CAMPUS PARK WEST PROJECT

APPENDIX N

HORSE RANCH CREEK FLOODPLAIN STUDY

SPA05-001, GPA05-003, REZ05-005,
TM 5424, LOG NO. 05-02-009

for the

DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

August 2013

HORSE RANCH CREEK FLOODPLAIN STUDY FOR CAMPUS PARK WEST

County of San Diego, CA
April 16, 2013

TM Tract 5424; GPA05-003; SPA05-001;

PROJECT DESIGN CONSULTANTS

HORSE RANCH CREEK FLOODPLAIN STUDY FOR CAMPUS PARK WEST

County of San Diego, CA
April 16, 2013

TM Tract 5424; GPA05-003; SPA05-001;

REZ05-005; ER05-02-009

Prepared For:

Pappas Investments
2020 L Street, 5th Floor
Sacramento, CA 95811

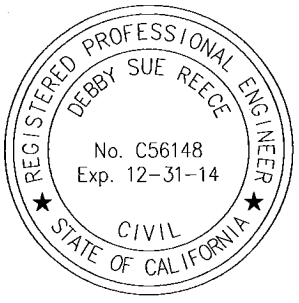
Prepared By:

PROJECT DESIGN CONSULTANTS

Planning | Landscape Architecture | Engineering | Survey

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

PDC Job No. 3631.10



Prepared by: C. Pack, P.E.
Under the supervision of

Debby Reece, PE RCE 56148
Registration Expires 12/31/14

TABLE OF CONTENTS

1. INTRODUCTION 1

2. EXISTING AND PROPOSED DRAINAGE PATTERNS AND IMPROVEMENTS 2

2.1 Existing Drainage Patterns 2

2.2 Proposed Drainage Patterns and Improvements 2

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS 3

3.1 Hydrology Criteria 3

3.2 Hydrologic Methodology 4

3.3 Explanation of the HEC-HMS Computer Program 6

3.4 Hydrology Results 6

4. HYDRAULIC CRITERIA AND METHODOLOGY 7

4.1 Previous Horse Ranch Creek Floodplain Studies 7

4.2 Approach to Creek Hydraulic Analysis 8

4.3 Horse Ranch Creek Floodplain Delineation 9

4.4 HEC-RAS Hydraulic Criteria 10

4.5 HEC-RAS Hydraulic Methodology 11

4.6 Explanation of the HEC-RAS Computer Model 13

5. RESULTS OF THE HEC-RAS HYDRAULIC ANALYSIS 13

6. CONCLUSION 14

FIGURES

Figure 1: Project Vicinity Map 1

TABLES

Table 1: Regional Basin Hydrology Criteria 4
Table 2: HEC-HMS Hydrology Results Summary 7
Table 3: HEC-RAS Hydraulic Criteria 10

APPENDICES

1 Regional Basin Hydrology Calculations and Results

2 Horse Ranch Creek Watershed: Land Cover, Land Use, and Soil Type Exhibits

3 Existing Conditions HEC-RAS Input Data

4 Existing Conditions HEC-RAS Cross Sections and Results

5 Proposed Conditions HEC-RAS Input Data

6 Proposed Conditions HEC-RAS Cross Sections and Results

7 Proposed Condition (Capacity/Worst Case) HEC-RAS Input Data

8 Proposed Condition (Capacity/Worst Case) HEC-RAS Cross Sections and Results

9 HEC-RAS Comparative Summary

10 Bridge Plans and As-builts

11 Bridge and Creek Photos

12 Drainage Exhibits

E – Regional Drainage Map, Horse Ranch Creek Watershed

F – Field Survey Spot Elevations of Creek and Existing Bridges

G – Horse Ranch Creek HEC-RAS Work Map: Existing Conditions

H – Horse Ranch Creek HEC-RAS Work Map: Proposed Conditions

1. INTRODUCTION

This floodplain study supports the preliminary design of the proposed grading and improvements associated with Campus Park West project, for a Tentative Map (TM) submittal. This report specifically addresses the project's relation and impacts to the Horse Ranch Creek floodplain. This report is a supplemental report to the onsite drainage study for Campus Park West prepared by Project Design Consultants, submitted under a separate cover. In addition, for the San Luis Rey flood study, refer to a separate report prepared by Chang Consultants.

The project is located in the County of San Diego within the Fallbrook Community Planning Area. The site is 116.5 acres in size and is located east of Interstate 15, with the majority of the site located north of State Route 76 (SR 76), adjacent to Interstate 15, and the remaining property is located south of SR 76 on either side of Pankey Road. Figure 1 shows the vicinity map for the project.

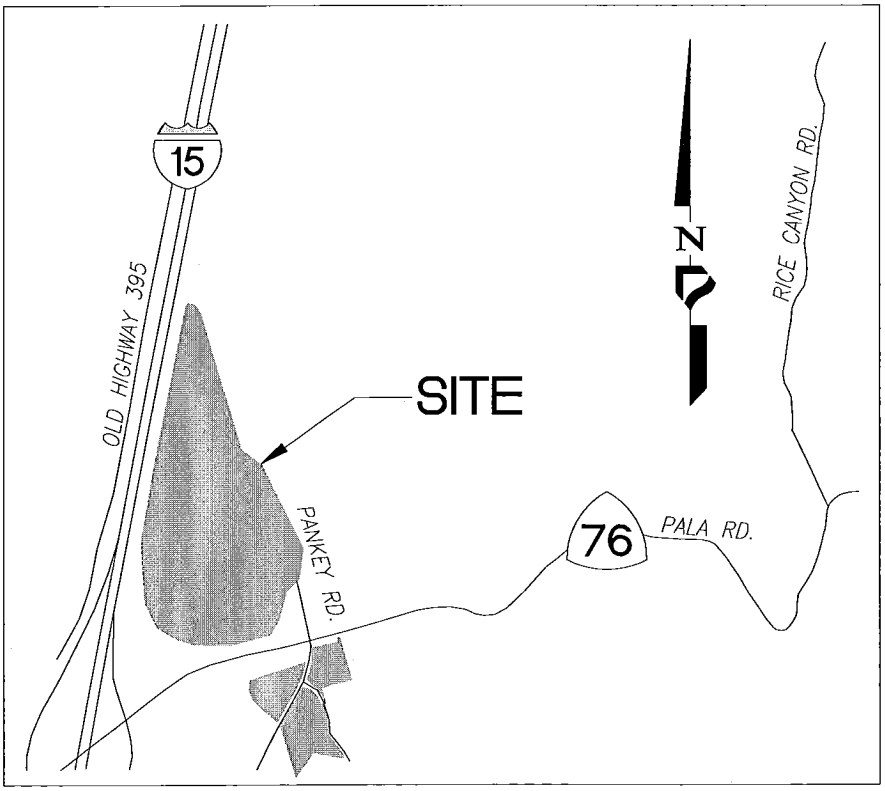


Figure 1: Project Vicinity Map

The purpose of this report is to determine the 100-year peak flow for the Horse Ranch Creek watershed, establish an existing condition floodplain model, and establish the proposed condition floodplain models to demonstrate the project's effect on the floodplain.

The drainage analyses presented herein reflect a Tentative Map level-of-effort, and will require additional modifications during final engineering design. *Therefore, the purpose of this report submittal is to acquire from the County: 1) concept approval of the proposed creek crossings and grading design, 2) approval of the methodology used in the evaluation of the Horse Ranch Creek regional hydrology and creek hydraulic calculations, and 3) identification of critical path drainage issues that need to be addressed during final engineering.*

2. EXISTING AND PROPOSED DRAINAGE PATTERNS AND IMPROVEMENTS

The following sections provide descriptions of the existing and proposed drainage patterns and improvements for the project.

2.1 Existing Drainage Patterns

The project is situated next to Horse Ranch Creek, which is a densely vegetated ephemeral stream that flows north to south. For the project area north of SR 76, Horse Ranch Creek is located to the east of the project boundary. There are three existing bridges that cross Horse Ranch Creek in the vicinity of the project, including two Pankey Road bridges, and one SR 76 Caltrans bridge. Approximately 600 feet south of the South Pankey Road bridge, the creek confluences with the San Luis Rey River.

2.2 Proposed Drainage Patterns and Improvements

The project proposes to demolish the existing North Pankey Road bridge and realign Pankey Road and extend Pankey Road through the project to intersect with Pala Mesa Drive. Part of the extension will include a new Pankey Road bridge over Horse Ranch Creek north of SR 76. The Caltrans SR 76 / Horse Ranch Creek bridge was recently widened by Caltrans per Caltrans EA 231501. Due to the projected combined traffic impacts of the Campus Park West, Campus Park, and Meadowood projects, Campus Park West is conditioned to widen SR 76 along the project

frontage to a 100' right-of-way (R/W) section in order to accommodate the construction of dual left SR 76 turn lanes onto Pankey Road North. The dual left turn lanes will require widening of the recently widened SR 76 bridge. The recent Caltrans widening widened the SR 76 bridge on the south (downstream) side and it is proposed that the Campus Park West project will widen the existing bridge on the north (upstream) side. For this reason, this revised geometry for the bridge was incorporated into the proposed condition model as a part of this floodplain study.

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS

This section of the report summarizes the drainage criteria that were used in the hydrologic analysis and key elements of the methodology. Also included is a description of the computer model used in the computations. Hydrologic analyses were performed for the Horse Ranch Creek watershed to determine the 100-year peak flow rates so that a floodplain analysis could be performed for Horse Ranch Creek. Since the Horse Ranch Creek watershed is significantly over one square mile in size, the Natural Resources Conservation Service (NRCS) unit hydrograph hydrologic method was used to determine the peak discharge rate for the watershed. Note that an existing condition (pre-project) and proposed condition (post-project) hydrologic analysis was performed for comparison purposes.

3.1 Hydrology Criteria

Table 1 summarizes the key hydrology assumptions and criteria used for the hydrologic modeling.

Table 1: Regional Basin Hydrology Criteria

Hydrology:	50-year and 100-year storm frequency
Land Use and Land Cover:	Existing land uses were obtained from: 1) County of San Diego DPLU Zoning Maps from SanGIS (2008). Land covers were obtained from: 1) County DPLU GIS vegetation information obtained from SanGIS, dated 4/7/2009. 2) The 2006 Aerial photograph from Digital Globe and the Ground Cover map from the 1969 San Diego County Soils Interpretation Study were also used as references.
Soil Type:	Hydrologic Soil Group information was obtained from the U.S. Department of Agriculture-Soil Survey Geographic (SSURGO) database for San Diego County, published in 2007. Note that the B and C type soils make up the majority of the watershed.
PZN Condition:	Based on 2003 County of San Diego Hydrology Manual
Existing & Proposed Curve Numbers:	Based on percentage of land use and land cover in the various soil groups and adjusted for PZN condition.
Rainfall intensity for hyetograph creation:	Hyetograph generated with 2/3, 1/3 distribution using 2003 County of San Diego Hydrology Manual methodology.

3.2 Hydrologic Methodology

The Horse Ranch Creek watershed area was delineated based on USGS and County topographic maps of the area. The NRCS unit hydrograph method was used to determine the peak 50-year and 100-year storm flow for both existing and proposed conditions. A single-basin model was performed using the soil types and the land use/land cover classifications developed for this study. The majority of the Horse Ranch Creek watershed is undeveloped and/or low density residential, with a significant amount of agricultural areas.

The composite curve number (CN) for the NRCS method was developed by performing a composite analysis of the land use, land cover, and soil type information for the basin. The GIS

data was first modified to simplify the hydrologic calculations. The soil data was aggregated into Hydrologic Soil Groups and the vegetation categories in the original vegetation shapefile were also simplified into broad land cover types. The zoning data obtained from SanGIS contained more land use categories than necessary for a hydrologic analysis, so the zoning categories were grouped into broad categories based on assumed imperviousness of the land use (similar to the categories listed in Table 4-2 of the 2003 County of San Diego Hydrology manual). The intensive agriculture category was assumed to be "Evergreen Orchard." The open space, extensive agriculture, and undeveloped land use areas were not assigned a curve number designation. Rather, the vegetation shapefile was used to assign curve numbers for these areas instead of the land use shapefile. This was done in order to make a correlation of the vegetation cover types to the land cover types listed in Table 4-2 of the 2003 County manual. Refer to the composite Land Use/Vegetation Cover exhibit for the illustration of the merging of the land use and land cover information. Finally, a composite Land Use/Vegetation Cover/Hydrologic Soil Group map was created in GIS and the tabulation of the areas for each cover and soil category was computed with GIS in order to determine a composite CN for the basin. The CN was adjusted to account for the precipitation zone number and antecedent moisture condition. The procedure for the analysis is summarized below.

The composite unadjusted composite CN was determined and it was then adjusted based on the PZN condition using Figure C-1 and Table 4-6 from the 2003 County of San Diego Hydrology Manual. See Appendix 1 for the hydrology calculations and Exhibit E for the regional drainage map.

The rainfall distribution for the basin was generated by first consulting the 100-year 6-hour and 24-hour duration isopluvial maps in the 2003 County Hydrology Manual. The rainfall hyetograph was generated based on the County 2/3, 1/3 distribution and the depth-area adjustment was applied based on the total drainage area. HEC-HMS, a hydrologic modeling program, was used to generate the hydrograph for the basin. The unit hydrograph was based on the NRCS unit hydrograph method with a lag time computed based on the Corps Lag equation and then converted to an NRCS lag time. The basin "n" factor was estimated to be 0.05.

3.3 Explanation of the HEC-HMS Computer Program

The procedures outlined in the 2003 County of San Diego Hydrology Manual were used to determine runoff curve numbers and lag times used in the HEC-HMS model. The HEC-HMS model was developed by the U.S. Army Corps of Engineers and is designed to simulate the surface runoff response of a drainage basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components. Each component models an aspect of the precipitation-runoff process within a portion of the basin, commonly referred to as a subbasin. A component may represent a surface runoff entity, a pipe system, a stream channel, or a reservoir. Representation of a component requires a set of parameters, which specify the particular characteristics of the component, and mathematical relations, which describe the physical processes. The result of the modeling process is the computation of runoff flow hydrographs at desired locations in the drainage basin.

3.4 Hydrology Results

Table 2 below summarizes the HEC-HMS regional hydrologic analyses results. The 100-year peak flows were used to develop the existing and proposed floodplain models for Horse Ranch Creek. Note that since the project area is such a small percentage of the overall watershed, the difference between the pre-project and post-project peak flow rates is essentially negligible (0.08% increase). Note that the project will provide significant detention for the smaller storm events for the onsite areas with the proposed water quality/hydromodification basins. However, the effect of the detention basins onsite are not accounted for in the peak flow NRCS model, as summarized in Table 2. Therefore, during final engineering, additional modeling will be provided to show that there is no net increase in the 100-year flow at the SR-76 Bridge due to the Campus Park West project. This will be accomplished by including the effect of detention in the model. Therefore, the pre-project Horse Ranch Creek flow rates are used in the hydraulic modeling in this report for both existing and proposed conditions.

Table 2: HEC-HMS Hydrology Results Summary

Location	Pre-Project Q50 (cfs)	Pre-Project Q100 (cfs)	Post-Project Q50 (cfs)	Post-Project Q100 (cfs)	Area (Acres)/(sq.mi.)
Horse Ranch Creek	7135	8441	7141	8448	7424.5/11.6

4. HYDRAULIC CRITERIA AND METHODOLOGY

Detailed hydraulic analyses are not within the scope of this preliminary design phase, but will be performed during final engineering. However, the roadway and pad elevations need to be set above the 100-year water surface elevations in the creek. Therefore, hydraulic backwater calculations are needed during this preliminary phase to ensure the proposed pad elevations are elevated above the 100-year floodplain and to ensure that the sizes of the bridge crossings are adequate for the peak 100-year design flow rate. This is accomplished by modeling the existing and proposed condition hydraulics of the stream and bridge crossings using HEC-RAS.

4.1 Previous Horse Ranch Creek Floodplain Studies

The hydraulics of the SR 76 Horse Creek Ranch bridge was modeled previously for the Caltrans SR 76 widening project. The widening project construction has recently been completed, and a LOMR (Case No. 12-09-0511P) has been approved with FEMA. The hydraulic results associated with the Caltrans widening project are in the URS study entitled *FEMA Letter of Map Revision (LOMR) – Follow up to CLOMR #05-09-1045R State Route 76 Widening And Realignment from Interstate 15 to 3.9 KM East, San Diego County*, dated August 26, 2011. This LOMR report was an update to the previous CLOMR report, entitled *Hydraulic and Scour Report – State Route 76 Widening and Realignment from Interstate 15 to 2.2km East*, dated March 25, 2005 (herein referred to as the "URS Hydraulic Report"). The URS Hydraulic Report was based on a peak Horse Ranch Creek flow rate of 6405 cfs, which was developed using the County 1993 NRCS methodology. The 2003 Hydrology Manual methodology was not used for the analysis of the bridge because the original bridge design was based upon the 1993 County methodology, and so the use of the original bridge design hydrology criteria and methodology

was considered appropriate for that project since it was a bridge widening, and not a bridge replacement. Note that the difference in the rainfall hyetographs of the 1993 versus 2003 County Hydrology manuals is the main reason why the 100-year peak flow rate for the watershed per this study is over 30% higher than the URS peak flow rate. The large difference in the two design flow rates is mainly due to the differences in the County Hydrology manual methodology and does not represent drastic landuse changes in the watershed.

For this project, the County and Caltrans have elected not to accept the 1993 County methodology, so the peak 100-year flow rate was calculated using the 2003 modeling criteria. The peak 100-year flow rate per Table 2 is the Horse Ranch Creek design flow rate used for this project in delineating the floodplain through the project limits.

4.2 Approach to Creek Hydraulic Analysis

The hydraulic capacity of Horse Ranch Creek is being studied concurrently as part of the CEQA process for two adjacent planned developments, namely Campus Park and Meadowood. Copies of the approved preliminary flood studies are available as a part of the Environmental Impact Reports (EIR) for the projects. The preliminary drainage study for Campus Park (written by Landmark Engineering) is dated February 23, 2010 and the most recent preliminary drainage study for Meadowood (written by Rick Engineering) is dated March 19, 2010. Both studies show significantly different results for the existing 100-year flood elevations of Horse Ranch Creek, particularly for the area upstream of the existing SR 76 bridge. Each study proposes different solutions for the North Pankey Road bridge replacement and both studies are based on the old alignment of Pankey Road, instead of the proposed alignment included as part of the Campus Park West TM. Due to the discrepancies of the studies, it was necessary to complete a separate flood study for the Campus Park West project. Further coordination between the upstream project teams and the regulatory agencies will be required during final engineering. Note that Hunsaker is the new engineer for Campus Park, and they have started final engineering plan processing. Part of the work proposed with the Campus Park project includes the construction of Pankey Place, which will tie into the proposed realignment of Pankey Road. The pump station, equestrian staging area, and Pankey Place are future improvements (by others) and will be addressed during final engineering by the three respective projects. Note that since these

improvements are not a part of the Campus Park West project and will be a future condition, they are not analyzed as a part of this Campus Park West TM study.

4.3 Horse Ranch Creek Floodplain Delineation

Three different preliminary HEC-RAS hydraulic models have been prepared for Horse Ranch Creek for the Campus Park West project, and they are as follows:

- Existing conditions hydraulic analysis,
- Proposed condition hydraulic analysis (Campus Park West and roadways completed including the widening of SR 76 to a 100/ R/W to accommodate dual left turning lanes on SR 76 for North Pankey Road),
- Proposed condition (Capacity/Worst Case). (Assumed worst case (high) "n" values used in order to set pad elevations).

Note that the Tentative Map shows the proposed project design plus one alternative design for the westerly pad located to the southwest of the SR 76/Pankey Road intersection. Grading Alternative #1 is the grading alternative that, if selected, would expand the development footprint to the north by decertifying a portion of the existing SR 76 Caltrans right-of-way. This alternative is dependent on whether the Caltrans Decertification process is achieved. If the process to decertify the right-of-way is not successful, the "Grading Alternative #1" would be eliminated. The "Grading Alternative #1" does not require a separate HEC-RAS hydraulic model because the area proposed to be filled is completely within the SR 76 downstream ineffective flow area of the proposed condition HEC-RAS model. Therefore, the water surface elevations calculated per the proposed condition hydraulic model will be the same for each alternative, although the floodplain delineation will be slightly different because the Grading Alternative #1 will eliminate the inundation area where the fill will be placed.

As part of the drainage evaluation for the Project, PDC conducted a field reconnaissance and field survey investigation to:

- Gather hydraulic data, i.e., Manning's n values and hydraulic control,

- Evaluate the existing conditions of the three existing bridge crossings and obtain field survey shots of the bridge crossings to accurately model the bridge crossings,

- Supplement the project's aerial topography with channel flow line elevations since the creek is heavily vegetated and many of the contours are interpolated near the creek. Note that the vertical datum for the County scanned topography, Landmark's Campus Park aerial topography, PDC aerial topography, and PDC field survey is NGVD29 (MSL). The design plan for the recent SR 76 bridge widening (EA 231501) is based on NAVD88 (in metric). All information entered into the HEC-RAS program came from the NGVD29 data sources. Note that, according to VERTCON, the NAVD88 datum is 2.231 feet higher than the NGVD29 datum near the project site.

