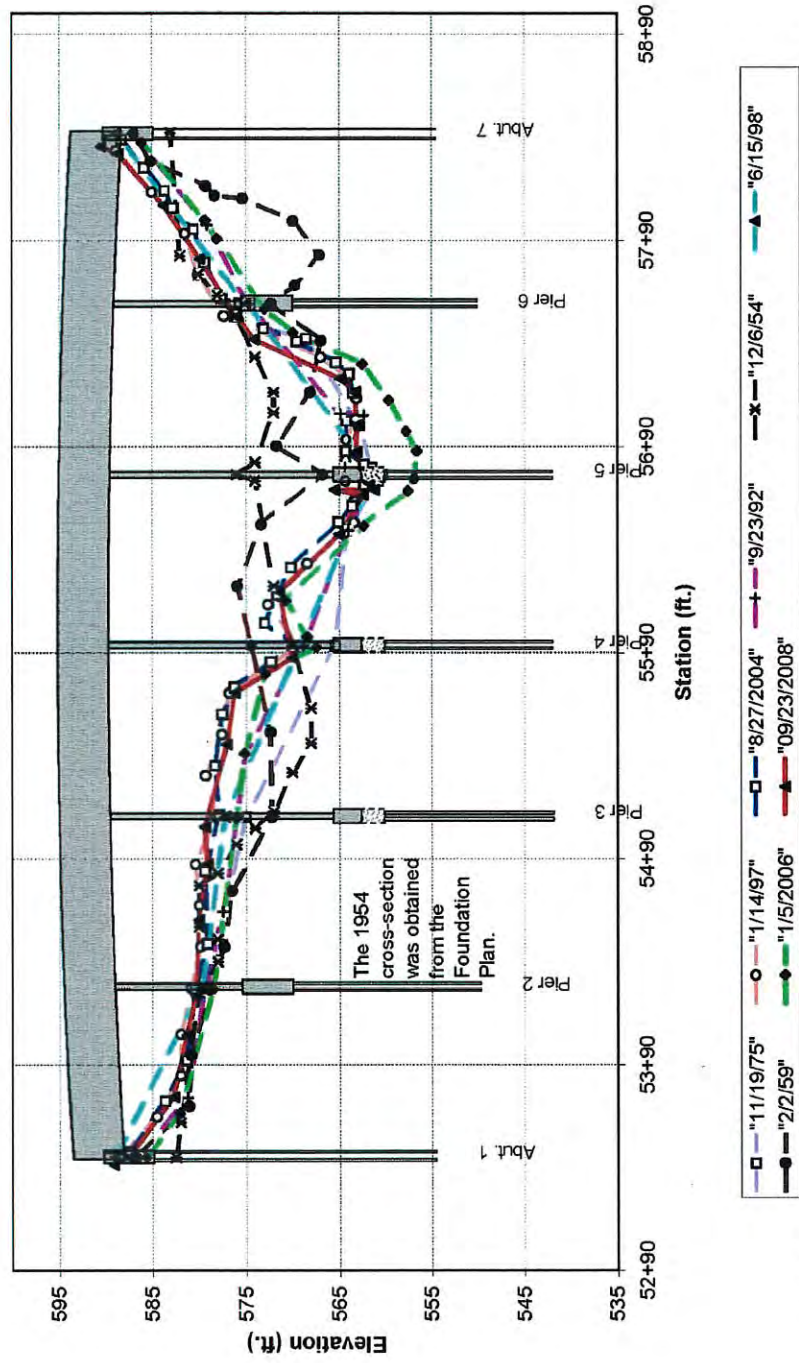
The North State Street Bridge has cross sections at the upstream of the bridge for 1965 (as-built plans), 1972, 1996 and 2011 (from survey data). The thalweg elevation varies as shown below:

Year	Elevation at the Bridge
1965	616
1972	613.5
1996	613.5
2011	612

Bridge ID: 10-0080

01-Men-222-0.98

Russian River Bridge - Upstream



10-0080.xlu

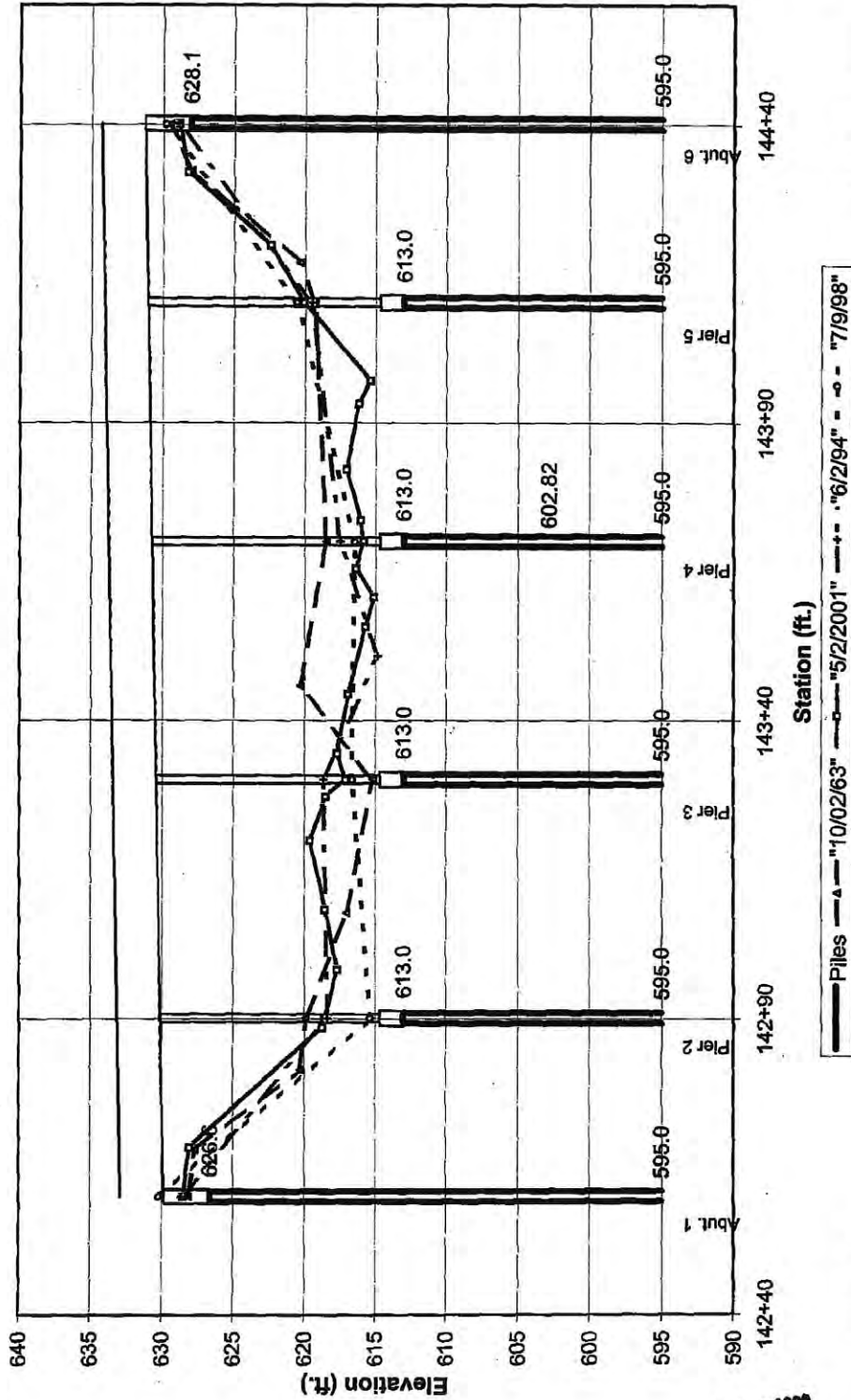
Printed by sv on 3/1/2010

Bridge ID: 10-0199L

Ackerman Creek Bridge - Upstream

01-Men-101-26.66

Historical



10-0199L.xlu

By Jifei Li on 5/15/02

OCT 23 2002

APPENDIX F - ROCK SLOPE PROTECTION

Project: Ackerman
Description: Ackerman

Cal B & SP Method

Input Parameters:

Average Channel Velocity 8.00 ft/s
Velocity Affecting Bank 10.67 ft/s
Unit Weight of Stone 165. lbs/cu ft
Cotangent of Side slope 2.00
Flow Type Impinging

Output Results:

Computed W 53.47 lbs

 ** CalTrans B Gradation **

(1) Outside Layer:

Gradation Class Backing No.1/Facing
Layer Thickness 1.80 ft

Percent Larger than Rock Size

0 - 5	200.00 lbs
50 - 100	75.00 lbs
95 - 100	25.00 lbs

(2) Inner Layer:

Gradation Class None
Layer Thickness 0.00 ft

(3) Backing:

Backing Class No. None
Layer Thickness 0.0 ft

(4) Fabric:

Fabric Type A

Total Thickness (1)+(2)+(3)+(4): 1.8 ft

HEC-11 Method

Input Parameters:

Average Channel Velocity	8.00 ft/s
Average Flow Depth	8.00 ft
Unit Weight of Stone	165. lbs/cu ft
Cotangent of Side Slope	2.00
Material Angle of Repose	43.00 deg.
Riprap Placement	Channel Bank
Safety Factor	1.1

Output Results:

Computed D50	0.24 ft
--------------	---------

** FHWA Gradation**

Gradation Class	Facing
Layer Thickness	1.90 ft

Percent Smaller by Size	Rock Size, ft	Rock Weight, lbs
-------------------------	---------------	------------------

D100	1.30	200.
D50	0.95	75.
D10	0.40	5.

APPENDIX G – LOCATION HYDRAULIC STUDY

LOCATION HYDRAULIC STUDY FORM CONT'D

District: 1 Co. Mendocino Rte. N. State Street P.M.
 ADV NO. _____ FED AID NO. BHLS-5910(081) BRIDGE NO. 10C0065

Floodplain Description:

1) Within the project area, Ackerman Creek runs in an easterly direction through the southeastern part of Mendocino County just north of the City of Ukiah which drains an approximate 20.6-square mile basin at the bridge. The area surrounding the project site is residential, commercial, and agricultural. The channel near the site is approximately 100-feet from top of bank to top of bank. Depth from the top of bank to the toe is approximately 15-feet. The banks are heavily vegetated and the channel bed is composed of silty sand and sand and gravel.

1. Description of Proposal (*include any physical barriers i.e. concrete barriers, soundwalls etc. and design elements to minimize floodplain impacts*)

The County of Mendocino is proposing to replace the structurally deficient N. State Street Bridge at Ackerman Creek. The existing structure is a 3-span concrete deck bridge supported by two concrete pier walls and concrete seat abutments. The proposed structure will be a single span concrete box girder bridge supported by concrete seat abutments. The proposed bridge is approximately the same length as the existing bridge but eliminates the two pier walls in the channel. Channel modifications to Ackerman Creek are proposed to eliminate an existing check dam and fish ladder and construct a step-pool stream bed with rock slope protection.

2. ADT: Current 11,712 Projected 17,403 (2033)

3. Hydraulic Data: Base Flood $Q_{100} =$ 5,370 CFS WSE₁₀₀ = 618.4 ft (upstream face of bridge)

The flood of record, if greater than Q_{100} : $Q =$ n/a CFS WSE = n/a

Overtopping flood $Q =$ 7,500 (> 500-yr) CFS WSE = 623.0 ft (low point in roadway approximately 300 feet south of bridge)

Are NFIP maps and studies available?

YES ☒ NO ☐

LOCATION HYDRAULIC STUDY FORM CONT'D

District: 1
ADV NO.

Co. Mendocino Rte. N. State Street
FED AID NO. BHLS-5910(081)

P.M.
BRIDGE NO. 10C0065

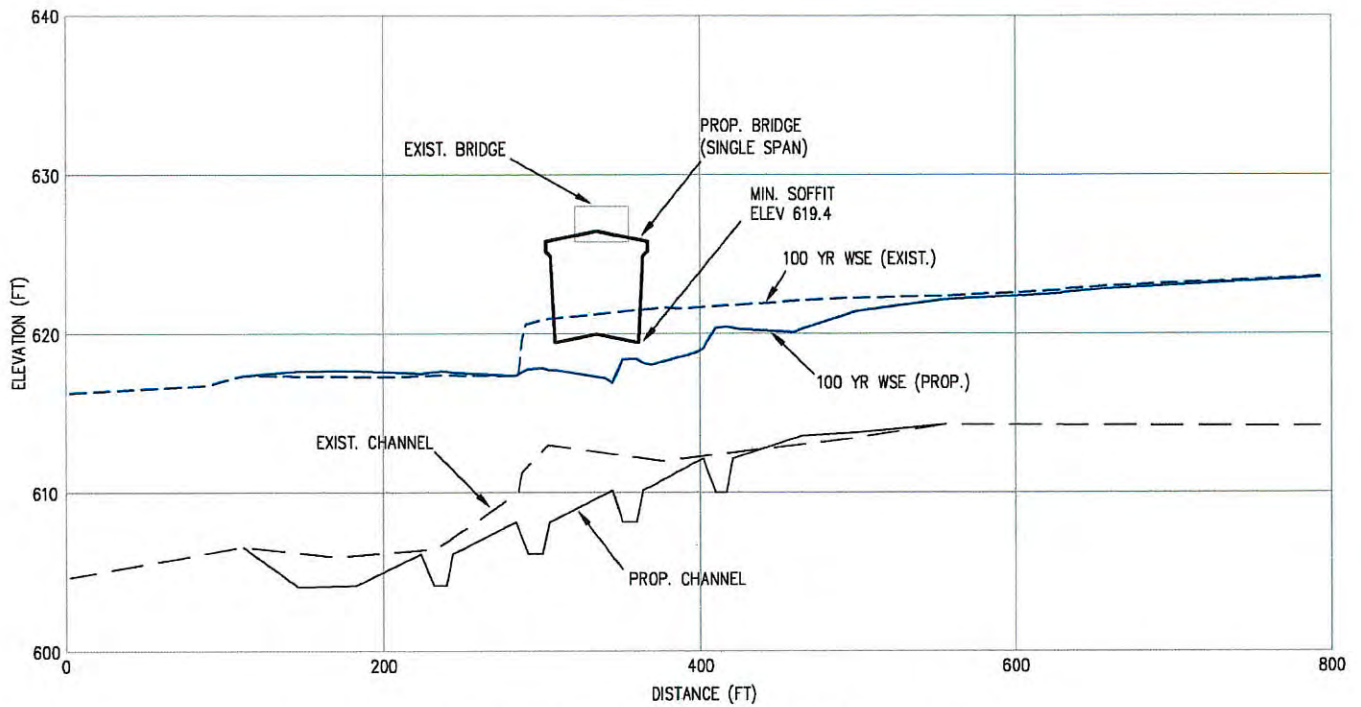


Figure 1: Water Surface Profile through the bridge reach

LOCATION HYDRAULIC STUDY FORM CONT'D

District: 1 Co. Mendocino Rte. N. State Street P.M.
 ADV NO. _____ FED AID NO. BHLS-5910(081) BRIDGE NO. 10C0065

4. Is the highway location alternative within a regulatory floodway? YES ☒ NO ☐

The reach is in a Zone AE FEMA floodplain with Base Flood Elevations determined as shown on Figure 2.



Figure 2: FEMA FIS FIRM Panel 1512 of 2100 dated June 2, 2011

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

Potential Q₁₀₀ backwater damages: The water surface elevation is lowered upstream as a result of the project. The floodplain is contained by the banks of the channel as shown on Figure 3. There is a slight increase in the water surface elevation (approximately 0.25 ft maximum) downstream from the bridge within the limits of the channel modification area and is a result of the transition from the proposed channel grading to existing. The increase is considered insignificant and the flow is fully contained by the channel and will not have an impact on any adjacent structures.

LOCATION HYDRAULIC STUDY FORM CONT'D

District: 1
ADV NO. _____

Co. Mendocino Rte. N. State Street
FED AID NO. BHLS-5910(081)

P.M.
BRIDGE NO. 10C0065

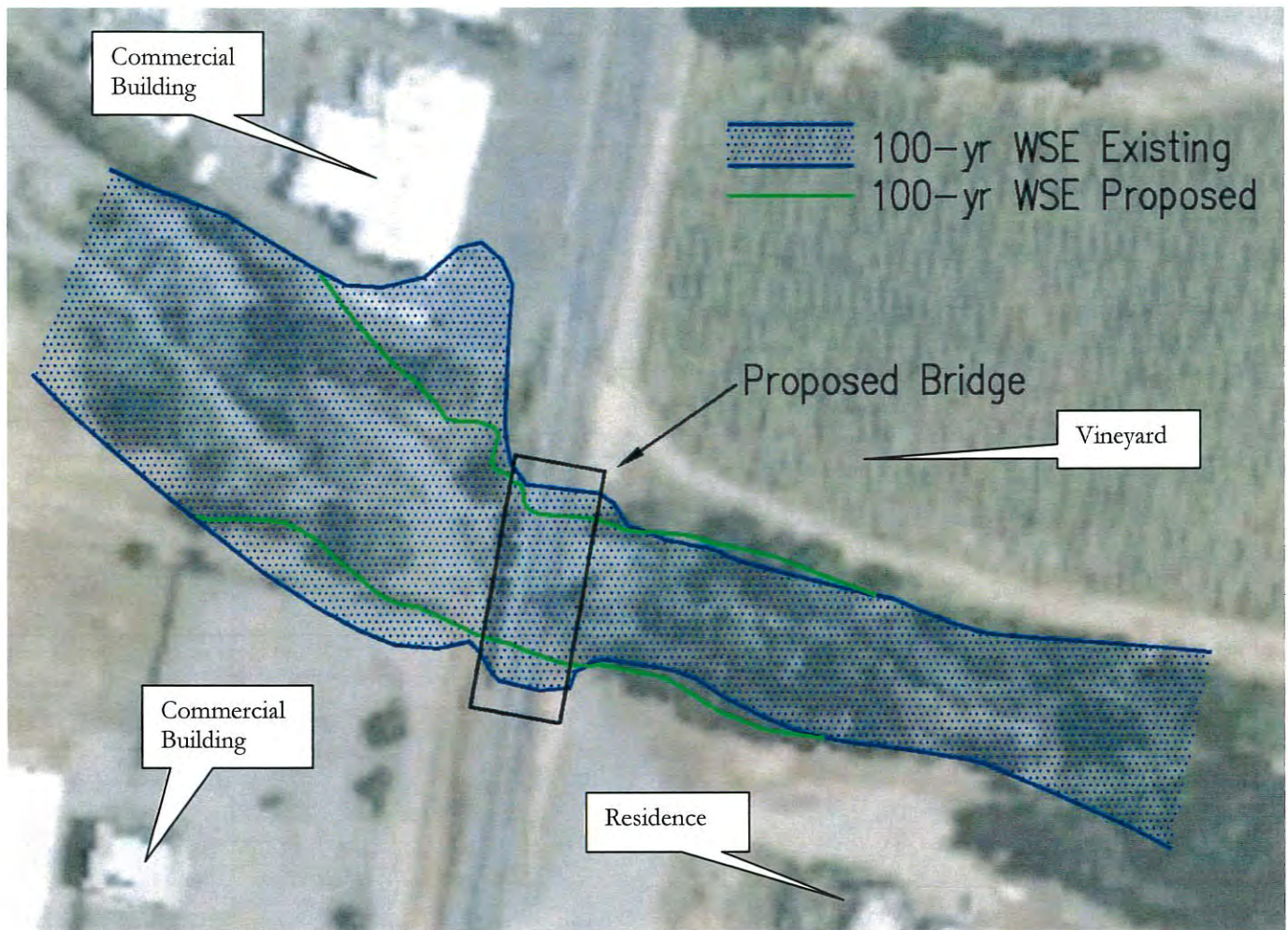


Figure 3: 100-year water surface elevation delineated on Plan View for Proposed Conditions

A. Residences? NO ☐ YES ☒

There is one residence downstream from the project on the south side of the channel. The water surface elevation is unchanged adjacent to the structure and the flow is contained within the channel. The proposed project will have no impact on the residence.

B. Other Bldgs? NO ☐ YES ☒

There are existing commercial buildings upstream from the project north and south of the channel. The water surface elevation is lowered upstream of the bridge and the flow is contained within the channel. The proposed project will have no impact on these other buildings.

C. Crops? NO ☒ YES ☐

There is an existing vineyard downstream from the project on the north side of the channel. The water surface elevation is slightly higher downstream of the bridge, but the flow is fully contained within the channel. The proposed project will have no adverse impact on the vineyard.

LOCATION HYDRAULIC STUDY FORM CONT'D

District: 1 Co. Mendocino Rte. N. State Street P.M.
 ADV NO. _____ FED AID NO. BHLS-5910(081) BRIDGE NO. 10C0065

D. Natural and beneficial Floodplain values? NO ☐ YES ☒

The proposed channel modifications will improve the floodplain values.

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

6. Type of Traffic:

A. Emergency supply or evacuation route? NO ☐ YES ☒
 B. Emergency vehicle access? NO ☐ YES ☒
 C. Practicable detour available? NO ☐ YES ☒
 D. School bus or mail route? NO ☐ YES ☒

7. Estimated duration of traffic interruption for 100-year event (hours): 0

8. Estimated value of Q₁₀₀ flood damages (if any) – medium risk level.

A. Roadway \$ n/a
 B. Property \$ n/a
 Total \$ n/a

9. Assessment of Level of Risk Low ☒
 Moderate ☐
 High ☐

For High Risk projects, during design phase, additional Design Study Risk Analysis may be necessary to determine design alternative.

LOCATION HYDRAULIC STUDY FORM CONT'D

District: 1
ADV NO. _____

Co. Mendocino Rte. N. State Street
FED AID NO. BILLS-5910(081)

P.M.
BRIDGE NO. 10C0065

PREPARED BY:

Signature:

I certify that I have conducted a Location Hydraulic Study consistent with 23 CFR 650 and that the information summarized in items numbers 3, 4, 5, 8 and 9 of this form are accurate.

Cash McLean Date 2/26/16
Local Agency/Consulting Hydraulic Engineer (local assistance projects)

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible floodplain development? NO ☒ YES ☐

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

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

I certify that item numbers 1, 2, 6 and 7 of this Location Hydraulic Study Form are accurate and will ensure that Final PS&E reflects the information and recommendations of said report:

Jason Date 2/20/16
Local Agency Project Engineer (local assistance projects)

CONCURRED BY:

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

Al. M. Date 3/10/16
Local Agency Project Manager (local assistance projects)

Suzanne Oberst Date 3/10/16
District Local Assistance Engineer for District Hydraulic Branch for very complex projects or when required expertise is unavailable. Note: District Hydraulic Branch review of local assistance projects shall be based on its confidence and agreement with the information provided.

I concur that the natural and beneficial floodplain values are consistent with the results of other studies prepared pursuant to 23 CFR 650, and that the NEPA analysis and determination, including consideration of mitigation, are consistent with the floodplain analysis.

Brandon Date 03/10/16
District Senior Environmental Planner for Design

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

APPENDIX H – SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Summary Floodplain Encroachment Report

District: 1
ADV NO. _____

Co. Mendocino Rte. N. State Street
FED AID NO. BHLS-5910(081)

P.M.
BRIDGE NO. 10C0065

Limits:

The Mendocino County Department of Transportation is proposing to replace the structurally deficient N. State Street Bridge at Ackerman Creek. The existing structure is a 3-span concrete deck bridge supported by two concrete pier walls and concrete seat abutments. The proposed structure is a single span concrete box girder bridge supported by concrete seat abutments. The proposed bridge is approximately the same length as the existing bridge but eliminates the two pier walls in the channel. Channel modifications to Ackerman Creek are proposed to eliminate an existing check dam and fish ladder and construct a step-pool stream bed with rock slope protection.

Floodplain Description:

The reach is in a Zone AE FEMA floodplain with base flood elevations determined. The proposed project will lower the water surface elevation upstream from the bridge within the limits of the channel modification and will slightly increase the water surface elevation downstream (maximum 0.25 ft) from the bridge within the limits of the channel modification. The flow however, is fully contained within the channel and will not affect the floodplain.