As a result of the field investigation, the following was established:

- Horse Ranch Creek's Manning's n value within the main channel and over banks is very high due to the dense vegetation. Photographs of the creek showing the vegetation are included in Appendix 11.

- Underneath the existing bridges, there is an absence of vegetation and the bridge sections are clear of debris or heavy vegetation. Photographs of the bridge sections are included in Appendix 11.

- The field surveyed cross sectional area of the SR 76 bridge crossing is significantly larger than the cross sectional area modeled in Rick Engineering's hydraulic model presented in the draft study for Meadowood. This explains the main discrepancy between the floodplain results of the Campus Park West and Meadowood studies.

4.4 HEC-RAS Hydraulic Criteria

Table 3 below summarizes the hydraulic design criteria for the HEC-RAS analysis.

Table 3: HEC-RAS Hydraulic Criteria

Water Surface Elevations (WSELs)	• Maintain WSELs, within 0.5 foot of existing water surface at upstream limit. Note this is a FEMA guideline.
Starting Water Surface Elevation	• The starting water surface elevation was interpolated from the San Luis Rey water surface elevation (per the cross sections in Chang's San Luis Rey Floodplain Study) at the junction of Horse Ranch Creek

	and the San Luis Rey River.
Road Overtopping	• Prevent overtopping of Pankey Road during the 100-year storm event.
Proposed Pad Elevations	• Design proposed pad elevations to maintain at least one foot of freeboard over creek flood elevations under the worst-case situation.
Flow Regime	• Subcritical flow regime. Downstream control depth of San Luis Rey River from Chang's San Luis Rey Floodplain Study was used as the downstream control. A subcritical analysis produces the most conservative WSELs by not allowing the flow depth to go below critical depth.
Contraction and Expansion Coefficients	• 0.1 and 0.3 for the majority of cross sections, 0.3 and 0.5 for cross sections near the bridges, and at other locations with major expansion and contraction.

4.5 HEC-RAS Hydraulic Methodology

The existing condition peak 100-year, 24-hour HEC-HMS hydrology results was used for both the existing and proposed creek hydraulic analysis. The HEC-RAS computer model was used to complete the creek hydraulic analysis. The most downstream cross section for Horse Ranch Creek is located just south of the southerly Pankey Road bridge and the most upstream cross section is located north of the project boundary. The water surface elevations (WSELs) generated by the existing condition analysis served as a baseline for the project and the proposed conditions WSELs were compared against the project baseline.

The HEC-RAS cross-sections were extracted from the topographic map that was recently flown specifically for the Project and other topographic sources. The topography for Campus Park from Landmark Engineering was used as supplemental topography for some of the cross sections. In addition, field survey crews collected cross section data for some of the modeled cross sections, since much of the creek bottom is obscured in the aerial topography due to the dense vegetation. All of the topography sources used in the model are based on the NGVD29 (MSL) vertical datum. Refer to Exhibit F for field survey information.

The following assumptions were included in the proposed condition hydraulic modeling:

- The assumed proposed Pankey Road North Bridge soffit elevation is modeled 7 feet below the proposed roadway centerline profile. Final configuration of the bridge will be developed during final engineering. The creek cross section will be widened at the

bridge to tie into the bridge abutments (to be finalized during final engineering). This will require grading within the channel to widen the existing channel underneath the bridge. Proposed bridge pier widths were assumed to be 1.25 feet in diameter.

- The cross sections between each proposed bridge are modeled with a lower Manning's n value than the upstream and downstream creek sections, since heavy vegetation is not expected to grow underneath the deck (similar to existing conditions).
- The area upstream of the North Pankey bridge was modeled with high Manning's n values due to the existing dense vegetation within the stream.
- The proposed condition Capacity/Worst Case model includes the worst case (high) "n" values used in order to set pad elevations. The separate Proposed Condition hydraulic model includes the Manning's n values used to delineate the proposed condition floodplain.
- The Campus Park and Meadowood encroachments into the existing floodplain were not modeled. This was done in order to show the project's direct effect on the floodplain.
- The proposed condition model for the widening of SR 76 to a 100' R/W was created assuming that the bridge would be widened to the north and that, due to the cross fall on the bridge, the existing bridge deck on the most upstream end would be lowered compared to existing conditions. Further alignment studies and traffic impact reports will give further information for this design scenario, which will be updated during final engineering.
- Ineffective flow areas were estimated based on angle of flow and estimated contraction and expansion ratios. For modeling purposes, ineffective flow areas are typically represented by 1:1 contraction ratios and 4:1 expansion ratios. This means that in areas of significant expansion and contraction due to a bridge, the areas to the side of the bridge abutments upstream and downstream of the bridge are ineffective flow areas. Note that the ineffective flow areas upstream of the North Pankey bridge were modeled conservatively to account for the angle of the bridge approach in relation to the streamlines. Due to the bridge geometry, the future improvements by others (Pankey Place, the pump station, and the equestrian area) may be partially within the ineffective flow area of the bridge. This will be addressed during final engineering with the three

respective projects (Meadowood, Campus Park, and Campus Park West). Note also that downstream of the North Pankey Road bridge (in between cross sections 988 and 1200), there is a knoll in the existing topography that limits conveyance in the right overbank. For this reason, the area was modeled as an ineffective flow area. In general, ineffective flow areas were set based on approximations of contraction and expansion ratios and streamline convergence and divergence due to the varied topographical features.

For the results of the hydraulic analysis see Appendices 3 through 9, and Exhibits G and H for the HEC-RAS cross-section locations.

4.6 Explanation of the HEC-RAS Computer Model

The HEC-RAS computer model was used in the preliminary design of the project, including the proposed North Pankey Bridge. The HEC-RAS model uses the Standard Step Method to calculate water surface profiles for open channel flow. It assumes that flow is steady, gradually varied, and can be modeled in one-dimension. The effects of various obstructions such as bridges, culverts, weirs, and structures in the flood plain may be considered in the computations. Input data requirement include, but are not limited to:

- Flow rate.
- Topographic cross-sections.
- Manning's roughness coefficients.
- Expansion and contraction coefficients.
- Conveyance structures.

5. RESULTS OF THE HEC-RAS HYDRAULIC ANALYSIS

Under existing conditions, the 100-year flow overtops the existing North Pankey Road bridge. The flow inundates the majority of Pankey Road, from just south of the bridge to just north of the intersection with SR 76. The deck of the South Pankey Road bridge is high enough that the flow is conveyed underneath the bridge without causing a significant backwater effect.

For the SR 76 bridge, the modeled 100-year flow rate is large enough to cause the water surface elevation to be above the upstream soffit elevation under both existing and proposed conditions. Because the water surface elevation is above the soffit, it is likely that water will pond in the shoulder of SR-76 during the 100-year storm under both existing and proposed conditions. Due to the much higher flow rate used in this study as compared to the URS Hydraulic Report, it is not surprising that the freeboard of the bridge has reduced considerably.

The proposed project was designed to convey the 100-year peak design flow without overtopping North Pankey Road and without having significant impacts on Meadowood and Campus Park projects or Campus Park West's proposed developable pads. Refer to Appendix 9 for the comparative analysis of the WSELs of the existing and proposed conditions.

The preliminary hydraulic results show that the proposed pad elevations (as shown in the Campus Park West TM) are at least one foot above the 100-year floodplain. The proposed project will eliminate overtopping of the North Pankey Road bridge that occurs under existing conditions. Due to the new bridge, there are increases in WSELs upstream of the north Pankey Road crossing when comparing the existing and proposed conditions. Campus Park West does not impact, with any level of significance, the floodplain elevations adjacent to the Campus Park and Meadowood projects, more than already established by their individual studies. Reciprocal agreements regarding impacts to the floodplain elevations are being coordinated at this time.

The proposed condition (Capacity/Worst Case) model reflects the same geometry as the proposed condition model. However, the proposed condition (Capacity/Worst Case) model is reflective of an extremely densely vegetated condition (0.06 to 0.075 for overbanks, 0.15 within the channel), in order to set the elevation of proposed streets and pads. This conservative assumption was used solely for this reason. Refer to the previously described proposed condition models for the WSELs used for the floodplain delineation.

6. CONCLUSION

This floodplain study supports the preliminary design of the proposed grading and improvements associated with Campus Park West project. The results indicate that 100-year water surface elevations increase due to the new North Pankey Road bridge over existing conditions, but the

water surface elevations of the existing and proposed condition models converge near the upstream end of the model, indicating that the 100-year flood plain modifications do not affect projects north of the northerly Campus Park West property boundary. The following issues will be coordinated with the regulatory agencies and/or adjacent developers during final engineering.

1) The North Pankey Road bridge is a community facility since Campus Park West, Campus Park, and Meadowood all require use of this transportation corridor for access and utility crossings. The proposed bridge will affect all three projects and Campus Park West's bridge design affects the upstream water surface elevations similarly to the crossing proposed by the Meadowood TM Drainage Study.

2) Landmark, Rick Engineering, and Project Design Consultants have prepared separate flood studies for Horse Ranch Creek for each project in a stand-alone condition. The peak 100-year flow rates per each study are in relative agreement, but the hydraulic results are not in agreement due to the differences in modeling the existing SR 76 bridge, and the three different proposed solutions for replacing the North Pankey Road bridge. These issues will be resolved during final engineering, when the final bridge design details are completed.

APPENDIX 1

Regional Basin Hydrology Calculations and Results

HEC-HMS HYDROLOGY INPUT SUMMARY FOR REGIONAL DRAINAGE BASIN

Project:	CAMPUS PARK WEST		
Storm frequency:	100	year	
6-Hour Storm Duration Precipitation:	3.5	inches	(From rainfall isopluvials, County of S.D. Hydrology Manual)
24-Hour Storm Duration Precipitation:	6.0	inches	(From rainfall isopluvials, County of S.D. Hydrology Manual)
Storm frequency:	50	year	
6-Hour Storm Duration Precipitation:	3.0	inches	(From rainfall isopluvials, County of S.D. Hydrology Manual)
24-Hour Storm Duration Precipitation:	5.4	inches	(From rainfall isopluvials, County of S.D. Hydrology Manual)
Precipitation Zone Number (PZN)=	1.8	(From Figure C-1, County of S.D. Hydrology Manual)	
PZN Adjustment Factor for return period=	2.8	(From Table 4-6, County of S.D. Hydrology Manual)	

HYDROLOGIC BASIN VARIABLES: EXISTING CONDITIONS (PRE-PROJECT)

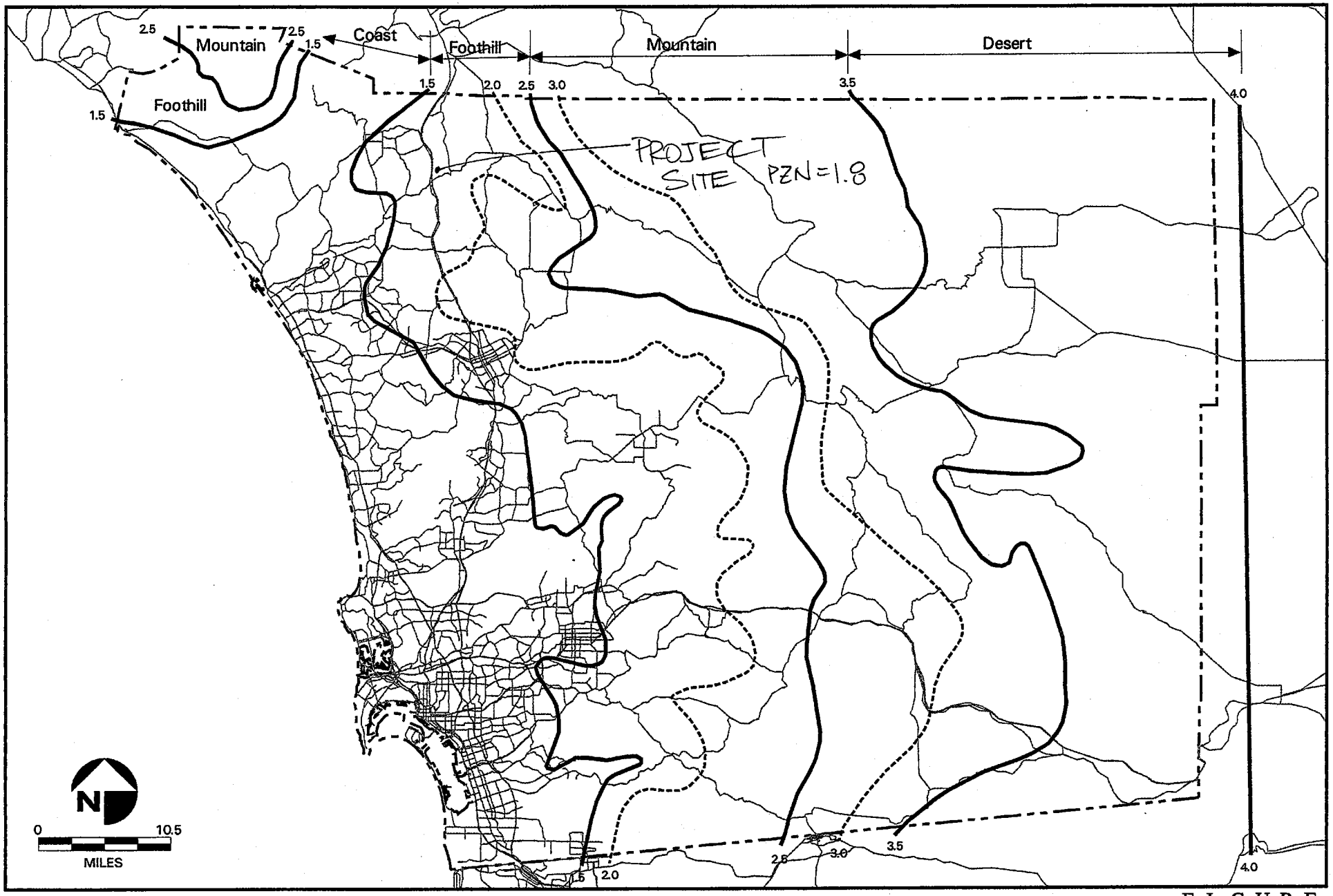
	HRC Basin	
Unadjusted Curve Number=	79.2	(From soil and landcover analysis)
PZN Adjusted Curve Number=	**88.64**	(Interpolated from Table 4-10)

HYDROLOGIC BASIN VARIABLES: PROPOSED CONDITIONS (POST-PROJECT)

	HRC Basin	
Unadjusted Curve Number=	79.5	(From soil and landcover analysis)
PZN Adjusted Curve Number=	**88.7**	(Interpolated from Table 4-10)

WATERSHED VARIABLES:

Area in square miles=	**11.600**			
Watershed Length (L)=	7.24	miles		
Length to Centroid (L_c)=	3.20	miles		
Watershed highest elevation =	1950	feet		
Watershed lowest elevation =	246	feet		
Slope (s)=	235.4	feet/mile		
Basin n factor=	0.05	(Estimate from site visit)		
Corps lag (T_L)=24n((L*L_c)/$s^{0.5}$)^m=	1.40	hours (m=0.38 from County of S.D. manual)		
Time to peak = 0.862*Corps lag=	1.21	hours		
Computation Interval (D) (min)=	10	minutes	<=0.2Tp=	14.5 OK
NRCS Lag = 0.862*Corps lag - D/2=	1.126	hours	=	**67.6** min



County of San Diego Hydrology Manual

Precipitation Zone Numbers (PZN)

FIGURE

C-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

PROJECT SITE

Orange County

Riverside County

S.D. COUNTY

Imperial County

Mexico

Pacific Ocean

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

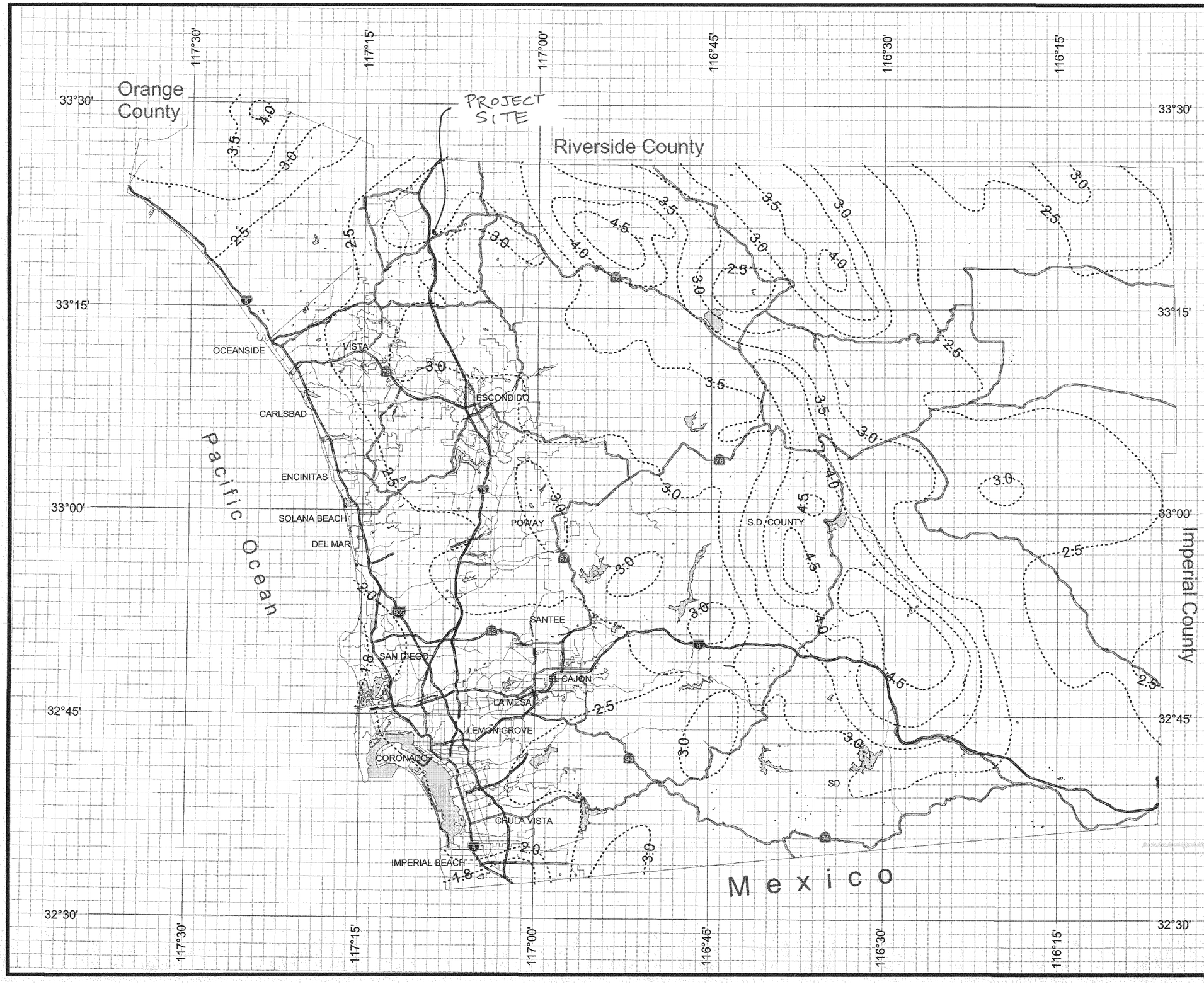
This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

PROJECT SITE

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
S.D. COUNTY
SD

33°30'
33°15'
33°00'
32°45'
32°30'
117°30'
117°15'
117°00'
116°45'
116°30'
116°15'

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

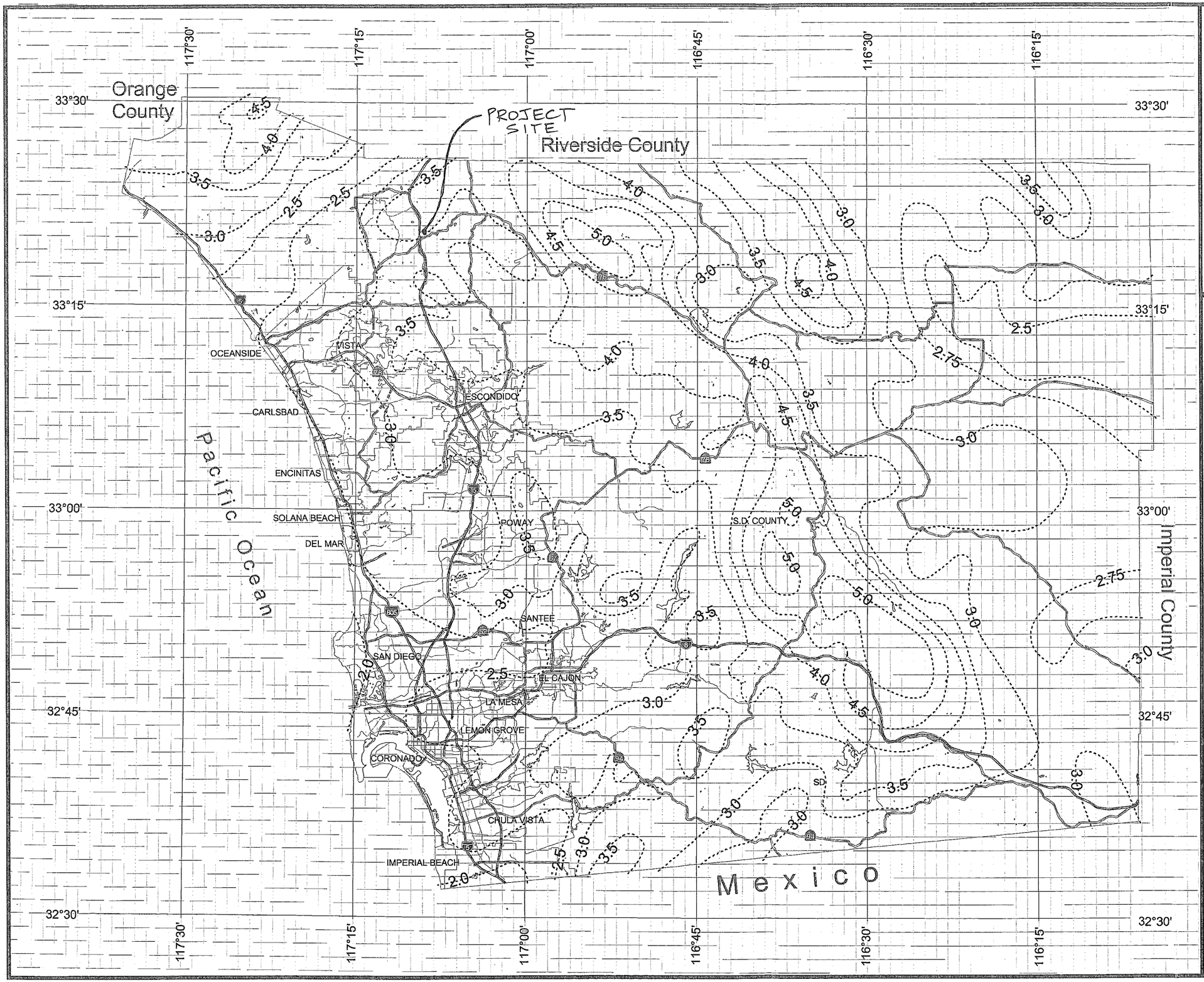
This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

The adjustment for PZN Condition may be made to the composite CN for the watershed. It is not necessary to make the PZN Condition adjustment to each of the CNs for the different combinations of ground cover and soil group within the watershed before calculating the composite CN.