- | | No | Yes |
|---|-------------------------------------|-------------------------------------|
| 1. Is the proposed action a longitudinal encroachment of the base floodplain?
<i>The proposed bridge is not a longitudinal encroachment.</i> | ☒ | ☐ |
| 2. Are the risks associated with the implementation of the proposed action significant?
<i>The level of risk to the floodplain of the project site is low.</i> | ☒ | ☐ |
| 3. Will the proposed action support probable incompatible floodplain development?
<i>The proposed bridge maintenance will not support incompatible floodplain development.</i> | ☒ | ☐ |
| 4. Are there any significant impacts on natural and beneficial floodplain values?
<i>The proposed maintenance will have no impact to the floodplain values.</i> | ☒ | ☐ |
| 5. Routine construction procedures are required to minimize impacts on the floodplain.
Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.
<i>Best management practices for erosion control measures should be used for proposed construction to minimize temporary impacts to the floodplain during construction.</i> | ☒ | ☐ |
| 6. Does the proposed action constitute a significant floodplain encroachment as defined in 23 CFR, Section 650.105(q). | ☒ | ☐ |
| 7. Are Location Hydraulic Studies that document the above answers on file? If not explain. | ☐ | ☒ |

Summary Floodplain Encroachment Report

District: 1
ADV NO. _____

Co. Mendocino Rte. N. State Street
FED AID NO. BHLS-5910(081)

P.M.
BRIDGE NO. 10C0065

PREPARED BY:

 Date 2/22/16
Local Agency Project Engineer (local assistance projects)

CONCURRED BY:

 Date 3/10/16
District Local Assistance Engineer (local Assistance projects)

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

 Date 03/10/16
District Senior Environmental Planner (or Designee)

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

APPENDIX I – HEC-RAS INPUT AND OUTPUT FILES

50-yr

HEC-RAS River Ackerman Creek Reach Main Profile 50-Year FEMA

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	140.859	50-Year FEMA	prop 02dec2015	4800.00	589.16	612.80	596.84	612.83	0.000041	1.53	3952.94	347.97	0.07
Main	140.859	50-Year FEMA	exist 02dec2015	4800.00	589.16	612.80	596.84	612.83	0.000041	1.53	3952.94	347.97	0.07
Main	218.070	50-Year FEMA	prop 02dec2015	4800.00	591.15	612.80		612.84	0.000062	1.83	3446.26	312.19	0.08
Main	218.070	50-Year FEMA	exist 02dec2015	4800.00	591.15	612.80		612.84	0.000062	1.83	3446.26	312.19	0.08
Main	296.838	50-Year FEMA	prop 02dec2015	4800.00	591.35	612.81		612.84	0.000082	1.73	3853.95	392.57	0.08
Main	296.838	50-Year FEMA	exist 02dec2015	4800.00	591.35	612.81		612.84	0.000082	1.73	3853.95	392.57	0.08
Main	635.602	50-Year FEMA	prop 02dec2015	4800.00	592.85	612.76		612.92	0.000326	3.40	1905.33	339.84	0.17
Main	635.602	50-Year FEMA	exist 02dec2015	4800.00	592.85	612.76		612.92	0.000326	3.40	1905.33	339.84	0.17
Main	1056.034	50-Year FEMA	prop 02dec2015	4800.00	594.65	612.86		613.13	0.000543	4.23	1244.46	273.52	0.22
Main	1056.034	50-Year FEMA	exist 02dec2015	4800.00	594.65	612.86		613.13	0.000543	4.23	1244.46	273.52	0.22
Main	1176	50-Year FEMA	prop 02dec2015	4800.00	595.22	612.91		613.21	0.000624	4.41	1180.15	324.23	0.23
Main	1176	50-Year FEMA	exist 02dec2015	4800.00	595.22	612.91		613.21	0.000624	4.41	1180.15	324.23	0.23
Main	1179	50-Year FEMA	prop 02dec2015	4800.00	595.22	612.91		613.21	0.000626	4.42	1151.84	255.49	0.23
Main	1179	50-Year FEMA	exist 02dec2015	4800.00	595.22	612.91		613.21	0.000626	4.42	1151.84	255.49	0.23
Main	1291	50-Year FEMA	prop 02dec2015	4800.00	595.74	612.97		613.28	0.000675	4.49	1159.00	256.51	0.24
Main	1291	50-Year FEMA	exist 02dec2015	4800.00	595.74	612.97		613.28	0.000675	4.49	1159.00	256.51	0.24
Main	1292	50-Year FEMA	prop 02dec2015	4800.00	595.74	612.98		613.29	0.000675	4.49	1161.61	272.19	0.24
Main	1292	50-Year FEMA	exist 02dec2015	4800.00	595.74	612.98		613.29	0.000675	4.49	1161.61	272.19	0.24
Main	1320	50-Year FEMA	prop 02dec2015	4800.00	595.88	612.99		613.30	0.000685	4.50	1160.14	263.46	0.24
Main	1320	50-Year FEMA	exist 02dec2015	4800.00	595.88	612.99		613.30	0.000685	4.50	1160.14	263.46	0.24
Main	1321	50-Year FEMA	prop 02dec2015	4800.00	595.88	612.99		613.31	0.000686	4.50	1148.20	232.13	0.24
Main	1321	50-Year FEMA	exist 02dec2015	4800.00	595.88	612.99		613.31	0.000686	4.50	1148.20	232.13	0.24
Main	1420	50-Year FEMA	prop 02dec2015	4800.00	596.33	613.07		613.37	0.000701	4.49	1167.65	234.34	0.24
Main	1420	50-Year FEMA	exist 02dec2015	4800.00	596.33	613.07		613.37	0.000701	4.49	1167.65	234.34	0.24
Main	1421	50-Year FEMA	prop 02dec2015	4800.00	596.33	613.07		613.38	0.000701	4.49	1168.19	238.74	0.24
Main	1421	50-Year FEMA	exist 02dec2015	4800.00	596.33	613.07		613.38	0.000701	4.49	1168.19	238.74	0.24
Main	1465.82	50-Year FEMA	prop 02dec2015	4800.00	596.55	613.10		613.41	0.000701	4.47	1175.34	229.94	0.24
Main	1465.82	50-Year FEMA	exist 02dec2015	4800.00	596.55	613.10		613.41	0.000701	4.47	1175.34	229.94	0.24
Main	1466.521	50-Year FEMA	prop 02dec2015	4800.00	596.55	613.10		613.41	0.000701	4.47	1175.52	229.96	0.24
Main	1466.521	50-Year FEMA	exist 02dec2015	4800.00	596.55	613.10		613.41	0.000701	4.47	1175.52	229.96	0.24
Main	1526	50-Year FEMA	prop 02dec2015	4800.00	596.67	613.16		613.45	0.000667	4.31	1190.90	229.71	0.24
Main	1526	50-Year FEMA	exist 02dec2015	4800.00	596.67	613.16		613.45	0.000667	4.31	1190.90	229.71	0.24
Main	1527	50-Year FEMA	prop 02dec2015	4800.00	596.67	613.17		613.45	0.000666	4.31	1191.05	229.72	0.24
Main	1527	50-Year FEMA	exist 02dec2015	4800.00	596.67	613.17		613.45	0.000666	4.31	1191.05	229.72	0.24
Main	1871.080	50-Year FEMA	prop 02dec2015	4800.00	597.35	613.46		613.69	0.000711	3.85	1257.81	180.76	0.24
Main	1871.080	50-Year FEMA	exist 02dec2015	4800.00	597.35	613.46		613.69	0.000711	3.85	1257.81	180.76	0.24
Main	1942.119	50-Year FEMA	prop 02dec2015	4800.00	597.35	613.46	605.22	613.79	0.000585	4.65	1031.69	89.15	0.23
Main	1942.119	50-Year FEMA	exist 02dec2015	4800.00	597.35	613.46	605.22	613.79	0.000585	4.65	1031.69	89.15	0.23
Main	1957		Bridge										
Main	1966.160	50-Year FEMA	prop 02dec2015	4800.00	598.15	613.47	605.44	613.81	0.000583	4.70	1022.34	92.69	0.23
Main	1966.160	50-Year FEMA	exist 02dec2015	4800.00	598.15	613.47	605.44	613.81	0.000583	4.70	1022.34	92.69	0.23
Main	1987.938	50-Year FEMA	prop 02dec2015	4800.00	598.15	613.60		613.85	0.000781	4.10	1296.28	245.51	0.25
Main	1987.938	50-Year FEMA	exist 02dec2015	4800.00	598.15	613.60		613.85	0.000781	4.10	1296.28	245.51	0.25
Main	2014.297	50-Year FEMA	prop 02dec2015	4800.00	599.15	613.55	606.84	613.94	0.001069	5.02	956.52	108.44	0.30
Main	2014.297	50-Year FEMA	exist 02dec2015	4800.00	599.15	613.55	606.84	613.94	0.001069	5.02	956.52	108.44	0.30
Main	2026		Bridge										
Main	2044.24	50-Year FEMA	prop 02dec2015	4800.00	600.02	613.59	608.30	614.10	0.001587	5.80	862.96	182.75	0.36
Main	2044.24	50-Year FEMA	exist 02dec2015	4800.00	600.02	613.59	608.30	614.10	0.001587	5.80	862.96	182.75	0.36
Main	2072.501	50-Year FEMA	prop 02dec2015	4800.00	600.15	613.59		614.21	0.002746	6.36	821.35	195.63	0.45
Main	2072.501	50-Year FEMA	exist 02dec2015	4800.00	600.15	613.59		614.21	0.002746	6.36	821.35	195.63	0.45
Main	2119.035	50-Year FEMA	prop 02dec2015	4800.00	600.15	613.39	610.38	614.55	0.005582	8.62	557.15	94.82	0.63
Main	2119.035	50-Year FEMA	exist 02dec2015	4800.00	600.15	613.39	610.38	614.55	0.005582	8.62	557.15	94.82	0.63
Main	2486.98	50-Year FEMA	prop 02dec2015	4800.00	600.52	614.96	609.69	615.72	0.001940	6.97	703.23	97.88	0.40
Main	2486.98	50-Year FEMA	exist 02dec2015	4800.00	600.52	614.96	609.69	615.72	0.001940	6.97	703.23	97.88	0.40

HEC-RAS River Ackerman Creek Reach Main Profile 50-Year FEMA (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	2487.98	50-Year FEMA	prop 02dec2015	4800.00	600.52	614.97	609.89	615.72	0.001938	6.98	703.48	97.96	0.39
Main	2487.98	50-Year FEMA	exist 02dec2015	4800.00	600.52	614.97	609.89	615.72	0.001938	6.98	703.48	97.96	0.39
Main	2562	50-Year FEMA	prop 02dec2015	4800.00	600.85	615.35	609.21	615.85	0.001201	5.76	898.25	140.16	0.32
Main	2562	50-Year FEMA	exist 02dec2015	4800.00	600.85	615.35	609.21	615.85	0.001201	5.76	898.25	140.16	0.32
Main	2563	50-Year FEMA	prop 02dec2015	4800.00	600.85	615.35	609.23	615.85	0.001200	5.76	898.44	140.29	0.32
Main	2563	50-Year FEMA	exist 02dec2015	4800.00	600.85	615.35	609.23	615.85	0.001200	5.76	898.44	140.29	0.32
Main	2863.81	50-Year FEMA	prop 02dec2015	4800.00	602.22	615.92	607.49	616.04	0.000254	2.96	2202.29	384.25	0.15
Main	2863.81	50-Year FEMA	exist 02dec2015	4800.00	602.22	615.92	607.49	616.04	0.000254	2.96	2202.29	384.25	0.15
Main	2864.81	50-Year FEMA	prop 02dec2015	4800.00	602.22	615.92	607.50	616.04	0.000253	2.96	2037.47	259.72	0.15
Main	2864.81	50-Year FEMA	exist 02dec2015	4800.00	602.22	615.92	607.50	616.04	0.000253	2.96	2037.47	259.72	0.15
Main	2948	50-Year FEMA	prop 02dec2015	4800.00	602.82	615.90	609.01	616.09	0.000469	3.71	1626.87	274.26	0.20
Main	2948	50-Year FEMA	exist 02dec2015	4800.00	602.82	615.90	609.01	616.09	0.000469	3.71	1626.87	274.26	0.20
Main	2949	50-Year FEMA	prop 02dec2015	4800.00	602.82	615.89	609.02	616.09	0.000477	3.75	1677.11	342.80	0.20
Main	2949	50-Year FEMA	exist 02dec2015	4800.00	602.82	615.89	609.02	616.09	0.000477	3.75	1677.11	342.80	0.20
Main	3018	50-Year FEMA	prop 02dec2015	4800.00	603.33	615.85	610.29	616.17	0.000886	4.70	1232.02	287.68	0.27
Main	3018	50-Year FEMA	exist 02dec2015	4800.00	603.33	615.85	610.29	616.17	0.000886	4.70	1232.02	287.68	0.27
Main	3201.89	50-Year FEMA	prop 02dec2015	4800.00	604.68	615.56	613.61	616.77	0.005348	8.80	545.18	87.28	0.62
Main	3201.89	50-Year FEMA	exist 02dec2015	4800.00	604.68	615.56	613.61	616.77	0.005348	8.80	545.18	87.28	0.62
Main	3202.89	50-Year FEMA	prop 02dec2015	4800.00	604.68	615.57	613.61	616.77	0.005332	8.80	545.71	87.31	0.62
Main	3202.89	50-Year FEMA	exist 02dec2015	4800.00	604.68	615.57	613.61	616.77	0.005332	8.80	545.71	87.31	0.62
Main	3288	50-Year FEMA	prop 02dec2015	4800.00	605.35	616.10	613.73	617.19	0.004343	8.37	573.24	86.14	0.57
Main	3288	50-Year FEMA	exist 02dec2015	4800.00	605.35	616.10	613.73	617.19	0.004343	8.37	573.24	86.14	0.57
Main	3289	50-Year FEMA	prop 02dec2015	4800.00	605.35	616.11	613.75	617.19	0.004331	8.37	573.76	86.16	0.57
Main	3289	50-Year FEMA	exist 02dec2015	4800.00	605.35	616.11	613.75	617.19	0.004331	8.37	573.76	86.16	0.57
Main	3312	50-Year FEMA	prop 02dec2015	4800.00	606.60	616.71		617.30	0.001533	6.17	778.29	105.50	0.40
Main	3312	50-Year FEMA	exist 02dec2015	4800.00	606.60	616.71		617.30	0.001533	6.17	778.29	105.50	0.40
Main	3346	50-Year FEMA	prop 02dec2015	4800.00	604.09	616.99		617.36	0.000766	4.86	987.14	112.99	0.29
Main	3378	50-Year FEMA	prop 02dec2015	4800.00	604.15	617.01		617.38	0.000774	4.88	984.27	113.08	0.29
Main	3383	50-Year FEMA	prop 02dec2015	4800.00	604.16	617.02		617.39	0.000779	4.89	981.13	112.69	0.29
Main	3407	50-Year FEMA	exist 02dec2015	4800.00	606.27	616.64	614.01	617.64	0.003888	8.01	599.52	85.29	0.53
Main	3408	50-Year FEMA	exist 02dec2015	4800.00	606.27	616.64	614.02	617.64	0.003681	8.00	599.89	85.30	0.53
Main	3419	50-Year FEMA	prop 02dec2015	4800.00	605.91	616.88		617.50	0.001584	6.33	758.62	101.15	0.41
Main	3424	50-Year FEMA	prop 02dec2015	4800.00	606.16	616.84		617.53	0.001603	6.64	723.40	98.97	0.43
Main	3432	50-Year FEMA	prop 02dec2015	4800.00	604.16	616.98		617.55	0.001340	6.07	790.95	98.11	0.38
Main	3433.40	50-Year FEMA	exist 02dec2015	4800.00	606.47	616.76	614.08	617.73	0.003587	7.92	605.86	85.37	0.52
Main	3440	50-Year FEMA	prop 02dec2015	4800.00	604.16	616.99		617.56	0.001336	6.08	792.19	98.29	0.38
Main	3444	50-Year FEMA	prop 02dec2015	4800.00	606.16	616.92		617.60	0.001775	6.61	726.12	98.71	0.43
Main	3449	50-Year FEMA	prop 02dec2015	4800.00	606.41	616.90		617.62	0.001927	6.79	706.55	98.14	0.45
Main	3479	50-Year FEMA	prop 02dec2015	4800.00	607.91	616.73		617.81	0.003549	8.32	576.83	93.98	0.59
Main	3484	50-Year FEMA	prop 02dec2015	4800.00	608.16	616.71		617.84	0.003888	8.55	561.66	94.28	0.62
Main	3485.48	50-Year FEMA	exist 02dec2015	4800.00	610.00	616.99	616.99	619.23	0.015312	12.01	399.57	88.64	1.00
Main	3488.01	50-Year FEMA	exist 02dec2015	4800.00	611.25	619.26	619.26	621.32	0.015545	11.54	416.01	100.33	1.00
Main	3490.54	50-Year FEMA	exist 02dec2015	4800.00	611.54	620.24	618.96	621.43	0.008537	8.77	547.42	159.57	0.68
Main	3492	50-Year FEMA	prop 02dec2015	4800.00	606.16	617.14		617.90	0.002161	7.00	685.62	99.07	0.47
Main	3501	50-Year FEMA	prop 02dec2015	4800.00	606.16	617.20		617.93	0.002036	6.82	703.94	101.30	0.46
Main	3504.24	50-Year FEMA	exist 02dec2015	4800.00	613.00	620.54	619.03	621.54	0.005243	8.00	600.28	146.85	0.62
Main	3505	50-Year FEMA	prop 02dec2015	4800.00	608.16	617.10		617.99	0.002872	7.58	633.66	101.89	0.53
Main	3505.24	50-Year FEMA	exist 02dec2015	4800.00	613.00	620.55	619.03	621.54	0.005210	7.98	601.16	147.22	0.62

HEC-RAS River Ackerman Creek Reach Main Profile 50-Year FEMA (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch
Main	3510	50-Year FEMA	prop 02dec2015	4800.00	608.41	617.06		618.02	0.003235	7.87	609.86	101.13	0.56
Main	3540	50-Year FEMA	prop 02dec2015	4800.00	609.91	618.46	616.29	618.51	0.010133	11.50	417.38	92.89	0.96
Main	3545	50-Year FEMA	prop 02dec2015	4800.00	610.16	618.56	616.56	618.78	0.011326	11.96	401.31	91.57	1.01
Main	3551	50-Year FEMA	prop 02dec2015	4800.00	608.16	617.95		618.93	0.003234	7.99	611.04	139.79	0.57
Main	3560	50-Year FEMA	prop 02dec2015	4800.00	608.16	617.98		618.97	0.003203	7.98	613.81	140.15	0.56
Main	3564	50-Year FEMA	prop 02dec2015	4800.00	610.16	617.71	616.58	619.10	0.005576	9.46	509.84	140.15	0.73
Main	3569	50-Year FEMA	prop 02dec2015	4800.00	610.41	617.59	616.83	619.20	0.008987	10.20	471.72	108.35	0.81
Main	3576.30	50-Year FEMA	exist 02dec2015	4800.00	612.00	621.23	619.07	621.95	0.003221	6.86	735.44	604.25	0.50
Main	3587	50-Year FEMA	exist 02dec2015	4800.00	613.00	621.14	619.54	622.04	0.004602	7.68	670.91	494.62	0.58
Main	3597	50-Year FEMA	prop 02dec2015	4800.00	611.90	618.43	618.43	620.55	0.010340	11.70	417.05	106.26	0.97
Main	3602	50-Year FEMA	prop 02dec2015	4800.00	612.16	618.68	618.68	620.72	0.009943	11.54	432.16	116.92	0.95
Main	3610	50-Year FEMA	prop 02dec2015	4800.00	610.02	620.00		620.88	0.002803	7.65	670.83	137.14	0.53
Main	3617	50-Year FEMA	prop 02dec2015	4800.00	610.02	620.05		620.90	0.002689	7.51	683.93	139.48	0.52
Main	3621	50-Year FEMA	prop 02dec2015	4800.00	612.16	619.96		620.95	0.003775	8.21	633.73	139.52	0.81
Main	3626	50-Year FEMA	prop 02dec2015	4800.00	612.31	619.90		621.01	0.004360	8.80	594.34	135.49	0.85
Main	3647	50-Year FEMA	exist 02dec2015	4800.00	614.00	621.50	619.72	622.31	0.004232	7.37	744.47	518.33	0.56
Main	3647.25	50-Year FEMA	exist 02dec2015	4800.00	614.00	621.50	619.72	622.32	0.004227	7.36	744.87	519.07	0.56
Main	3658	50-Year FEMA	exist 02dec2015	4800.00	613.83	621.83	619.66	622.37	0.003714	7.03	785.09	553.90	0.52
Main	3660	50-Year FEMA	prop 02dec2015	4800.00	613.43	619.76	619.76	621.73	0.010100	11.34	439.93	118.99	0.95
Main	3665	50-Year FEMA	prop 02dec2015	4800.00	613.59	619.99	619.99	621.94	0.009787	11.34	444.98	121.64	0.94
Main	3690	50-Year FEMA	exist 02dec2015	4800.00	613.33	621.80	619.77	622.49	0.003468	6.73	816.69	567.75	0.51
Main	3691	50-Year FEMA	exist 02dec2015	4800.00	613.33	621.81	619.77	622.49	0.003456	6.72	818.21	384.00	0.50
Main	3700	50-Year FEMA	prop 02dec2015	4800.00	613.80	621.10		622.28	0.008030	8.73	550.37	127.35	0.73
Main	3755.59	50-Year FEMA	prop 02dec2015	4800.00	614.30	621.75	620.21	622.62	0.005103	7.52	671.22	218.57	0.60
Main	3755.59	50-Year FEMA	exist 02dec2015	4800.00	614.30	621.99	620.21	622.77	0.004290	7.12	726.37	231.77	0.55
Main	3829	50-Year FEMA	prop 02dec2015	4800.00	614.26	622.16	620.62	622.99	0.004907	7.36	690.18	318.55	0.59
Main	3829	50-Year FEMA	exist 02dec2015	4800.00	614.26	622.32	620.62	623.08	0.004348	7.08	745.56	363.80	0.56
Main	3830	50-Year FEMA	prop 02dec2015	4800.00	614.26	622.16	620.62	622.99	0.004672	7.35	698.41	375.84	0.59
Main	3830	50-Year FEMA	exist 02dec2015	4800.00	614.26	622.33	620.62	623.09	0.004281	7.04	773.07	544.12	0.55
Main	3859	50-Year FEMA	prop 02dec2015	4800.00	614.25	622.37	620.76	623.14	0.004532	7.11	788.71	564.05	0.57
Main	3859	50-Year FEMA	exist 02dec2015	4800.00	614.25	622.52	620.76	623.21	0.003988	6.81	869.97	631.06	0.54
Main	3992.67	50-Year FEMA	prop 02dec2015	4800.00	614.18	623.21	621.43	623.64	0.002833	5.69	1170.25	609.19	0.45
Main	3992.67	50-Year FEMA	exist 02dec2015	4800.00	614.18	623.26	621.43	623.68	0.002708	5.60	1195.17	610.99	0.44
Main	3993.67	50-Year FEMA	prop 02dec2015	4800.00	614.18	623.21	621.43	623.65	0.002822	5.68	1172.36	530.33	0.45
Main	3993.67	50-Year FEMA	exist 02dec2015	4800.00	614.18	623.26	621.43	623.68	0.002898	5.59	1197.13	532.15	0.44
Main	4096	50-Year FEMA	prop 02dec2015	4800.00	614.95	623.46		623.91	0.002234	5.79	1145.35	403.45	0.41
Main	4096	50-Year FEMA	exist 02dec2015	4800.00	614.95	623.49		623.93	0.002176	5.73	1159.59	405.08	0.41
Main	4097	50-Year FEMA	prop 02dec2015	4800.00	614.95	623.48		623.91	0.002157	5.70	1198.51	458.43	0.40
Main	4097	50-Year FEMA	exist 02dec2015	4800.00	614.95	623.51		623.94	0.002098	5.64	1214.85	460.07	0.40
Main	4134.83	50-Year FEMA	prop 02dec2015	4800.00	615.27	623.53		624.00	0.002175	5.95	1139.24	411.75	0.41
Main	4134.83	50-Year FEMA	exist 02dec2015	4800.00	615.27	623.56		624.03	0.002123	5.90	1153.00	412.95	0.40
Main	4277.55	50-Year FEMA	prop 02dec2015	4800.00	614.99	623.77		624.40	0.002766	6.55	844.20	222.56	0.46
Main	4277.55	50-Year FEMA	exist 02dec2015	4800.00	614.99	623.79		624.42	0.002726	6.52	849.62	223.20	0.46