Table 4-6

PZN ADJUSTMENT FACTORS FOR FLOW COMPUTATIONS (San Diego County)

Storm Frequency	Coast (PZN = 1.0)	Foothills (PZN = 2.0)	Mountains (PZN = 3.0)	Desert (PZN = 4.0)
Less than 35-year return period	1.5	2.5	2.0	1.5
Greater than or equal to 35-year return period	2.0	3.0	3.0	2.0

Notes: PZN is the precipitation zone number (see Map, Appendix C). The PZN adjustment factor represents the PZN Condition that the CN for the watershed should be adjusted to.

4.1.3 Rainfall-Runoff Relationship

A relationship between accumulated rainfall and accumulated runoff was derived by NRCS from experimental plots for numerous soils and vegetative cover conditions. The following NRCS runoff equation is used to estimate direct runoff from 24-hour or 6-hour storm rainfall. The equation is:

$$Q_a = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad \text{(Eq. 4-1)}$$

where: Q_a = accumulated direct runoff (in)

P = accumulated rainfall (potential maximum runoff) (in)

I_a = initial abstraction including surface storage, interception, evaporation, and infiltration prior to runoff (in)

S = potential maximum soil retention (in)

Summary Calculations to Determine Existing Condition Unadjusted Composite Curve Numbers for Horse Ranch Creek Watershed

Land Use / Land Cover	Soil A (acres)	Soil B (acres)	Soil C (acres)	Soil D (acres)	Total (acres)	Soil A CN	Soil B CN	Soil C CN	Soil D CN	Soil A A*CN	Soil B A*CN	Soil C A*CN	Soil D A*CN	Unadjusted Average CN
Dryland Pasture, Poor Condition	0.31	248.76	379.34	36.15	664.57	67	78	86	89	20.7	19403.5	32623.5	3217.4	
Orchard, Evergreen, Poor Condition	0.87	1143.35	1305.28	315.17	2764.67	57	73	82	86	49.7	83464.2	107033.1	27104.9	
Narrowleaf Chaparral, Poor Condition	0.17	194.25	999.60	97.92	1291.94	71	82	88	91	12.3	15928.6	87964.9	8910.7	
Streets, paved, open ditches	0.01	441.35	136.06	57.95	635.37	83	89	92	93	0.9	39280.2	12517.2	5389.5	
Water surfaces		1.95	13.42		15.37	97	98	99	99	0.0	191.1	1329.0	0.0	
Woodland, Poor Condition		85.05	84.48	14.01	183.54	45	66	77	83	0.0			1162.6	
Turf (Parks), Fair condition		122.99	1.17	2.76	126.92	44	65	77	82	0.0	7994.1	90.4	226.3	
Low Density Residential (assume 1ac lots)		541.19	780.57	242.71	1564.47	51	68	79	84	0.0	36801.2	61664.8	20387.3	
Med Density Residential (assume 1/4ac lots)		16.40	1.19	21.79	39.37	61	75	83	87	0.0	1230.1	98.5	1895.4	
High Density Residential (assume 65% impervious)		66.88	4.44	11.36	82.67	77	85	90	92	0.0	5684.5	399.5	1045.0	
Commercial (assume 85% impervious)		12.56	41.64	1.42	55.62	89	92	94	95	0.0	1155.3	3914.4	135.2	
Total					**7424.52**									**79.2**

Summary Calculations to Determine Proposed Condition Unadjusted Composite Curve Numbers for Horse Ranch Creek Watershed

Land Use / Land Cover	Soil A (acres)	Soil B (acres)	Soil C (acres)	Soil D (acres)	Total (acres)	Soil A CN	Soil B CN	Soil C CN	Soil D CN	Soil A A*CN	Soil B A*CN	Soil C A*CN	Soil D A*CN	Unadjusted Average CN
Dryland Pasture, Poor Condition	0.31	242.02	379.34	36.15	657.82	67	78	86	89	20.7	18877.6	32623.5	3217.4	
Orchard, Evergreen, Poor Condition	0.87	1074.85	1305.29	315.17	2696.18	57	73	82	86	49.7	78464.1	107033.8	27104.9	
Narrowleaf Chaparral, Poor Condition	0.17	194.25	999.60	97.92	1291.94	71	82	88	91	12.3	15928.6	87964.9	8910.7	
Streets, paved, open ditches	0.01	440.72	136.06	57.95	634.74	83	89	92	93	0.9	39224.1	12517.2	5389.5	
Water surfaces		1.95	13.42		15.37	97	98	99	99	0.0	191.1	1329.0	0.0	
Woodland, Poor Condition		80.67	84.48	14.01	179.16	45	66	77	83	0.0			1162.6	
Turf (Parks), Fair condition		122.99	1.17	2.76	126.92	44	65	77	82	0.0	7994.1	90.4	226.3	
Low Density Residential (assume 1ac lots)		541.19	780.57	242.71	1564.47	51	68	79	84	0.0	36801.2	61664.8	20387.3	
Med Density Resid.(assume 1/4ac lots)		16.40	1.19	21.79	39.37	61	75	83	87	0.0	1230.1	98.5	1895.4	
High Density Residential (assume 65% impervious)		79.25	4.44	11.36	95.05	77	85	90	92	0.0	6736.3	399.5	1045.0	
Commercial (assume 85% impervious)		67.94	41.64	1.42	111.00	89	92	94	95	0.0	6250.5	3914.2	135.2	
Light Industrial (assume 72% impervious)	0.00	12.48	0.00	0.00	12.48	81	88	91	93	0.0	1098.2	0.0	0.0	
Total					**7424.52**									**79.5**

Table 4-10

RUNOFF CURVE NUMBERS FOR PZN CONDITIONS 1.0, 2.0, AND 3.0

PZN = 2.8

CN For:			CN For:		
PZN Condition = 1.0	PZN Condition = 2.0	PZN Condition = 3.0	PZN Condition = 1.0	PZN Condition = 2.0	PZN Condition = 3.0
100	100	100	40	60	78
97	99	100	39	59	77
94	98	99	38	58	76
91	97	99	37	57	75
89	96	99	37	56	75
87	95	98	34	55	73
85	94	98	34	54	73
83	93	98	33	53	72
81	92	97	32	52	71
80	91	97	31	51	70
78	90	96	31	50	70
76	89	96	30	49	69
75	88	95	29	48	68
73	87	95	28	47	67
72	86	94	27	46	66
70	85	94	26	45	65
68	84	93	25	44	64
67	83	93	25	43	63
66	82	92	24	42	62
64	81 EX: 88.64	92	23	41	61
63	80	91	22	40	60
62	79 PR: 88.7	91	21	39	59
60	78	90	21	38	58
59	77	89	20	37	57
58	76	89	19	36	56
57	75	88	18	35	55
55	74	88	18	34	54
54	73	87	17	33	53
53	72	86	16	32	52
52	71	86	16	31	51
51	70	85	15	30	50
50	69	84			
48	68	84	12	25	43
47	67	83	9	20	37
46	66	82	6	15	30
45	65	82	4	10	22
44	64	81	2	5	13
43	63	80	0	0	0
42	62	79			
41	61	78			

SD COUNTY HYETOGRAPH CALCULATIONS
HORSE RANCH CREEK WATERSHED
100 YEAR STORM PER COUNTY OF SAN DIEGO HYDROLOGY MANUAL

slope= 0.389

Watershed area	**Rainfall Depth-Area Adjustment Data Points**					
(sq mi)	30	60	180	360	1440	
10	0.9	0.947	0.97	0.98	0.985	Taken from Table 4-1
11.60	**0.889**	**0.939**	**0.967**	**0.977**	**0.983**	Interpolated
20	0.834	0.9	0.952	0.963	0.975	Taken from Table 4-1

P(24)= 6 in
P(6)= 3.5 in 5.900 5.900

RAINFALL DISTRIBUTION SORTED IN ORDER OF INCREASING DURATION

Duration (min)	Rainfall Precipitation for Duration (in)	Depth Area Adjustment for Duration	Depth-Area Adjusted Precipitation (in)	Hyetograph Ordinate (in)		Sorted Hyetograph Ordinate (in)
10	0.983	0.889	0.874	0.874	1	0.016
20	1.257	0.889	1.118	0.244	2	0.017
30	1.452	0.889	1.291	0.173	3	0.017
40	1.608	0.906	1.457	0.166	4	0.017
50	1.740	0.923	1.606	0.149	5	0.017
60	1.857	0.939	1.744	0.138	6	0.017
70	1.961	0.942	1.847	0.103	7	0.017
80	2.056	0.944	1.941	0.094	8	0.017
90	2.144	0.946	2.029	0.088	9	0.017
100	2.226	0.949	2.112	0.082	10	0.017
110	2.302	0.951	2.190	0.078	11	0.017
120	2.375	0.953	2.264	0.074	12	0.018
130	2.443	0.956	2.335	0.071	13	0.018
140	2.508	0.958	2.403	0.068	14	0.018
150	2.570	0.960	2.468	0.065	15	0.018
160	2.630	0.963	2.531	0.063	16	0.018
170	2.687	0.965	2.593	0.061	17	0.018
180	2.742	0.967	2.652	0.059	18	0.018
190	2.795	0.968	2.705	0.053	19	0.019
200	2.847	0.968	2.756	0.051	20	0.019
210	2.897	0.969	2.806	0.050	21	0.019
220	2.945	0.969	2.855	0.048	22	0.019
230	2.992	0.970	2.902	0.047	23	0.019
240	3.037	0.971	2.948	0.046	24	0.019
250	3.081	0.971	2.992	0.045	25	0.019
260	3.125	0.972	3.036	0.044	26	0.020
270	3.167	0.972	3.079	0.043	27	0.020
280	3.208	0.973	3.121	0.042	28	0.020
290	3.248	0.973	3.162	0.041	29	0.020
300	3.288	0.974	3.202	0.040	30	0.020
310	3.326	0.974	3.241	0.039	31	0.020

320	3.364	0.975	3.280	0.039	32	0.021
330	3.401	0.976	3.318	0.038	33	0.021
340	3.437	0.976	3.355	0.037	34	0.021
350	3.472	0.977	3.392	0.037	35	0.021
360	3.507	0.977	3.428	0.036	36	0.022
370	3.537	0.977	3.457	0.030	74	0.022
380	3.574	0.977	3.494	0.036	75	0.022
390	3.611	0.977	3.529	0.036	76	0.022
400	3.646	0.978	3.564	0.035	77	0.022
410	3.682	0.978	3.599	0.035	78	0.023
420	3.716	0.978	3.633	0.034	79	0.023
430	3.750	0.978	3.667	0.034	80	0.023
440	3.784	0.978	3.700	0.033	81	0.023
450	3.817	0.978	3.732	0.033	82	0.024
460	3.850	0.978	3.765	0.032	83	0.024
470	3.882	0.978	3.797	0.032	84	0.024
480	3.914	0.978	3.828	0.031	85	0.025
490	3.946	0.978	3.859	0.031	86	0.025
500	3.977	0.978	3.890	0.031	87	0.025
510	4.008	0.978	3.920	0.030	88	0.025
520	4.038	0.978	3.950	0.030	89	0.026
530	4.068	0.978	3.979	0.030	90	0.026
540	4.098	0.978	4.009	0.029	91	0.027
550	4.127	0.978	4.038	0.029	92	0.027
560	4.156	0.978	4.066	0.029	93	0.027
570	4.185	0.978	4.095	0.028	94	0.028
580	4.213	0.979	4.123	0.028	95	0.028
590	4.241	0.979	4.150	0.028	96	0.029
600	4.269	0.979	4.178	0.027	97	0.029
610	4.296	0.979	4.205	0.027	98	0.030
620	4.324	0.979	4.232	0.027	99	0.030
630	4.351	0.979	4.259	0.027	100	0.031
640	4.377	0.979	4.285	0.026	101	0.031
650	4.404	0.979	4.311	0.026	102	0.032
660	4.430	0.979	4.337	0.026	103	0.033
670	4.456	0.979	4.363	0.026	104	0.033
680	4.482	0.979	4.388	0.025	105	0.034
690	4.507	0.979	4.413	0.025	106	0.035
700	4.533	0.979	4.438	0.025	107	0.036
710	4.558	0.979	4.463	0.025	108	0.036
720	4.583	0.979	4.488	0.025	109	0.036
730	4.607	0.979	4.512	0.024	110	0.037
740	4.632	0.979	4.536	0.024	111	0.038
750	4.656	0.979	4.560	0.024	112	0.039
760	4.680	0.980	4.584	0.024	113	0.040
770	4.704	0.980	4.608	0.024	114	0.041
780	4.727	0.980	4.631	0.023	115	0.043
790	4.751	0.980	4.655	0.023	116	0.044
800	4.774	0.980	4.678	0.023	117	0.046
810	4.797	0.980	4.701	0.023	118	0.047
820	4.820	0.980	4.723	0.023	119	0.050
830	4.843	0.980	4.746	0.023	120	0.051

840	4.866	0.980	4.768	0.022	121	0.059
850	4.888	0.980	4.791	0.022	122	0.061
860	4.910	0.980	4.813	0.022	123	0.065
870	4.932	0.980	4.835	0.022	124	0.068
880	4.954	0.980	4.856	0.022	125	0.074
890	4.976	0.980	4.878	0.022	126	0.078
900	4.998	0.980	4.900	0.022	127	0.088
910	5.019	0.980	4.921	0.021	128	0.094
920	5.041	0.980	4.942	0.021	129	0.138
930	5.062	0.981	4.963	0.021	130	0.149
940	5.083	0.981	4.984	0.021	131	0.173
950	5.104	0.981	5.005	0.021	132	0.244
960	**5.125**	**0.981**	**5.026**	**0.021**	**133**	**0.874**
970	5.146	0.981	5.046	0.021	134	0.166
980	5.166	0.981	5.067	0.020	135	0.103
990	5.187	0.981	5.087	0.020	136	0.082
1000	5.207	0.981	5.107	0.020	137	0.071
1010	5.227	0.981	5.128	0.020	138	0.063
1020	5.247	0.981	5.148	0.020	139	0.053
1030	5.267	0.981	5.167	0.020	140	0.048
1040	5.287	0.981	5.187	0.020	141	0.045
1050	5.307	0.981	5.207	0.020	142	0.042
1060	5.326	0.981	5.226	0.020	143	0.039
1070	5.346	0.981	5.246	0.019	144	0.037
1080	5.365	0.981	5.265	0.019	145	0.030
1090	5.384	0.981	5.284	0.019	146	0.035
1100	5.403	0.981	5.303	0.019	147	0.034
1110	5.423	0.982	5.322	0.019	148	0.032
1120	5.441	0.982	5.341	0.019	149	0.031
1130	5.460	0.982	5.360	0.019	150	0.030
1140	5.479	0.982	5.379	0.019	151	0.029
1150	5.498	0.982	5.397	0.019	152	0.028
1160	5.516	0.982	5.416	0.019	153	0.027
1170	5.535	0.982	5.434	0.018	154	0.026
1180	5.553	0.982	5.453	0.018	155	0.026
1190	5.571	0.982	5.471	0.018	156	0.025
1200	5.589	0.982	5.489	0.018	157	0.024
1210	5.607	0.982	5.507	0.018	158	0.024
1220	5.625	0.982	5.525	0.018	159	0.023
1230	5.643	0.982	5.543	0.018	160	0.023
1240	5.661	0.982	5.561	0.018	161	0.022
1250	5.679	0.982	5.578	0.018	162	0.022
1260	5.696	0.982	5.596	0.018	163	0.021
1270	5.714	0.982	5.614	0.018	164	0.021
1280	5.731	0.982	5.631	0.017	165	0.021
1290	5.749	0.983	5.648	0.017	166	0.020
1300	5.766	0.983	5.666	0.017	167	0.020
1310	5.783	0.983	5.683	0.017	168	0.020
1320	5.800	0.983	5.700	0.017	169	0.019
1330	5.817	0.983	5.717	0.017	170	0.019
1340	5.834	0.983	5.734	0.017	171	0.019
1350	5.851	0.983	5.751	0.017	172	0.018

1360	5.868	0.983	5.768	0.017	173	0.018
1370	5.885	0.983	5.785	0.017	174	0.018
1380	5.902	0.983	5.802	0.017	175	0.018
1390	5.918	0.983	5.818	0.017	176	0.017
1400	5.935	0.983	5.835	0.017	177	0.017
1410	5.951	0.983	5.851	0.017	178	0.017
1420	5.967	0.983	5.868	0.016	179	0.017
1430	5.984	0.983	5.884	0.016	180	0.016
1440	6.000	0.983	5.900	0.016	181	0.016

SD COUNTY HYETOGRAPH CALCULATIONS
HORSE RANCH CREEK WATERSHED
50 YEAR STORM PER COUNTY OF SAN DIEGO HYDROLOGY MANUAL

slope= 0.424

Watershed area	**Rainfall Depth-Area Adjustment Data Points**					
(sq mi)	30	60	180	360	1440	
10	0.9	0.947	0.97	0.98	0.985	Taken from Table 4-1
11.60	**0.889**	**0.939**	**0.967**	**0.977**	**0.983**	Interpolated
20	0.834	0.9	0.952	0.963	0.975	Taken from Table 4-1

P(24)= 5.4 in
P(6)= 3 in 5.310 5.310

RAINFALL DISTRIBUTION SORTED IN ORDER OF INCREASING DURATION

Duration (min)	Rainfall Precipitation for Duration (in)	Depth Area Adjustment for Duration	Depth-Area Adjusted Precipitation (in)	Hyetograph Ordinate (in)		Sorted Hyetograph Ordinate (in)
10	0.842	0.889	0.749	0.749	1	0.016
20	1.077	0.889	0.958	0.209	2	0.016
30	1.244	0.889	1.107	0.148	3	0.016
40	1.378	0.906	1.249	0.142	4	0.016
50	1.492	0.923	1.377	0.128	5	0.016
60	1.591	0.939	1.495	0.119	6	0.017
70	1.681	0.942	1.583	0.088	7	0.017
80	1.763	0.944	1.664	0.081	8	0.017
90	1.838	0.946	1.739	0.075	9	0.017
100	1.908	0.949	1.810	0.071	10	0.017
110	1.974	0.951	1.877	0.067	11	0.017
120	2.035	0.953	1.940	0.064	12	0.017
130	2.094	0.956	2.001	0.061	13	0.017
140	2.150	0.958	2.059	0.058	14	0.017
150	2.203	0.960	2.116	0.056	15	0.018
160	2.254	0.963	2.170	0.054	16	0.018
170	2.303	0.965	2.222	0.053	17	0.018
180	2.351	0.967	2.273	0.051	18	0.018
190	2.396	0.968	2.319	0.045	19	0.018
200	2.440	0.968	2.363	0.044	20	0.018
210	2.483	0.969	2.405	0.043	21	0.018
220	2.524	0.969	2.447	0.041	22	0.018
230	2.564	0.970	2.487	0.040	23	0.019
240	2.603	0.971	2.526	0.039	24	0.019
250	2.641	0.971	2.565	0.038	25	0.019
260	2.678	0.972	2.602	0.037	26	0.019
270	2.714	0.972	2.639	0.037	27	0.019
280	2.750	0.973	2.675	0.036	28	0.019
290	2.784	0.973	2.710	0.035	29	0.019
300	2.818	0.974	2.744	0.034	30	0.020
310	2.851	0.974	2.778	0.034	31	0.020

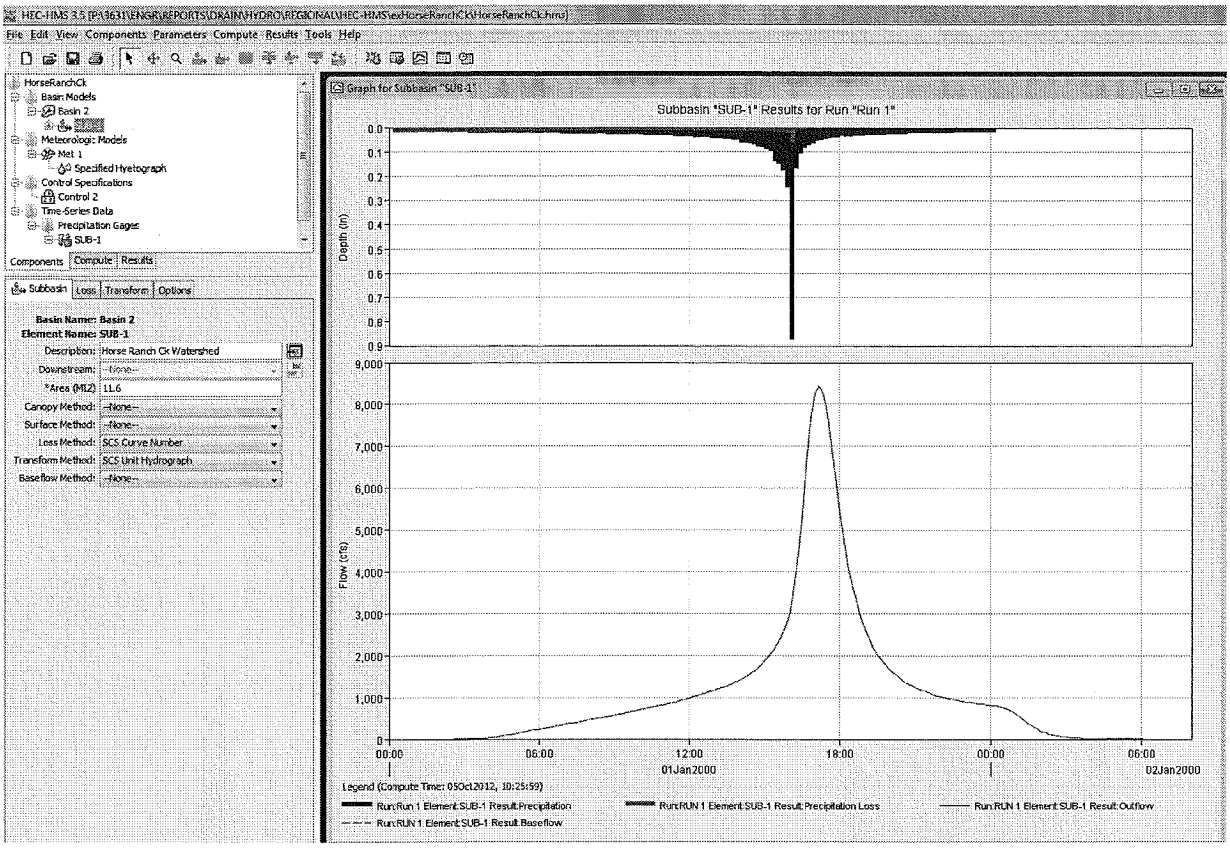
320	2.883	0.975	2.811	0.033	32	0.020
330	2.915	0.976	2.844	0.033	33	0.020
340	2.946	0.976	2.876	0.032	34	0.020
350	2.976	0.977	2.907	0.031	35	0.020
360	3.006	0.977	2.938	0.031	36	0.021
370	3.035	0.977	2.966	0.028	74	0.021
380	3.070	0.977	3.000	0.034	75	0.021
390	3.104	0.977	3.034	0.033	76	0.021
400	3.137	0.978	3.066	0.033	77	0.022
410	3.170	0.978	3.099	0.032	78	0.022
420	3.203	0.978	3.131	0.032	79	0.022
430	3.235	0.978	3.163	0.032	80	0.022
440	3.266	0.978	3.194	0.031	81	0.022
450	3.298	0.978	3.224	0.031	82	0.023
460	3.329	0.978	3.255	0.030	83	0.023
470	3.359	0.978	3.285	0.030	84	0.023
480	3.389	0.978	3.314	0.030	85	0.024
490	3.419	0.978	3.344	0.029	86	0.024
500	3.448	0.978	3.373	0.029	87	0.024
510	3.477	0.978	3.401	0.029	88	0.024
520	3.506	0.978	3.430	0.028	89	0.025
530	3.535	0.978	3.458	0.028	90	0.025
540	3.563	0.978	3.485	0.028	91	0.025
550	3.591	0.978	3.513	0.027	92	0.026
560	3.618	0.978	3.540	0.027	93	0.026
570	3.645	0.978	3.567	0.027	94	0.026
580	3.672	0.979	3.593	0.027	95	0.027
590	3.699	0.979	3.620	0.026	96	0.027
600	3.726	0.979	3.646	0.026	97	0.028
610	3.752	0.979	3.672	0.026	98	0.028
620	3.778	0.979	3.697	0.026	99	0.029
630	3.803	0.979	3.723	0.025	100	0.029
640	3.829	0.979	3.748	0.025	101	0.030
650	3.854	0.979	3.773	0.025	102	0.030
660	3.879	0.979	3.798	0.025	103	0.031
670	3.904	0.979	3.822	0.025	104	0.031
680	3.929	0.979	3.846	0.024	105	0.032
690	3.953	0.979	3.871	0.024	106	0.032
700	3.977	0.979	3.894	0.024	107	0.033
710	4.001	0.979	3.918	0.024	108	0.034
720	4.025	0.979	3.942	0.024	109	0.031
730	4.049	0.979	3.965	0.023	110	0.031
740	4.072	0.979	3.988	0.023	111	0.033
750	4.095	0.979	4.011	0.023	112	0.033
760	4.118	0.980	4.034	0.023	113	0.034
770	4.141	0.980	4.057	0.023	114	0.035
780	4.164	0.980	4.079	0.022	115	0.037
790	4.186	0.980	4.102	0.022	116	0.037
800	4.209	0.980	4.124	0.022	117	0.039
810	4.231	0.980	4.146	0.022	118	0.040
820	4.253	0.980	4.168	0.022	119	0.043
830	4.275	0.980	4.189	0.022	120	0.044

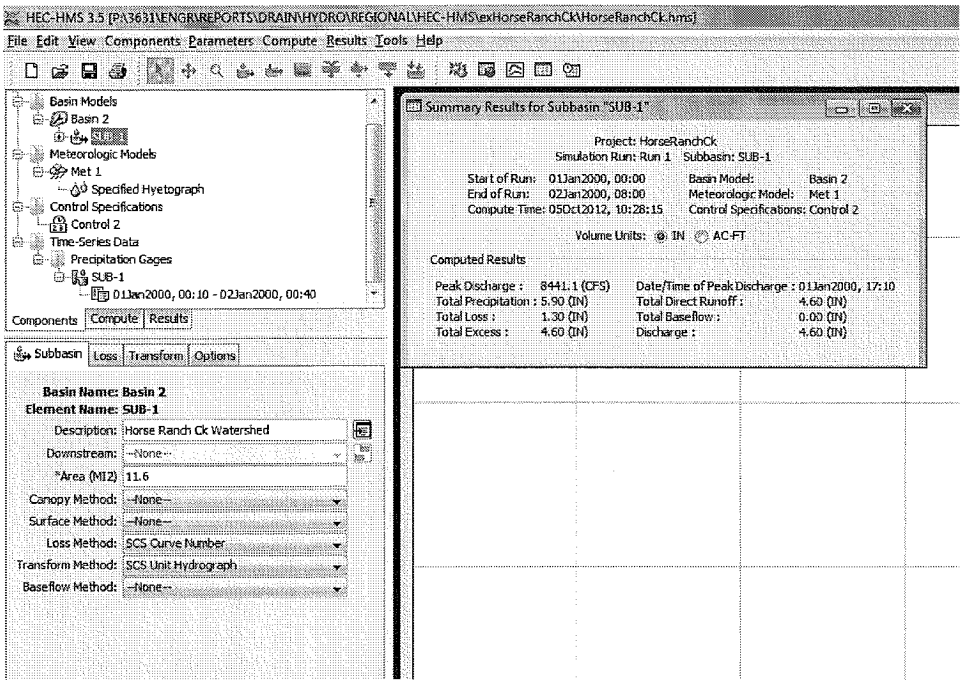
840	4.297	0.980	4.211	0.022	121	0.051
850	4.318	0.980	4.232	0.021	122	0.053
860	4.340	0.980	4.254	0.021	123	0.056
870	4.361	0.980	4.275	0.021	124	0.058
880	4.382	0.980	4.296	0.021	125	0.064
890	4.403	0.980	4.317	0.021	126	0.067
900	4.424	0.980	4.337	0.021	127	0.075
910	4.445	0.980	4.358	0.021	128	0.081
920	4.466	0.980	4.378	0.020	129	0.119
930	4.486	0.981	4.399	0.020	130	0.128
940	4.507	0.981	4.419	0.020	131	0.148
950	4.527	0.981	4.439	0.020	132	0.209
960	**4.547**	**0.981**	**4.459**	**0.020**	**133**	**0.749**
970	4.567	0.981	4.479	0.020	134	0.142
980	4.587	0.981	4.499	0.020	135	0.088
990	4.607	0.981	4.519	0.020	136	0.071
1000	4.626	0.981	4.538	0.020	137	0.061
1010	4.646	0.981	4.558	0.019	138	0.054
1020	4.665	0.981	4.577	0.019	139	0.045
1030	4.685	0.981	4.596	0.019	140	0.041
1040	4.704	0.981	4.615	0.019	141	0.038
1050	4.723	0.981	4.634	0.019	142	0.036
1060	4.742	0.981	4.653	0.019	143	0.034
1070	4.761	0.981	4.672	0.019	144	0.032
1080	4.780	0.981	4.691	0.019	145	0.028
1090	4.799	0.981	4.709	0.019	146	0.033
1100	4.817	0.981	4.728	0.019	147	0.032
1110	4.836	0.982	4.746	0.018	148	0.030
1120	4.854	0.982	4.765	0.018	149	0.029
1130	4.873	0.982	4.783	0.018	150	0.028
1140	4.891	0.982	4.801	0.018	151	0.027
1150	4.909	0.982	4.819	0.018	152	0.027
1160	4.927	0.982	4.837	0.018	153	0.026
1170	4.945	0.982	4.855	0.018	154	0.025
1180	4.963	0.982	4.873	0.018	155	0.025
1190	4.981	0.982	4.891	0.018	156	0.024
1200	4.998	0.982	4.909	0.018	157	0.023
1210	5.016	0.982	4.926	0.018	158	0.023
1220	5.033	0.982	4.944	0.018	159	0.022
1230	5.051	0.982	4.961	0.017	160	0.022
1240	5.068	0.982	4.978	0.017	161	0.021
1250	5.086	0.982	4.996	0.017	162	0.021
1260	5.103	0.982	5.013	0.017	163	0.021
1270	5.120	0.982	5.030	0.017	164	0.020
1280	5.137	0.982	5.047	0.017	165	0.020
1290	5.154	0.983	5.064	0.017	166	0.020
1300	5.171	0.983	5.081	0.017	167	0.019
1310	5.188	0.983	5.098	0.017	168	0.019
1320	5.204	0.983	5.114	0.017	169	0.019
1330	5.221	0.983	5.131	0.017	170	0.018
1340	5.238	0.983	5.148	0.017	171	0.018
1350	5.254	0.983	5.164	0.017	172	0.018

1360	5.271	0.983	5.181	0.016	173	0.018
1370	5.287	0.983	5.197	0.016	174	0.017
1380	5.303	0.983	5.214	0.016	175	0.017
1390	5.320	0.983	5.230	0.016	176	0.017
1400	5.336	0.983	5.246	0.016	177	0.017
1410	5.352	0.983	5.262	0.016	178	0.016
1420	5.368	0.983	5.278	0.016	179	0.016
1430	5.384	0.983	5.294	0.016	180	0.016
1440	5.400	0.983	5.310	0.016	181	0.016