100-yr

HEC-RAS River Ackerman Creek Reach: Main Profile 100-Year FEMA

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	140.859	100-Year_FEMA	prop 02dec2015	5370.00	589.16	613.50	597.66	613.53	0.000044	1.63	4196.52	347.97	0.07
Main	140.859	100-Year_FEMA	exist 02dec2015	5370.00	589.16	613.50	597.66	613.53	0.000044	1.63	4196.52	347.97	0.07
Main	218.070	100-Year_FEMA	prop 02dec2015	5370.00	591.15	613.50		613.54	0.000067	1.94	3665.57	314.75	0.08
Main	218.070	100-Year_FEMA	exist 02dec2015	5370.00	591.15	613.50		613.54	0.000067	1.94	3665.57	314.75	0.08
Main	296.838	100-Year_FEMA	prop 02dec2015	5370.00	591.35	613.51		613.55	0.000064	1.82	4129.37	392.57	0.08
Main	296.838	100-Year_FEMA	exist 02dec2015	5370.00	591.35	613.51		613.55	0.000064	1.82	4129.37	392.57	0.08
Main	635.602	100-Year_FEMA	prop 02dec2015	5370.00	592.85	613.47		613.63	0.000314	3.47	2144.64	339.84	0.17
Main	635.602	100-Year_FEMA	exist 02dec2015	5370.00	592.85	613.47		613.63	0.000314	3.47	2144.64	339.84	0.17
Main	1056.034	100-Year_FEMA	prop 02dec2015	5370.00	594.65	613.55		613.83	0.000538	4.37	1468.07	340.24	0.22
Main	1056.034	100-Year_FEMA	exist 02dec2015	5370.00	594.65	613.55		613.83	0.000538	4.37	1468.07	340.24	0.22
Main	1178	100-Year_FEMA	prop 02dec2015	5370.00	595.22	613.60		613.91	0.000609	4.54	1408.98	330.49	0.23
Main	1178	100-Year_FEMA	exist 02dec2015	5370.00	595.22	613.60		613.91	0.000609	4.54	1408.98	330.49	0.23
Main	1179	100-Year_FEMA	prop 02dec2015	5370.00	595.22	613.60		613.91	0.000622	4.58	1327.43	255.49	0.23
Main	1179	100-Year_FEMA	exist 02dec2015	5370.00	595.22	613.60		613.91	0.000622	4.58	1327.43	255.49	0.23
Main	1291	100-Year_FEMA	prop 02dec2015	5370.00	595.74	613.66		613.99	0.000661	4.63	1335.77	256.51	0.24
Main	1291	100-Year_FEMA	exist 02dec2015	5370.00	595.74	613.66		613.99	0.000661	4.63	1335.77	256.51	0.24
Main	1292	100-Year_FEMA	prop 02dec2015	5370.00	595.74	613.67		613.99	0.000659	4.63	1364.86	321.51	0.24
Main	1292	100-Year_FEMA	exist 02dec2015	5370.00	595.74	613.67		613.99	0.000659	4.63	1364.86	321.51	0.24
Main	1320	100-Year_FEMA	prop 02dec2015	5370.00	595.88	613.68		614.01	0.000669	4.64	1354.94	306.97	0.24
Main	1320	100-Year_FEMA	exist 02dec2015	5370.00	595.88	613.68		614.01	0.000669	4.64	1354.94	306.97	0.24
Main	1321	100-Year_FEMA	prop 02dec2015	5370.00	595.88	613.68		614.01	0.000674	4.65	1307.76	232.13	0.24
Main	1321	100-Year_FEMA	exist 02dec2015	5370.00	595.88	613.68		614.01	0.000674	4.65	1307.76	232.13	0.24
Main	1420	100-Year_FEMA	prop 02dec2015	5370.00	596.33	613.75		614.08	0.000684	4.63	1329.05	234.34	0.24
Main	1420	100-Year_FEMA	exist 02dec2015	5370.00	596.33	613.75		614.08	0.000684	4.63	1329.05	234.34	0.24
Main	1421	100-Year_FEMA	prop 02dec2015	5370.00	596.33	613.76		614.08	0.000684	4.63	1341.24	268.73	0.24
Main	1421	100-Year_FEMA	exist 02dec2015	5370.00	596.33	613.76		614.08	0.000684	4.63	1341.24	268.73	0.24
Main	1465.82	100-Year_FEMA	prop 02dec2015	5370.00	596.55	613.79		614.11	0.000685	4.61	1339.80	253.13	0.24
Main	1465.82	100-Year_FEMA	exist 02dec2015	5370.00	596.55	613.79		614.11	0.000685	4.61	1339.80	253.13	0.24
Main	1466.821	100-Year_FEMA	prop 02dec2015	5370.00	596.55	613.79		614.11	0.000684	4.60	1337.92	238.01	0.24
Main	1466.821	100-Year_FEMA	exist 02dec2015	5370.00	596.55	613.79		614.11	0.000684	4.60	1337.92	238.01	0.24
Main	1526	100-Year_FEMA	prop 02dec2015	5370.00	596.67	613.85		614.15	0.000650	4.44	1355.17	251.81	0.24
Main	1526	100-Year_FEMA	exist 02dec2015	5370.00	596.67	613.85		614.15	0.000650	4.44	1355.17	251.81	0.24
Main	1527	100-Year_FEMA	prop 02dec2015	5370.00	596.67	613.85		614.15	0.000650	4.44	1355.35	251.85	0.24
Main	1527	100-Year_FEMA	exist 02dec2015	5370.00	596.67	613.85		614.15	0.000650	4.44	1355.35	251.85	0.24
Main	1871.080	100-Year_FEMA	prop 02dec2015	5370.00	597.35	614.14		614.38	0.000674	3.96	1391.13	213.13	0.24
Main	1871.080	100-Year_FEMA	exist 02dec2015	5370.00	597.35	614.14		614.38	0.000674	3.96	1391.13	213.13	0.24
Main	1942.119	100-Year_FEMA	prop 02dec2015	5370.00	597.35	614.12	605.64	614.50	0.000619	4.95	1085.35	90.43	0.24
Main	1942.119	100-Year_FEMA	exist 02dec2015	5370.00	597.35	614.12	605.64	614.50	0.000619	4.95	1085.35	90.43	0.24
Main	1957			Bridge									
Main	1966.160	100-Year_FEMA	prop 02dec2015	5370.00	598.15	614.40	605.86	614.78	0.000575	4.89	1097.63	93.41	0.23
Main	1966.160	100-Year_FEMA	exist 02dec2015	5370.00	598.15	614.40	605.86	614.78	0.000575	4.89	1097.63	93.41	0.23
Main	1987.938	100-Year_FEMA	prop 02dec2015	5370.00	598.15	614.59		614.83	0.000630	3.98	1540.49	245.51	0.23
Main	1987.938	100-Year_FEMA	exist 02dec2015	5370.00	598.15	614.59		614.83	0.000630	3.98	1540.49	245.51	0.23
Main	2014.297	100-Year_FEMA	prop 02dec2015	5370.00	599.15	614.53	607.32	614.93	0.000994	5.04	1065.04	113.34	0.29
Main	2014.297	100-Year_FEMA	exist 02dec2015	5370.00	599.15	614.53	607.32	614.93	0.000994	5.04	1065.04	113.34	0.29
Main	2026			Bridge									
Main	2044.24	100-Year_FEMA	prop 02dec2015	5370.00	600.02	614.56	608.79	615.06	0.001347	5.73	982.06	246.56	0.34
Main	2044.24	100-Year_FEMA	exist 02dec2015	5370.00	600.02	614.56	608.79	615.06	0.001347	5.73	982.06	246.56	0.34
Main	2072.501	100-Year_FEMA	prop 02dec2015	5370.00	600.15	614.60		615.12	0.001962	5.94	1020.48	200.49	0.39
Main	2072.501	100-Year_FEMA	exist 02dec2015	5370.00	600.15	614.60		615.12	0.001962	5.94	1020.48	200.49	0.39
Main	2119.035	100-Year_FEMA	prop 02dec2015	5370.00	600.15	614.38	610.99	615.41	0.004832	8.13	661.25	117.27	0.59
Main	2119.035	100-Year_FEMA	exist 02dec2015	5370.00	600.15	614.38	610.99	615.41	0.004832	8.13	661.25	117.27	0.59
Main	2466.98	100-Year_FEMA	prop 02dec2015	5370.00	600.52	615.70	610.21	616.49	0.001910	7.18	808.16	192.94	0.40
Main	2466.98	100-Year_FEMA	exist 02dec2015	5370.00	600.52	615.70	610.21	616.49	0.001910	7.18	808.16	192.94	0.40

HEC-RAS River Ackerman Creek Reach Main Profile 100-Year FEMA (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cnt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	2487.98	100-Year FEMA	prop 02dec2015	5370.00	600.52	615.70	610.21	616.49	0.001908	7.18	806.64	193.30	0.40
Main	2487.98	100-Year FEMA	exist 02dec2015	5370.00	600.52	615.70	610.21	616.49	0.001908	7.18	806.64	193.30	0.40
Main	2562	100-Year FEMA	prop 02dec2015	5370.00	600.85	616.11	609.67	616.63	0.001150	5.89	1049.76	245.81	0.31
Main	2562	100-Year FEMA	exist 02dec2015	5370.00	600.85	616.11	609.67	616.63	0.001150	5.89	1049.76	245.81	0.31
Main	2563	100-Year FEMA	prop 02dec2015	5370.00	600.85	616.11	609.68	616.63	0.001150	5.89	1050.11	245.86	0.31
Main	2563	100-Year FEMA	exist 02dec2015	5370.00	600.85	616.11	609.68	616.63	0.001150	5.89	1050.11	245.86	0.31
Main	2863.81	100-Year FEMA	prop 02dec2015	5370.00	602.22	616.69	607.81	616.81	0.000243	3.02	2503.42	431.13	0.15
Main	2863.81	100-Year FEMA	exist 02dec2015	5370.00	602.22	616.69	607.81	616.81	0.000243	3.02	2503.42	431.13	0.15
Main	2864.81	100-Year FEMA	prop 02dec2015	5370.00	602.22	616.69	607.80	616.81	0.000247	3.04	2247.82	300.90	0.15
Main	2864.81	100-Year FEMA	exist 02dec2015	5370.00	602.22	616.69	607.80	616.81	0.000247	3.04	2247.82	300.90	0.15
Main	2948	100-Year FEMA	prop 02dec2015	5370.00	602.82	616.66	609.35	616.86	0.000435	3.75	1844.90	298.52	0.20
Main	2948	100-Year FEMA	exist 02dec2015	5370.00	602.82	616.66	609.35	616.86	0.000435	3.75	1844.90	298.52	0.20
Main	2949	100-Year FEMA	prop 02dec2015	5370.00	602.82	616.66	609.35	616.86	0.000440	3.77	1962.10	402.97	0.20
Main	2949	100-Year FEMA	exist 02dec2015	5370.00	602.82	616.66	609.35	616.86	0.000440	3.77	1962.10	402.97	0.20
Main	3018	100-Year FEMA	prop 02dec2015	5370.00	603.33	616.62	610.64	616.93	0.000794	4.69	1482.69	362.40	0.26
Main	3018	100-Year FEMA	exist 02dec2015	5370.00	603.33	616.62	610.64	616.93	0.000794	4.69	1482.69	362.40	0.26
Main	3201.89	100-Year FEMA	prop 02dec2015	5370.00	604.68	616.29	614.04	617.50	0.004827	8.80	610.13	90.40	0.60
Main	3201.89	100-Year FEMA	exist 02dec2015	5370.00	604.68	616.29	614.04	617.50	0.004827	8.80	610.13	90.40	0.60
Main	3202.89	100-Year FEMA	prop 02dec2015	5370.00	604.68	616.30	614.04	617.50	0.004816	8.79	610.62	90.42	0.60
Main	3202.89	100-Year FEMA	exist 02dec2015	5370.00	604.68	616.30	614.04	617.50	0.004816	8.79	610.62	90.42	0.60
Main	3268	100-Year FEMA	prop 02dec2015	5370.00	605.35	616.76	614.16	617.88	0.004095	8.52	630.54	88.12	0.56
Main	3268	100-Year FEMA	exist 02dec2015	5370.00	605.35	616.76	614.16	617.88	0.004095	8.52	630.54	88.12	0.56
Main	3269	100-Year FEMA	prop 02dec2015	5370.00	605.35	616.76	614.17	617.89	0.004086	8.51	631.04	88.13	0.56
Main	3269	100-Year FEMA	exist 02dec2015	5370.00	605.35	616.76	614.17	617.89	0.004086	8.51	631.04	88.13	0.56
Main	3312	100-Year FEMA	prop 02dec2015	5370.00	606.60	617.37		617.99	0.001502	6.32	849.36	109.09	0.40
Main	3312	100-Year FEMA	exist 02dec2015	5370.00	606.60	617.37		617.99	0.001502	6.32	849.36	109.09	0.40
Main	3346	100-Year FEMA	prop 02dec2015	5370.00	604.09	617.66		618.05	0.000779	5.05	1063.40	116.31	0.29
Main	3378	100-Year FEMA	prop 02dec2015	5370.00	604.15	617.68		618.08	0.000786	5.06	1060.65	116.43	0.30
Main	3383	100-Year FEMA	prop 02dec2015	5370.00	604.16	617.68		618.08	0.000791	5.08	1057.23	116.02	0.30
Main	3407	100-Year FEMA	exist 02dec2015	5370.00	606.27	617.29	614.42	618.33	0.003539	8.20	655.00	86.82	0.53
Main	3408	100-Year FEMA	exist 02dec2015	5370.00	606.27	617.29	614.41	618.33	0.003534	8.19	655.37	86.83	0.53
Main	3419	100-Year FEMA	prop 02dec2015	5370.00	605.91	617.54		618.20	0.001557	6.50	826.72	104.46	0.41
Main	3424	100-Year FEMA	prop 02dec2015	5370.00	606.16	617.51		618.22	0.001781	6.80	790.03	102.28	0.43
Main	3432	100-Year FEMA	prop 02dec2015	5370.00	604.16	617.64		618.25	0.001346	6.27	856.46	101.39	0.38
Main	3433.40	100-Year FEMA	exist 02dec2015	5370.00	606.47	617.40	614.46	618.42	0.003456	8.13	660.80	86.76	0.52
Main	3440	100-Year FEMA	prop 02dec2015	5370.00	604.16	617.65		618.26	0.001341	6.26	857.83	101.57	0.38
Main	3444	100-Year FEMA	prop 02dec2015	5370.00	606.16	617.58		618.29	0.001739	6.78	792.30	102.00	0.43
Main	3449	100-Year FEMA	prop 02dec2015	5370.00	606.41	617.56		618.31	0.001877	6.95	772.39	101.44	0.44
Main	3479	100-Year FEMA	prop 02dec2015	5370.00	607.91	617.40		618.49	0.003284	8.38	640.83	97.31	0.58
Main	3484	100-Year FEMA	prop 02dec2015	5370.00	608.16	617.38		618.52	0.003556	8.58	626.24	97.65	0.60
Main	3485.48	100-Year FEMA	exist 02dec2015	5370.00	610.00	617.36	617.36	619.75	0.015020	12.39	433.40	90.43	1.00
Main	3488.01	100-Year FEMA	exist 02dec2015	5370.00	611.25	619.58	619.58	621.80	0.015367	11.95	449.20	101.78	1.00
Main	3490.54	100-Year FEMA	exist 02dec2015	5370.00	611.54	620.63	619.31	621.92	0.006567	9.12	588.70	178.92	0.69
Main	3492	100-Year FEMA	prop 02dec2015	5370.00	606.16	617.79		618.58	0.002086	7.15	755.76	118.53	0.46
Main	3501	100-Year FEMA	prop 02dec2015	5370.00	606.16	617.85		618.60	0.001936	6.97	778.70	139.81	0.45
Main	3504.24	100-Year FEMA	exist 02dec2015	5370.00	613.00	620.96	619.33	622.02	0.005169	8.28	648.21	172.51	0.62
Main	3505	100-Year FEMA	prop 02dec2015	5370.00	606.16	617.75		618.66	0.002661	7.66	704.95	139.81	0.52
Main	3606.24	100-Year FEMA	exist 02dec2015	5370.00	619.00	620.06	619.34	622.03	0.005147	8.27	648.00	172.07	0.62

HEC-RAS River Ackerman Creek Reach Main Profile 100-Year FEMA (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cnt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3510	100-Year FEMA	prop 02dec2015	5370.00	608.41	617.71		618.69	0.002863	7.93	681.34	139.80	0.55
Main	3540	100-Year FEMA	prop 02dec2015	5370.00	609.91	617.23	616.87	619.09	0.007810	10.93	491.16	96.77	0.86
Main	3545	100-Year FEMA	prop 02dec2015	5370.00	610.18	616.94	616.92	619.29	0.011012	12.30	436.71	93.48	1.00
Main	3551	100-Year FEMA	prop 02dec2015	5370.00	608.16	616.40		619.45	0.003157	8.27	674.03	139.79	0.57
Main	3560	100-Year FEMA	prop 02dec2015	5370.00	608.16	616.43		619.48	0.003121	8.25	677.44	140.15	0.56
Main	3584	100-Year FEMA	prop 02dec2015	5370.00	610.18	618.18		619.62	0.005200	9.67	574.56	140.15	0.71
Main	3589	100-Year FEMA	prop 02dec2015	5370.00	610.41	618.08	617.22	619.71	0.006366	10.34	537.59	140.15	0.78
Main	3578.30	100-Year FEMA	exist 02dec2015	5370.00	612.00	621.67	619.40	622.43	0.003138	7.11	798.29	618.58	0.50
Main	3587	100-Year FEMA	exist 02dec2015	5370.00	613.00	621.60	619.93	622.52	0.004289	7.83	746.71	642.63	0.57
Main	3597	100-Year FEMA	prop 02dec2015	5370.00	611.80	616.60	618.80	621.03	0.010023	12.04	459.71	109.67	0.96
Main	3602	100-Year FEMA	prop 02dec2015	5370.00	612.16	619.07	619.07	621.18	0.009469	11.80	478.41	122.92	0.94
Main	3610	100-Year FEMA	prop 02dec2015	5370.00	610.02	620.39		621.34	0.002844	7.96	725.71	143.50	0.54
Main	3617	100-Year FEMA	prop 02dec2015	5370.00	610.02	620.45		621.36	0.002726	7.81	740.12	140.48	0.53
Main	3621	100-Year FEMA	prop 02dec2015	5370.00	612.16	620.37		621.41	0.003693	8.45	691.29	140.90	0.61
Main	3626	100-Year FEMA	prop 02dec2015	5370.00	612.31	620.30		621.47	0.004254	8.84	649.90	137.65	0.65
Main	3647	100-Year FEMA	exist 02dec2015	5370.00	614.00	621.98	620.15	622.77	0.003773	7.36	863.99	711.93	0.53
Main	3647.25	100-Year FEMA	exist 02dec2015	5370.00	614.00	621.98	620.15	622.78	0.003770	7.36	864.32	711.99	0.53
Main	3658	100-Year FEMA	exist 02dec2015	5370.00	613.83	622.09	620.00	622.82	0.003355	7.05	908.42	726.53	0.51
Main	3660	100-Year FEMA	prop 02dec2015	5370.00	613.43	620.11	620.11	622.18	0.009820	11.69	481.41	123.51	0.95
Main	3665	100-Year FEMA	prop 02dec2015	5370.00	613.59	620.33	620.33	622.39	0.009533	11.68	487.60	126.44	0.94
Main	3690	100-Year FEMA	exist 02dec2015	5370.00	613.33	622.26	620.09	622.93	0.003122	6.74	957.78	764.31	0.49
Main	3691	100-Year FEMA	exist 02dec2015	5370.00	613.33	622.27	620.09	622.93	0.003112	6.73	959.12	452.60	0.49
Main	3700	100-Year FEMA	prop 02dec2015	5370.00	613.80	621.46		622.72	0.005908	9.01	597.44	129.55	0.73
Main	3755.59	100-Year FEMA	prop 02dec2015	5370.00	614.30	622.16	620.52	623.05	0.004758	7.66	766.59	235.39	0.58
Main	3755.59	100-Year FEMA	exist 02dec2015	5370.00	614.30	622.40	620.52	623.20	0.004030	7.26	825.56	272.23	0.54
Main	3829	100-Year FEMA	prop 02dec2015	5370.00	614.26	622.56	620.91	623.40	0.004493	7.44	842.00	410.38	0.57
Main	3829	100-Year FEMA	exist 02dec2015	5370.00	614.26	622.75	620.91	623.50	0.003910	7.10	918.32	434.48	0.54
Main	3830	100-Year FEMA	prop 02dec2015	5370.00	614.26	622.61	620.91	623.40	0.004257	7.28	928.65	678.52	0.56
Main	3830	100-Year FEMA	exist 02dec2015	5370.00	614.26	622.84	620.91	623.51	0.003483	6.78	1067.05	742.60	0.51
Main	3859	100-Year FEMA	prop 02dec2015	5370.00	614.25	622.87	621.06	623.53	0.003625	6.79	1074.50	718.29	0.52
Main	3859	100-Year FEMA	exist 02dec2015	5370.00	614.25	623.03	621.06	623.61	0.003149	6.45	1168.04	730.56	0.48
Main	3992.67	100-Year FEMA	prop 02dec2015	5370.00	614.18	623.55	622.08	623.97	0.002616	5.71	1343.30	622.41	0.44
Main	3992.67	100-Year FEMA	exist 02dec2015	5370.00	614.18	623.60	622.08	624.00	0.002494	5.61	1371.86	624.59	0.43
Main	3993.67	100-Year FEMA	prop 02dec2015	5370.00	614.18	623.55	622.08	623.97	0.002608	5.70	1345.18	543.56	0.44
Main	3993.67	100-Year FEMA	exist 02dec2015	5370.00	614.18	623.60	622.08	624.01	0.002486	5.61	1373.65	545.72	0.43
Main	4096	100-Year FEMA	prop 02dec2015	5370.00	614.95	623.76		624.23	0.002239	5.98	1272.17	426.61	0.41
Main	4096	100-Year FEMA	exist 02dec2015	5370.00	614.95	623.80		624.26	0.002172	5.92	1290.07	428.18	0.41
Main	4097	100-Year FEMA	prop 02dec2015	5370.00	614.95	623.80		624.24	0.002121	5.84	1348.47	481.89	0.40
Main	4097	100-Year FEMA	exist 02dec2015	5370.00	614.95	623.84		624.27	0.002055	5.78	1368.68	483.46	0.40
Main	4134.83	100-Year FEMA	prop 02dec2015	5370.00	615.27	623.84		624.33	0.002178	6.14	1269.38	422.95	0.41
Main	4134.83	100-Year FEMA	exist 02dec2015	5370.00	615.27	623.88		624.36	0.002122	6.09	1285.91	427.33	0.41
Main	4277.55	100-Year FEMA	prop 02dec2015	5370.00	614.99	624.05		624.75	0.002923	6.93	908.41	230.08	0.48
Main	4277.55	100-Year FEMA	exist 02dec2015	5370.00	614.99	624.08		624.77	0.002873	6.89	915.23	230.86	0.47

Ackerman.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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PROJECT DATA

Project Title: Ackerman Creek

Project File : Ackerman.prj

Run Date and Time: 1/18/2016 10:25:51 AM

Project in English units

Project Description:

Date: October 6, 2008

SHG Ref: 05-471

KUNZLER

Steady Model Created by: MBK updated by SHG

Unsteady Model Created

by: SH+G

Modeled by: B.M.S.

Notes:

1. Steady Model

originally created by MBK.

2. 100 day/yr flow estimated from exceedence

probability calculated for USGS gage Russian River near Hopland (#11462500).

The Ukiah gage would not incorporate the releases from Lake Mendocino.

3. 2

year Russian River flows calculated from Regression of Hopland gage data.

Ukiah gage produced too large of values and does not have the effects of the

dam at lake mendocino. 2-year Ackerman Creek flow was calculated using

Regional Regression Equations.

4. Unsteady flow hydrograph taken from Dec

2005-Jan 2006 Flood which was then scaled so that the 2005-2006 flood

hydrograph peak matches the peak flows published by FEMA for the 10-yr, 50-yr,

or 100-yr discharges. Used ukiah gage data because of the steeper peak which

will be a more conservative design for fuseplug overtopping.

5. Existing

geometry updated to add cross section surveyed by SHN in May 2007.

6. When comparing to FEMA data there is an approx. elevation datum difference of 2.85 ft. (NGVD 29 to NAVD 88)
7. Model was calibrated to the 2006 flood high water marks surveyed by SHN. Model was calibrated closely to the high water mark at the confluence of Ackerman because this is near the location of the fuse plug and low point along the Russian River.
8. Hydrology was adjusted following Options 2 and 3 hydraulic report to remove flows pre 1960 (dam construction) that were used in the hydrologic analysis. Flows for the 2-yr flood were impacted most significantly.
9. Peak flows for the 10-yr and 20-yr events were calculated from the Hopland gage data and adjusted for drainage area. the 10-yr and 20-yr Ackerman Flow was scaled by the ratio of the FEMA 10-yr flows.

PLAN DATA

Plan Title: existing 02dec2015

Plan File : e:\2007 projects\Ackerman (Avila)\HEC RAS\Ackerman.p21

Geometry Title: Ackerman Creek_existing 02dec2015

Geometry File : e:\2007 projects\Ackerman (Avila)\HEC RAS\Ackerman.g20

Flow Title : Steady Flows RR influence

Flow File : e:\2007 projects\Ackerman (Avila)\HEC RAS\Ackerman.f07

Plan Summary Information:

Number of: Cross Sections = 64 Multiple Openings = 0

Culverts = 0 Inline Structures = 0

Bridges = 3 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01

Critical depth calculation tolerance = 0.01

Maximum number of iterations = 20

Maximum difference tolerance = 0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Ackerman.rep

Flow Title: Steady Flows RR influence

Flow File : e:\2007 projects\Ackerman (Avila)\HEC RAS\Ackerman.f07

Flow Data (cfs)

River	Reach	RS	10-Year_FEMA	50-Year_FEMA	100-Year_FEMA	500-Year_FEMA
Ackerman Creek	Main	4277.55	3190	4800	5370	7000
Ackerman Creek	Main	2119.035	3190	4800	5370	7000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Ackerman Creek	Main	10-Year_FEMA	Normal S = 0.003	Known WS = 609.8
Ackerman Creek	Main	50-Year_FEMA	Normal S = 0.003	Known WS = 612.8
Ackerman Creek	Main	100-Year_FEMA	Normal S = 0.003	Known WS = 613.5
Ackerman Creek	Main	500-Year_FEMA	Normal S = 0.003	Known WS = 615.4

Observed Water Surface Marks

River	Reach	RS	10-Year_FEMA	50-Year_FEMA	100-Year_FEMA	500-Year_FEMA
Ackerman Creek	Main	1942.119	613.35	615.55	616.45	
Ackerman Creek	Main	1466.821				
Russian River	Downstream	73815.98	612.6	615.6	616.4	
Russian River	Downstream	73497.50				
Russian River	Downstream	71967.72	605.85	607.85	608.85	
Russian River	Downstream	70044				

GEOMETRY DATA

Geometry Title: Ackerman Creek_existing 02dec2015

Geometry File : e:\2007 projects\Ackerman (Avila)\HEC RAS\Ackerman.g20

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 4277.55

INPUT

Description:

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	631.39	46.47	626.94	89.95	622.32	110.73	614.99	118.27	615.48
121.96	617.42	142.84	615.57	172.9	617.56	199.96	620.98	233.31	621.12
276.51	625.36	288.03	623.69	326.04	622.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-----	-------	-----	-------	-----	-------

Ackerman.rep

0 .06 89.95 .04 199.96 .06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	89.95	199.96		142.72	142.72	142.72	.1	.3

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 4134.83

INPUT

Description:

Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-278.53	636.44	-119.72	626.76	-94	624.78	-91.7	622.63	-84.7	623.05
-16.8	622.22	0	622.26	25.9	623.84	42.68	624.02	51.26	622.99
62.45	615.27	75.79	616.45	97.96	617.13	136.76	616.44	148.11	615.35
154.66	620.47	163.33	621.36	176.34	623.39	193.03	622.19	218.28	621.23
244.76	620.72	261.76	621.34	288.56	623.39	304.86	619.53	392.06	628.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-278.53	.06	51.26	.04	154.66	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	51.26	154.66		37.83	37.83	37.83	.1	.3

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 4097

INPUT

Description:

Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-298.1	634.89	-263.91	632.62	-174.03	627.97	-154.39	627.03	-152.5	626.29
-135.02	625.53	-108.61	624.11	-106.25	622.58	-99.06	622.87	-65.14	622.55
-29.33	622.31	-12.08	622.37	14.51	623.53	27.17	623.64	31.74	623.96
33.06	623.93	40.55	623.06	54.02	614.95	62.66	615.47	68.71	616.36
69.5	616.45	77.37	616.69	84.37	617.28	93.13	617.47	95.32	617.45
105.08	617.15	135.86	617.39	143.72	617.06	148.37	617.07	155.58	621.16
165.75	621.61	174.22	622.27	181.01	622.93	193.21	622.45	200.59	622.09
230.21	621.29	253.84	620.92	261.27	620.85	281.21	621.35	312.65	622.9
331.68	620.23	331.77	620.22	434.06	628.03				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-298.1	.06	40.55	.04	155.58	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	40.55	155.58		1	1	1	.1	.3

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 4096

INPUT

Description:

Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-298.1	634.89	-263.91	632.62	-174.03	627.97	-154.39	627.03	-152.5	626.29
-135.02	625.53	-108.61	624.11	-106.25	622.58	-99.06	622.87	-65.14	622.55
-29.33	622.31	-12.08	622.37	14.51	623.53	27.17	623.64	31.74	623.96
33.06	623.93	40.55	623.06	54.02	614.95	62.66	615.47	68.71	616.36
69.5	616.45	77.37	616.69	84.37	617.28	93.13	617.47	95.32	617.45
105.08	617.15	135.86	617.39	143.72	617.06	148.37	617.07	155.58	621.16
165.75	621.61	174.22	622.27	181.01	622.93	193.21	622.45	200.59	622.09
230.21	621.29	253.84	620.92	261.27	620.85	281.21	621.35	312.65	622.9
331.68	620.23	331.77	620.22	434.06	628.03				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-298.1	.06	40.55	.04	155.58	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	40.55	155.58	102.33	102.33	102.33	.1	.3	

Blocked Obstructions num= 1

Sta L	Sta R	Elev
-103	-49	635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3993.67

INPUT

Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-346.19	631.07	-309.8	628.21	-214.14	625.26	-193.24	624.87	-191.22	622.57
-98.24	622.33	0	622.84	6.27	624.08	14.25	623.23	33.3	614.18
43.9	614.27	52.29	616.39	61.94	616.68	70.52	618.25	83.95	618.32
95.91	617.66	143.3	620.27	157.84	622.86	183.24	621.72	209.11	621.96
291.72	621.1	397.78	621.9	537.28	627.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-346.19	.06	14.25	.04	157.84	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	14.25	157.84	1	1	1	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-346.19	-91.42	630	F

Blocked Obstructions num= 1
 Sta L Sta R Elev
 -184 -105 635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 3992.67

INPUT

Description:

Station Elevation Data num= 23
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 -346.19 631.07 -309.8 628.21 -214.14 625.26 -193.24 624.87 -191.22 622.57
 -98.24 622.33 0 622.84 6.27 624.08 14.25 623.23 33.3 614.18
 43.9 614.27 52.29 616.39 61.94 616.68 70.52 618.25 83.95 618.32
 95.91 617.66 143.3 620.27 157.84 622.86 183.24 621.72 209.11 621.96
 291.72 621.1 397.78 621.9 537.28 627.6

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -346.19 .06 14.25 .04 157.84 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 14.25 157.84 133.67 133.67 133.67 .1 .3

Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 -346.19 -91.42 630 F

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 3859

INPUT

Description:

Station Elevation Data num= 45
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 -344.59 628.4 -308.39 626.78 -293.92 626.51 -225.99 624.32 -213.21 623.97
 -207.1 623.83 -192.42 623.84 -191.39 623.33 -190.41 622.83 -97.91 622.33
 -18.71 622.18 -.17 622.04 .13 622.06 6.07 622.59 14.01 622.22
 24.7 619.32 30.05 617.08 50.06 614.25 58.47 616.54 58.94 616.73
 65.13 617.14 72.79 616.7 79.6 616.88 86.14 616.41 90.26 616.45
 99.76 616.23 114.24 616.78 118.41 618.9 124.27 619.23 136.8 618.75
 137.38 618.85 148.92 621.78 183.75 621.5 184.37 621.51 190.71 621.6
 215.81 622.48 219.23 622.48 313.88 621.84 332.52 621.85 336.77 621.88
 477.98 622.22 572.7 623.46 616.76 624.38 649 624.75 669.29 624.87

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -344.59 .06 14.01 .04 148.92 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

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14.01 148.92 29 29 29 .1 .3

Ineffective Flow num= 1

Sta L Sta R Elev Permanent

-344.59 -63.45 630 F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3830

INPUT

Description:

Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-344.22	627.78	-308.06	626.45	-293.61	626.22	-225.76	624.01	-213	623.67
-206.89	623.53	-192.23	623.6	-191.2	623.24	-190.22	622.89	-97.83	622.33
-18.73	622.05	-.21	621.85	.09	621.87	6.02	622.24	13.95	621.98
25.82	619.04	31.76	616.59	53.97	614.26	61.88	617.07	62.32	617.27
68.13	617.32	75.33	616.7	81.73	616.56	87.87	615.97	91.74	616.02
100.66	615.9	114.26	616.34	118.18	618.89	123.68	619.2	135.45	618.4
135.99	618.52	146.83	621.53	183.87	621.45	184.53	621.46	191.28	621.56
217.95	622.61	221.6	622.6	322.24	621.98	342.06	622.03	346.57	622.06
496.72	622.29	597.43	623.17	644.29	623.99	678.56	624.23	700.14	624.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-344.22	.06	13.95	.04	146.83	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	13.95	146.83		1	1	1	.1	.3	

Ineffective Flow num= 1

Sta L Sta R Elev Permanent

-344.22 -56.6 630 F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3829

INPUT

Description:

Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-344.22	627.78	-308.06	626.45	-293.61	626.22	-225.76	624.01	-213	623.67
-206.89	623.53	-192.23	623.6	-191.2	623.24	-190.22	622.89	-97.83	622.33
-18.73	622.05	-.21	621.85	.09	621.87	6.02	622.24	13.95	621.98
25.82	619.04	31.76	616.59	53.97	614.26	61.88	617.07	62.32	617.27
68.13	617.32	75.33	616.7	81.73	616.56	87.87	615.97	91.74	616.02
100.66	615.9	114.26	616.34	118.18	618.89	123.68	619.2	135.45	618.4
135.99	618.52	146.83	621.53	183.87	621.45	184.53	621.46	191.28	621.56
217.95	622.61	221.6	622.6	322.24	621.98	342.06	622.03	346.57	622.06
496.72	622.29	597.43	623.17	644.29	623.99	678.56	624.23	700.14	624.23

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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-344.22	.06	13.95	.04	146.83	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	13.95	146.83		73.41	73.41	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-344.22	-56.6	630	F

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
-153	-1	635	420	657	635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3755.59

INPUT

Description:

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-343.32	626.28	-307.26	625.65	-292.86	625.52	-225.2	623.26	-206.39	622.79
-190.74	623.04	-18.77	621.74	0	621.4	13.82	621.41	28.51	618.35
35.87	615.4	63.37	614.3	70.42	618.57	92.01	614.92	114.31	615.28
117.62	618.86	122.27	619.13	132.21	617.57	141.83	620.92	184.91	621.34
192.62	621.46	223.11	622.91	342.29	622.32	370.1	622.48	656.79	622.46
710.34	623.06	749.51	622.97	774.17	622.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-343.32	.06	13.82	.04	141.83	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	13.82	141.83		64.59	64.59	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-343.32	-39.78	630	F
380.33	774.17	630	F

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
376	632	635	-181	-28	635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3691

INPUT

Description:

Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-339.76	626.36	-301.85	625.59	-299.69	625.55	-287.26	624.61	-286.71	624.6

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-275.6 624.39 -265.74 624.19 -247.96 623.8 -215.57 623.16 -206.39 623.02
-195.79 622.85 -187.42 622.91 -179.34 622.96 -168.11 622.89 -143.08 622.68
-117.09 622.4 -113.37 622.41 -101.06 622.67 -79.24 622.6 -61.52 622.16
-24.92 621.5 -7.85 621.18 1.47 621.12 21.2 620.86 35.74 620.82
45.37 619.19 49.84 618.38 53.2 617.39 56.9 616.19 58.29 616.04
62.77 615.51 66.11 615.01 68.42 614.53 83.3 613.33 86.76 613.33
93.48 616.35 97.09 616.27 114.04 614.83 121.49 615.03 134.83 615.58
135.29 615.6 138.44 617.78 142.87 618.08 147.26 617.81 151.26 617.85
152.34 617.8 161.5 620.11 188.2 620.5 198.09 620.65 204.64 620.78
211.55 621.07 221.34 621.39 230.54 621.68 265.08 621.57 289.91 621.48
331.77 621.41 355.39 621.54 556.72 621.85 598.9 621.84 644.38 622.19
677.65 622.14 698.6 621.98

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-339.76 .06 35.74 .04 161.5 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
35.74 161.5 1 1 1 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
-339.76 -6.8 630 F
299.04 698.6 630 F

Blocked Obstructions num= 2
Sta L Sta R Elev Sta L Sta R Elev
354 630 635 -182 -30 635

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 3690

INPUT

Description:

Station Elevation Data num= 62
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
-339.76 626.36 -301.85 625.59 -299.69 625.55 -287.26 624.61 -286.71 624.6
-275.6 624.39 -265.74 624.19 -247.96 623.8 -215.57 623.16 -206.39 623.02
-195.79 622.85 -187.42 622.91 -179.34 622.96 -168.11 622.89 -143.08 622.68
-117.09 622.4 -113.37 622.41 -101.06 622.67 -79.24 622.6 -61.52 622.16
-24.92 621.5 -7.85 621.18 1.47 621.12 21.2 620.86 35.74 620.82
45.37 619.19 49.84 618.38 53.2 617.39 56.9 616.19 58.29 616.04
62.77 615.51 66.11 615.01 68.42 614.53 83.3 613.33 86.76 613.33
93.48 616.35 97.09 616.27 114.04 614.83 121.49 615.03 134.83 615.58
135.29 615.6 138.44 617.78 142.87 618.08 147.26 617.81 151.26 617.85
152.34 617.8 161.5 620.11 188.2 620.5 198.09 620.65 204.64 620.78
211.55 621.07 221.34 621.39 230.54 621.68 265.08 621.57 289.91 621.48
331.77 621.41 355.39 621.54 556.72 621.85 598.9 621.84 644.38 622.19
677.65 622.14 698.6 621.98

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-339.76 .06 35.74 .04 161.5 .06

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Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	35.74	161.5	32	32	32	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-339.76	-6.8	630	F
299.04	698.6	630	F

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 3658

INPUT

Description:

Station Elevation Data num= 118

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-337.93	626.4	-299.44	625.57	-298.94	625.56	-297.25	625.52	-296.72	625.5
-284.63	624.2	-284.07	624.15	-283.95	624.14	-283.37	624.13	-272.79	624
-271.95	623.99	-262.78	623.85	-261.81	623.84	-244.72	623.57	-243.52	623.55
-211.83	623.12	-210.22	623.1	-202.51	623.02	-200.78	623	-191.75	622.89
-189.89	622.88	-183.25	622.9	-181.27	622.91	-175.05	622.92	-172.96	622.91
-163.65	622.86	-161.42	622.85	-138.23	622.64	-135.68	622.62	-111.84	622.32
-108.95	622.3	-108.06	622.3	-105.12	622.34	-95.56	622.68	-92.47	622.77
-73.41	622.75	-70.04	622.73	-55.42	622.24	-51.81	622.12	-18.25	621.35
-14.17	621.26	-.92	620.95	3.38	620.86	8.54	620.82	12.97	620.78
28.57	620.61	33.26	620.57	43.34	620.52	52.16	619.3	54.89	618.91
56.25	618.7	59.33	618.13	62.03	617.61	62.72	617.4	63.99	617.08
65.48	616.71	68.1	616.04	68.81	615.85	71.16	615.08	71.42	614.99
73.27	614.79	86.9	613.83	97.11	613.83	102.55	615.33	106.08	616.08
108.59	616.08	109.63	615.33	110.96	614.58	112.84	613.83	119.25	613.83
120.77	613.83	124.42	614.81	126.38	614.91	133.21	615.05	135.59	615.18
139.64	615.6	141.32	615.79	145.3	616.61	146.89	616.96	147.14	617.01
148.85	617.9	149.09	617.95	151.25	618.49	152.55	618.73	153.64	618.79
155.81	618.99	156.4	619.02	161.37	620.03	176.16	620.01	186.95	620.19
194.74	620.31	196.42	620.34	202.7	620.46	204.07	620.5	209.31	620.64
210.24	620.66	216.75	620.89	218.69	620.95	225.98	621.14	227.5	621.18
234.66	621.31	260.59	621.24	267.22	621.22	284.37	621.17	290.62	621.16
324.47	621.13	330.08	621.14	347.09	621.23	352.33	621.26	539.94	621.66
542.12	621.66	580.34	621.66	581.87	621.66	623.91	621.92	624.74	621.93
655.78	621.89	656.1	621.89	675.84	621.77				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-337.93	.06	43.34	.04	161.37	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	43.34	161.37	10.75	10.75	10.75	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-337.93	16.85	630	F
279.79	675.84	630	F

CROSS SECTION

Ackerman.rep

RIVER: Ackerman Creek

REACH: Main RS: 3647.25

INPUT

Description:

Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-337.32	626.42	-298.13	625.55	-295.9	625.5	-283.06	623.98	-282.48	623.98
-271	623.86	-260.81	623.73	-242.43	623.47	-208.96	623.09	-199.47	623
-188.52	622.89	-179.86	622.9	-171.51	622.9	-159.91	622.84	-134.04	622.61
-107.17	622.26	-103.32	622.3	-90.61	622.81	-68.06	622.8	-49.74	622.13
-11.91	621.2	5.73	620.76	15.37	620.69	35.76	620.48	45.89	620.42
57.09	619	64.01	618	67.35	617	70.58	616	73.11	615
88.11	614	101.4	614	108.48	616	113.08	617	116.34	617
117.7	616	119.42	615	121.87	614	130.22	614	132.2	614
141.12	615	146.94	616	149.8	617	152.52	618	155	619
161.33	620	175.9	619.9	194.2	620.21	203.4	620.38	209.48	620.51
215.89	620.75	224.98	620.98	233.53	621.19	265.61	621.11	288.67	621.05
327.54	621.04	349.47	621.16	536.45	621.6	575.61	621.6	617.85	621.84
648.75	621.81	668.2	621.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-337.32	.06	45.89	.04	161.33	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
45.89	161.33		.25	.25	.25	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-337.32	26.13	630	F
274.22	668.2	630	F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3647

INPUT

Description:

Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-337.32	626.42	-298.13	625.55	-295.9	625.5	-283.06	623.98	-282.48	623.98
-271	623.86	-260.81	623.73	-242.43	623.47	-208.96	623.09	-199.47	623
-188.52	622.89	-179.86	622.9	-171.51	622.9	-159.91	622.84	-134.04	622.61
-107.17	622.26	-103.32	622.3	-90.61	622.81	-68.06	622.8	-49.74	622.13
-11.91	621.2	5.73	620.76	15.37	620.69	35.76	620.48	45.89	620.42
57.09	619	64.01	618	67.35	617	70.58	616	73.11	615
88.11	614	101.4	614	108.48	616	113.08	617	116.34	617
117.7	616	119.42	615	121.87	614	130.22	614	132.2	614
141.12	615	146.94	616	149.8	617	152.52	618	155	619
161.33	620	175.9	619.9	194.2	620.21	203.4	620.38	209.48	620.51
215.89	620.75	224.98	620.98	233.53	621.19	265.61	621.11	288.67	621.05
327.54	621.04	349.47	621.16	536.45	621.6	575.61	621.6	617.85	621.84

Ackerman.rep

648.75 621.81 668.2 621.7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-337.32	.06	45.89	.04	161.33	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	45.89	161.33	60	60	60	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-337.32	26.13	630	F
274.22	668.2	630	F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3587

INPUT

Description:

Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-334.93	626.48	-294.5	625.51	-292.19	625.45	-278.94	623.36	-278.35	623.36
-266.5	623.34	-255.98	623.28	-237.03	623.15	-202.49	623.02	-192.69	622.99
-181.4	622.93	-172.47	622.89	-163.85	622.85	-151.88	622.79	-125.18	622.54
-97.46	622.13	-93.49	622.19	-80.37	622.94	-57.11	622.99	-38.21	622.11
.83	620.92	19.03	620.34	28.97	620.27	50.01	620.12	65.51	620.01
74.6	619	78.81	618.43	81.99	617.99	85.48	617.26	85.65	617.2
86.88	617	90.97	616	94.52	615	97.1	614	109.6	613
117.77	613	127.47	614	143.33	615	159.27	616	165.77	617
170.68	618	178.18	619	186.26	620	192.86	619.5	203.5	619.75
211.6	619.95	216.95	620.09	222.61	620.27	230.62	620.35	238.15	620.43
266.42	620.4	286.74	620.38	320.99	620.47	340.32	620.57	505.09	621.21
539.6	621.21	576.83	621.3	604.05	621.29	621.2	621.25		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-334.93	.06	65.51	.04	186.26	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	65.51	186.26	10.7	10.7	10.7	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-334.93	72.72	630	F
239.53	621.2	630	F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3576.30

INPUT

Description:

Ackerman.rep

Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-334.88	626.48	-292.12	625.45	-278.86	623.35	-266.41	623.33	-255.89	623.27
-236.92	623.14	-192.56	622.99	-172.32	622.89	-151.72	622.79	-125.01	622.54
-97.27	622.13	-93.3	622.19	-80.17	622.94	-56.89	622.99	-37.98	622.11
1.08	620.91	19.29	620.33	65.8	620	74.88	619	82.27	618
87.07	617	91.29	616	94.44	615	96.62	614	110.65	612
118.85	612	128.47	614	151.21	615	163.64	616	175.22	617
178.95	618	188.49	619	208.69	619.5	226.36	620	233.77	620
266.87	620	285.66	620	487.56	621	594.92	621		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-334.88	.06	65.8	.04	188.49	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	65.8	188.49		71.06	71.06	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-334.88	73.54	629.25	F
216.39	594.92	629.25	F

BRIDGE

RIVER: Ackerman Creek

REACH: Main RS: 3557

INPUT

Description: N. State Bridge

Distance from Upstream XS = 19.1

Deck/Roadway Width = 34

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 23			
Sta	Hi	Cord	Lo Cord
-328.38	626	600	-298.65
-170.97	623.51	600	-99.23
-24.07	626	600	12.41
73.54	628.76	626.1	94.79
162.28	629.24	626.58	190.84
218.26	628.72	600	249.76
348.96	626	600	389.63
502.31	623	600	594.92

Upstream Bridge Cross Section Data

Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-334.88	626.48	-292.12	625.45	-278.86	623.35	-266.41	623.33	-255.89	623.27
-236.92	623.14	-192.56	622.99	-172.32	622.89	-151.72	622.79	-125.01	622.54
-97.27	622.13	-93.3	622.19	-80.17	622.94	-56.89	622.99	-37.98	622.11
1.08	620.91	19.29	620.33	65.8	620	74.88	619	82.27	618
87.07	617	91.29	616	94.44	615	96.62	614	110.65	612
118.85	612	128.47	614	151.21	615	163.64	616	175.22	617
178.95	618	188.49	619	208.69	619.5	226.36	620	233.77	620

266.87 620 285.66 620 487.56 621 594.92 621

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-334.88	.06	65.8	.04	188.49	.06

Bank Sta: Left Right Coeff Contr. Expan.

65.8 188.49 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-334.88	73.54	629.25	F
216.39	594.92	629.25	F

Downstream Deck/Roadway Coordinates

num= 23

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-328.38	626	600	-298.65	625	600	-239.09	624	600						
-170.97	623.51	600	-99.23	624	600	-55.85	625	600						
-24.07	626	600	12.41	627	600	72.55	628.75	600						
73.54	628.76	626.1	94.79	628.84	626.19	125.85	629.21	626.56						
162.28	629.24	626.58	190.84	628.97	626.32	216.39	628.82	626.17						
218.26	628.72	600	249.76	628	600	303.24	627	600						
348.96	626	600	389.63	625	600	435.06	624	600						
502.31	623	600	594.92	623	600									

Downstream Bridge Cross Section Data

Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-361.52	627.3	-319.38	625.6	-254.55	622.82	-243.33	622.28	-223.36	622.3
-218.58	622.28	-206.71	622.22	-191.62	621.78	-186.63	621.62	-138.34	621.54
-108.06	621.46	-83.31	621.7	-33.82	621	5.92	620	24.97	621
42.55	622	50.49	623	58.8	624	65.41	624.5	73.86	624
81.44	623	84.58	622	88.41	620	92.03	618	96.2	617
99.71	616	103.76	615	109.64	614	137.11	613	139.64	613
143.34	614	160.06	615	185.32	616	189.71	617	193.34	618
200.26	619	201.71	620	202.88	621	208.07	623	223.78	623
365.18	623	383.67	623	423.43	622	545.76	621	592.31	622.15

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-361.52	.06	65.41	.04	208.07	.06

Bank Sta: Left Right Coeff Contr. Expan.