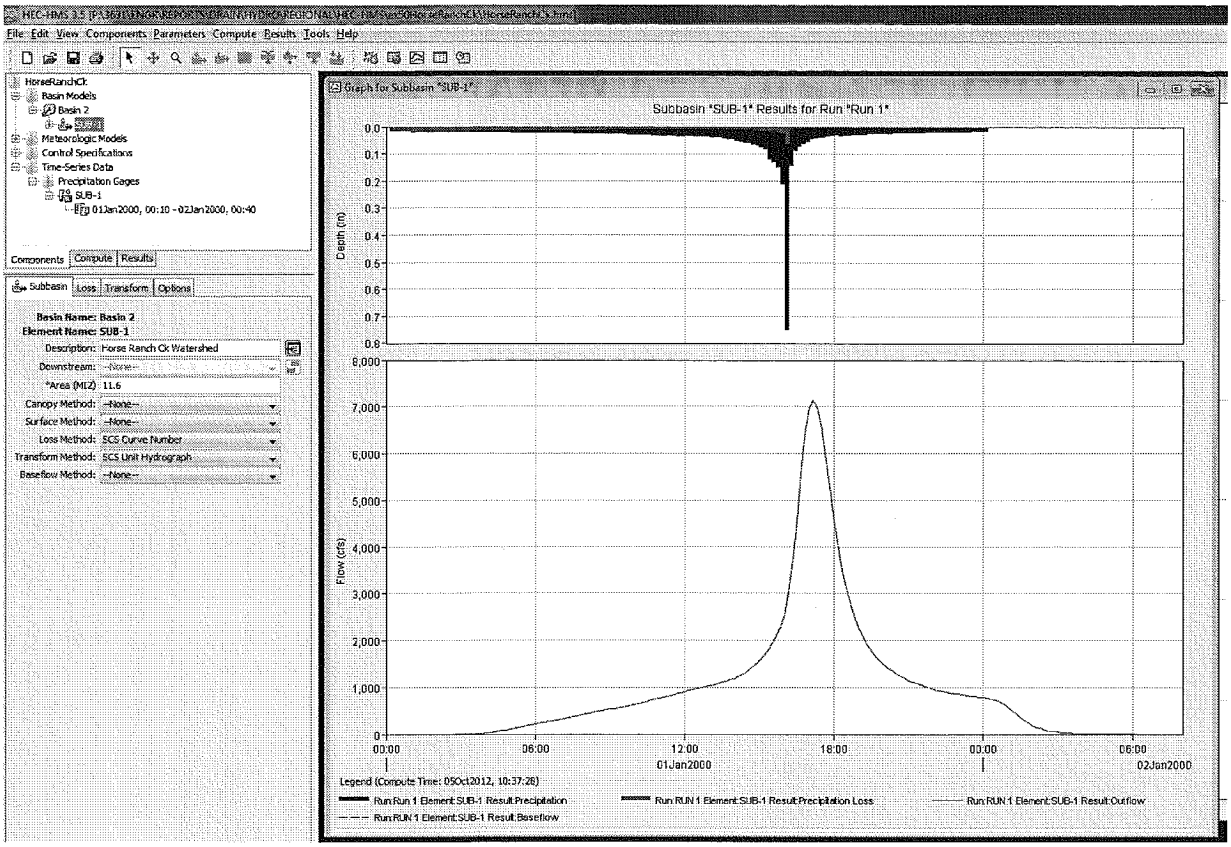
HEC-HMS RESULTS

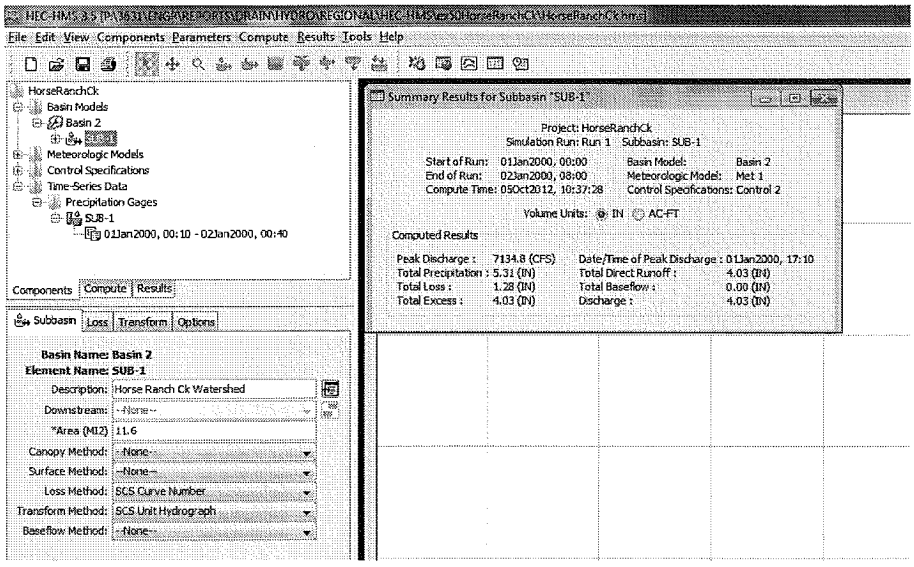
100-YEAR EXISTING CONDITION RESULTS



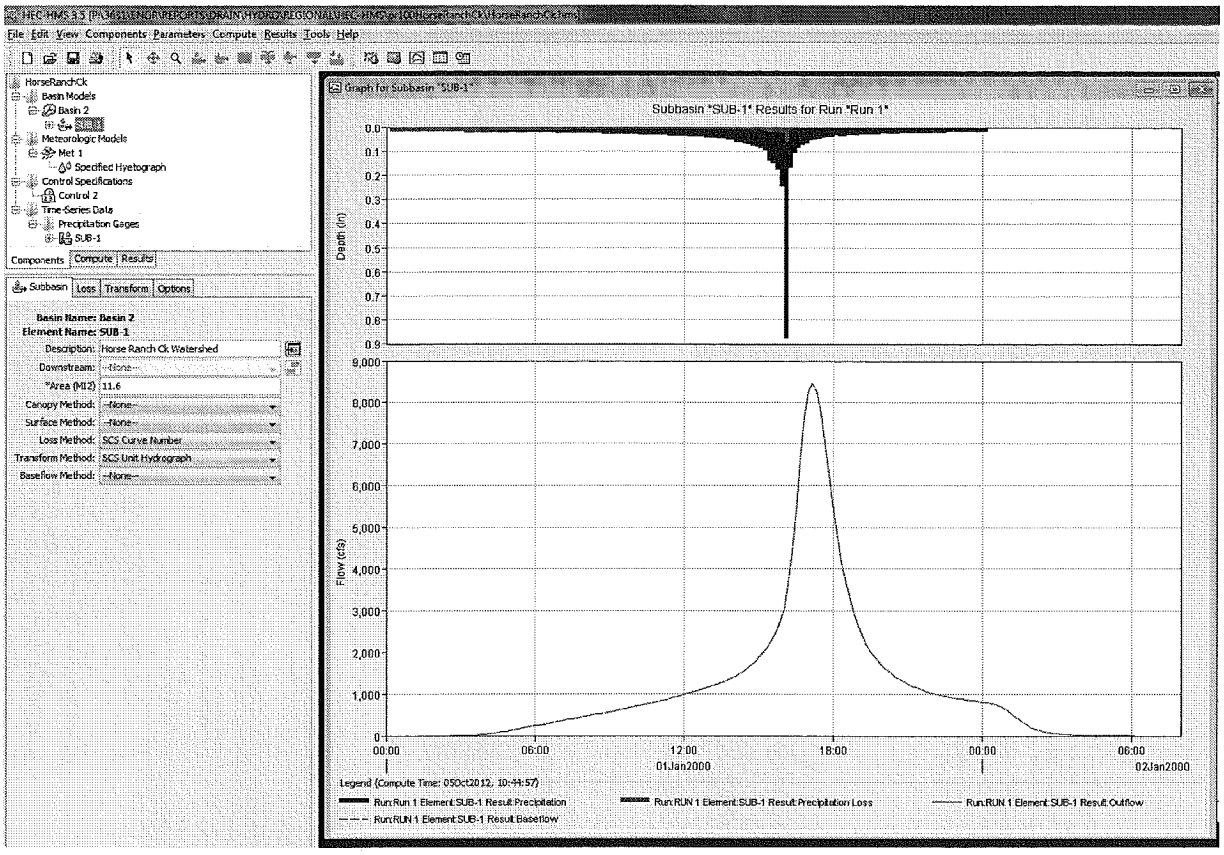


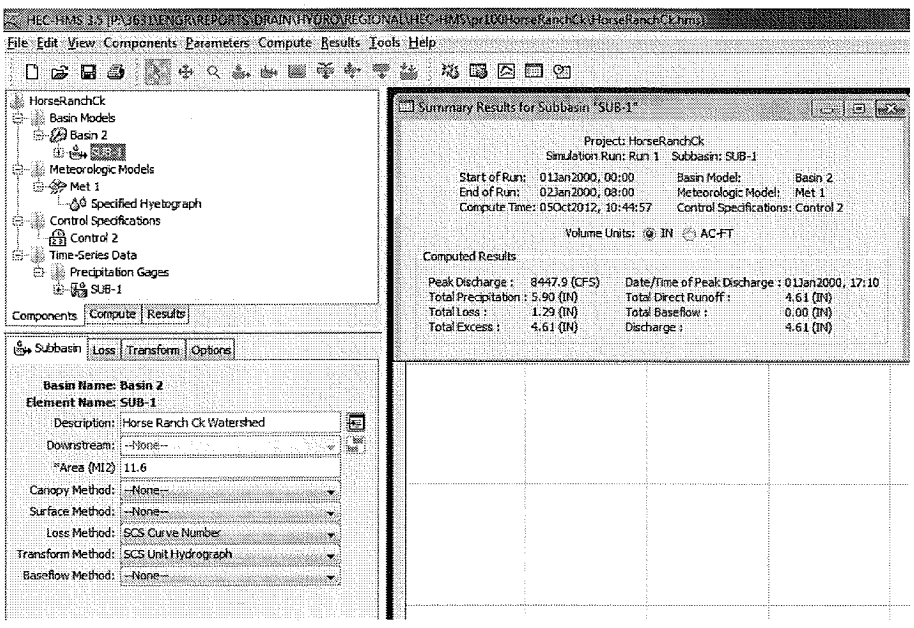
50-YEAR EXISTING CONDITION RESULTS



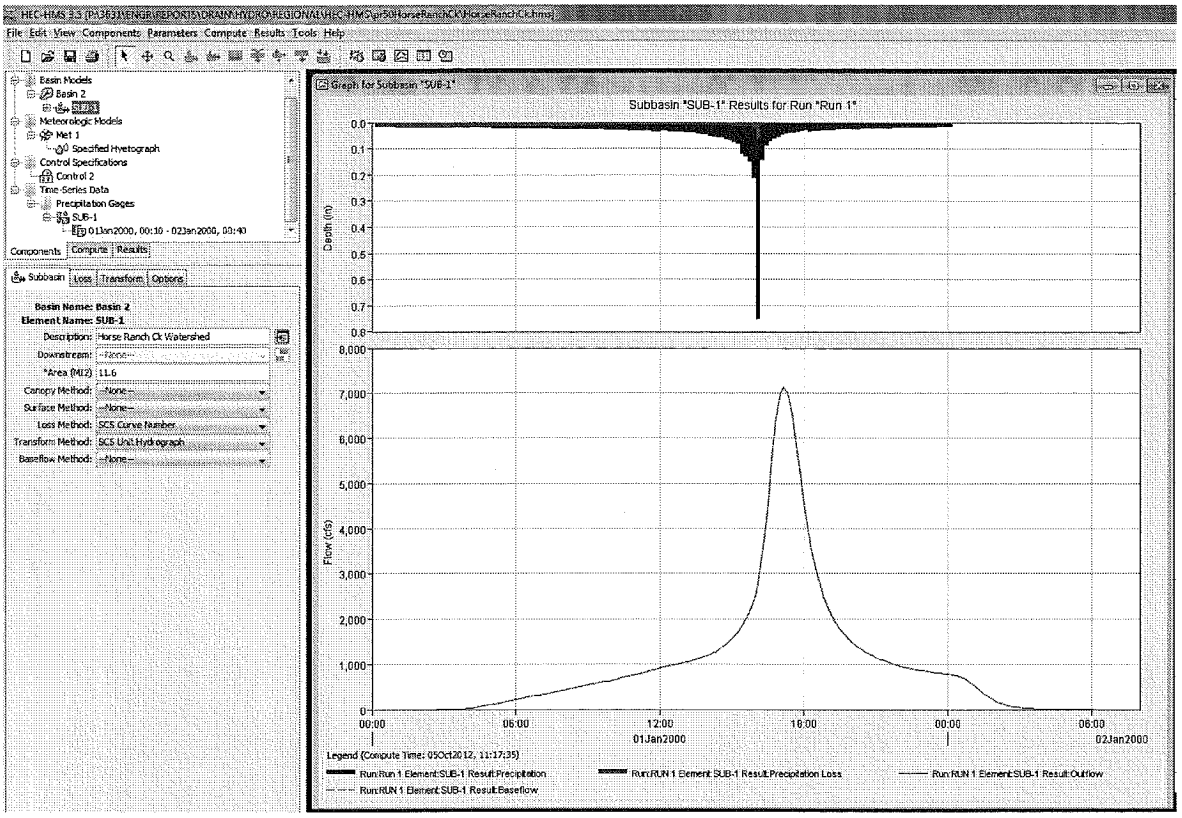


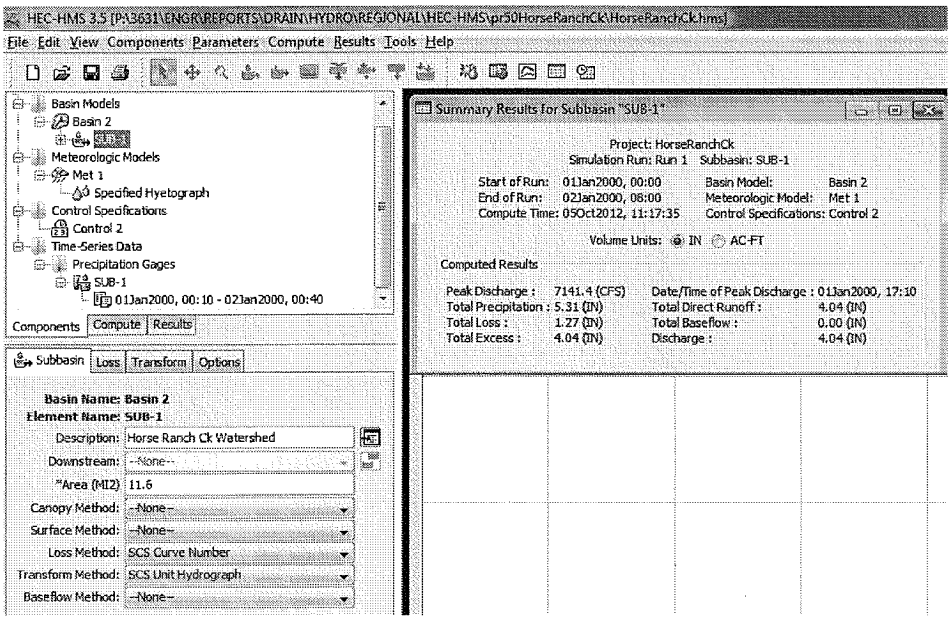
100-YEAR PROPOSED CONDITION RESULTS





50-YEAR PROPOSED CONDITION RESULTS





HEC-HMS RESULTS: 100 YR EXISTING

Date	Time	Precip (IN)	Loss (IN)	Excess (IN)	Direct Flow (CFS)	Base Flow (CFS)	Total Flow (CFS)
1-Jan-00	0:00				0	0	0
1-Jan-00	0:10	0	0	0	0	0	0
1-Jan-00	0:20	0.02	0.02	0	0	0	0
1-Jan-00	0:30	0.02	0.02	0	0	0	0
1-Jan-00	0:40	0.02	0.02	0	0	0	0
1-Jan-00	0:50	0.02	0.02	0	0	0	0
1-Jan-00	1:00	0.02	0.02	0	0	0	0
1-Jan-00	1:10	0.02	0.02	0	0	0	0
1-Jan-00	1:20	0.02	0.02	0	0	0	0
1-Jan-00	1:30	0.02	0.02	0	0	0	0
1-Jan-00	1:40	0.02	0.02	0	0	0	0
1-Jan-00	1:50	0.02	0.02	0	0	0	0
1-Jan-00	2:00	0.02	0.02	0	0	0	0
1-Jan-00	2:10	0.02	0.02	0	0	0	0
1-Jan-00	2:20	0.02	0.02	0	0	0	0
1-Jan-00	2:30	0.02	0.02	0	0	0	0
1-Jan-00	2:40	0.02	0.02	0	0	0	0
1-Jan-00	2:50	0.02	0.02	0	0.1	0	0.1
1-Jan-00	3:00	0.02	0.02	0	0.4	0	0.4
1-Jan-00	3:10	0.02	0.02	0	1.4	0	1.4
1-Jan-00	3:20	0.02	0.02	0	3.4	0	3.4
1-Jan-00	3:30	0.02	0.02	0	7	0	7
1-Jan-00	3:40	0.02	0.02	0	12.7	0	12.7
1-Jan-00	3:50	0.02	0.02	0	20.5	0	20.5
1-Jan-00	4:00	0.02	0.02	0	30.6	0	30.6
1-Jan-00	4:10	0.02	0.02	0	42.6	0	42.6
1-Jan-00	4:20	0.02	0.01	0	56.4	0	56.4
1-Jan-00	4:30	0.02	0.01	0.01	71.5	0	71.5
1-Jan-00	4:40	0.02	0.01	0.01	87.7	0	87.7
1-Jan-00	4:50	0.02	0.01	0.01	104.7	0	104.7
1-Jan-00	5:00	0.02	0.01	0.01	122.3	0	122.3
1-Jan-00	5:10	0.02	0.01	0.01	140.3	0	140.3
1-Jan-00	5:20	0.02	0.01	0.01	158.5	0	158.5
1-Jan-00	5:30	0.02	0.01	0.01	176.9	0	176.9
1-Jan-00	5:40	0.02	0.01	0.01	195.3	0	195.3
1-Jan-00	5:50	0.02	0.01	0.01	213.8	0	213.8
1-Jan-00	6:00	0.02	0.01	0.01	232.3	0	232.3
1-Jan-00	6:10	0.02	0.01	0.01	250.9	0	250.9
1-Jan-00	6:20	0.02	0.01	0.01	269.6	0	269.6
1-Jan-00	6:30	0.02	0.01	0.01	288.3	0	288.3
1-Jan-00	6:40	0.02	0.01	0.01	307.2	0	307.2
1-Jan-00	6:50	0.02	0.01	0.01	326	0	326
1-Jan-00	7:00	0.02	0.01	0.01	344.8	0	344.8
1-Jan-00	7:10	0.02	0.01	0.01	363.4	0	363.4
1-Jan-00	7:20	0.02	0.01	0.01	381.8	0	381.8
1-Jan-00	7:30	0.02	0.01	0.01	400.2	0	400.2
1-Jan-00	7:40	0.02	0.01	0.01	418.6	0	418.6
1-Jan-00	7:50	0.02	0.01	0.01	436.9	0	436.9

1-Jan-00	8:00	0.02	0.01	0.01	455.2	0	455.2
1-Jan-00	8:10	0.02	0.01	0.01	473.6	0	473.6
1-Jan-00	8:20	0.02	0.01	0.01	492.2	0	492.2
1-Jan-00	8:30	0.02	0.01	0.01	511.1	0	511.1
1-Jan-00	8:40	0.02	0.01	0.02	530	0	530
1-Jan-00	8:50	0.03	0.01	0.02	549.1	0	549.1
1-Jan-00	9:00	0.03	0.01	0.02	568	0	568
1-Jan-00	9:10	0.03	0.01	0.02	587.1	0	587.1
1-Jan-00	9:20	0.03	0.01	0.02	606.4	0	606.4
1-Jan-00	9:30	0.03	0.01	0.02	625.9	0	625.9
1-Jan-00	9:40	0.03	0.01	0.02	645.9	0	645.9
1-Jan-00	9:50	0.03	0.01	0.02	666.1	0	666.1
1-Jan-00	10:00	0.03	0.01	0.02	686.7	0	686.7
1-Jan-00	10:10	0.03	0.01	0.02	707.7	0	707.7
1-Jan-00	10:20	0.03	0.01	0.02	729.2	0	729.2
1-Jan-00	10:30	0.03	0.01	0.02	751.2	0	751.2
1-Jan-00	10:40	0.03	0.01	0.02	773.8	0	773.8
1-Jan-00	10:50	0.03	0.01	0.02	796.9	0	796.9
1-Jan-00	11:00	0.03	0.01	0.02	820.5	0	820.5
1-Jan-00	11:10	0.03	0.01	0.02	844.8	0	844.8
1-Jan-00	11:20	0.03	0.01	0.02	869.7	0	869.7
1-Jan-00	11:30	0.03	0.01	0.03	895.4	0	895.4
1-Jan-00	11:40	0.04	0.01	0.03	922	0	922
1-Jan-00	11:50	0.04	0.01	0.03	949.7	0	949.7
1-Jan-00	12:00	0.04	0.01	0.03	978.3	0	978.3
1-Jan-00	12:10	0.04	0.01	0.03	1007.9	0	1007.9
1-Jan-00	12:20	0.04	0.01	0.03	1038.2	0	1038.2
1-Jan-00	12:30	0.04	0.01	0.03	1068.8	0	1068.8
1-Jan-00	12:40	0.04	0.01	0.03	1099.6	0	1099.6
1-Jan-00	12:50	0.04	0.01	0.03	1130.7	0	1130.7
1-Jan-00	13:00	0.04	0.01	0.03	1162.5	0	1162.5
1-Jan-00	13:10	0.04	0.01	0.03	1195.8	0	1195.8
1-Jan-00	13:20	0.04	0.01	0.04	1230.9	0	1230.9
1-Jan-00	13:30	0.05	0.01	0.04	1268.5	0	1268.5
1-Jan-00	13:40	0.05	0.01	0.04	1309.1	0	1309.1
1-Jan-00	13:50	0.05	0.01	0.04	1353.3	0	1353.3
1-Jan-00	14:00	0.05	0.01	0.04	1401.5	0	1401.5
1-Jan-00	14:10	0.06	0.01	0.05	1454.9	0	1454.9
1-Jan-00	14:20	0.06	0.01	0.05	1515	0	1515
1-Jan-00	14:30	0.06	0.01	0.06	1583.4	0	1583.4
1-Jan-00	14:40	0.07	0.01	0.06	1662.4	0	1662.4
1-Jan-00	14:50	0.07	0.01	0.06	1753.2	0	1753.2
1-Jan-00	15:00	0.08	0.01	0.07	1855.9	0	1855.9
1-Jan-00	15:10	0.09	0.01	0.08	1971.3	0	1971.3
1-Jan-00	15:20	0.09	0.01	0.08	2101.7	0	2101.7
1-Jan-00	15:30	0.14	0.02	0.12	2256.8	0	2256.8
1-Jan-00	15:40	0.15	0.02	0.13	2448.6	0	2448.6
1-Jan-00	15:50	0.17	0.02	0.16	2690.8	0	2690.8
1-Jan-00	16:00	0.24	0.02	0.22	3014.4	0	3014.4
1-Jan-00	16:10	0.87	0.06	0.81	3591.2	0	3591.2
1-Jan-00	16:20	0.17	0.01	0.16	4401.5	0	4401.5
1-Jan-00	16:30	0.1	0.01	0.1	5399.9	0	5399.9

1-Jan-00	16:40	0.08	0	0.08	6579.8	0	6579.8
1-Jan-00	16:50	0.07	0	0.07	7642.5	0	7642.5
1-Jan-00	17:00	0.06	0	0.06	8270.1	0	8270.1
1-Jan-00	17:10	0.05	0	0.05	8441.1	0	**8441.1**
1-Jan-00	17:20	0.05	0	0.05	8269.3	0	8269.3
1-Jan-00	17:30	0.04	0	0.04	7743.4	0	7743.4
1-Jan-00	17:40	0.04	0	0.04	7076.6	0	7076.6
1-Jan-00	17:50	0.04	0	0.04	6270.9	0	6270.9
1-Jan-00	18:00	0.04	0	0.04	5413.4	0	5413.4
1-Jan-00	18:10	0.03	0	0.03	4713.8	0	4713.8
1-Jan-00	18:20	0.04	0	0.03	4145.1	0	4145.1
1-Jan-00	18:30	0.03	0	0.03	3677.2	0	3677.2
1-Jan-00	18:40	0.03	0	0.03	3273.2	0	3273.2
1-Jan-00	18:50	0.03	0	0.03	2927.6	0	2927.6
1-Jan-00	19:00	0.03	0	0.03	2637.6	0	2637.6
1-Jan-00	19:10	0.03	0	0.03	2395.7	0	2395.7
1-Jan-00	19:20	0.03	0	0.03	2194.5	0	2194.5
1-Jan-00	19:30	0.03	0	0.03	2024.1	0	2024.1
1-Jan-00	19:40	0.03	0	0.02	1877.9	0	1877.9
1-Jan-00	19:50	0.03	0	0.02	1756.3	0	1756.3
1-Jan-00	20:00	0.02	0	0.02	1652	0	1652
1-Jan-00	20:10	0.02	0	0.02	1559.2	0	1559.2
1-Jan-00	20:20	0.02	0	0.02	1477.8	0	1477.8
1-Jan-00	20:30	0.02	0	0.02	1406.4	0	1406.4
1-Jan-00	20:40	0.02	0	0.02	1343	0	1343
1-Jan-00	20:50	0.02	0	0.02	1287.1	0	1287.1
1-Jan-00	21:00	0.02	0	0.02	1238.6	0	1238.6
1-Jan-00	21:10	0.02	0	0.02	1193.7	0	1193.7
1-Jan-00	21:20	0.02	0	0.02	1151.8	0	1151.8
1-Jan-00	21:30	0.02	0	0.02	1113.1	0	1113.1
1-Jan-00	21:40	0.02	0	0.02	1077.3	0	1077.3
1-Jan-00	21:50	0.02	0	0.02	1044.2	0	1044.2
1-Jan-00	22:00	0.02	0	0.02	1014	0	1014
1-Jan-00	22:10	0.02	0	0.02	989	0	989
1-Jan-00	22:20	0.02	0	0.02	967.3	0	967.3
1-Jan-00	22:30	0.02	0	0.02	947.4	0	947.4
1-Jan-00	22:40	0.02	0	0.02	928.8	0	928.8
1-Jan-00	22:50	0.02	0	0.02	911	0	911
1-Jan-00	23:00	0.02	0	0.02	894.2	0	894.2
1-Jan-00	23:10	0.02	0	0.02	878.2	0	878.2
1-Jan-00	23:20	0.02	0	0.02	862.6	0	862.6
1-Jan-00	23:30	0.02	0	0.02	848	0	848
1-Jan-00	23:40	0.02	0	0.02	834.1	0	834.1
1-Jan-00	23:50	0.02	0	0.02	820.7	0	820.7
2-Jan-00	0:00	0.02	0	0.02	807.8	0	807.8
2-Jan-00	0:10	0.02	0	0.02	795.3	0	795.3
2-Jan-00	0:20	0	0	0	779.3	0	779.3
2-Jan-00	0:30	0	0	0	755.6	0	755.6
2-Jan-00	0:40	0	0	0	720.6	0	720.6
2-Jan-00	0:50	0	0	0	669.3	0	669.3
2-Jan-00	1:00	0	0	0	602.2	0	602.2
2-Jan-00	1:10	0	0	0	526	0	526