65.41 208.07 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-361.52	73.54	629.25	F
216.39	592.31	629.25	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Piers = 2

Pier Data

Pier Station Upstream= 121.62 Downstream= 121.62

Upstream num= 2

Width Elev Width Elev

1.2 600 1.2 626.51

Downstream num= 2

Width Elev Width Elev

1.2 600 1.2 626.51

Pier Data

Pier Station Upstream= 170.42 Downstream= 170.42

Upstream num= 2

Width Elev Width Elev

1.2 600 1.2 626.51

Downstream num= 2

Width Elev Width Elev

1.2 600 1.2 626.51

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3505.24

INPUT

Description:

Station Elevation Data num= 45

Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

-361.52 627.3 -319.38 625.6 -254.55 622.82 -243.33 622.28 -223.36 622.3
 -218.58 622.28 -206.71 622.22 -191.62 621.78 -186.63 621.62 -138.34 621.54
 -108.06 621.46 -83.31 621.7 -33.82 621 5.92 620 24.97 621
 42.55 622 50.49 623 58.8 624 65.41 624.5 73.86 624
 81.44 623 84.58 622 88.41 620 92.03 618 96.2 617
 99.71 616 103.76 615 109.64 614 137.11 613 139.64 613
 143.34 614 160.06 615 185.32 616 189.71 617 193.34 618

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200.26	619	201.71	620	202.88	621	208.07	623	223.78	623
365.18	623	383.67	623	423.43	622	545.76	621	592.31	622.15

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
-361.52	.06	65.41	.04	208.07	.06			

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
65.41	208.07		1	1	1	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-361.52	73.54	629.25	F
216.39	592.31	629.25	F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3504.24

INPUT

Description:

Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-361.52	627.3	-319.38	625.6	-254.55	622.82	-243.33	622.28	-223.36	622.3
-218.58	622.28	-206.71	622.22	-191.62	621.78	-186.63	621.62	-138.34	621.54
-108.06	621.46	-83.31	621.7	-33.82	621	5.92	620	24.97	621
42.55	622	50.49	623	58.8	624	65.41	624.5	73.86	624
81.44	623	84.58	622	88.41	620	92.03	618	96.2	617
99.71	616	103.76	615	109.64	614	137.11	613	139.64	613
143.34	614	160.06	615	185.32	616	189.71	617	193.34	618
200.26	619	201.71	620	202.88	621	208.07	623	223.78	623
365.18	623	383.67	623	423.43	622	545.76	621	592.31	622.15

Manning's n Values num= 3

Sta	n	Val	Sta	n	Val	Sta	n	Val
-361.52	.06	65.41	.04	208.07	.06			

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
65.41	208.07		13.7	13.7	13.7	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-361.52	73.54	629.25	F
216.39	592.31	629.25	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
418	523	635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3490.54

INPUT

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Description:

Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-365.94	628.29	-319.91	626	-284.42	624.92	-255.47	622.4	-243.44	621.94
-221.53	621.83	-206.64	621.57	-185.82	621.33	-137.02	621.13	-108.57	621
-80.77	621.29	-42.19	621	-9.66	620	33.22	620	46.27	621
54.68	622	65.63	623	83.38	623	85.62	622	87.46	621
89.47	620	91.75	619	94.04	618	96.3	617	98.89	616
101.06	615	106.87	614	115.32	614.33	131.23	613	132.65	612
132.96	611.77	136.8	611.54	136.91	612	137.13	613	143.19	614
146.98	615	176.85	615.12	180.1	615	183.27	616	187.36	617
190.11	618	192.08	619	194.17	620	196.56	621	199.59	622
202.54	623	264.56	623	304.7	622	398.11	621	608.03	621
615.83	621.18								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-365.94	.06	83.38	.04	202.54	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
83.38	202.54		2.53	2.53	2.53	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-365.94	53.84	630	F
243.23	615.83	630	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
419	525	635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3488.01

INPUT

Description:

Station Elevation Data num= 46

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-366.65	628.29	-319.9	626.08	-286.43	625.08	-255.72	622.31	-243.52	621.86
-222.3	621.72	-206.81	621.43	-185.67	621.25	-136.78	621.04	-108.73	620.91
-46.73	621	-10.46	620	36.04	620	47.94	621	56.14	622
69.79	623	83.1	623	89.77	620	101.07	615	104.4	614
116.18	614.27	129.39	614.38	131.17	613	132.53	612	133.33	611.48
137.15	611.25	137.77	614	138.04	614.6	148.07	615.36	159.53	615.72
176.36	615.09	181.01	615	183.32	616	186.58	617	189.07	618
191.23	619	193.39	620	195.77	621	198.49	622	201.56	623
215.54	624.92	254.77	623	288.01	622	391.74	621	609.33	621
616.44	621.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-366.65	.06	83.1	.04	201.56	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.

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83.1	201.56	2.53	2.53	2.53	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-366.65	51.39	630	F
245.86	616.44	630	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
419	525	635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 3485.48

INPUT

Description:

Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-367.37	628.29	-319.91	626.17	-288.38	625.23	-255.99	622.22	-243.61	621.78
-223.07	621.61	-207.84	621.39	-185.19	621.17	-136.39	620.95	-108.14	620.85
-81.39	621.13	-11.23	620	38.47	620	49.88	621	55.98	622
69.92	623	83.05	623	85.65	622	89.86	620	101.39	615
103.17	614	106.01	613	109.88	612	112.65	611	117.27	610.49
128.87	610	132.78	610	133.7	610	133.725	611.1	137.5	610.96
137.55	611	138.33	612	138.89	613	142.39	613	158.29	612.09
158.91	613	159.69	614	162.42	614	167.17	613	173.21	612
176.61	612	177.87	613	178.89	614	181.18	615	183.02	616
185.48	617	187.93	618	190.38	619	192.62	620	195.01	621
197.73	622	200.93	623	245.36	623	275.3	622	381.76	621
611.2	621	617.04	621.1						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-367.37	.06	83.05	.04	200.93	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	83.05	200.93		52.08	52.08	52.08	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-367.37	48.94	630	F
248.48	617.04	630	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
419	525	635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 3433.40

INPUT

Description:

Station Elevation Data num= 20

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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-468.68	628.69	-430.36	628.02	-392.2	627.32	-361.16	626.36	-309.25	620.68
-170.03	620.29	0	619.96	11.23	623.64	18.92	623.87	32.07	613.53
45.74	608.41	64.26	607.29	75.63	606.54	79.9	606.47	88.33	607.72
100.15	612.9	110.3	613.4	117.61	621.5	171.19	620.17	587.68	621.13

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-468.68	.06	18.92	.04	117.61	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Lengths	Left Channel	Right	Coeff Contr.	Expan.
18.92	117.61	25.4	25.4	25.4	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-468.68	-74.94	630	F
224.55	587.68	630	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
350	456	635

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 3408

INPUT

Description:

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-454.96	628.26	-417.26	627.28	-395.23	626.69	-379.72	626.43	-349.18	625.56
-298.11	620.49	-161.14	620.09	-58.12	619.87	6.14	619.72	11.17	621.21
17.19	622.98	24.76	623.18	31.96	617.66	37.84	613.5	44.43	611.27
51.44	608.73	56.09	608.35	65.71	607.73	69.87	607.24	70.69	607.14
81.18	606.39	85.43	606.27	93.8	607.46	101.1	610.39	105.53	612.17
106.86	612.24	109.19	612.92	115.61	613.46	122.87	620.96	148.63	620.57
169.51	620.13	177.12	619.96	465.56	620.58	561.9	620.93	598.78	621.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-454.96	.06	24.76	.04	122.87	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Lengths	Left Channel	Right	Coeff Contr.	Expan.
24.76	122.87	1	1	1	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-454.96	-96.19	630	F
254.46	598.78	630	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
354	461	635

CROSS SECTION

Ackerman.rep

RIVER: Ackerman Creek
REACH: Main RS: 3407

INPUT

Description:

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-454.96	628.26	-417.26	627.28	-395.23	626.69	-379.72	626.43	-349.18	625.56
-298.11	620.49	-161.14	620.09	-58.12	619.87	6.14	619.72	11.17	621.21
17.19	622.98	24.76	623.18	31.96	617.66	37.84	613.5	44.43	611.27
51.44	608.73	56.09	608.35	65.71	607.73	69.87	607.24	70.69	607.14
81.18	606.39	85.43	606.27	93.8	607.46	101.1	610.39	105.53	612.17
106.86	612.24	109.19	612.92	115.61	613.46	122.87	620.96	148.63	620.57
169.51	620.13	177.12	619.96	465.56	620.58	561.9	620.93	598.78	621.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-454.96	.06	24.76	.04	122.87	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
24.76	122.87	95	95	95	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-454.96	-96.19	630	F
254.46	598.78	630	F

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 3312

INPUT

Description:

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-75.56	618.4	-56.65	618.4	-52.46	618	-46.29	615	-41.63	613
-38.66	612	-34.48	611	-27.31	610	-6.65	607	6.85	606.6
14.03	606.6	23.64	607	36.9	608	43.32	610	52.44	615
56.25	617	60.74	618	64.41	619	72.02	619.4	79.1	619.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-75.56	.04	-52.46	.035	64.41	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
-52.46	64.41	23	23	23	.1	.3	

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 3289

INPUT

Ackerman.rep

Description:

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-390.7	626.27	-355.9	623.82	-335.56	622.38	-321.25	622.24	-293.06	621.81
-245.92	619.58	-119.49	619.15	-24.4	618.85	34.91	618.59	39.56	619.2
45.11	619.91	52.09	619.96	59.13	615.27	64.87	613.39	71.3	612.3
78.14	610.23	82.68	609.41	92.07	608.61	96.13	607.02	96.94	606.71
107.17	605.68	111.32	605.35	119.41	606.22	126.48	607.78	130.76	608.74
132.04	608.83	134.3	612.15	140.51	613.75	147.53	618.44	174.77	619.15
196.85	619.06	204.89	618.99	509.92	619.45	611.8	620.39	650.81	620.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-390.7	.06	52.09	.04	147.53	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
52.09	147.53		1	1	1	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-390.7	-189.71	630	F
398.56	650.81	630	F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3288

INPUT

Description:

Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-390.7	626.27	-355.9	623.82	-335.56	622.38	-321.25	622.24	-293.06	621.81
-245.92	619.58	-119.49	619.15	-24.4	618.85	34.91	618.59	39.56	619.2
45.11	619.91	52.09	619.96	59.13	615.27	64.87	613.39	71.3	612.3
78.14	610.23	82.68	609.41	92.07	608.61	96.13	607.02	96.94	606.71
107.17	605.68	111.32	605.35	119.41	606.22	126.48	607.78	130.76	608.74
132.04	608.83	134.3	612.15	140.51	613.75	147.53	618.44	174.77	619.15
196.85	619.06	204.89	618.99	509.92	619.45	611.8	620.39	650.81	620.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-390.7	.06	52.09	.04	147.53	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
52.09	147.53		85.11	85.11	85.11	.1	.3		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-390.7	-189.71	630	F
398.56	650.81	630	F

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
283	335	635	450	516	635

CROSS SECTION

Ackerman.rep

RIVER: Ackerman Creek
REACH: Main RS: 3202.89

INPUT

Description:

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-344.19	624.82	-292.38	619.26	0	618.12	60.1	617.74	71.88	617.63
78.79	613.53	90.75	613.04	101.93	610.18	111.15	609.24	115.93	606.39
130.06	604.68	144.84	605.9	150.27	606.37	152.47	611.6	165.37	616.62
193.68	618.13	216.63	618.28	542.03	618.63	647.92	620	688.46	620.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-344.19	.06	71.88	.04	165.37	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
71.88	165.37	1	1	1	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-344.19	-251.52	630	F
507.33	688.46	630	F

Right Levee Station= 641.7 Elevation= 635

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
288	341	635	446	514	635

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 3201.89

INPUT

Description:

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-344.19	624.82	-292.38	619.26	0	618.12	60.1	617.74	71.88	617.63
78.79	613.53	90.75	613.04	101.93	610.18	111.15	609.24	115.93	606.39
130.06	604.68	144.84	605.9	150.27	606.37	152.47	611.6	165.37	616.62
193.68	618.13	216.63	618.28	542.03	618.63	647.92	620	688.46	620.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-344.19	.06	71.88	.04	165.37	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
71.88	165.37	183.89	183.89	183.89	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-344.19	-251.52	630	F
507.33	688.46	630	F

Right Levee Station= 641.7 Elevation= 635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 3018

INPUT

Description:

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-153.03	618.02	-26.69	617.48	28.27	617.15	44.2	616.95
56.36	616.78	79	616.07	85.82	615.84	91.82	609.37
93.63	608.87	107.15	608.1	109.05	607.83	119.79	606.64
130.22	606.12	135.62	604.78	139.99	604.53	151.6	603.33
167.99	604.03	174.01	604.3	176.45	606.68	180.99	607.44
190.76	613.2	195.09	612.52	215.62	613.39	235.78	613.75
501.43	617.8	521.6	618.08	593.3	619.53	593.81	619.81
614.61	619.95	650.21	620				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-153.03	.06	85.82	.04	190.76	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.82 190.76 69 69 69 .1 .3

Right Levee Station= 606.6 Elevation= 635

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 2949

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.15	618	0	617.55	9.2	617.07	49.18	616.75	60.77	616.52
69.61	616.33	86.08	615.45	91.04	615.17	97.3	607.45	99.19	607.12
113.3	606.26	115.28	606.04	126.48	605.31	137.36	604.95	143	604.18
147.56	604.01	159.67	602.82	176.66	603.33	182.91	603.53	185.44	604.84
190.15	605.29	200.27	611.92	204.38	610.89	223.85	611.61	242.96	612.05
494.82	617.5	513.94	617.88	581.92	619.47	582.4	619.86	602.12	619.93
635.88	619.96								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-84.15	.06	91.04	.04	200.27	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

91.04 200.27 1 1 1 .1 .3

Right Levee Station= 590.7 Elevation= 635

CROSS SECTION

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RIVER: Ackerman Creek
REACH: Main RS: 2948

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.15	618	0	617.55	9.2	617.07	49.18	616.75	60.77	616.52
69.61	616.33	86.08	615.45	91.04	615.17	97.3	607.45	99.19	607.12
113.3	606.26	115.28	606.04	126.48	605.31	137.36	604.95	143	604.18
147.56	604.01	159.67	602.82	176.66	603.33	182.91	603.53	185.44	604.84
190.15	605.29	200.27	611.92	204.38	610.89	223.85	611.61	242.96	612.05
494.82	617.5	513.94	617.88	581.92	619.47	582.4	619.86	602.12	619.93
635.88	619.96								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-84.15	.06	91.04	.04	200.27	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

91.04	200.27	83.19	83.19	.1	.3
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Right Levee Station= 590.7 Elevation= 635

Blocked Obstructions num= 1

Sta L	Sta R	Elev
352	482	635

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 2864.81

INPUT

Description:

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	617.13	51.82	616.57	74.01	616.27	85.35	615.79	97.24	614.38
103.81	605.18	122.68	603.92	156.55	603.39	169.25	602.22	201.02	602.73
211.57	610.4	215.41	608.95	486.97	617.14	568.41	619.4	568.86	619.91
618.86	619.91								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	97.24	.04	211.57	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

97.24	211.57	1	1	1	.1	.3
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Right Levee Station= 574.2 Elevation= 635

Blocked Obstructions num= 1

Sta L	Sta R	Elev
342	472	635

CROSS SECTION

Ackerman.rep

RIVER: Ackerman Creek
REACH: Main RS: 2863.81

INPUT

Description:

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	617.13	51.82	616.57	74.01	616.27	85.35	615.79	97.24	614.38
103.81	605.18	122.68	603.92	156.55	603.39	169.25	602.22	201.02	602.73
211.57	610.4	215.41	608.95	486.97	617.14	568.41	619.4	568.86	619.91
618.86	619.91								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	97.24	.04	211.57	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
97.24	211.57	300.81	300.81	300.81	.1	.3	
Right Levee	Station=	574.2	Elevation=	635			

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 2563

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.47	54.78	615.8	71.06	615.89	78.24	616.32	81.62	616.51
90.23	615.44	90.98	615.34	102.8	615.58	107.3	611.6	120.23	605.13
123.41	603.58	137.91	602.31	143.43	601.82	152.14	600.85	157.38	602.56
164.58	602.91	175.69	607.91	183.51	612.9	187.25	612.82	199.37	613.58
218.66	614.18	224.41	614.41	239.4	615.15	258.88	616.27	451.75	616.48
453.94	616.49	529.65	617.81	529.88	618.21	531.07	618.22	531.51	618.32
580.2	618.32								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	102.8	.04	183.51	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
102.8	183.51	1	1	1	.1	.3	
Right Levee	Station=	538	Elevation=	635			

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 2562

INPUT

Description:

Station Elevation Data num= 31

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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.47	54.78	615.8	71.06	615.89	78.24	616.32	81.62	616.51
90.23	615.44	90.98	615.34	102.8	615.58	107.3	611.6	120.23	605.13
123.41	603.58	137.91	602.31	143.43	601.82	152.14	600.85	157.38	602.56
164.58	602.91	175.69	607.91	183.51	612.9	187.25	612.82	199.37	613.58
218.66	614.18	224.41	614.41	239.4	615.15	258.88	616.27	451.75	616.48
453.94	616.49	529.65	617.81	529.88	618.21	531.07	618.22	531.51	618.32
580.2	618.32								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	102.8	.04	183.51	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 102.8 183.51 74.02 74.02 74.02 .1 .3
 Right Levee Station= 538 Elevation= 635
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 274 334 635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 2487.98

INPUT

Description:

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.06	72	615.78	82.7	616.6	92.18	615.25	104.16	615.87
122.45	603.52	135.32	602.02	147.95	600.52	152.75	602.62	159.33	603.01
176.65	613.51	192.4	614.62	211.57	615.22	217.28	615.46	232.17	616.27
251.53	617.52	445.31	616.31	520.53	617.43	520.75	617.93	570.75	617.93

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	104.16	.04	176.65	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 104.16 176.65 1 1 1 .1 .3
 Right Levee Station= 524.2 Elevation= 635
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 267 330 635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 2486.98

INPUT

Description:

Station Elevation Data num= 20

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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.06	72	615.78	82.7	616.6	92.18	615.25	104.16	615.87
122.45	603.52	135.32	602.02	147.95	600.52	152.75	602.62	159.33	603.01
176.65	613.51	192.4	614.62	211.57	615.22	217.28	615.46	232.17	616.27
251.53	617.52	445.31	616.31	520.53	617.43	520.75	617.93	570.75	617.93

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	104.16	.04	176.65	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 104.16 176.65 367.95 367.95 367.95 .1 .3
 Right Levee Station= 524.2 Elevation= 635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 2119.035

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.13	5.15	615.11	9.37	615.09	27.24	614.65	27.48	614.65
35.29	613.78	48.8	612.15	54.09	610.57	57.2	609.65	60.22	608.75
65.86	607.15	73.66	602.88	75.12	602.15	79.21	602.15	80.87	602.15
90.43	600.15	103.24	602.15	103.56	603.17	103.97	604.65	104.42	605.89
105.08	607.15	107.07	608.44	108.88	609.65	115.49	611.52	118.19	612.15
140.83	614.01	143.27	614.16	151.92	614.65	155.71	615.54	156.66	615.76
159.68	616.49	160.48	616.63	162.42	616.88	167.03	617.15	171.98	617.61
173.27	617.15	174.39	617.15	184.3	617.15	187.35	617.15	202.74	617.15
214.42	617.15	218.22	617.15	220.14	617.02	221.21	617.08	241.18	616.23
332.18	617.65	448.18	617.65	448.43	617.75	498.43	617.75		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	27.24	.04	140.83	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 27.24 140.83 46.53 46.53 46.53 .1 .3
 Right Levee Station= 449 Elevation= 635

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 2072.501

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	613.63	5.21	612.89	8.08	612.87	17.25	612.6	26.3	612.32
27.48	612.34	30.98	612.15	36.79	612.15	45.71	611.26	51.97	610.59

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55.02 610.37 57.15 610.21 60.73 609.65 65.02 607.55 65.88 607.15
 67.9 606.15 75.27 602.15 86.42 600.15 97.78 602.15 108.2 602.15
 110.12 604.33 110.31 604.65 111.55 605.63 113.5 607.15 114.53 608.47
 115.32 609.65 118.96 609.88 121 610 130.59 610.93 133.56 611
 143.98 611.4 144.1 611.4 145.94 611.44 150.17 611.44 155.83 612.15
 162.53 612.15 169.54 612.15 172.7 612.15 175.2 612.15 186.73 612.62
 191.71 612.68 193.8 613.14 200.73 614.65 229.28 614.65 234 614.65
 239.09 614.65 243.01 614.65 342.37 618.87

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 36.79 .04 155.83 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 36.79 155.83 28.26 28.26 28.26 .3 .5

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 2044.24

INPUT

Description:

Station Elevation Data num= 11
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 -21.5 614 28.23 613.74 44.06 611.49 62.67 605.99 75.94 600.04
 87.85 600.02 100.04 600.53 119.2 606.91 129.84 610.62 148.38 610.97
 225.06 614.12

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -21.5 .06 28.23 .04 129.84 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 28.23 129.84 29.94 29.94 29.94 .1 .3

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 -21.5 26.86 620 F
 148.86 225.06 620 F

BRIDGE

RIVER: Ackerman Creek
 REACH: Main RS: 2026

INPUT

Description: Southern Pacific Railroad
 Distance from Upstream XS = 7.252
 Deck/Roadway Width = 18
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates
 num= 6

Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

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-21.5 620 600.82 26.86 620 600.82 26.86 620 616.04
148.86 620 616.04 148.86 620 600.82 246.43 620 600.82

Upstream Bridge Cross Section Data

Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-21.5	614	28.23	613.74	44.06	611.49	62.67	605.99	75.94	600.04
87.85	600.02	100.04	600.53	119.2	606.91	129.84	610.62	148.38	610.97
225.06	614.12								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-21.5	.06	28.23	.04	129.84	.06

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff	Contr.	Expan.
28.23	129.84	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-21.5	26.86	620	F
148.86	225.06	620	F

Downstream Deck/Roadway Coordinates

num= 6

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-21.5	620	600.82	26.42	620	600.82	26.42	620	616.04						
148.42	620	616.04	148.42	620	600.82	243.09	620	600.82						

Downstream Bridge Cross Section Data

Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	617.84	7.17	617.95	15.61	618.08	21.48	617.69	22.75	617.5
25.05	617.15	31.74	614.25	34.85	612.15	37.52	611.32	43.9	609.65
47.68	609.2	52.7	607.15	55.44	605.5	61.24	602.15	61.76	601.48
66.24	599.65	70.66	599.15	76.7	599.65	88.7	599.65	97.98	600.76
109.28	602.15	113.03	603.5	116.12	604.65	119.5	606.39	121.38	607.15
136.36	612.07	151.1	616.57	152.09	616.91	156.74	616.88	157.08	617.15
159.21	617.15	175.04	617.15	190.53	617.15	192.5	617.15	193.05	617.15
207.41	617.15	209.93	617.15	212.74	617.63	222.46	617.57	232.83	617.5
243.09	617.43								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	22.75	.04	152.09	.06

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff	Contr.	Expan.
22.75	152.09	.3	.5	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	27.61	620	F
148.42	243.09	620	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow =

Elevation at which weir flow begins = 622.6

Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Piers = 3

Pier Data

Pier Station Upstream= 59 Downstream= 59

Upstream num= 2

Width Elev Width Elev

2.5 599 2.5 616.04

Downstream num= 2

Width Elev Width Elev

2.5 599 2.5 616.04

Pier Data

Pier Station Upstream= 89 Downstream= 89

Upstream num= 2

Width Elev Width Elev

2.5 599 2.5 616.04

Downstream num= 2

Width Elev Width Elev

2.5 599 2.5 616.04

Pier Data

Pier Station Upstream= 119 Downstream= 119

Upstream num= 2

Width Elev Width Elev

2.5 599 2.5 616.04

Downstream num= 2

Width Elev Width Elev

2.5 599 2.5 616.04

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Momentum Cd = 2

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =

Submerged Inlet + Outlet Cd = .8

Max Low Cord =

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

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RIVER: Ackerman Creek

REACH: Main RS: 2014.297

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	617.84	7.17	617.95	15.61	618.08	21.48	617.69	22.75	617.5
25.05	617.15	31.74	614.25	34.85	612.15	37.52	611.32	43.9	609.65
47.68	609.2	52.7	607.15	55.44	605.5	61.24	602.15	61.76	601.48
66.24	599.65	70.66	599.15	76.7	599.65	88.7	599.65	97.98	600.76
109.28	602.15	113.03	603.5	116.12	604.65	119.5	606.39	121.38	607.15
136.36	612.07	151.1	616.57	152.09	616.91	156.74	616.88	157.08	617.15
159.21	617.15	175.04	617.15	190.53	617.15	192.5	617.15	193.05	617.15
207.41	617.15	209.93	617.15	212.74	617.63	222.46	617.57	232.83	617.5
243.09	617.43								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	22.75	.04	152.09	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
22.75	152.09	25.91	26.36	25.95	.3	.5		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	27.61	620	F
148.42	243.09	620	F

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 1987.938

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	612.15	3.22	612.15	6.33	612.15	19.34	612.15	24.38	612.15
25.55	611.8	32.66	609.7	32.79	609.69	32.87	609.65	33.14	609.58
45.37	607.15	52.3	604.33	57.83	602.15	60.43	600.33	61.73	599.65
72.73	598.15	84.8	599.65	95.4	600.85	106.79	602.15	112.31	604.24
113.19	604.65	113.88	605.06	118.86	607.15	121.86	608.27	131.82	609.65
132.04	609.69	132.31	609.76	140.96	610.55	147.68	610.77	153.97	611.12
160.89	610.95	166.25	612.15	169.54	612.15	179.51	612.15	182.26	612.15
191.3	612.15	191.81	612.04	195.65	611.2	201.12	611.27	205.98	612.15
215.36	612.15	217.99	612.15	238.23	612.15	239.2	612.15	240.36	612.15
242.94	612.15	245.51	612.45						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	25.55	.04	166.25	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.