2-Jan-00	1:20	0	0	0	447.5	0	447.5
2-Jan-00	1:30	0	0	0	370.6	0	370.6
2-Jan-00	1:40	0	0	0	301.1	0	301.1
2-Jan-00	1:50	0	0	0	240.1	0	240.1
2-Jan-00	2:00	0	0	0	189.7	0	189.7
2-Jan-00	2:10	0	0	0	151	0	151
2-Jan-00	2:20	0	0	0	120.6	0	120.6
2-Jan-00	2:30	0	0	0	96.5	0	96.5
2-Jan-00	2:40	0	0	0	76.9	0	76.9
2-Jan-00	2:50	0	0	0	61.2	0	61.2
2-Jan-00	3:00	0	0	0	48.7	0	48.7
2-Jan-00	3:10	0	0	0	38.6	0	38.6
2-Jan-00	3:20	0	0	0	30.7	0	30.7
2-Jan-00	3:30	0	0	0	24.3	0	24.3
2-Jan-00	3:40	0	0	0	19.2	0	19.2
2-Jan-00	3:50	0	0	0	15.2	0	15.2
2-Jan-00	4:00	0	0	0	12	0	12
2-Jan-00	4:10	0	0	0	9.4	0	9.4
2-Jan-00	4:20	0	0	0	7.3	0	7.3
2-Jan-00	4:30	0	0	0	5.6	0	5.6
2-Jan-00	4:40	0	0	0	4.3	0	4.3
2-Jan-00	4:50	0	0	0	3.3	0	3.3
2-Jan-00	5:00	0	0	0	2.4	0	2.4
2-Jan-00	5:10	0	0	0	1.7	0	1.7
2-Jan-00	5:20	0	0	0	1.2	0	1.2
2-Jan-00	5:30	0	0	0	0.7	0	0.7
2-Jan-00	5:40	0	0	0	0.4	0	0.4
2-Jan-00	5:50	0	0	0	0.2	0	0.2
2-Jan-00	6:00	0	0	0	0	0	0
2-Jan-00	6:10	0	0	0	0	0	0
2-Jan-00	6:20	0	0	0	0	0	0
2-Jan-00	6:30	0	0	0	0	0	0
2-Jan-00	6:40	0	0	0	0	0	0
2-Jan-00	6:50	0	0	0	0	0	0
2-Jan-00	7:00	0	0	0	0	0	0
2-Jan-00	7:10	0	0	0	0	0	0

HEC-HMS RESULTS: 50 YR EXISTING

Date	Time	Precip (IN)	Loss (IN)	Excess (IN)	Direct Flow (CFS)	Base Flow (CFS)	Total Flow (CFS)
1-Jan-00	0:00				0	0	0
1-Jan-00	0:10	0	0	0	0	0	0
1-Jan-00	0:20	0.02	0.02	0	0	0	0
1-Jan-00	0:30	0.02	0.02	0	0	0	0
1-Jan-00	0:40	0.02	0.02	0	0	0	0
1-Jan-00	0:50	0.02	0.02	0	0	0	0
1-Jan-00	1:00	0.02	0.02	0	0	0	0
1-Jan-00	1:10	0.02	0.02	0	0	0	0
1-Jan-00	1:20	0.02	0.02	0	0	0	0
1-Jan-00	1:30	0.02	0.02	0	0	0	0
1-Jan-00	1:40	0.02	0.02	0	0	0	0
1-Jan-00	1:50	0.02	0.02	0	0	0	0
1-Jan-00	2:00	0.02	0.02	0	0	0	0
1-Jan-00	2:10	0.02	0.02	0	0	0	0
1-Jan-00	2:20	0.02	0.02	0	0	0	0
1-Jan-00	2:30	0.02	0.02	0	0	0	0
1-Jan-00	2:40	0.02	0.02	0	0	0	0
1-Jan-00	2:50	0.02	0.02	0	0	0	0
1-Jan-00	3:00	0.02	0.02	0	0.3	0	0.3
1-Jan-00	3:10	0.02	0.02	0	0.9	0	0.9
1-Jan-00	3:20	0.02	0.02	0	2.5	0	2.5
1-Jan-00	3:30	0.02	0.02	0	5.3	0	5.3
1-Jan-00	3:40	0.02	0.02	0	10	0	10
1-Jan-00	3:50	0.02	0.02	0	16.7	0	16.7
1-Jan-00	4:00	0.02	0.02	0	25.4	0	25.4
1-Jan-00	4:10	0.02	0.02	0	36.1	0	36.1
1-Jan-00	4:20	0.02	0.01	0	48.5	0	48.5
1-Jan-00	4:30	0.02	0.01	0	62.5	0	62.5
1-Jan-00	4:40	0.02	0.01	0	77.8	0	77.8
1-Jan-00	4:50	0.02	0.01	0.01	93.8	0	93.8
1-Jan-00	5:00	0.02	0.01	0.01	110.4	0	110.4
1-Jan-00	5:10	0.02	0.01	0.01	127.3	0	127.3
1-Jan-00	5:20	0.02	0.01	0.01	144.5	0	144.5
1-Jan-00	5:30	0.02	0.01	0.01	161.8	0	161.8
1-Jan-00	5:40	0.02	0.01	0.01	179.4	0	179.4
1-Jan-00	5:50	0.02	0.01	0.01	197	0	197
1-Jan-00	6:00	0.02	0.01	0.01	214.6	0	214.6
1-Jan-00	6:10	0.02	0.01	0.01	232.1	0	232.1
1-Jan-00	6:20	0.02	0.01	0.01	249.6	0	249.6
1-Jan-00	6:30	0.02	0.01	0.01	267	0	267
1-Jan-00	6:40	0.02	0.01	0.01	284.3	0	284.3
1-Jan-00	6:50	0.02	0.01	0.01	301.8	0	301.8
1-Jan-00	7:00	0.02	0.01	0.01	319.3	0	319.3
1-Jan-00	7:10	0.02	0.01	0.01	336.8	0	336.8
1-Jan-00	7:20	0.02	0.01	0.01	354.5	0	354.5
1-Jan-00	7:30	0.02	0.01	0.01	372.1	0	372.1
1-Jan-00	7:40	0.02	0.01	0.01	389.8	0	389.8
1-Jan-00	7:50	0.02	0.01	0.01	407.2	0	407.2

1-Jan-00	8:00	0.02	0.01	0.01	424.5	0	424.5
1-Jan-00	8:10	0.02	0.01	0.01	441.9	0	441.9
1-Jan-00	8:20	0.02	0.01	0.01	459.5	0	459.5
1-Jan-00	8:30	0.02	0.01	0.01	477.2	0	477.2
1-Jan-00	8:40	0.02	0.01	0.01	495	0	495
1-Jan-00	8:50	0.02	0.01	0.02	513.1	0	513.1
1-Jan-00	9:00	0.02	0.01	0.02	531.2	0	531.2
1-Jan-00	9:10	0.02	0.01	0.02	549.2	0	549.2
1-Jan-00	9:20	0.03	0.01	0.02	567.4	0	567.4
1-Jan-00	9:30	0.03	0.01	0.02	585.7	0	585.7
1-Jan-00	9:40	0.03	0.01	0.02	604.1	0	604.1
1-Jan-00	9:50	0.03	0.01	0.02	622.7	0	622.7
1-Jan-00	10:00	0.03	0.01	0.02	641.6	0	641.6
1-Jan-00	10:10	0.03	0.01	0.02	660.7	0	660.7
1-Jan-00	10:20	0.03	0.01	0.02	680.2	0	680.2
1-Jan-00	10:30	0.03	0.01	0.02	700.3	0	700.3
1-Jan-00	10:40	0.03	0.01	0.02	721	0	721
1-Jan-00	10:50	0.03	0.01	0.02	742.3	0	742.3
1-Jan-00	11:00	0.03	0.01	0.02	764.4	0	764.4
1-Jan-00	11:10	0.03	0.01	0.02	787	0	787
1-Jan-00	11:20	0.03	0.01	0.02	810.3	0	810.3
1-Jan-00	11:30	0.03	0.01	0.02	834	0	834
1-Jan-00	11:40	0.03	0.01	0.02	858.2	0	858.2
1-Jan-00	11:50	0.03	0.01	0.02	882.7	0	882.7
1-Jan-00	12:00	0.03	0.01	0.03	907.7	0	907.7
1-Jan-00	12:10	0.03	0.01	0.02	932.6	0	932.6
1-Jan-00	12:20	0.03	0.01	0.02	956.8	0	956.8
1-Jan-00	12:30	0.03	0.01	0.03	979.8	0	979.8
1-Jan-00	12:40	0.03	0.01	0.03	1000.9	0	1000.9
1-Jan-00	12:50	0.03	0.01	0.03	1019.8	0	1019.8
1-Jan-00	13:00	0.04	0.01	0.03	1038	0	1038
1-Jan-00	13:10	0.04	0.01	0.03	1056.8	0	1056.8
1-Jan-00	13:20	0.04	0.01	0.03	1077.1	0	1077.1
1-Jan-00	13:30	0.04	0.01	0.03	1100	0	1100
1-Jan-00	13:40	0.04	0.01	0.03	1126.3	0	1126.3
1-Jan-00	13:50	0.04	0.01	0.03	1156.5	0	1156.5
1-Jan-00	14:00	0.04	0.01	0.04	1191.6	0	1191.6
1-Jan-00	14:10	0.05	0.01	0.04	1232.5	0	1232.5
1-Jan-00	14:20	0.05	0.01	0.04	1280.5	0	1280.5
1-Jan-00	14:30	0.06	0.01	0.05	1336.7	0	1336.7
1-Jan-00	14:40	0.06	0.01	0.05	1402.9	0	1402.9
1-Jan-00	14:50	0.06	0.01	0.05	1479.8	0	1479.8
1-Jan-00	15:00	0.07	0.01	0.06	1567.1	0	1567.1
1-Jan-00	15:10	0.08	0.01	0.06	1664.9	0	1664.9
1-Jan-00	15:20	0.08	0.01	0.07	1775.1	0	1775.1
1-Jan-00	15:30	0.12	0.02	0.1	1906.1	0	1906.1
1-Jan-00	15:40	0.13	0.02	0.11	2067.7	0	2067.7
1-Jan-00	15:50	0.15	0.02	0.13	2272	0	2272
1-Jan-00	16:00	0.21	0.02	0.19	2545	0	2545
1-Jan-00	16:10	0.75	0.06	0.69	3032.2	0	3032.2
1-Jan-00	16:20	0.14	0.01	0.13	3716.7	0	3716.7
1-Jan-00	16:30	0.09	0.01	0.08	4560.3	0	4560.3

1-Jan-00	16:40	0.07	0	0.07	5557.8	0	5557.8
1-Jan-00	16:50	0.06	0	0.06	6456.9	0	6456.9
1-Jan-00	17:00	0.05	0	0.05	6988.7	0	6988.7
1-Jan-00	17:10	0.04	0	0.04	7134.8	0	**7134.8**
1-Jan-00	17:20	0.04	0	0.04	6991.3	0	6991.3
1-Jan-00	17:30	0.04	0	0.04	6548	0	6548
1-Jan-00	17:40	0.04	0	0.03	5985	0	5985
1-Jan-00	17:50	0.03	0	0.03	5304.2	0	5304.2
1-Jan-00	18:00	0.03	0	0.03	4579.3	0	4579.3
1-Jan-00	18:10	0.03	0	0.03	3988.5	0	3988.5
1-Jan-00	18:20	0.03	0	0.03	3510	0	3510
1-Jan-00	18:30	0.03	0	0.03	3119	0	3119
1-Jan-00	18:40	0.03	0	0.03	2784.7	0	2784.7
1-Jan-00	18:50	0.03	0	0.03	2502.5	0	2502.5
1-Jan-00	19:00	0.03	0	0.03	2269.1	0	2269.1
1-Jan-00	19:10	0.03	0	0.03	2076.3	0	2076.3
1-Jan-00	19:20	0.03	0	0.03	1917.3	0	1917.3
1-Jan-00	19:30	0.03	0	0.02	1783	0	1783
1-Jan-00	19:40	0.02	0	0.02	1667.8	0	1667.8
1-Jan-00	19:50	0.02	0	0.02	1572.2	0	1572.2
1-Jan-00	20:00	0.02	0	0.02	1490	0	1490
1-Jan-00	20:10	0.02	0	0.02	1416.3	0	1416.3
1-Jan-00	20:20	0.02	0	0.02	1351.3	0	1351.3
1-Jan-00	20:30	0.02	0	0.02	1294	0	1294
1-Jan-00	20:40	0.02	0	0.02	1242.5	0	1242.5
1-Jan-00	20:50	0.02	0	0.02	1196.4	0	1196.4
1-Jan-00	21:00	0.02	0	0.02	1155.7	0	1155.7
1-Jan-00	21:10	0.02	0	0.02	1117.5	0	1117.5
1-Jan-00	21:20	0.02	0	0.02	1081.4	0	1081.4
1-Jan-00	21:30	0.02	0	0.02	1047.9	0	1047.9
1-Jan-00	21:40	0.02	0	0.02	1017.2	0	1017.2
1-Jan-00	21:50	0.02	0	0.02	988.8	0	988.8
1-Jan-00	22:00	0.02	0	0.02	962.6	0	962.6
1-Jan-00	22:10	0.02	0	0.02	940.9	0	940.9
1-Jan-00	22:20	0.02	0	0.02	922	0	922
1-Jan-00	22:30	0.02	0	0.02	904	0	904
1-Jan-00	22:40	0.02	0	0.02	887.3	0	887.3
1-Jan-00	22:50	0.02	0	0.02	871.2	0	871.2
1-Jan-00	23:00	0.02	0	0.02	855.8	0	855.8
1-Jan-00	23:10	0.02	0	0.02	841.3	0	841.3
1-Jan-00	23:20	0.02	0	0.02	827.5	0	827.5
1-Jan-00	23:30	0.02	0	0.02	814.2	0	814.2
1-Jan-00	23:40	0.02	0	0.02	801.5	0	801.5
1-Jan-00	23:50	0.02	0	0.02	789.1	0	789.1
2-Jan-00	0:00	0.02	0	0.02	777.3	0	777.3
2-Jan-00	0:10	0.02	0	0.02	765.7	0	765.7
2-Jan-00	0:20	0	0	0	750.5	0	750.5
2-Jan-00	0:30	0	0	0	728	0	728
2-Jan-00	0:40	0	0	0	694.8	0	694.8
2-Jan-00	0:50	0	0	0	646.2	0	646.2
2-Jan-00	1:00	0	0	0	582	0	582
2-Jan-00	1:10	0	0	0	508.8	0	508.8

2-Jan-00	1:20	0	0	0	433.1	0	433.1
2-Jan-00	1:30	0	0	0	359	0	359
2-Jan-00	1:40	0	0	0	291.9	0	291.9
2-Jan-00	1:50	0	0	0	232.8	0	232.8
2-Jan-00	2:00	0	0	0	183.9	0	183.9
2-Jan-00	2:10	0	0	0	146.3	0	146.3
2-Jan-00	2:20	0	0	0	116.9	0	116.9
2-Jan-00	2:30	0	0	0	93.5	0	93.5
2-Jan-00	2:40	0	0	0	74.6	0	74.6
2-Jan-00	2:50	0	0	0	59.3	0	59.3
2-Jan-00	3:00	0	0	0	47.2	0	47.2
2-Jan-00	3:10	0	0	0	37.5	0	37.5
2-Jan-00	3:20	0	0	0	29.7	0	29.7
2-Jan-00	3:30	0	0	0	23.6	0	23.6
2-Jan-00	3:40	0	0	0	18.6	0	18.6
2-Jan-00	3:50	0	0	0	14.7	0	14.7
2-Jan-00	4:00	0	0	0	11.6	0	11.6
2-Jan-00	4:10	0	0	0	9.1	0	9.1
2-Jan-00	4:20	0	0	0	7.1	0	7.1
2-Jan-00	4:30	0	0	0	5.5	0	5.5
2-Jan-00	4:40	0	0	0	4.2	0	4.2
2-Jan-00	4:50	0	0	0	3.2	0	3.2
2-Jan-00	5:00	0	0	0	2.4	0	2.4
2-Jan-00	5:10	0	0	0	1.7	0	1.7
2-Jan-00	5:20	0	0	0	1.1	0	1.1
2-Jan-00	5:30	0	0	0	0.7	0	0.7
2-Jan-00	5:40	0	0	0	0.4	0	0.4
2-Jan-00	5:50	0	0	0	0.2	0	0.2
2-Jan-00	6:00	0	0	0	0	0	0
2-Jan-00	6:10	0	0	0	0	0	0
2-Jan-00	6:20	0	0	0	0	0	0
2-Jan-00	6:30	0	0	0	0	0	0
2-Jan-00	6:40	0	0	0	0	0	0
2-Jan-00	6:50	0	0	0	0	0	0
2-Jan-00	7:00	0	0	0	0	0	0
2-Jan-00	7:10	0	0	0	0	0	0

HEC-HMS RESULTS: 100 YR PROPOSED

Date	Time	Precip (IN)	Loss (IN)	Excess (IN)	Direct Flow (CFS)	Base Flow (CFS)	Total Flow (CFS)
1-Jan-00	0:00				0	0	0
1-Jan-00	0:10	0	0	0	0	0	0
1-Jan-00	0:20	0.02	0.02	0	0	0	0
1-Jan-00	0:30	0.02	0.02	0	0	0	0
1-Jan-00	0:40	0.02	0.02	0	0	0	0
1-Jan-00	0:50	0.02	0.02	0	0	0	0
1-Jan-00	1:00	0.02	0.02	0	0	0	0
1-Jan-00	1:10	0.02	0.02	0	0	0	0
1-Jan-00	1:20	0.02	0.02	0	0	0	0
1-Jan-00	1:30	0.02	0.02	0	0	0	0
1-Jan-00	1:40	0.02	0.02	0	0	0	0
1-Jan-00	1:50	0.02	0.02	0	0	0	0
1-Jan-00	2:00	0.02	0.02	0	0	0	0
1-Jan-00	2:10	0.02	0.02	0	0	0	0
1-Jan-00	2:20	0.02	0.02	0	0	0	0
1-Jan-00	2:30	0.02	0.02	0	0	0	0
1-Jan-00	2:40	0.02	0.02	0	0	0	0
1-Jan-00	2:50	0.02	0.02	0	0.1	0	0.1
1-Jan-00	3:00	0.02	0.02	0	0.5	0	0.5
1-Jan-00	3:10	0.02	0.02	0	1.5	0	1.5
1-Jan-00	3:20	0.02	0.02	0	3.7	0	3.7
1-Jan-00	3:30	0.02	0.02	0	7.5	0	7.5
1-Jan-00	3:40	0.02	0.02	0	13.3	0	13.3
1-Jan-00	3:50	0.02	0.02	0	21.4	0	21.4
1-Jan-00	4:00	0.02	0.02	0	31.7	0	31.7
1-Jan-00	4:10	0.02	0.01	0	43.9	0	43.9
1-Jan-00	4:20	0.02	0.01	0	57.9	0	57.9
1-Jan-00	4:30	0.02	0.01	0.01	73.2	0	73.2
1-Jan-00	4:40	0.02	0.01	0.01	89.5	0	89.5
1-Jan-00	4:50	0.02	0.01	0.01	106.6	0	106.6
1-Jan-00	5:00	0.02	0.01	0.01	124.2	0	124.2
1-Jan-00	5:10	0.02	0.01	0.01	142.3	0	142.3
1-Jan-00	5:20	0.02	0.01	0.01	160.7	0	160.7
1-Jan-00	5:30	0.02	0.01	0.01	179.1	0	179.1
1-Jan-00	5:40	0.02	0.01	0.01	197.6	0	197.6
1-Jan-00	5:50	0.02	0.01	0.01	216.1	0	216.1
1-Jan-00	6:00	0.02	0.01	0.01	234.6	0	234.6
1-Jan-00	6:10	0.02	0.01	0.01	253.3	0	253.3
1-Jan-00	6:20	0.02	0.01	0.01	272	0	272
1-Jan-00	6:30	0.02	0.01	0.01	290.8	0	290.8
1-Jan-00	6:40	0.02	0.01	0.01	309.7	0	309.7
1-Jan-00	6:50	0.02	0.01	0.01	328.5	0	328.5
1-Jan-00	7:00	0.02	0.01	0.01	347.3	0	347.3
1-Jan-00	7:10	0.02	0.01	0.01	366	0	366
1-Jan-00	7:20	0.02	0.01	0.01	384.4	0	384.4
1-Jan-00	7:30	0.02	0.01	0.01	402.8	0	402.8
1-Jan-00	7:40	0.02	0.01	0.01	421.1	0	421.1
1-Jan-00	7:50	0.02	0.01	0.01	439.5	0	439.5