25.55 166.25 21.77 21.78 21.8 .3 .5

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 1966.160

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.33	8.15	615.27	17.24	615.18	26.24	614.87	32.49	614.65
33.89	614.65	35.26	614.65	35.87	612.75	36.13	612.15	38.21	610.2
38.79	609.65	39.57	608.93	41.14	607.49	41.46	607.15	42.23	606.63
48.89	602.15	49.74	601.74	54.4	599.65	75.81	598.15	86.86	599.65
96.06	600.58	113.59	602.15	115.15	602.15	118.42	604.62	118.46	604.65
118.5	604.68	121.48	607.15	122.04	607.56	125.11	609.65	126.01	610.52
127.59	612.15	128.21	613.21	128.87	614.65	130.92	614.65	139.47	615.62
153.15	615.64	157.61	615.65	168.55	614.65	169.73	614.65	172.81	614.65
189.57	614.65	193.36	614.65	214.38	614.65	218.58	614.65	228.42	615.01

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.26	.04	128.87	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
35.26	128.87	24.04	24.04	24.07	.3	.5		

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.56	616.65	F
122.57	228.42	616.65	F

BRIDGE

RIVER: Ackerman Creek

REACH: Main RS: 1957

INPUT

Description: Louisiana Pacific Bridge

Distance from Upstream XS = 2

Deck/Roadway Width = 18

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	6	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	616.65	598.15	41.565	616.65	598.15	41.565	616.65	613.57		
122.565	616.65	613.57	122.565	616.65	598.15	228.42	616.65	598.15		

Upstream Bridge Cross Section Data

Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.33	8.15	615.27	17.24	615.18	26.24	614.87	32.49	614.65
33.89	614.65	35.26	614.65	35.87	612.75	36.13	612.15	38.21	610.2

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38.79	609.65	39.57	608.93	41.14	607.49	41.46	607.15	42.23	606.63
48.89	602.15	49.74	601.74	54.4	599.65	75.81	598.15	86.86	599.65
96.06	600.58	113.59	602.15	115.15	602.15	118.42	604.62	118.46	604.65
118.5	604.68	121.48	607.15	122.04	607.56	125.11	609.65	126.01	610.52
127.59	612.15	128.21	613.21	128.87	614.65	130.92	614.65	139.47	615.62
153.15	615.64	157.61	615.65	168.55	614.65	169.73	614.65	172.81	614.65
189.57	614.65	193.36	614.65	214.38	614.65	218.58	614.65	228.42	615.01

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.26	.04	128.87	.06

Bank Sta: Left Right Coeff Contr. Expan.

35.26	128.87	.3	.5
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.56	616.65	F
122.57	228.42	616.65	F

Downstream Deck/Roadway Coordinates num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	616.65	598.15	43.52	616.65	598.15	43.52	616.65	613.57
124.52	616.65	613.57	124.52	616.65	598.15	231.77	616.65	598.15

Downstream Bridge Cross Section Data

Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.42	5.79	616.04	7.64	615.99	16.74	615.7	30.74	615.02
31.78	614.97	38.26	614.65	39.85	612.21	40.4	611.49	41.82	609.65
42.75	608.29	43.53	607.15	47.95	603.56	49.93	602.15	55.64	600.22
56.86	599.65	70	597.35	84.18	599.65	91.47	599.65	100.44	600.53
117.2	602.15	118.67	603.5	119.91	604.65	121.44	605.99	122.62	607.15
123.3	608.76	123.68	609.65	125.25	611.08	126.53	612.15	128.94	614.05
129.78	614.65	133.65	615.12	138.06	615.57	146.22	616.16	153.59	616.25
171.08	614.65	174.93	614.65	184.89	614.65	190.82	614.65	194.56	614.65
204.44	614.65	219.28	614.65	231.77	615.11				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	38.26	.04	129.78	.06

Bank Sta: Left Right Coeff Contr. Expan.

38.26	129.78	.3	.5
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	43.52	616.65	F
124.52	231.77	616.65	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow =
 Elevation at which weir flow begins = 219.6
 Energy head used in spillway design =
 Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Momentum Cd = 2

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =

Submerged Inlet + Outlet Cd = .8

Max Low Cord =

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 1942.119

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	615.42	5.79	616.04	7.64	615.99	16.74	615.7	30.74	615.02
31.78	614.97	38.26	614.65	39.85	612.21	40.4	611.49	41.82	609.65
42.75	608.29	43.53	607.15	47.95	603.56	49.93	602.15	55.64	600.22
56.86	599.65	70	597.35	84.18	599.65	91.47	599.65	100.44	600.53
117.2	602.15	118.67	603.5	119.91	604.65	121.44	605.99	122.62	607.15
123.3	608.76	123.68	609.65	125.25	611.08	126.53	612.15	128.94	614.05
129.78	614.65	133.65	615.12	138.06	615.57	146.22	616.16	153.59	616.25
171.08	614.65	174.93	614.65	184.89	614.65	190.82	614.65	194.56	614.65
204.44	614.65	219.28	614.65	231.77	615.11				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	38.26	.04	129.78	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	38.26	129.78		71.24	71.04	71.14	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	43.52	616.65	F
124.52	231.77	616.65	F

CROSS SECTION

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RIVER: Ackerman Creek
REACH: Main RS: 1871.080

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	616.17	150	614.74	154.08	614.65	167.94	614.08	174.76	613.58
184.78	612.84	194.21	612.15	196.85	610.89	199.31	609.65	199.72	608.76
200.52	607.15	206.29	603.28	208	602.15	212.2	599.88	212.8	599.65
216.21	599.65	230	597.35	248.61	599.65	252.91	601.4	254.81	602.15
266.43	603.69	275.93	604.65	282.24	605.44	294.03	607.15	297.63	607.15
299.38	607.15	300.41	607.15	302.3	607.68	308.84	609.65	317.96	611.03
324.11	612.15	333.63	612.67	346.33	613.11	350.73	613.27	378.38	614.11
410	614.95								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	194.21	.04	350.73	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
194.21	350.73		344.08	344.08	344.08	.1	.3

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 1527

INPUT

Description:

Station Elevation Data num= 82

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	614.87	4.09	614.86	69.13	613.88	71.4	613.84	71.68	613.84
73.87	613.81	74.12	613.8	74.21	613.8	74.98	613.77	75.64	613.76
88.69	613.32	91.1	613.24	99.29	612.9	103.33	612.71	104.61	612.64
109.25	612.42	114.83	612.15	116.36	610.81	117.6	609.89	118.91	609.36
122.73	607.83	123.33	607.49	123.36	607.47	123.55	607.35	124.04	607.11
124.6	606.83	133.54	603.56	136.19	602.6	137.66	602.07	138.53	601.78
139.28	601.54	142.69	600.19	143.62	599.84	144.17	599.65	148.9	598.26
151.18	597.56	151.51	597.48	154.56	597.43	170.26	596.67	178.48	597.25
180.38	597.57	181.22	597.7	186.35	598.08	187.21	598.14	188.06	598.63
189.64	599.78	190.46	600.38	190.54	600.51	191.51	601.96	191.97	602.58
192.89	603.25	193.33	603.58	194.28	604.29	194.96	604.84	195.47	605.39
197.2	607.09	198.53	607.4	200.12	607.7	200.61	607.79	200.9	607.84
201.35	607.92	202.19	608.15	205.07	608.96	208.92	609.84	209.1	609.87
211.82	610.37	216.02	610.95	219.19	611.38	221.63	611.7	222.36	611.8
223.57	612.01	239.47	612.29	269.78	612.41	277.82	612.44	288.09	612.43
288.74	612.48	292.86	612.49	297	612.5	307.69	612.53	312.16	612.54
318.53	612.55	322.62	612.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	114.83	.04	223.57	.06

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Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 114.83 223.57 1 1 1 .1 .3

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1526

INPUT

Description:

Station Elevation Data num= 82

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	614.87	4.09	614.86	69.13	613.88	71.4	613.84	71.68	613.84
73.87	613.81	74.12	613.8	74.21	613.8	74.98	613.77	75.64	613.76
88.69	613.32	91.1	613.24	99.29	612.9	103.33	612.71	104.61	612.64
109.25	612.42	114.83	612.15	116.36	610.81	117.6	609.89	118.91	609.36
122.73	607.83	123.33	607.49	123.36	607.47	123.55	607.35	124.04	607.11
124.6	606.83	133.54	603.56	136.19	602.6	137.66	602.07	138.53	601.78
139.28	601.54	142.69	600.19	143.62	599.84	144.17	599.65	148.9	598.26
151.18	597.56	151.51	597.48	154.56	597.43	170.26	596.67	178.48	597.25
180.38	597.57	181.22	597.7	186.35	598.08	187.21	598.14	188.06	598.63
189.64	599.78	190.46	600.38	190.54	600.51	191.51	601.96	191.97	602.58
192.89	603.25	193.33	603.58	194.28	604.29	194.96	604.84	195.47	605.39
197.2	607.09	198.53	607.4	200.12	607.7	200.61	607.79	200.9	607.84
201.35	607.92	202.19	608.15	205.07	608.96	208.92	609.84	209.1	609.87
211.82	610.37	216.02	610.95	219.19	611.38	221.63	611.7	222.36	611.8
223.57	612.01	239.47	612.29	269.78	612.41	277.82	612.44	288.09	612.43
288.74	612.48	292.86	612.49	297	612.5	307.69	612.53	312.16	612.54
318.53	612.55	322.62	612.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	114.83	.04	223.57	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 114.83 223.57 59.18 59.18 59.18 .1 .3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	58	630

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1466.821

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	614.65	3.6	614.65	60.92	613.68	62.92	613.64
63.17	613.64	65.1	613.61	65.32	613.6	65.4	613.6
66.08	613.57	66.66	613.55	92.19	612.51	101.19	612.15
102.82	610.66	104.13	609.65	110.21	607.27		

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110.45	607.15	110.96	606.98	125.41	602.15	126.34	601.86	127.13	601.62
132.32	599.65	139.76	597.24	140.11	597.15	143.34	597.15	160	596.55
173.27	597.15	173.93	597.69	175.17	598.98	175.81	599.65	176.63	601.45
176.99	602.15	177.71	602.9	178.8	604.04	179.33	604.65	179.73	605.26
181.09	607.15	183.76	607.9	190.26	609.65	198.3	611.11	200.78	611.56
201.73	611.79	218.73	612.07	259.72	612.13	270.7	612.09	271.39	612.15
275.8	612.15	280.22	612.15	291.65	612.15	296.43	612.15	303.24	612.15
307.61	612.15								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 101.19 .04 201.73 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 101.19 201.73 1 1 1 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 .33 69.6 630

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1465.82

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	614.65	3.6	614.65	60.92	613.68	62.92	613.64	63.17	613.64
65.1	613.61	65.32	613.6	65.4	613.6	66.08	613.57	66.66	613.55
92.19	612.51	101.19	612.15	102.82	610.66	104.13	609.65	110.21	607.27
110.45	607.15	110.96	606.98	125.41	602.15	126.34	601.86	127.13	601.62
132.32	599.65	139.76	597.24	140.11	597.15	143.34	597.15	160	596.55
173.27	597.15	173.93	597.69	175.17	598.98	175.81	599.65	176.63	601.45
176.99	602.15	177.71	602.9	178.8	604.04	179.33	604.65	179.73	605.26
181.09	607.15	183.76	607.9	190.26	609.65	198.3	611.11	200.78	611.56
201.73	611.79	218.73	612.07	259.72	612.13	270.7	612.09	271.39	612.15
275.8	612.15	280.22	612.15	291.65	612.15	296.43	612.15	303.24	612.15
307.61	612.15								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 101.19 .04 201.73 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 101.19 201.73 44.82 44.82 44.82 .1 .3

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1421

INPUT

Ackerman.rep

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	614.37	3.56	614.37	23.55	614.06	41.14	613.78	47.64	613.67
55.33	613.52	60.16	613.44	62.14	613.41	62.38	613.41	64.29	613.38
64.51	613.37	64.58	613.37	65.26	613.34	65.83	613.32	87.2	612.52
91.04	612.38	93.2	612.31	96.8	612.18	99.93	612.08	101.5	610.74
102.76	609.83	108.61	607.65	108.84	607.54	109.33	607.38	111.45	606.7
113.22	606.15	115.21	605.52	116.6	605.05	123.24	602.82	124.13	602.54
124.89	602.3	126.52	601.68	129.89	600.32	130.61	600.06	135.7	598.2
137.05	597.73	137.38	597.64	138.29	597.59	140.49	597.48	141.42	597.41
144.66	597.14	147.39	596.92	153.7	596.52	156.53	596.33	157.12	596.33
158.7	596.33	158.86	596.33	160.08	596.33	161.7	596.47	167.16	596.92
170.36	597.21	172.67	597.41	173.23	597.86	173.3	597.92	174.47	599.13
175.08	599.75	175.86	601.39	176.2	602.03	176.4	602.24	176.88	602.73
177.92	603.79	178.42	604.36	178.48	604.45	178.8	604.92	180.09	606.65
182.62	607.42	183.42	607.66	185.13	608.16	188.67	609.25	188.79	609.29
190.07	609.58	193.22	610.35	193.87	610.51	196.42	611.06	198.77	611.57
199.02	611.64	199.67	611.82	199.77	611.83	199.79	611.83	199.96	611.84
217.6	612.1	247.25	612.18	260.83	612.21	272.41	612.19	273.14	612.24
277.79	612.25	281.18	612.25	282.45	612.25	288.06	612.25	294.51	612.26
299.55	612.26	306.73	612.26	311.34	612.27				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	99.93	.04	199.79	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	99.93	199.79		1	1	1	.1	.3	

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 1420

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	614.37	3.56	614.37	23.55	614.06	41.14	613.78	47.64	613.67
55.33	613.52	60.16	613.44	62.14	613.41	62.38	613.41	64.29	613.38
64.51	613.37	64.58	613.37	65.26	613.34	65.83	613.32	87.2	612.52
91.04	612.38	93.2	612.31	96.8	612.18	99.93	612.08	101.5	610.74
102.76	609.83	108.61	607.65	108.84	607.54	109.33	607.38	111.45	606.7
113.22	606.15	115.21	605.52	116.6	605.05	123.24	602.82	124.13	602.54
124.89	602.3	126.52	601.68	129.89	600.32	130.61	600.06	135.7	598.2
137.05	597.73	137.38	597.64	138.29	597.59	140.49	597.48	141.42	597.41
144.66	597.14	147.39	596.92	153.7	596.52	156.53	596.33	157.12	596.33
158.7	596.33	158.86	596.33	160.08	596.33	161.7	596.47	167.16	596.92
170.36	597.21	172.67	597.41	173.23	597.86	173.3	597.92	174.47	599.13
175.08	599.75	175.86	601.39	176.2	602.03	176.4	602.24	176.88	602.73
177.92	603.79	178.42	604.36	178.48	604.45	178.8	604.92	180.09	606.65
182.62	607.42	183.42	607.66	185.13	608.16	188.67	609.25	188.79	609.29
190.07	609.58	193.22	610.35	193.87	610.51	196.42	611.06	198.77	611.57

Ackerman.rep

199.02 611.64 199.67 611.82 199.77 611.83 199.79 611.83 199.96 611.84
 217.6 612.1 247.25 612.18 260.83 612.21 272.41 612.19 273.14 612.24
 277.79 612.25 281.18 612.25 282.45 612.25 288.06 612.25 294.51 612.26
 299.55 612.26 306.73 612.26 311.34 612.27

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 99.93 .04 199.79 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 99.93 199.79 99 99 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 77 630

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1321

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	613.79	3.46	613.79	22.93	613.55	40.06	613.32	46.38	613.2
53.87	613.02	58.58	612.95	60.5	612.92	60.74	612.92	62.6	612.89
62.81	612.89	62.88	612.89	63.54	612.86	64.1	612.85	84.91	612.2
88.64	612.11	90.75	612.07	94.25	611.98	97.3	611.93	98.74	610.9
99.9	610.2	105.27	608.43	105.48	608.34	105.93	608.21	107.88	607.65
109.5	607.24	111.33	606.74	112.61	606.29	118.71	604.22	119.53	603.96
120.23	603.73	121.72	603.16	124.81	601.72	125.48	601.43	130.15	599.27
131.39	598.76	131.7	598.65	132.53	598.51	134.56	598.17	135.4	598.01
138.38	597.46	140.9	596.98	146.69	596.25	149.28	595.88	151.11	595.88
156	595.88	156.47	595.88	160.26	595.88	161.69	596.14	166.53	596.98
169.37	597.57	171.43	597.96	171.92	598.35	171.98	598.39	173.02	599.43
173.56	599.97	174.25	601.27	174.56	601.79	174.73	601.96	175.16	602.38
176.08	603.28	176.53	603.76	176.58	603.83	176.86	604.2	178.01	605.6
180.25	606.43	180.96	606.68	182.47	607.21	185.62	608.5	185.72	608.54
186.86	608.93	189.65	610.04	190.23	610.28	192.49	610.96	194.58	611.59
194.8	611.67	195.38	611.87	195.49	611.91	195.51	611.91	195.7	611.92
215.25	612.17	248.1	612.32	263.15	612.38	275.99	612.39	276.79	612.43
281.95	612.45	285.71	612.46	287.11	612.46	293.33	612.46	300.47	612.48
306.06	612.49	314.02	612.5	319.13	612.51				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 97.3 .04 195.51 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 97.3 195.51 1 1 1 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 87 630

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 1320

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	613.79	3.46	613.79	22.93	613.55	40.06	613.32	46.38	613.2
53.87	613.02	58.58	612.95	60.5	612.92	60.74	612.92	62.6	612.89
62.81	612.89	62.88	612.89	63.54	612.86	64.1	612.85	84.91	612.2
88.64	612.11	90.75	612.07	94.25	611.98	97.3	611.93	98.74	610.9
99.9	610.2	105.27	608.43	105.48	608.34	105.93	608.21	107.88	607.65
109.5	607.24	111.33	606.74	112.61	606.29	118.71	604.22	119.53	603.96
120.23	603.73	121.72	603.16	124.81	601.72	125.48	601.43	130.15	599.27
131.39	598.76	131.7	598.65	132.53	598.51	134.56	598.17	135.4	598.01
138.38	597.46	140.9	596.98	146.69	596.25	149.28	595.88	151.11	595.88
156	595.88	156.47	595.88	160.26	595.88	161.69	596.14	166.53	596.98
169.37	597.57	171.43	597.96	171.92	598.35	171.98	598.39	173.02	599.43
173.56	599.97	174.25	601.27	174.56	601.79	174.73	601.96	175.16	602.38
176.08	603.28	176.53	603.76	176.58	603.83	176.86	604.2	178.01	605.6
180.25	606.43	180.96	606.68	182.47	607.21	185.62	608.5	185.72	608.54
186.86	608.93	189.65	610.04	190.23	610.28	192.49	610.96	194.58	611.59
194.8	611.67	195.38	611.87	195.49	611.91	195.51	611.91	195.7	611.92
215.25	612.17	248.1	612.32	263.15	612.38	275.99	612.39	276.79	612.43
281.95	612.45	285.71	612.46	287.11	612.46	293.33	612.46	300.47	612.48
306.06	612.49	314.02	612.5	319.13	612.51				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	97.3	.04	195.51	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	97.3	195.51	28	28	28	.1	.3

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 1292

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	613.61	3.43	613.61	22.74	613.39	39.73	613.18	46	613.06
53.43	612.87	58.09	612.8	60	612.77	60.24	612.77	62.08	612.75
62.29	612.74	62.36	612.74	63.01	612.72	63.56	612.7	84.2	612.11
87.91	612.03	89.99	611.99	93.47	611.92	96.49	611.88	97.89	610.95
99.02	610.31	104.25	608.67	104.45	608.59	104.89	608.47	106.79	607.94
108.37	607.58	110.15	607.11	111.39	606.67	117.32	604.65	118.12	604.39
118.8	604.17	120.25	603.61	123.26	602.14	123.91	601.85	128.45	599.59
129.66	599.08	129.96	598.96	130.77	598.79	132.74	598.39	133.56	598.2

Ackerman.rep

136.46	597.55	138.91	597	144.54	596.16	147.07	595.74	149.27	595.74
155.18	595.74	155.74	595.74	160.31	595.74	161.69	596.04	166.34	597
169.07	597.67	171.04	598.12	171.52	598.49	171.58	598.54	172.58	599.53
173.1	600.04	173.76	601.24	174.05	601.71	174.22	601.88	174.63	602.28
175.52	603.13	175.94	603.57	176	603.64	176.27	603.99	177.37	605.28
179.53	606.12	180.21	606.38	181.66	606.92	184.68	608.27	184.79	608.31
185.87	608.73	188.56	609.94	189.12	610.21	191.29	610.93	193.29	611.6
193.5	611.68	194.06	611.89	194.18	611.93	194.2	611.94	194.4	611.95
214.52	612.19	248.36	612.36	263.86	612.43	277.08	612.45	277.91	612.49
283.22	612.51	287.09	612.52	288.54	612.52	294.94	612.52	302.3	612.54
308.05	612.56	316.25	612.58	321.51	612.59				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 96.49 .04 194.2 .06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	96.49	194.2		1	1	1	.1	.3	

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1291

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	613.61	3.43	613.61	22.74	613.39	39.73	613.18	46	613.06
53.43	612.87	58.09	612.8	60	612.77	60.24	612.77	62.08	612.75
62.29	612.74	62.36	612.74	63.01	612.72	63.56	612.7	84.2	612.11
87.91	612.03	89.99	611.99	93.47	611.92	96.49	611.88	97.89	610.95
99.02	610.31	104.25	608.67	104.45	608.59	104.89	608.47	106.79	607.94
108.37	607.58	110.15	607.11	111.39	606.67	117.32	604.65	118.12	604.39
118.8	604.17	120.25	603.61	123.26	602.14	123.91	601.85	128.45	599.59
129.66	599.08	129.96	598.96	130.77	598.79	132.74	598.39	133.56	598.2
136.46	597.55	138.91	597	144.54	596.16	147.07	595.74	149.27	595.74
155.18	595.74	155.74	595.74	160.31	595.74	161.69	596.04	166.34	597
169.07	597.67	171.04	598.12	171.52	598.49	171.58	598.54	172.58	599.53
173.1	600.04	173.76	601.24	174.05	601.71	174.22	601.88	174.63	602.28
175.52	603.13	175.94	603.57	176	603.64	176.27	603.99	177.37	605.28
179.53	606.12	180.21	606.38	181.66	606.92	184.68	608.27	184.79	608.31
185.87	608.73	188.56	609.94	189.12	610.21	191.29	610.93	193.29	611.6
193.5	611.68	194.06	611.89	194.18	611.93	194.2	611.94	194.4	611.95
214.52	612.19	248.36	612.36	263.86	612.43	277.08	612.45	277.91	612.49
283.22	612.51	287.09	612.52	288.54	612.52	294.94	612.52	302.3	612.54
308.05	612.56	316.25	612.58	321.51	612.59				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 96.49 .04 194.2 .06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	96.49	194.2		112	112	112	.1	.3	

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 65 630

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1179

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	612.94	3.32	612.93	22.03	612.79	38.48	612.64	44.55	612.52
51.75	612.3	56.26	612.24	58.11	612.21	58.34	612.21	60.13	612.19
60.33	612.18	60.4	612.18	61.03	612.17	61.57	612.16	81.56	611.74
85.14	611.72	87.17	611.71	90.53	611.7	93.46	611.71	94.71	611.14
95.72	610.74	100.4	609.57	100.58	609.51	100.98	609.43	102.67	609.04
104.08	608.83	105.68	608.51	106.79	608.1	112.1	606.27	112.81	606.03
113.42	605.81	114.72	605.3	117.41	603.75	117.99	603.43	122.06	600.82
123.14	600.27	123.41	600.14	124.13	599.86	125.89	599.18	126.63	598.89
129.22	597.92	131.41	597.07	136.46	595.85	138.71	595.22	142.35	595.22
152.06	595.22	152.99	595.22	160.51	595.22	161.68	595.66	165.62	597.07
167.93	598.08	169.61	598.75	170.01	599.05	170.06	599.09	170.91	599.88
171.35	600.29	171.91	601.1	172.16	601.43	172.3	601.56	172.65	601.87
173.4	602.54	173.76	602.88	173.8	602.93	174.03	603.16	174.97	604.07
176.8	604.97	177.37	605.25	178.6	605.83	181.16	607.4	181.25	607.45
182.17	607.97	184.45	609.59	184.92	609.94	186.76	610.81	188.46	611.62
188.64	611.71	189.11	611.95	189.24	612.02	189.26	612.04	189.48	612.04
211.81	612.27	249.34	612.52	266.54	612.62	281.2	612.68	282.12	612.71
288.01	612.74	292.3	612.76	293.91	612.76	301.01	612.77	309.18	612.8
315.56	612.82	324.65	612.85	330.49	612.87				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 93.46 .04 189.26 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 93.46 189.26 1 1 1 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 0 75 630

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1178

INPUT

Description:

Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	612.94	3.32	612.93	22.03	612.79	38.48	612.64	44.55	612.52