1-Jan-00	8:00	0.02	0.01	0.01	457.8	0	457.8
1-Jan-00	8:10	0.02	0.01	0.01	476.2	0	476.2
1-Jan-00	8:20	0.02	0.01	0.01	494.9	0	494.9
1-Jan-00	8:30	0.02	0.01	0.01	513.7	0	513.7
1-Jan-00	8:40	0.02	0.01	0.02	532.7	0	532.7
1-Jan-00	8:50	0.03	0.01	0.02	551.7	0	551.7
1-Jan-00	9:00	0.03	0.01	0.02	570.7	0	570.7
1-Jan-00	9:10	0.03	0.01	0.02	589.8	0	589.8
1-Jan-00	9:20	0.03	0.01	0.02	609.1	0	609.1
1-Jan-00	9:30	0.03	0.01	0.02	628.6	0	628.6
1-Jan-00	9:40	0.03	0.01	0.02	648.5	0	648.5
1-Jan-00	9:50	0.03	0.01	0.02	668.8	0	668.8
1-Jan-00	10:00	0.03	0.01	0.02	689.4	0	689.4
1-Jan-00	10:10	0.03	0.01	0.02	710.4	0	710.4
1-Jan-00	10:20	0.03	0.01	0.02	731.9	0	731.9
1-Jan-00	10:30	0.03	0.01	0.02	753.9	0	753.9
1-Jan-00	10:40	0.03	0.01	0.02	776.5	0	776.5
1-Jan-00	10:50	0.03	0.01	0.02	799.6	0	799.6
1-Jan-00	11:00	0.03	0.01	0.02	823.2	0	823.2
1-Jan-00	11:10	0.03	0.01	0.02	847.5	0	847.5
1-Jan-00	11:20	0.03	0.01	0.02	872.4	0	872.4
1-Jan-00	11:30	0.03	0.01	0.03	898.1	0	898.1
1-Jan-00	11:40	0.04	0.01	0.03	924.8	0	924.8
1-Jan-00	11:50	0.04	0.01	0.03	952.4	0	952.4
1-Jan-00	12:00	0.04	0.01	0.03	981.1	0	981.1
1-Jan-00	12:10	0.04	0.01	0.03	1010.6	0	1010.6
1-Jan-00	12:20	0.04	0.01	0.03	1040.9	0	1040.9
1-Jan-00	12:30	0.04	0.01	0.03	1071.6	0	1071.6
1-Jan-00	12:40	0.04	0.01	0.03	1102.4	0	1102.4
1-Jan-00	12:50	0.04	0.01	0.03	1133.4	0	1133.4
1-Jan-00	13:00	0.04	0.01	0.03	1165.3	0	1165.3
1-Jan-00	13:10	0.04	0.01	0.03	1198.6	0	1198.6
1-Jan-00	13:20	0.04	0.01	0.04	1233.7	0	1233.7
1-Jan-00	13:30	0.05	0.01	0.04	1271.3	0	1271.3
1-Jan-00	13:40	0.05	0.01	0.04	1311.9	0	1311.9
1-Jan-00	13:50	0.05	0.01	0.04	1356.1	0	1356.1
1-Jan-00	14:00	0.05	0.01	0.04	1404.3	0	1404.3
1-Jan-00	14:10	0.06	0.01	0.05	1457.8	0	1457.8
1-Jan-00	14:20	0.06	0.01	0.05	1517.9	0	1517.9
1-Jan-00	14:30	0.06	0.01	0.06	1586.3	0	1586.3
1-Jan-00	14:40	0.07	0.01	0.06	1665.3	0	1665.3
1-Jan-00	14:50	0.07	0.01	0.06	1756.2	0	1756.2
1-Jan-00	15:00	0.08	0.01	0.07	1859	0	1859
1-Jan-00	15:10	0.09	0.01	0.08	1974.5	0	1974.5
1-Jan-00	15:20	0.09	0.01	0.08	2105	0	2105
1-Jan-00	15:30	0.14	0.02	0.12	2260.2	0	2260.2
1-Jan-00	15:40	0.15	0.02	0.13	2452.1	0	2452.1
1-Jan-00	15:50	0.17	0.02	0.16	2694.5	0	2694.5
1-Jan-00	16:00	0.24	0.02	0.22	3018.3	0	3018.3
1-Jan-00	16:10	0.87	0.06	0.81	3595.6	0	3595.6
1-Jan-00	16:20	0.17	0.01	0.16	4406.4	0	4406.4
1-Jan-00	16:30	0.1	0.01	0.1	5405.4	0	5405.4

1-Jan-00	16:40	0.08	0	0.08	6586	0	6586
1-Jan-00	16:50	0.07	0	0.07	7649.2	0	7649.2
1-Jan-00	17:00	0.06	0	0.06	8277	0	8277
1-Jan-00	17:10	0.05	0	0.05	8447.9	0	**8447.9**
1-Jan-00	17:20	0.05	0	0.05	8275.7	0	8275.7
1-Jan-00	17:30	0.04	0	0.04	7749.2	0	7749.2
1-Jan-00	17:40	0.04	0	0.04	7081.7	0	7081.7
1-Jan-00	17:50	0.04	0	0.04	6275.3	0	6275.3
1-Jan-00	18:00	0.04	0	0.04	5417.1	0	5417.1
1-Jan-00	18:10	0.03	0	0.03	4717	0	4717
1-Jan-00	18:20	0.04	0	0.03	4147.8	0	4147.8
1-Jan-00	18:30	0.03	0	0.03	3679.6	0	3679.6
1-Jan-00	18:40	0.03	0	0.03	3275.2	0	3275.2
1-Jan-00	18:50	0.03	0	0.03	2929.3	0	2929.3
1-Jan-00	19:00	0.03	0	0.03	2639.2	0	2639.2
1-Jan-00	19:10	0.03	0	0.03	2397.1	0	2397.1
1-Jan-00	19:20	0.03	0	0.03	2195.7	0	2195.7
1-Jan-00	19:30	0.03	0	0.03	2025.2	0	2025.2
1-Jan-00	19:40	0.03	0	0.02	1878.9	0	1878.9
1-Jan-00	19:50	0.03	0	0.02	1757.2	0	1757.2
1-Jan-00	20:00	0.02	0	0.02	1652.9	0	1652.9
1-Jan-00	20:10	0.02	0	0.02	1560	0	1560
1-Jan-00	20:20	0.02	0	0.02	1478.5	0	1478.5
1-Jan-00	20:30	0.02	0	0.02	1407.1	0	1407.1
1-Jan-00	20:40	0.02	0	0.02	1343.7	0	1343.7
1-Jan-00	20:50	0.02	0	0.02	1287.7	0	1287.7
1-Jan-00	21:00	0.02	0	0.02	1239.2	0	1239.2
1-Jan-00	21:10	0.02	0	0.02	1194.3	0	1194.3
1-Jan-00	21:20	0.02	0	0.02	1152.3	0	1152.3
1-Jan-00	21:30	0.02	0	0.02	1113.5	0	1113.5
1-Jan-00	21:40	0.02	0	0.02	1077.8	0	1077.8
1-Jan-00	21:50	0.02	0	0.02	1044.6	0	1044.6
1-Jan-00	22:00	0.02	0	0.02	1014.4	0	1014.4
1-Jan-00	22:10	0.02	0	0.02	989.4	0	989.4
1-Jan-00	22:20	0.02	0	0.02	967.7	0	967.7
1-Jan-00	22:30	0.02	0	0.02	947.8	0	947.8
1-Jan-00	22:40	0.02	0	0.02	929.2	0	929.2
1-Jan-00	22:50	0.02	0	0.02	911.3	0	911.3
1-Jan-00	23:00	0.02	0	0.02	894.6	0	894.6
1-Jan-00	23:10	0.02	0	0.02	878.5	0	878.5
1-Jan-00	23:20	0.02	0	0.02	863	0	863
1-Jan-00	23:30	0.02	0	0.02	848.3	0	848.3
1-Jan-00	23:40	0.02	0	0.02	834.4	0	834.4
1-Jan-00	23:50	0.02	0	0.02	821	0	821
2-Jan-00	0:00	0.02	0	0.02	808.1	0	808.1
2-Jan-00	0:10	0.02	0	0.02	795.6	0	795.6
2-Jan-00	0:20	0	0	0	779.6	0	779.6
2-Jan-00	0:30	0	0	0	755.9	0	755.9
2-Jan-00	0:40	0	0	0	720.9	0	720.9
2-Jan-00	0:50	0	0	0	669.6	0	669.6
2-Jan-00	1:00	0	0	0	602.4	0	602.4
2-Jan-00	1:10	0	0	0	526.2	0	526.2

2-Jan-00	1:20	0	0	0	447.7	0	447.7
2-Jan-00	1:30	0	0	0	370.8	0	370.8
2-Jan-00	1:40	0	0	0	301.2	0	301.2
2-Jan-00	1:50	0	0	0	240.2	0	240.2
2-Jan-00	2:00	0	0	0	189.8	0	189.8
2-Jan-00	2:10	0	0	0	151	0	151
2-Jan-00	2:20	0	0	0	120.7	0	120.7
2-Jan-00	2:30	0	0	0	96.5	0	96.5
2-Jan-00	2:40	0	0	0	76.9	0	76.9
2-Jan-00	2:50	0	0	0	61.2	0	61.2
2-Jan-00	3:00	0	0	0	48.7	0	48.7
2-Jan-00	3:10	0	0	0	38.7	0	38.7
2-Jan-00	3:20	0	0	0	30.7	0	30.7
2-Jan-00	3:30	0	0	0	24.3	0	24.3
2-Jan-00	3:40	0	0	0	19.2	0	19.2
2-Jan-00	3:50	0	0	0	15.2	0	15.2
2-Jan-00	4:00	0	0	0	12	0	12
2-Jan-00	4:10	0	0	0	9.4	0	9.4
2-Jan-00	4:20	0	0	0	7.3	0	7.3
2-Jan-00	4:30	0	0	0	5.6	0	5.6
2-Jan-00	4:40	0	0	0	4.3	0	4.3
2-Jan-00	4:50	0	0	0	3.3	0	3.3
2-Jan-00	5:00	0	0	0	2.4	0	2.4
2-Jan-00	5:10	0	0	0	1.7	0	1.7
2-Jan-00	5:20	0	0	0	1.2	0	1.2
2-Jan-00	5:30	0	0	0	0.7	0	0.7
2-Jan-00	5:40	0	0	0	0.4	0	0.4
2-Jan-00	5:50	0	0	0	0.2	0	0.2
2-Jan-00	6:00	0	0	0	0	0	0
2-Jan-00	6:10	0	0	0	0	0	0
2-Jan-00	6:20	0	0	0	0	0	0
2-Jan-00	6:30	0	0	0	0	0	0
2-Jan-00	6:40	0	0	0	0	0	0
2-Jan-00	6:50	0	0	0	0	0	0
2-Jan-00	7:00	0	0	0	0	0	0
2-Jan-00	7:10	0	0	0	0	0	0
2-Jan-00	7:20	0	0	0	0	0	0
2-Jan-00	7:30	0	0	0	0	0	0
2-Jan-00	7:40	0	0	0	0	0	0
2-Jan-00	7:50	0	0	0	0	0	0
2-Jan-00	8:00	0	0	0	0	0	0

HEC-HMS RESULTS: 50 YR PROPOSED

Date	Time	Precip (IN)	Loss (IN)	Excess (IN)	Direct Flow (CFS)	Base Flow (CFS)	Total Flow (CFS)
1-Jan-00	0:00				0	0	0
1-Jan-00	0:10	0	0	0	0	0	0
1-Jan-00	0:20	0.02	0.02	0	0	0	0
1-Jan-00	0:30	0.02	0.02	0	0	0	0
1-Jan-00	0:40	0.02	0.02	0	0	0	0
1-Jan-00	0:50	0.02	0.02	0	0	0	0
1-Jan-00	1:00	0.02	0.02	0	0	0	0
1-Jan-00	1:10	0.02	0.02	0	0	0	0
1-Jan-00	1:20	0.02	0.02	0	0	0	0
1-Jan-00	1:30	0.02	0.02	0	0	0	0
1-Jan-00	1:40	0.02	0.02	0	0	0	0
1-Jan-00	1:50	0.02	0.02	0	0	0	0
1-Jan-00	2:00	0.02	0.02	0	0	0	0
1-Jan-00	2:10	0.02	0.02	0	0	0	0
1-Jan-00	2:20	0.02	0.02	0	0	0	0
1-Jan-00	2:30	0.02	0.02	0	0	0	0
1-Jan-00	2:40	0.02	0.02	0	0	0	0
1-Jan-00	2:50	0.02	0.02	0	0	0	0
1-Jan-00	3:00	0.02	0.02	0	0.3	0	0.3
1-Jan-00	3:10	0.02	0.02	0	1	0	1
1-Jan-00	3:20	0.02	0.02	0	2.7	0	2.7
1-Jan-00	3:30	0.02	0.02	0	5.7	0	5.7
1-Jan-00	3:40	0.02	0.02	0	10.5	0	10.5
1-Jan-00	3:50	0.02	0.02	0	17.4	0	17.4
1-Jan-00	4:00	0.02	0.02	0	26.3	0	26.3
1-Jan-00	4:10	0.02	0.02	0	37.2	0	37.2
1-Jan-00	4:20	0.02	0.01	0	49.9	0	49.9
1-Jan-00	4:30	0.02	0.01	0	64.1	0	64.1
1-Jan-00	4:40	0.02	0.01	0	79.5	0	79.5
1-Jan-00	4:50	0.02	0.01	0.01	95.6	0	95.6
1-Jan-00	5:00	0.02	0.01	0.01	112.3	0	112.3
1-Jan-00	5:10	0.02	0.01	0.01	129.3	0	129.3
1-Jan-00	5:20	0.02	0.01	0.01	146.5	0	146.5
1-Jan-00	5:30	0.02	0.01	0.01	164	0	164
1-Jan-00	5:40	0.02	0.01	0.01	181.5	0	181.5
1-Jan-00	5:50	0.02	0.01	0.01	199.2	0	199.2
1-Jan-00	6:00	0.02	0.01	0.01	216.9	0	216.9
1-Jan-00	6:10	0.02	0.01	0.01	234.4	0	234.4
1-Jan-00	6:20	0.02	0.01	0.01	251.9	0	251.9
1-Jan-00	6:30	0.02	0.01	0.01	269.3	0	269.3
1-Jan-00	6:40	0.02	0.01	0.01	286.7	0	286.7
1-Jan-00	6:50	0.02	0.01	0.01	304.2	0	304.2
1-Jan-00	7:00	0.02	0.01	0.01	321.7	0	321.7
1-Jan-00	7:10	0.02	0.01	0.01	339.3	0	339.3
1-Jan-00	7:20	0.02	0.01	0.01	356.9	0	356.9
1-Jan-00	7:30	0.02	0.01	0.01	374.6	0	374.6
1-Jan-00	7:40	0.02	0.01	0.01	392.3	0	392.3
1-Jan-00	7:50	0.02	0.01	0.01	409.8	0	409.8

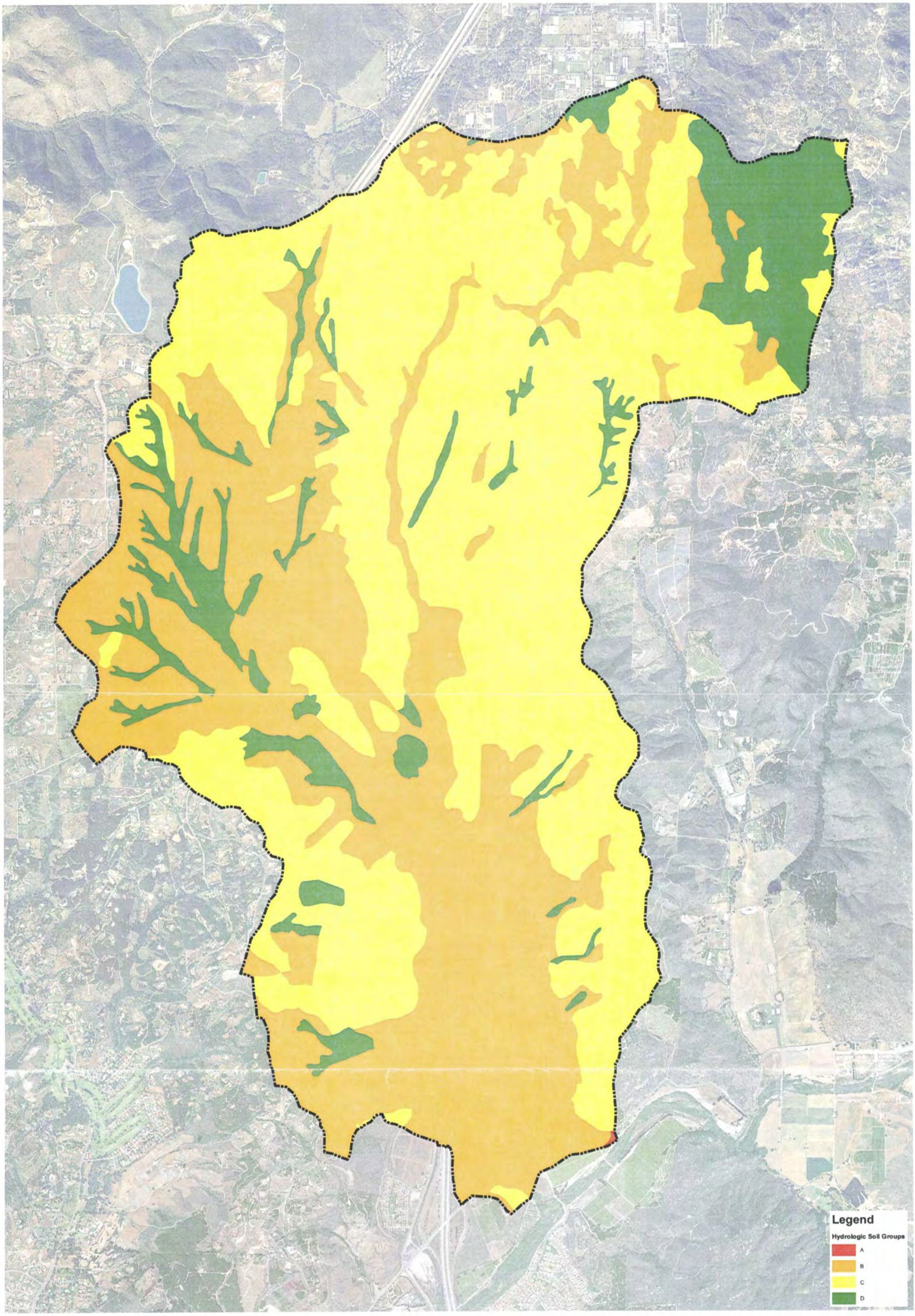
1-Jan-00	8:00	0.02	0.01	0.01	427.1	0	427.1
1-Jan-00	8:10	0.02	0.01	0.01	444.4	0	444.4
1-Jan-00	8:20	0.02	0.01	0.01	462	0	462
1-Jan-00	8:30	0.02	0.01	0.01	479.7	0	479.7
1-Jan-00	8:40	0.02	0.01	0.01	497.6	0	497.6
1-Jan-00	8:50	0.02	0.01	0.02	515.6	0	515.6
1-Jan-00	9:00	0.02	0.01	0.02	533.7	0	533.7
1-Jan-00	9:10	0.02	0.01	0.02	551.8	0	551.8
1-Jan-00	9:20	0.03	0.01	0.02	570	0	570
1-Jan-00	9:30	0.03	0.01	0.02	588.3	0	588.3
1-Jan-00	9:40	0.03	0.01	0.02	606.7	0	606.7
1-Jan-00	9:50	0.03	0.01	0.02	625.3	0	625.3
1-Jan-00	10:00	0.03	0.01	0.02	644.2	0	644.2
1-Jan-00	10:10	0.03	0.01	0.02	663.3	0	663.3
1-Jan-00	10:20	0.03	0.01	0.02	682.8	0	682.8
1-Jan-00	10:30	0.03	0.01	0.02	702.9	0	702.9
1-Jan-00	10:40	0.03	0.01	0.02	723.6	0	723.6
1-Jan-00	10:50	0.03	0.01	0.02	745	0	745
1-Jan-00	11:00	0.03	0.01	0.02	767	0	767
1-Jan-00	11:10	0.03	0.01	0.02	789.6	0	789.6
1-Jan-00	11:20	0.03	0.01	0.02	812.9	0	812.9
1-Jan-00	11:30	0.03	0.01	0.02	836.6	0	836.6
1-Jan-00	11:40	0.03	0.01	0.02	860.8	0	860.8
1-Jan-00	11:50	0.03	0.01	0.02	885.4	0	885.4
1-Jan-00	12:00	0.03	0.01	0.03	910.4	0	910.4
1-Jan-00	12:10	0.03	0.01	0.02	935.3	0	935.3
1-Jan-00	12:20	0.03	0.01	0.02	959.4	0	959.4
1-Jan-00	12:30	0.03	0.01	0.03	982.4	0	982.4
1-Jan-00	12:40	0.03	0.01	0.03	1003.5	0	1003.5
1-Jan-00	12:50	0.03	0.01	0.03	1022.4	0	1022.4
1-Jan-00	13:00	0.04	0.01	0.03	1040.6	0	1040.6
1-Jan-00	13:10	0.04	0.01	0.03	1059.4	0	1059.4
1-Jan-00	13:20	0.04	0.01	0.03	1079.6	0	1079.6
1-Jan-00	13:30	0.04	0.01	0.03	1102.5	0	1102.5
1-Jan-00	13:40	0.04	0.01	0.03	1128.8	0	1128.8
1-Jan-00	13:50	0.04	0.01	0.04	1159.1	0	1159.1
1-Jan-00	14:00	0.04	0.01	0.04	1194.2	0	1194.2
1-Jan-00	14:10	0.05	0.01	0.04	1235.1	0	1235.1
1-Jan-00	14:20	0.05	0.01	0.04	1283.1	0	1283.1
1-Jan-00	14:30	0.06	0.01	0.05	1339.4	0	1339.4
1-Jan-00	14:40	0.06	0.01	0.05	1405.6	0	1405.6
1-Jan-00	14:50	0.06	0.01	0.05	1482.6	0	1482.6
1-Jan-00	15:00	0.07	0.01	0.06	1569.9	0	1569.9
1-Jan-00	15:10	0.08	0.01	0.06	1667.8	0	1667.8
1-Jan-00	15:20	0.08	0.01	0.07	1778.1	0	1778.1
1-Jan-00	15:30	0.12	0.02	0.1	1909.2	0	1909.2
1-Jan-00	15:40	0.13	0.02	0.11	2071	0	2071
1-Jan-00	15:50	0.15	0.02	0.13	2275.4	0	2275.4
1-Jan-00	16:00	0.21	0.02	0.19	2548.7	0	2548.7
1-Jan-00	16:10	0.75	0.06	0.69	3036.3	0	3036.3
1-Jan-00	16:20	0.14	0.01	0.13	3721.4	0	3721.4
1-Jan-00	16:30	0.09	0.01	0.08	4565.6	0	4565.6