Ackerman.rep

51.75	612.3	56.26	612.24	58.11	612.21	58.34	612.21	60.13	612.19
60.33	612.18	60.4	612.18	61.03	612.17	61.57	612.16	81.56	611.74
85.14	611.72	87.17	611.71	90.53	611.7	93.46	611.71	94.71	611.14
95.72	610.74	100.4	609.57	100.58	609.51	100.98	609.43	102.67	609.04
104.08	608.83	105.68	608.51	106.79	608.1	112.1	606.27	112.81	606.03
113.42	605.81	114.72	605.3	117.41	603.75	117.99	603.43	122.06	600.82
123.14	600.27	123.41	600.14	124.13	599.86	125.89	599.18	126.63	598.89
129.22	597.92	131.41	597.07	136.46	595.85	138.71	595.22	142.35	595.22
152.06	595.22	152.99	595.22	160.51	595.22	161.68	595.66	165.62	597.07
167.93	598.08	169.61	598.75	170.01	599.05	170.06	599.09	170.91	599.88
171.35	600.29	171.91	601.1	172.16	601.43	172.3	601.56	172.65	601.87
173.4	602.54	173.76	602.88	173.8	602.93	174.03	603.16	174.97	604.07
176.8	604.97	177.37	605.25	178.6	605.83	181.16	607.4	181.25	607.45
182.17	607.97	184.45	609.59	184.92	609.94	186.76	610.81	188.46	611.62
188.64	611.71	189.11	611.95	189.24	612.02	189.26	612.04	189.48	612.04
211.81	612.27	249.34	612.52	266.54	612.62	281.2	612.68	282.12	612.71
288.01	612.74	292.3	612.76	293.91	612.76	301.01	612.77	309.18	612.8
315.56	612.82	324.65	612.85	330.49	612.87				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 93.46 .04 189.26 .06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	93.46	189.26		121.97	121.97	121.97	.1	.3	

CROSS SECTION

RIVER: Ackerman Creek
 REACH: Main RS: 1056.034

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 49									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	612.21	21.25	612.15	37.12	612.06	42.98	611.94	49.92	611.67
78.68	611.35	84.09	611.41	87.34	611.45	90.16	611.52	98.2	610.23
99.43	610.2	100.82	610.04	101.79	609.65	107.05	607.8	108.71	607.15
111.56	605.15	115.11	602.15	116.92	601.01	119.1	599.65	121.36	598.31
123.27	597.15	127.67	595.5	129.64	594.65	134.82	594.65	148.68	594.65
150	594.65	160.73	594.65	161.67	595.25	164.84	597.15	166.7	598.53
168.37	599.65	170.21	601.22	171.42	602.15	174.29	604.03	175.28	604.65
177.34	606.45	178.15	607.15	179.98	609.2	180.36	609.65	183.35	611.75
183.73	612.02	183.87	612.12	183.9	612.14	183.91	612.15	184.14	612.15
250.41	612.7	297.97	613.02	307.61	613.03	340.24	613.18		

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 90.16 .04 183.73 .06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	90.16	183.73		415.7	420.43	416.66	.1	.3	

CROSS SECTION

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RIVER: Ackerman Creek
REACH: Main RS: 635.602

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	610.37	30.82	609.87	50.31	609.65	62.57	609.65	63.25	609.64
90.44	608.5	105.29	607.88	109.32	609.39	113.45	607.43	114.06	607.15
114.98	606.2	115.81	605.41	119.24	602.15	121.55	600.64	123.05	599.65
124.02	598.98	126.47	597.15	135.3	595.18	137.72	594.65	142.72	594.65
150	592.85	163.78	594.65	166.25	596.14	167.92	597.15	168.31	597.39
171.35	599.65	172.96	600.55	175.64	602.15	178.29	602.74	185.53	604.65
191.82	605.84	199.2	607.15	203.96	608.82	205.05	609.29	206.06	609.65
207.22	609.84	209.55	610.23	297.37	610.44	301.22	610.46	307.61	610.54
339.84	610.72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	109.32	.04	209.55	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
109.32	209.55	340.22	336.76	332	.1	.3	

CROSS SECTION

RIVER: Ackerman Creek
REACH: Main RS: 298.838

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-47.68	607.55	0	594.6	.56	594.65	.77	594.65	1.71	594.77
19.1	597.15	20.6	597.15	21.54	597.15	21.68	597.15	22.6	597.15
30.4	597.15	31.98	597.15	33.5	597.15	36.57	597.15	47.21	597.15
48.17	597.15	48.93	597.15	49.88	597.59	52.56	598.25	58.23	599.65
62.73	600.99	65.17	602.15	67.01	602.15	69.59	602.15	70.3	602.15
78.21	602.15	93.12	602.15	115.71	599.97	117.42	599.65	123.92	598.04
127.39	597.15	129.07	596.72	136.7	594.65	140.29	592.95	142.25	592.15
150	591.35	169.87	592.15	170.53	592.15	170.67	592.25	173.57	594.65
173.85	594.94	176.09	597.15	179.52	599.57	179.62	599.65	179.64	599.67
182.07	602.15	182.11	602.17	185.67	604.65	188.34	606.91	188.62	607.15
189.67	607.86	192.16	609.54	192.35	609.65	192.8	609.81	196.92	611.24
207.26	609.69	207.64	609.69	213.39	609.7	214.49	609.71	261.21	609.74
307.61	609.91	344.89	610.12						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-47.68	.06	93.12	.04	192.35	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.

93.12 192.35 79.45 80.77 84.78 .1 .3

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 218.070

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	601.15	9.69	599.88	11.61	599.65	28.97	597.87	35.5	597.15
41.6	597.15	52.09	597.15	52.44	597.15	57.01	598.08	63.6	599.43
63.79	599.47	64.55	599.65	65.97	599.77	72.15	600.31	73.33	600.41
98.84	601.12	111.86	599.77	112.19	599.74	113.02	599.65	113.76	599.45
122.12	597.15	124.06	596.18	126.8	594.65	128.36	594.18	128.64	594.1
136.34	592.15	150	591.15	180.85	592.15	184.86	592.15	186.6	593.73
187.6	594.65	190.92	597.02	191.1	597.15	191.22	597.33	192.5	599.65
192.56	599.74	194.3	602.15	195.07	603.32	195.97	604.65	196.22	605.43
196.92	607.15	202.56	609.1	204.17	609.65	204.36	609.88	204.82	610.62
205.78	612.15	212.29	614.4	212.99	614.65	215.27	615.97	220.85	619.04
224.92	619.3	226.59	619.43	231.15	618.67	235.72	617.15	239.04	615.42
240.25	614.65	241.53	613.19	242.24	612.15	245.38	611.41	247.11	611
248.49	610.68	251.58	610.48	263.55	609.71	307.61	609.83	319.92	609.92
346.34	609.92								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	98.84	.04	204.82	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
98.84	204.82		79.86	77.21	75.7	.1	.3

CROSS SECTION

RIVER: Ackerman Creek

REACH: Main RS: 140.859

INPUT

Description: From Kunzler model lowered 2.85 ft

Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	597.73	.95	597.67	5.84	597.15	25.83	597.15	28.73	597.15
41.73	597.15	47.2	597.15	52.9	597.15	77.17	599.12	89.41	599.4
95.76	599.08	109.11	598.8	124.28	597.15	125.78	596.86	136.29	594.65
137.19	594.43	138.61	593.96	144.15	592.15	147.28	589.96	147.61	589.65
148.69	589.65	153.7	589.16	162.26	589.65	168.05	590.09	175.87	590.69
194.95	592.15	198.17	594.08	199.24	594.65	203.97	597.05	204.14	597.15
204.61	597.51	207.4	599.65	208.41	600.44	210.69	602.15	210.78	602.23
213.69	604.65	214.56	605.3	216.85	607.15	221.1	608.78	222.41	609.28
223.91	609.65	233.32	611.48	236.52	612.15	237.09	612.25	245.53	612.18
245.59	612.18	245.71	612.15	248.73	612.15	257.8	611.39	258.31	611.34
263.19	610.87	267.24	610.49	302.67	609.8	307.61	609.81	330.08	609.81

347.97 609.87

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 89.41 .04 223.91 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 89.41 223.91 0 0 0 .1 .3

SUMMARY OF MANNING'S N VALUES

River:Ackerman Creek

Reach	River Sta.	n1	n2	n3
Main	4277.55	.06	.04	.06
Main	4134.83	.06	.04	.06
Main	4097	.06	.04	.06
Main	4096	.06	.04	.06
Main	3993.67	.06	.04	.06
Main	3992.67	.06	.04	.06
Main	3859	.06	.04	.06
Main	3830	.06	.04	.06
Main	3829	.06	.04	.06
Main	3755.59	.06	.04	.06
Main	3691	.06	.04	.06
Main	3690	.06	.04	.06
Main	3658	.06	.04	.06
Main	3647.25	.06	.04	.06
Main	3647	.06	.04	.06
Main	3587	.06	.04	.06
Main	3576.30	.06	.04	.06
Main	3557	Bridge		
Main	3505.24	.06	.04	.06
Main	3504.24	.06	.04	.06
Main	3490.54	.06	.04	.06
Main	3488.01	.06	.04	.06
Main	3485.48	.06	.04	.06
Main	3433.40	.06	.04	.06
Main	3408	.06	.04	.06
Main	3407	.06	.04	.06
Main	3312	.04	.035	.04
Main	3289	.06	.04	.06
Main	3288	.06	.04	.06
Main	3202.89	.06	.04	.06
Main	3201.89	.06	.04	.06
Main	3018	.06	.04	.06
Main	2949	.06	.04	.06
Main	2948	.06	.04	.06
Main	2864.81	.06	.04	.06
Main	2863.81	.06	.04	.06
Main	2563	.06	.04	.06
Main	2562	.06	.04	.06

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Main	2487.98	.06	.04	.06
Main	2486.98	.06	.04	.06
Main	2119.035	.06	.04	.06
Main	2072.501	.06	.04	.06
Main	2044.24	.06	.04	.06
Main	2026	Bridge		
Main	2014.297	.06	.04	.06
Main	1987.938	.06	.04	.06
Main	1966.160	.06	.04	.06
Main	1957	Bridge		
Main	1942.119	.06	.04	.06
Main	1871.080	.06	.04	.06
Main	1527	.06	.04	.06
Main	1526	.06	.04	.06
Main	1466.821	.06	.04	.06
Main	1465.82	.06	.04	.06
Main	1421	.06	.04	.06
Main	1420	.06	.04	.06
Main	1321	.06	.04	.06
Main	1320	.06	.04	.06
Main	1292	.06	.04	.06
Main	1291	.06	.04	.06
Main	1179	.06	.04	.06
Main	1178	.06	.04	.06
Main	1056.034	.06	.04	.06
Main	635.602	.06	.04	.06
Main	298.838	.06	.04	.06
Main	218.070	.06	.04	.06
Main	140.859	.06	.04	.06

SUMMARY OF REACH LENGTHS

River: Ackerman Creek

Reach	River Sta.	Left	Channel	Right
Main	4277.55	142.72	142.72	142.72
Main	4134.83	37.83	37.83	37.83
Main	4097	1	1	1
Main	4096	102.33	102.33	102.33
Main	3993.67	1	1	1
Main	3992.67	133.67	133.67	133.67
Main	3859	29	29	29
Main	3830	1	1	1
Main	3829	73.41	73.41	73.41
Main	3755.59	64.59	64.59	64.59
Main	3691	1	1	1
Main	3690	32	32	32
Main	3658	10.75	10.75	10.75
Main	3647.25	.25	.25	.25
Main	3647	60	60	60
Main	3587	10.7	10.7	10.7

Main	3576.30	71.06	71.06	71.06
Main	3557	Bridge		
Main	3505.24	1	1	1
Main	3504.24	13.7	13.7	13.7
Main	3490.54	2.53	2.53	2.53
Main	3488.01	2.53	2.53	2.53
Main	3485.48	52.08	52.08	52.08
Main	3433.40	25.4	25.4	25.4
Main	3408	1	1	1
Main	3407	95	95	95
Main	3312	23	23	23
Main	3289	1	1	1
Main	3288	85.11	85.11	85.11
Main	3202.89	1	1	1
Main	3201.89	183.89	183.89	183.89
Main	3018	69	69	69
Main	2949	1	1	1
Main	2948	83.19	83.19	83.19
Main	2864.81	1	1	1
Main	2863.81	300.81	300.81	300.81
Main	2563	1	1	1
Main	2562	74.02	74.02	74.02
Main	2487.98	1	1	1
Main	2486.98	367.95	367.95	367.95
Main	2119.035	46.53	46.53	46.53
Main	2072.501	28.26	28.26	28.26
Main	2044.24	29.94	29.94	29.94
Main	2026	Bridge		
Main	2014.297	25.91	26.36	25.95
Main	1987.938	21.77	21.78	21.8
Main	1966.160	24.04	24.04	24.07
Main	1957	Bridge		
Main	1942.119	71.24	71.04	71.14
Main	1871.080	344.08	344.08	344.08
Main	1527	1	1	1
Main	1526	59.18	59.18	59.18
Main	1466.821	1	1	1
Main	1465.82	44.82	44.82	44.82
Main	1421	1	1	1
Main	1420	99	99	99
Main	1321	1	1	1
Main	1320	28	28	28
Main	1292	1	1	1
Main	1291	112	112	112
Main	1179	1	1	1
Main	1178	121.97	121.97	121.97
Main	1056.034	415.7	420.43	416.66
Main	635.602	340.22	336.76	332
Main	298.838	79.45	80.77	84.78
Main	218.070	79.86	77.21	75.7
Main	140.859	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Ackerman Creek

Reach	River Sta.	Contr.	Expan.
Main	4277.55	.1	.3
Main	4134.83	.1	.3
Main	4097	.1	.3
Main	4096	.1	.3
Main	3993.67	.1	.3
Main	3992.67	.1	.3
Main	3859	.1	.3
Main	3830	.1	.3
Main	3829	.1	.3
Main	3755.59	.1	.3
Main	3691	.1	.3
Main	3690	.1	.3
Main	3658	.1	.3
Main	3647.25	.1	.3
Main	3647	.1	.3
Main	3587	.1	.3
Main	3576.30	.1	.3
Main	3557 Bridge		
Main	3505.24	.1	.3
Main	3504.24	.1	.3
Main	3490.54	.1	.3
Main	3488.01	.1	.3
Main	3485.48	.1	.3
Main	3433.40	.1	.3
Main	3408	.1	.3
Main	3407	.1	.3
Main	3312	.1	.3
Main	3289	.1	.3
Main	3288	.1	.3
Main	3202.89	.1	.3
Main	3201.89	.1	.3
Main	3018	.1	.3
Main	2949	.1	.3
Main	2948	.1	.3
Main	2864.81	.1	.3
Main	2863.81	.1	.3
Main	2563	.1	.3
Main	2562	.1	.3
Main	2487.98	.1	.3
Main	2486.98	.1	.3
Main	2119.035	.1	.3
Main	2072.501	.3	.5
Main	2044.24	.1	.3
Main	2026 Bridge		
Main	2014.297	.3	.5
Main	1987.938	.3	.5
Main	1966.160	.3	.5
Main	1957 Bridge		
Main	1942.119	.3	.5

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Main	1871.080	.1	.3
Main	1527	.1	.3
Main	1526	.1	.3
Main	1466.821	.1	.3
Main	1465.82	.1	.3
Main	1421	.1	.3
Main	1420	.1	.3
Main	1321	.1	.3
Main	1320	.1	.3
Main	1292	.1	.3
Main	1291	.1	.3
Main	1179	.1	.3
Main	1178	.1	.3
Main	1056.034	.1	.3
Main	635.602	.1	.3
Main	298.838	.1	.3
Main	218.070	.1	.3
Main	140.859	.1	.3

Profile Output Table - Standard Table 1

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/s)	(sq ft)	(ft)
Main	140.859	50-Year_FEMA	4800.00	589.16	612.80	596.84	612.83	0.000041	1.53
3952.94	347.97	0.07							
Main	140.859	100-Year_FEMA	5370.00	589.16	613.50	597.66	613.53	0.000044	1.63
4196.52	347.97	0.07							
Main	218.070	50-Year_FEMA	4800.00	591.15	612.80		612.84	0.000062	1.83
3446.26	312.19	0.08							
Main	218.070	100-Year_FEMA	5370.00	591.15	613.50		613.54	0.000067	1.94
3665.57	314.75	0.08							
Main	298.838	50-Year_FEMA	4800.00	591.35	612.81		612.84	0.000062	1.73
3853.95	392.57	0.08							
Main	298.838	100-Year_FEMA	5370.00	591.35	613.51		613.55	0.000064	1.82
4129.37	392.57	0.08							
Main	635.602	50-Year_FEMA	4800.00	592.85	612.76		612.92	0.000326	3.40
1905.33	339.84	0.17							
Main	635.602	100-Year_FEMA	5370.00	592.85	613.47		613.63	0.000314	3.47
2144.64	339.84	0.17							
Main	1056.034	50-Year_FEMA	4800.00	594.65	612.86		613.13	0.000543	4.23
1244.46	273.52	0.22							
Main	1056.034	100-Year_FEMA	5370.00	594.65	613.55		613.83	0.000538	4.37
1468.07	340.24	0.22							
Main	1178	50-Year_FEMA	4800.00	595.22	612.91		613.21	0.000624	4.41
1180.15	324.23	0.23							
Main	1178	100-Year_FEMA	5370.00	595.22	613.60		613.91	0.000609	4.54
1408.98	330.49	0.23							

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Main	1179	50-Year_FEMA	4800.00	595.22	612.91	613.21	0.000626	4.42
1151.84	255.49	0.23						
Main	1179	100-Year_FEMA	5370.00	595.22	613.60	613.91	0.000622	4.58
1327.43	255.49	0.23						
Main	1291	50-Year_FEMA	4800.00	595.74	612.97	613.28	0.000675	4.49
1159.00	256.51	0.24						
Main	1291	100-Year_FEMA	5370.00	595.74	613.66	613.99	0.000661	4.63
1335.77	256.51	0.24						
Main	1292	50-Year_FEMA	4800.00	595.74	612.98	613.29	0.000675	4.49
1161.61	272.19	0.24						
Main	1292	100-Year_FEMA	5370.00	595.74	613.67	613.99	0.000659	4.63
1364.86	321.51	0.24						
Main	1320	50-Year_FEMA	4800.00	595.88	612.99	613.30	0.000685	4.50
1160.14	263.46	0.24						
Main	1320	100-Year_FEMA	5370.00	595.88	613.68	614.01	0.000669	4.64
1354.94	306.97	0.24						
Main	1321	50-Year_FEMA	4800.00	595.88	612.99	613.31	0.000686	4.50
1148.20	232.13	0.24						
Main	1321	100-Year_FEMA	5370.00	595.88	613.68	614.01	0.000674	4.65
1307.76	232.13	0.24						
Main	1420	50-Year_FEMA	4800.00	596.33	613.07	613.37	0.000701	4.49
1167.65	234.34	0.24						
Main	1420	100-Year_FEMA	5370.00	596.33	613.75	614.08	0.000684	4.63
1329.05	234.34	0.24						
Main	1421	50-Year_FEMA	4800.00	596.33	613.07	613.38	0.000701	4.49
1168.19	238.74	0.24						
Main	1421	100-Year_FEMA	5370.00	596.33	613.76	614.08	0.000684	4.63
1341.24	268.73	0.24						
Main	1465.82	50-Year_FEMA	4800.00	596.55	613.10	613.41	0.000701	4.47
1175.34	229.94	0.24						
Main	1465.82	100-Year_FEMA	5370.00	596.55	613.79	614.11	0.000685	4.61
1339.80	253.13	0.24						
Main	1466.821	50-Year_FEMA	4800.00	596.55	613.10	613.41	0.000701	4.47
1175.52	229.96	0.24						
Main	1466.821	100-Year_FEMA	5370.00	596.55	613.79	614.11	0.000684	4.60
1337.92	238.01	0.24						
Main	1526	50-Year_FEMA	4800.00	596.67	613.16	613.45	0.000667	4.31
1190.90	229.71	0.24						
Main	1526	100-Year_FEMA	5370.00	596.67	613.85	614.15	0.000650	4.44
1355.17	251.81	0.24						
Main	1527	50-Year_FEMA	4800.00	596.67	613.17	613.45	0.000666	4.31
1191.05	229.72	0.24						
Main	1527	100-Year_FEMA	5370.00	596.67	613.85	614.15	0.000650	4.44
1355.35	251.85	0.24						

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Main	1871.080	50-Year_FEMA	4800.00	597.35	613.46		613.69	0.000711	3.85
1257.81	180.76	0.24							
Main	1871.080	100-Year_FEMA	5370.00	597.35	614.14		614.38	0.000674	3.96
1391.13	213.13	0.24							
Main	1942.119	50-Year_FEMA	4800.00	597.35	613.46	605.22	613.79	0.000585	4.65
1031.69	89.15	0.23							
Main	1942.119	100-Year_FEMA	5370.00	597.35	614.12	605.64	614.50	0.000619	4.95
1085.35	90.43	0.24							
Main	1957	Bridge							
Main	1966.160	50-Year_FEMA	4800.00	598.15	613.47	605.44	613.81	0.000583	4.70
1022.34	92.69	0.23							
Main	1966.160	100-Year_FEMA	5370.00	598.15	614.40	605.86	614.78	0.000575	4.89
1097.83	93.41	0.23							
Main	1987.938	50-Year_FEMA	4800.00	598.15	613.60		613.85	0.000781	4.10
1296.28	245.51	0.25							
Main	1987.938	100-Year_FEMA	5370.00	598.15	614.59		614.83	0.000630	3.98
1540.49	245.51	0.23							
Main	2014.297	50-Year_FEMA	4800.00	599.15	613.55	606.84	613.94	0.001069	5.02
956.52	108.44	0.30							
Main	2014.297	100-Year_FEMA	5370.00	599.15	614.53	607.32	614.93	0.000994	5.04
1065.04	113.34	0.29							
Main	2026	Bridge							
Main	2044.24	50-Year_FEMA	4800.00	600.02	613.59	608.30	614.10	0.001587	5.80
862.96	182.75	0.36							
Main	2044.24	100-Year_FEMA	5370.00	600.02	614.56	608.79	615.06	0.001347	5.73
982.06	246.56	0.34							
Main	2072.501	50-Year_FEMA	4800.00	600.15	613.59		614.21	0.002746	6.36
821.35	195.63	0.45							
Main	2072.501	100-Year_FEMA	5370.00	600.15	614.60		615.12	0.001962	5.94
1020.48	200.49	0.39							
Main	2119.035	50-Year_FEMA	4800.00	600.15	613.39	610.38	614.55	0.005582	8.62
557.15	94.82	0.63							
Main	2119.035	100-Year_FEMA	5370.00	600.15	614.38	610.99	615.41	0.004832	8.13
661.25	117.27	0.59							
Main	2486.98	50-Year_FEMA	4800.00	600.52	614.96	609.69	615.72	0.001940	6.97
703.23	97.88	0.40							
Main	2486.98	100-Year_FEMA	5370.00	600.52	615.70	610.21	616.49	0.001910	7.18
806.16	192.94	0.40							
Main	2487.98	50-Year_FEMA	4800.00	600.52	614.97	609.69	615.72	0.001938	6.96
703.48	97.96	0.39							
Main	2487.98	100-Year_FEMA	5370.00	600.52	615.70	610.21	616.49	0.001908	7.18
806.64	193.30	0.40							

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Main	2562	50-Year_FEMA	4800.00	600.85	615.35	609.21	615.85	0.001201	5.76
898.25	140.18	0.32							
Main	2562	100-Year_FEMA	5370.00	600.85	616.11	609.67	616.63	0.001150	5.89
1049.76	245.81	0.31							
Main	2563	50-Year_FEMA	4800.00	600.85	615.35	609.23	615.85	0.001200	5.76
898.44	140.29	0.32							
Main	2563	100-Year_FEMA	5370.00	600.85	616.11	609.68	616.63	0.001150	5.89
1050.11	245.86	0.31							
Main	2863.81	50-Year_FEMA	4800.00	602.22	615.92	607.49	616.04	0.000254	2.96
2202.29	364.25	0.15							
Main	2863.81	100-Year_FEMA	5370.00	602.22	616.69	607.81	616.81	0.000243	3.02
2503.42	431.13	0.15							
Main	2864.81	50-Year_FEMA	4800.00	602.22	615.92	607.50	616.04	0.000253	2.96
2037.47	259.72	0.15							
Main	2864.81	100-Year_FEMA	5370.00	602.22	616.69	607.80	616.81	0.000247	3.04
2247.82	300.90	0.15							
Main	2948	50-Year_FEMA	4800.00	602.82	615.90	609.01	616.09	0.000469	3.71
1626.87	274.26	0.20							
Main	2948	100-Year_FEMA	5370.00	602.82	616.66	609.35	616.86	0.000435	3.75
1844.90	298.52	0.20							
Main	2949	50-Year_FEMA	4800.00	602.82	615.89	609.02	616.09	0.000477	3.75
1677.11	342.80	0.20							
Main	2949	100-Year_FEMA	5370.00	602.82	616.66	609.35	616.86	0.000440	3.77
1962.10	402.67	0.20							
Main	3018	50-Year_FEMA	4800.00	603.33	615.85	610.29	616.17	0.000886	4.70
1232.02	287.68	0.27							
Main	3018	100-Year_FEMA	5370.00	603.33	616.62	610.64	616.93	0.000794	4.69
1482.69	362.40	0.26							
Main	3201.89	50-Year_FEMA	4800.00	604.68	615.56	613.61	616.77	0.005348	8.80
545.18	87.28	0.62							
Main	3201.89	100-Year_FEMA	5370.00	604.68	616.29	614.04	617.50	0.004827	8.80
610.13	90.40	0.60							
Main	3202.89	50-Year_FEMA	4800.00	604.68	615.57	613.61	616.77	0.005332	8.80
545.71	87.31	0.62							
Main	3202.89	100-Year_FEMA	5370.00	604.68	616.30	614.04	617.50	0.004816	8.79
610.62	90.42	0.60							
Main	3288	50-Year_FEMA	4800.00	605.35	616.10	613.73	617.19	0.004343	8.37
573.24	86.14	0.57							
Main	3288	100-Year_FEMA	5370.00	605.35	616.76	614.16	617.88	0.004095	8.52
630.54	88.12	0.56							
Main	3289	50-Year_FEMA	4800.00	605.35	616.11	613.75	617.19	0.004331	8.37
573.76	86.16	0.57							
Main	3289	100-Year_FEMA	5370.00	605.35	616.76	614.17	617.89	0.004086	8.51
631.04	88.13	0.56							

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Main	3312	50-Year_FEMA	4800.00	606.60	616.71		617.30	0.001533	6.17
778.29	105.50	0.40							
Main	3312	100-Year_FEMA	5370.00	606.60	617.37		617.99	0.001502	6.32
849.36	109.09	0.40							
Main	3407	50-Year_FEMA	4800.00	606.27	616.64	614.01	617.64	0.003688	8.01
599.52	85.29	0.53							
Main	3407	100-Year_FEMA	5370.00	606.27	617.29	614.42	618.33	0.003539	8.20
655.00	86.82	0.53							
Main	3408	50-Year_FEMA	4800.00	606.27	616.64	614.02	617.64	0.003681	8.00
599.89	85.30	0.53							
Main	3408	100-Year_FEMA	5370.00	606.27	617.29	614.41	618.33	0.003534	8.19
655.37	86.83	0.53							
Main	3433.40	50-Year_FEMA	4800.00	606.47	616.76	614.08	617.73	0.003587	7.92
605.86	85.37	0.52							
Main	3433.40	100-Year_FEMA	5370.00	606.47	617.40	614.46	618.42	0.003456	8.13
660.80	86.76	0.52							
Main	3485.48	50-Year_FEMA	4800.00	610.00	616.99	616.99	619.23	0.015312	12.01
399.57	88.64	1.00							
Main	3485.48	100-Year_FEMA	5370.00	610.00	617.36	617.36	619.75	0.015020	12.39
433.40	90.43	1.00							
Main	3488.01	50-Year_FEMA	4800.00	611.25	619.26	619.26	621.32	0.015545	11.54
416.01	100.33	1.00							
Main	3488.01	100-Year_FEMA	5370.00	611.25	619.58	619.58	621.80	0.015367	11.95
449.20	101.78	1.00							
Main	3490.54	50-Year_FEMA	4800.00	611.54	620.24	618.96	621.43	0.006537	8.77
547.42	159.57	0.68							
Main	3490.54	100-Year_FEMA	5370.00	611.54	620.63	619.31	621.92	0.006567	9.12
588.70	178.92	0.69							
Main	3504.24	50-Year_FEMA	4800.00	613.00	620.54	619.03	621.54	0.005243	8.00
600.28	146.85	0.62							
Main	3504.24	100-Year_FEMA	5370.00	613.00	620.96	619.33	622.02	0.005169	8.28
648.21	172.51	0.62							
Main	3505.24	50-Year_FEMA	4800.00	613.00	620.55	619.03	621.54	0.005219	7.98
601.16	147.33	0.62							
Main	3505.24	100-Year_FEMA	5370.00	613.00	620.96	619.34	622.03	0.005147	8.27
649.09	172.97	0.62							
Main	3557	Bridge							
Main	3576.30	50-Year_FEMA	4800.00	612.00	621.23	619.07	621.95	0.003221	6.86
735.44	604.25	0.50							
Main	3576.30	100-Year_FEMA	5370.00	612.00	621.67	619.40	622.43	0.003138	7.11
798.29	618.58	0.50							
Main	3587	50-Year_FEMA	4800.00	613.00	621.14	619.54	622.04	0.004602	7.68
670.91	494.62	0.58							
Main	3587	100-Year_FEMA	5370.00	613.00	621.60	619.93	622.52	0.004289	7.83

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746.71	642.63	0.57							
Main	3647	50-Year_FEMA	4800.00	614.00	621.50	619.72	622.31	0.004232	7.37
744.47	518.33	0.56							
Main	3647	100-Year_FEMA	5370.00	614.00	621.98	620.15	622.77	0.003773	7.36
863.99	711.93	0.53							
Main	3647.25	50-Year_FEMA	4800.00	614.00	621.50	619.72	622.32	0.004227	7.36
744.87	519.07	0.56							
Main	3647.25	100-Year_FEMA	5370.00	614.00	621.98	620.15	622.78	0.003770	7.36
864.32	711.99	0.53							
Main	3658	50-Year_FEMA	4800.00	613.83	621.63	619.66	622.37	0.003714	7.03
785.09	553.90	0.52							
Main	3658	100-Year_FEMA	5370.00	613.83	622.09	620.00	622.82	0.003355	7.05
908.42	726.53	0.51							
Main	3690	50-Year_FEMA	4800.00	613.33	621.80	619.77	622.49	0.003468	6.73
816.69	567.75	0.51							
Main	3690	100-Year_FEMA	5370.00	613.33	622.26	620.09	622.93	0.003122	6.74
957.78	764.31	0.49							
Main	3691	50-Year_FEMA	4800.00	613.33	621.81	619.77	622.49	0.003456	6.72
818.21	384.00	0.50							
Main	3691	100-Year_FEMA	5370.00	613.33	622.27	620.09	622.93	0.003112	6.73
959.12	452.60	0.49							
Main	3755.59	50-Year_FEMA	4800.00	614.30	621.99	620.21	622.77	0.004290	7.12
726.37	231.77	0.55							
Main	3755.59	100-Year_FEMA	5370.00	614.30	622.40	620.52	623.20	0.004030	7.26
825.56	272.23	0.54							
Main	3829	50-Year_FEMA	4800.00	614.26	622.32	620.62	623.08	0.004348	7.08
745.56	363.60	0.56							
Main	3829	100-Year_FEMA	5370.00	614.26	622.75	620.91	623.50	0.003910	7.10
918.32	434.48	0.54							
Main	3830	50-Year_FEMA	4800.00	614.26	622.33	620.62	623.09	0.004281	7.04
773.07	544.12	0.55							
Main	3830	100-Year_FEMA	5370.00	614.26	622.84	620.91	623.51	0.003483	6.78
1067.05	742.60	0.51							
Main	3859	50-Year_FEMA	4800.00	614.25	622.52	620.76	623.21	0.003988	6.81
869.97	631.06	0.54							
Main	3859	100-Year_FEMA	5370.00	614.25	623.03	621.06	623.61	0.003149	6.45
1168.04	730.56	0.48							
Main	3992.67	50-Year_FEMA	4800.00	614.18	623.26	621.43	623.68	0.002708	5.60
1195.17	610.99	0.44							
Main	3992.67	100-Year_FEMA	5370.00	614.18	623.60	622.08	624.00	0.002494	5.61
1371.86	624.59	0.43							
Main	3993.67	50-Year_FEMA	4800.00	614.18	623.26	621.43	623.68	0.002698	5.59
1197.13	532.15	0.44							
Main	3993.67	100-Year_FEMA	5370.00	614.18	623.60	622.08	624.01	0.002486	5.61

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1373.65	545.72	0.43							
Main	4096	50-Year_FEMA	4800.00	614.95	623.49	623.93	0.002176	5.73	
1159.59	405.08	0.41							
Main	4096	100-Year_FEMA	5370.00	614.95	623.80	624.26	0.002172	5.92	
1290.07	428.18	0.41							
Main	4097	50-Year_FEMA	4800.00	614.95	623.51	623.94	0.002098	5.64	
1214.85	460.07	0.40							
Main	4097	100-Year_FEMA	5370.00	614.95	623.84	624.27	0.002055	5.78	
1368.68	483.46	0.40							
Main	4134.83	50-Year_FEMA	4800.00	615.27	623.56	624.03	0.002123	5.90	
1153.00	412.95	0.40							
Main	4134.83	100-Year_FEMA	5370.00	615.27	623.88	624.36	0.002122	6.09	
1285.91	427.33	0.41							
Main	4277.55	50-Year_FEMA	4800.00	614.99	623.79	624.42	0.002726	6.52	
849.62	223.20	0.46							
Main	4277.55	100-Year_FEMA	5370.00	614.99	624.08	624.77	0.002873	6.89	
915.23	230.86	0.47							

Profile Output Table - Standard Table 2

Reach Channel	River Sta Q Right	Profile Top Width	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (cfs)	C & E Loss (cfs)	Q Left (ft)	Q
Main	140.859	50-Year_FEMA	612.83	612.80	0.03		1172.00	3549.73	78.27
347.97									
Main	140.859	100-Year_FEMA	613.53	613.50	0.03		1306.46	3937.84	
125.70	347.97								
Main	218.070	50-Year_FEMA	612.84	612.80	0.04	0.00	0.00	1388.56	3299.60
111.84	312.19								
Main	218.070	100-Year_FEMA	613.54	613.50	0.05	0.00	0.00	1554.45	3648.98
166.56	314.75								
Main	298.838	50-Year_FEMA	612.84	612.81	0.03	0.00	0.00	1956.04	2670.21
173.76	392.57								
Main	298.838	100-Year_FEMA	613.55	613.51	0.04	0.01	0.00	2174.80	2941.16
254.03	392.57								
Main	635.602	50-Year_FEMA	612.92	612.76	0.16	0.04	0.04	359.05	4202.62
238.34	339.84								
Main	635.602	100-Year_FEMA	613.63	613.47	0.16	0.04	0.04	482.80	4525.91
361.29	339.84								
Main	1056.034	50-Year_FEMA	613.13	612.86	0.27	0.17	0.03	55.26	4736.11
8.63	273.52								
Main	1056.034	100-Year_FEMA	613.83	613.55	0.29	0.17	0.04	128.09	5178.44
63.48	340.24								
Main	1178	50-Year_FEMA	613.21	612.91	0.30	0.07	0.01	21.12	4762.55

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16.33	324.23								
Main	1178	100-Year_FEMA	613.91	613.60	0.31	0.07	0.01	79.50	5195.96
94.55	330.49								
Main	1179	50-Year_FEMA	613.21	612.91	0.30	0.00	0.00	14.13	4769.54
16.34	255.49								
Main	1179	100-Year_FEMA	613.91	613.60	0.32	0.00	0.00	29.87	5245.46
94.66	255.49								
Main	1291	50-Year_FEMA	613.28	612.97	0.31	0.07	0.00	12.34	4751.93
35.73	256.51								
Main	1291	100-Year_FEMA	613.99	613.66	0.32	0.07	0.00	35.82	5209.76
124.42	256.51								
Main	1292	50-Year_FEMA	613.29	612.98	0.31	0.00	0.00	11.23	4752.98
35.79	272.19								
Main	1292	100-Year_FEMA	613.99	613.67	0.32	0.00	0.00	39.34	5206.11
124.55	321.51								
Main	1320	50-Year_FEMA	613.30	612.99	0.31	0.02	0.00	9.23	4749.40
41.37	263.46								
Main	1320	100-Year_FEMA	614.01	613.68	0.32	0.02	0.00	33.63	5204.53
131.84	306.97								
Main	1321	50-Year_FEMA	613.31	612.99	0.31	0.00	0.00	5.91	4752.67
41.42	232.13								
Main	1321	100-Year_FEMA	614.01	613.68	0.33	0.00	0.00	13.86	5224.07
132.07	232.13								
Main	1420	50-Year_FEMA	613.37	613.07	0.31	0.07	0.00	6.13	4732.76
61.11	234.34								
Main	1420	100-Year_FEMA	614.08	613.75	0.32	0.07	0.00	21.70	5193.35
154.95	234.34								
Main	1421	50-Year_FEMA	613.38	613.07	0.31	0.00	0.00	5.74	4733.07
61.19	238.74								
Main	1421	100-Year_FEMA	614.08	613.76	0.32	0.00	0.00	21.45	5193.49
155.06	268.73								
Main	1465.82	50-Year_FEMA	613.41	613.10	0.31	0.03	0.00	4.50	4725.25
70.25	229.94								
Main	1465.82	100-Year_FEMA	614.11	613.79	0.32	0.03	0.00	17.64	5188.24
164.11	253.13								
Main	1466.821	50-Year_FEMA	613.41	613.10	0.31	0.00	0.00	4.51	4725.16
70.33	229.96								
Main	1466.821	100-Year_FEMA	614.11	613.79	0.32	0.00	0.00	20.37	5185.44
164.19	238.01								
Main	1526	50-Year_FEMA	613.45	613.16	0.29	0.04	0.00	4.29	4754.69
41.02	229.71								
Main	1526	100-Year_FEMA	614.15	613.85	0.30	0.04	0.00	16.83	5236.90
116.27	251.81								
Main	1527	50-Year_FEMA	613.45	613.17	0.29	0.00	0.00	4.30	4754.63

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41.07	229.72								
Main	1527	100-Year_FEMA	614.15	613.85	0.30	0.00	0.00	16.85	5236.80
116.35	251.85								
Main	1871.080	50-Year_FEMA	613.69	613.46	0.23	0.24	0.01	5.87	4794.05
0.09	180.76								
Main	1871.080	100-Year_FEMA	614.38	614.14	0.24	0.23	0.01	17.04	5348.36
4.60	213.13								
Main	1942.119	50-Year_FEMA	613.79	613.46	0.34	0.05	0.05		4800.00
89.15									
Main	1942.119	100-Year_FEMA	614.50	614.12	0.38	0.05	0.07		5370.00
90.43									
Main	1957	Bridge							
Main	1966.160	50-Year_FEMA	613.81	613.47	0.34	0.00	0.00		4800.00
92.69									
Main	1966.160	100-Year_FEMA	614.78	614.40	0.37				5370.00
93.41									
Main	1987.938	50-Year_FEMA	613.85	613.60	0.25	0.01	0.03	31.84	4654.45
113.72	245.51								
Main	1987.938	100-Year_FEMA	614.83	614.59	0.23	0.01	0.04	66.48	5072.97
230.55	245.51								
Main	2014.297	50-Year_FEMA	613.94	613.55	0.39	0.02	0.07		4800.00
108.44									
Main	2014.297	100-Year_FEMA	614.93	614.53	0.39	0.02	0.08		5370.00
113.34									
Main	2026	Bridge							
Main	2044.24	50-Year_FEMA	614.10	613.59	0.51	0.02	0.01		4696.49
103.51	182.75								
Main	2044.24	100-Year_FEMA	615.06	614.56	0.50	0.01	0.01	0.90	5211.59
157.52	246.56								
Main	2072.501	50-Year_FEMA	614.21	613.59	0.61	0.06	0.05	47.33	4681.30
71.37	195.63								
Main	2072.501	100-Year_FEMA	615.12	614.60	0.52	0.05	0.01	125.49	5084.44
160.07	200.49								
Main	2119.035	50-Year_FEMA	614.55	613.39	1.15	0.18	0.16		4800.00
94.82									
Main	2119.035	100-Year_FEMA	615.41	614.38	1.03	0.14	0.15		5369.37
0.64	117.27								
Main	2486.98	50-Year_FEMA	615.72	614.96	0.75	1.13	0.04		4787.57
12.43	97.88								
Main	2486.98	100-Year_FEMA	616.49	615.70	0.79	1.06	0.02	11.30	5313.20
45.50	192.94								
Main	2487.98	50-Year_FEMA	615.72	614.97	0.75	0.00	0.00		4787.51
12.49	97.96								

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Main 45.64	2487.98 193.30	100-Year_FEMA	616.49	615.70	0.79	0.00	0.00	11.42	5312.94
Main 81.19	2562 140.18	50-Year_FEMA	615.85	615.35	0.51	0.11	0.02	0.00	4718.81
Main 157.95	2562 245.81	100-Year_FEMA	616.63	616.11	0.52	0.11	0.03	19.59	5192.46
Main 81.30	2563 140.29	50-Year_FEMA	615.85	615.35	0.51	0.00	0.00	0.00	4718.71
Main 158.08	2563 245.86	100-Year_FEMA	616.63	616.11	0.52	0.00	0.00	19.68	5192.24
Main 758.17	2863.81 364.25	50-Year_FEMA	616.04	615.92	0.12	0.14	0.04	3.07	4038.76
Main 977.03	2863.81 431.13	100-Year_FEMA	616.81	616.69	0.12	0.14	0.04	8.97	4384.01
Main 762.52	2864.81 259.72	50-Year_FEMA	616.04	615.92	0.12	0.00	0.00	3.07	4034.42
Main 946.25	2864.81 300.90	100-Year_FEMA	616.81	616.69	0.12	0.00	0.00	8.99	4414.76
Main 545.89	2948 274.26	50-Year_FEMA	616.09	615.90	0.19	0.03	0.02	1.29	4252.82
Main 754.25	2948 298.52	100-Year_FEMA	616.86	616.66	0.19	0.03	0.02	8.03	4607.72
Main 511.17	2949 342.80	50-Year_FEMA	616.09	615.89	0.20	0.00	0.00	1.29	4287.54
Main 730.01	2949 402.67	100-Year_FEMA	616.86	616.66	0.19	0.00	0.00	8.06	4631.93
Main 246.28	3018 287.68	50-Year_FEMA	616.17	615.85	0.33	0.04	0.04	0.00	4553.72
Main 438.66	3018 362.40	100-Year_FEMA	616.93	616.62	0.31	0.04	0.04	3.43	4927.91
Main 87.28	3201.89	50-Year_FEMA	616.77	615.56	1.20	0.33	0.26		4800.00
Main 90.40	3201.89	100-Year_FEMA	617.50	616.29	1.20	0.30	0.27		5370.00
Main 87.31	3202.89	50-Year_FEMA	616.77	615.57	1.20	0.01	0.00		4800.00
Main 90.42	3202.89	100-Year_FEMA	617.50	616.30	1.20	0.00	0.00		5370.00
Main 86.14	3288	50-Year_FEMA	617.19	616.10	1.09	0.41	0.01		4800.00
Main 88.12	3288	100-Year_FEMA	617.88	616.76	1.13	0.38	0.01		5370.00
Main 86.16	3289	50-Year_FEMA	617.19	616.11	1.09	0.00	0.00		4800.00

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Main 88.13	3289	100-Year_FEMA	617.89	616.76	1.12	0.00	0.00	5370.00
Main 105.50	3312	50-Year_FEMA	617.30	616.71	0.59	0.06	0.05	4800.00
Main 109.09	3312	100-Year_FEMA	617.99	617.37	0.62	0.05	0.05	5370.00
Main 85.29	3407	50-Year_FEMA	617.64	616.64	1.00	0.22	0.12	4800.00
Main 86.82	3407	100-Year_FEMA	618.33	617.29	1.04	0.21	0.13	5370.00
Main 85.30	3408	50-Year_FEMA	617.64	616.64	0.99	0.00	0.00	4800.00
Main 86.83	3408	100-Year_FEMA	618.33	617.29	1.04	0.00	0.00	5370.00
Main 85.37	3433.40	50-Year_FEMA	617.73	616.76	0.97	0.09	0.00	4800.00
Main 86.76	3433.40	100-Year_FEMA	618.42	617.40	1.03	0.09	0.00	5370.00
Main 88.64	3485.48	50-Year_FEMA	619.23	616.99	2.24	0.34	0.38	4800.00
Main 90.43	3485.48	100-Year_FEMA	619.75	617.36	2.38	0.33	0.41	5370.00
Main 100.33	3488.01	50-Year_FEMA	621.32	619.26	2.07	0.04	0.02	4800.00
Main 101.78	3488.01	100-Year_FEMA	621.80	619.58	2.22	0.04	0.02	5370.00
Main 159.57	3490.54	50-Year_FEMA	621.43	620.24	1.19	0.02	0.09	4800.00
Main 178.92	3490.54	100-Year_FEMA	621.92	620.63	1.29	0.02	0.09	5370.00
Main 146.85	3504.24	50-Year_FEMA	621.54	620.54	0.99	0.08	0.02	4800.00
Main 172.51	3504.24	100-Year_FEMA	622.02	620.96	1.07	0.08	0.02	5370.00
Main 147.33	3505.24	50-Year_FEMA	621.54	620.55	0.99	0.01	0.00	4800.00
Main 172.97	3505.24	100-Year_FEMA	622.03	620.96	1.06	0.01	0.00	5370.00
Main	3557	Bridge						
Main 112.35	3576.30	50-Year_FEMA	621.95	621.23	0.72	0.07	0.01	4687.65
Main 157.44	604.25 3576.30 618.58	100-Year_FEMA	622.43	621.67	0.76	0.07	0.01	5212.56

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Main 494.62	3587	50-Year_FEMA	622.04	621.14	0.90	0.04	0.05	4688.91	111.09
Main 187.69	3587 642.63	100-Year_FEMA	622.52	621.60	0.92	0.04	0.05	5182.31	
Main 139.22	3647	50-Year_FEMA	622.31	621.50	0.81	0.26	0.01	32.46	4628.32
Main 277.47	518.33 3647 711.93	100-Year_FEMA	622.77	621.98	0.79	0.24	0.01	58.66	5033.87
Main 139.57	3647.25	50-Year_FEMA	622.32	621.50	0.81	0.00	0.00	32.53	4627.90
Main 277.81	519.07 3647.25 711.99	100-Year_FEMA	622.78	621.98	0.79	0.00	0.00	58.72	5033.47
Main 135.69	3658	50-Year_FEMA	622.37	621.63	0.74	0.04	0.01	41.00	4623.31
Main 268.70	553.90 3658 726.53	100-Year_FEMA	622.82	622.09	0.73	0.04	0.01	73.39	5027.91
Main 97.90	3690	50-Year_FEMA	622.49	621.80	0.68	0.11	0.01	45.80	4656.29
Main 227.00	567.75 3690 764.31	100-Year_FEMA	622.93	622.26	0.67	0.10	0.01	90.55	5052.45
Main 98.97	3691	50-Year_FEMA	622.49	621.81	0.68	0.00	0.00	46.17	4654.86
Main 228.15	384.00 3691 452.60	100-Year_FEMA	622.93	622.27	0.66	0.00	0.00	90.92	5050.93
Main 58.02	3755.59	50-Year_FEMA	622.77	621.99	0.77	0.25	0.03	16.53	4725.45
Main 114.94	231.77 3755.59 272.23	100-Year_FEMA	623.20	622.40	0.79	0.23	0.04	49.07	5205.99
Main 73.33	3829	50-Year_FEMA	623.08	622.32	0.77	0.32	0.00	2.30	4724.37
Main 218.41	363.60 3829 434.48	100-Year_FEMA	623.50	622.75	0.75	0.29	0.00	11.61	5139.98
Main 77.62	3830	50-Year_FEMA	623.09	622.33	0.76	0.00	0.00	12.35	4710.02
Main 306.28	544.12 3830 742.60	100-Year_FEMA	623.51	622.84	0.66	0.00	0.01	67.75	4995.97
Main 160.69	3859	50-Year_FEMA	623.21	622.52	0.69	0.12	0.01	16.64	4622.67
Main 468.76	631.06 3859 730.56	100-Year_FEMA	623.61	623.03	0.58	0.10	0.01	75.33	4825.91
Main 701.62	3992.67	50-Year_FEMA	623.68	623.26	0.42	0.44	0.03	58.15	4040.23
Main 930.92	610.99 3992.67 624.59	100-Year_FEMA	624.00	623.60	0.40	0.37	0.02	112.69	4326.38

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Main 703.18	3993.67 532.15	50-Year_FEMA	623.68	623.26	0.42	0.00	0.00	58.62	4038.20
Main 932.29	3993.67 545.72	100-Year_FEMA	624.01	623.60	0.40	0.00	0.00	113.18	4324.53
Main 650.52	4096 405.08	50-Year_FEMA	623.93	623.49	0.44	0.25	0.01	62.89	4086.59
Main 843.66	4096 428.18	100-Year_FEMA	624.26	623.80	0.46	0.24	0.02	96.48	4429.86
Main 651.29	4097 460.07	50-Year_FEMA	623.94	623.51	0.42	0.00	0.00	112.56	4036.15
Main 842.56	4097 483.46	100-Year_FEMA	624.27	623.84	0.43	0.00	0.00	180.52	4346.92
Main 618.35	4134.83 412.95	50-Year_FEMA	624.03	623.56	0.46	0.08	0.01	112.97	4068.67
Main 795.01	4134.83 427.33	100-Year_FEMA	624.36	623.88	0.48	0.08	0.02	179.62	4395.37
Main 289.46	4277.55 223.20	50-Year_FEMA	624.42	623.79	0.62	0.34	0.05	10.74	4499.79
Main 372.59	4277.55 230.86	100-Year_FEMA	624.77	624.08	0.69	0.35	0.06	17.78	4979.62