1-Jan-00	16:40	0.07	0	0.07	5563.7	0	5563.7
1-Jan-00	16:50	0.06	0	0.06	6463.4	0	6463.4
1-Jan-00	17:00	0.05	0	0.05	6995.4	0	6995.4
1-Jan-00	17:10	0.04	0	0.04	7141.4	0	**7141.4**
1-Jan-00	17:20	0.04	0	0.04	6997.6	0	6997.6
1-Jan-00	17:30	0.04	0	0.04	6553.7	0	6553.7
1-Jan-00	17:40	0.04	0	0.03	5990.1	0	5990.1
1-Jan-00	17:50	0.03	0	0.03	5308.6	0	5308.6
1-Jan-00	18:00	0.03	0	0.03	4582.9	0	4582.9
1-Jan-00	18:10	0.03	0	0.03	3991.6	0	3991.6
1-Jan-00	18:20	0.03	0	0.03	3512.7	0	3512.7
1-Jan-00	18:30	0.03	0	0.03	3121.3	0	3121.3
1-Jan-00	18:40	0.03	0	0.03	2786.7	0	2786.7
1-Jan-00	18:50	0.03	0	0.03	2504.3	0	2504.3
1-Jan-00	19:00	0.03	0	0.03	2270.6	0	2270.6
1-Jan-00	19:10	0.03	0	0.03	2077.7	0	2077.7
1-Jan-00	19:20	0.03	0	0.03	1918.5	0	1918.5
1-Jan-00	19:30	0.03	0	0.02	1784.1	0	1784.1
1-Jan-00	19:40	0.02	0	0.02	1668.8	0	1668.8
1-Jan-00	19:50	0.02	0	0.02	1573.1	0	1573.1
1-Jan-00	20:00	0.02	0	0.02	1490.9	0	1490.9
1-Jan-00	20:10	0.02	0	0.02	1417.1	0	1417.1
1-Jan-00	20:20	0.02	0	0.02	1352.1	0	1352.1
1-Jan-00	20:30	0.02	0	0.02	1294.7	0	1294.7
1-Jan-00	20:40	0.02	0	0.02	1243.2	0	1243.2
1-Jan-00	20:50	0.02	0	0.02	1197	0	1197
1-Jan-00	21:00	0.02	0	0.02	1156.3	0	1156.3
1-Jan-00	21:10	0.02	0	0.02	1118.1	0	1118.1
1-Jan-00	21:20	0.02	0	0.02	1082	0	1082
1-Jan-00	21:30	0.02	0	0.02	1048.5	0	1048.5
1-Jan-00	21:40	0.02	0	0.02	1017.7	0	1017.7
1-Jan-00	21:50	0.02	0	0.02	989.3	0	989.3
1-Jan-00	22:00	0.02	0	0.02	963	0	963
1-Jan-00	22:10	0.02	0	0.02	941.4	0	941.4
1-Jan-00	22:20	0.02	0	0.02	922.4	0	922.4
1-Jan-00	22:30	0.02	0	0.02	904.5	0	904.5
1-Jan-00	22:40	0.02	0	0.02	887.7	0	887.7
1-Jan-00	22:50	0.02	0	0.02	871.7	0	871.7
1-Jan-00	23:00	0.02	0	0.02	856.2	0	856.2
1-Jan-00	23:10	0.02	0	0.02	841.7	0	841.7
1-Jan-00	23:20	0.02	0	0.02	827.9	0	827.9
1-Jan-00	23:30	0.02	0	0.02	814.6	0	814.6
1-Jan-00	23:40	0.02	0	0.02	801.9	0	801.9
1-Jan-00	23:50	0.02	0	0.02	789.5	0	789.5
2-Jan-00	0:00	0.02	0	0.02	777.6	0	777.6
2-Jan-00	0:10	0.02	0	0.02	766.1	0	766.1
2-Jan-00	0:20	0	0	0	750.8	0	750.8
2-Jan-00	0:30	0	0	0	728.3	0	728.3
2-Jan-00	0:40	0	0	0	695.1	0	695.1
2-Jan-00	0:50	0	0	0	646.4	0	646.4
2-Jan-00	1:00	0	0	0	582.3	0	582.3
2-Jan-00	1:10	0	0	0	509	0	509

2-Jan-00	1:20	0	0	0	433.3	0	433.3
2-Jan-00	1:30	0	0	0	359.2	0	359.2
2-Jan-00	1:40	0	0	0	292	0	292
2-Jan-00	1:50	0	0	0	232.9	0	232.9
2-Jan-00	2:00	0	0	0	184	0	184
2-Jan-00	2:10	0	0	0	146.4	0	146.4
2-Jan-00	2:20	0	0	0	117	0	117
2-Jan-00	2:30	0	0	0	93.6	0	93.6
2-Jan-00	2:40	0	0	0	74.6	0	74.6
2-Jan-00	2:50	0	0	0	59.4	0	59.4
2-Jan-00	3:00	0	0	0	47.2	0	47.2
2-Jan-00	3:10	0	0	0	37.5	0	37.5
2-Jan-00	3:20	0	0	0	29.8	0	29.8
2-Jan-00	3:30	0	0	0	23.6	0	23.6
2-Jan-00	3:40	0	0	0	18.6	0	18.6
2-Jan-00	3:50	0	0	0	14.7	0	14.7
2-Jan-00	4:00	0	0	0	11.6	0	11.6
2-Jan-00	4:10	0	0	0	9.1	0	9.1
2-Jan-00	4:20	0	0	0	7.1	0	7.1
2-Jan-00	4:30	0	0	0	5.5	0	5.5
2-Jan-00	4:40	0	0	0	4.2	0	4.2
2-Jan-00	4:50	0	0	0	3.2	0	3.2
2-Jan-00	5:00	0	0	0	2.4	0	2.4
2-Jan-00	5:10	0	0	0	1.7	0	1.7
2-Jan-00	5:20	0	0	0	1.1	0	1.1
2-Jan-00	5:30	0	0	0	0.7	0	0.7
2-Jan-00	5:40	0	0	0	0.4	0	0.4
2-Jan-00	5:50	0	0	0	0.2	0	0.2
2-Jan-00	6:00	0	0	0	0	0	0
2-Jan-00	6:10	0	0	0	0	0	0
2-Jan-00	6:20	0	0	0	0	0	0
2-Jan-00	6:30	0	0	0	0	0	0
2-Jan-00	6:40	0	0	0	0	0	0
2-Jan-00	6:50	0	0	0	0	0	0
2-Jan-00	7:00	0	0	0	0	0	0
2-Jan-00	7:10	0	0	0	0	0	0
2-Jan-00	7:20	0	0	0	0	0	0
2-Jan-00	7:30	0	0	0	0	0	0
2-Jan-00	7:40	0	0	0	0	0	0
2-Jan-00	7:50	0	0	0	0	0	0
2-Jan-00	8:00	0	0	0	0	0	0

APPENDIX 2

Horse Ranch Creek Watershed: Land Cover, Land Use, and Soil Type Exhibits



Campus Park West

Hydrologic Soil Groups

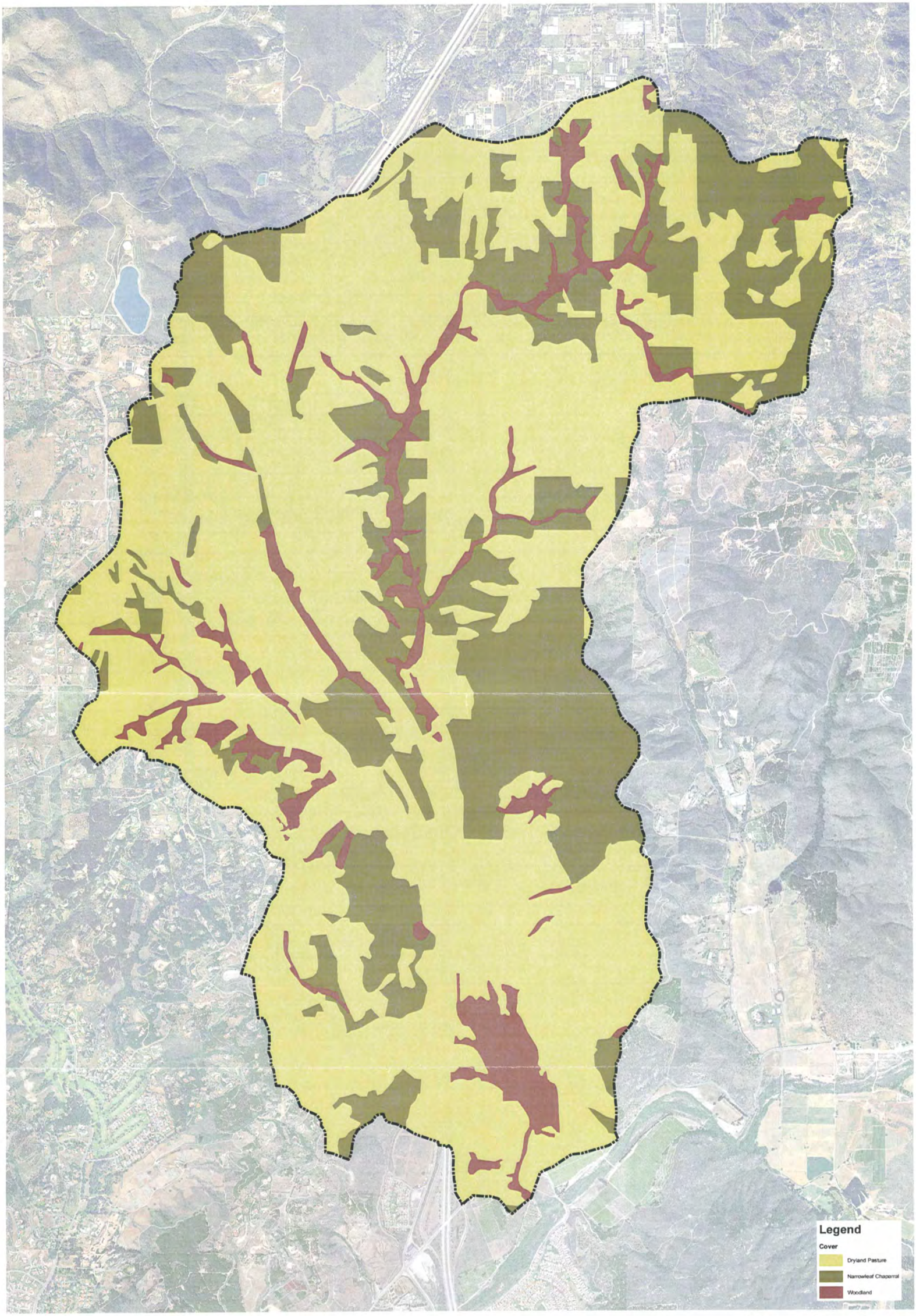
Pappas Investments

File Name: P:\363 HGIS\MXD\363I_HydrologicGroups.mxd
Date: 06.23.09
Source: Aerial - 2008-DigitalGlobe - SanGIS, 2007

0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS
Planning · Landscape Architecture · Engineering · Survey



Campus Park West

Vegetation Cover

Pappas Investments

File Name: P:\3631\GIS\MXD\3631_HydrologicGroups.mxd
Date: 09.23.09
Source: Aerial - 2008-DigitalGlobe - SanGIS, 2007
GIS exhibits may be composed from various sources with differing levels of accuracy. For details on accuracy of this exhibit please refer to Notes. Data provided

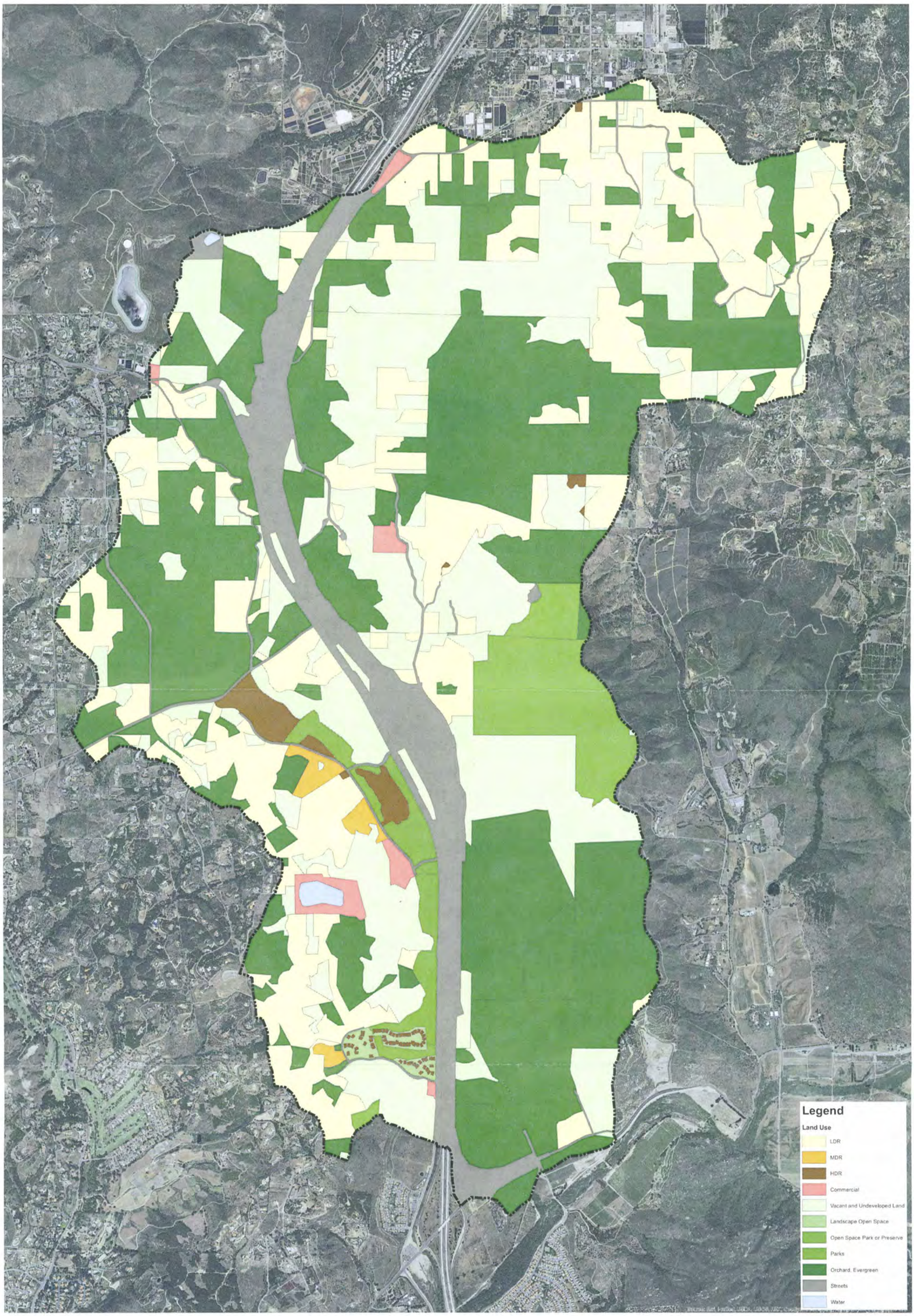
0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS
Planning · Landscape Architecture · Engineering · Survey

Aug03X.dwg 4

NOV/2009 1:21:15 PM



Campus Park West

Pre-Project Land Use

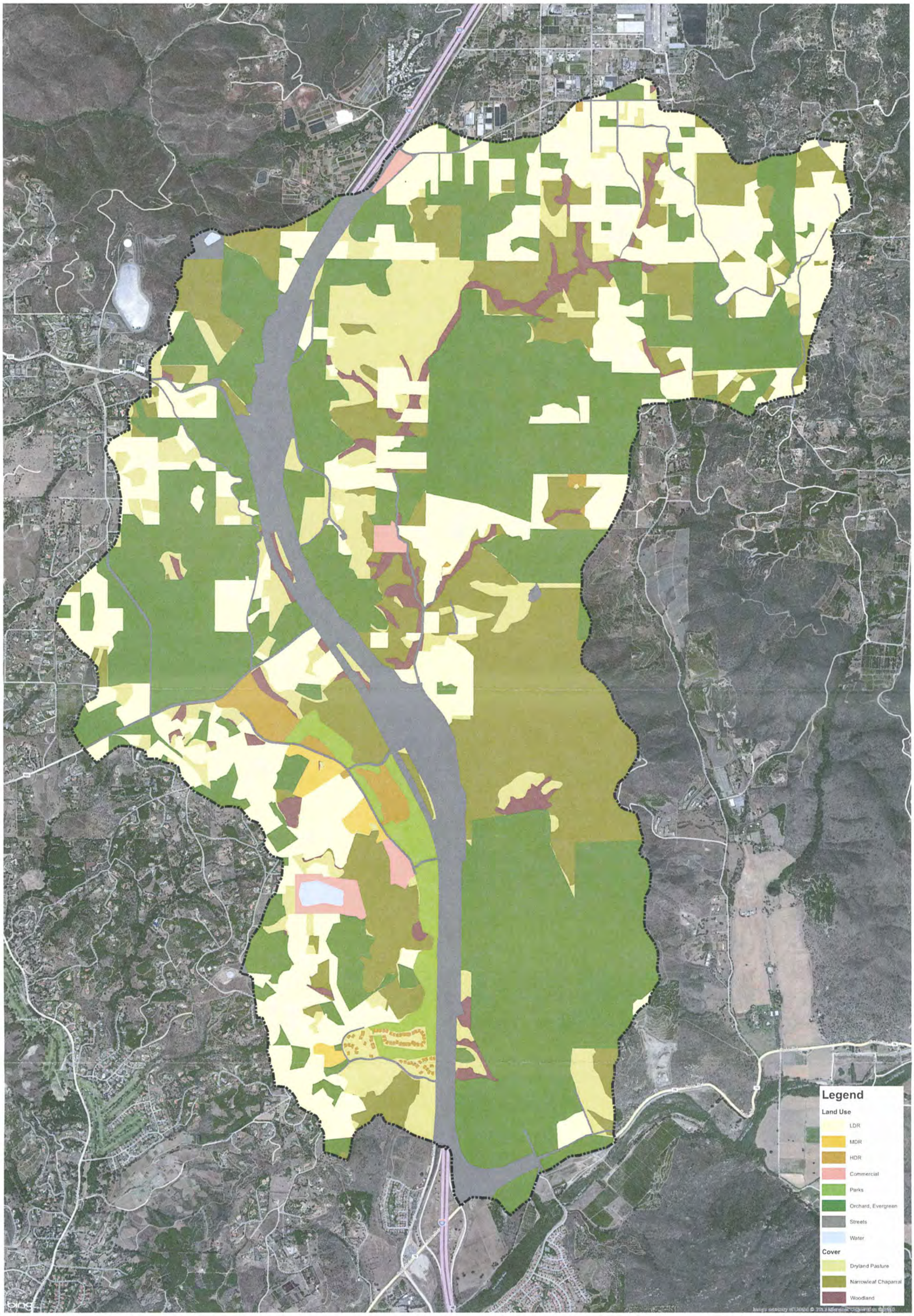
Pappas Investments

File Name: P:\361\GIS\MXD\531 - HydrologicGroups.mxd
Date: 09.23.09
Source: Aerial - 2008 DigitalGlobe - SanGIS, 2007

0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS



Campus Park West

Pre-Project Land Use / Vegetation Cover

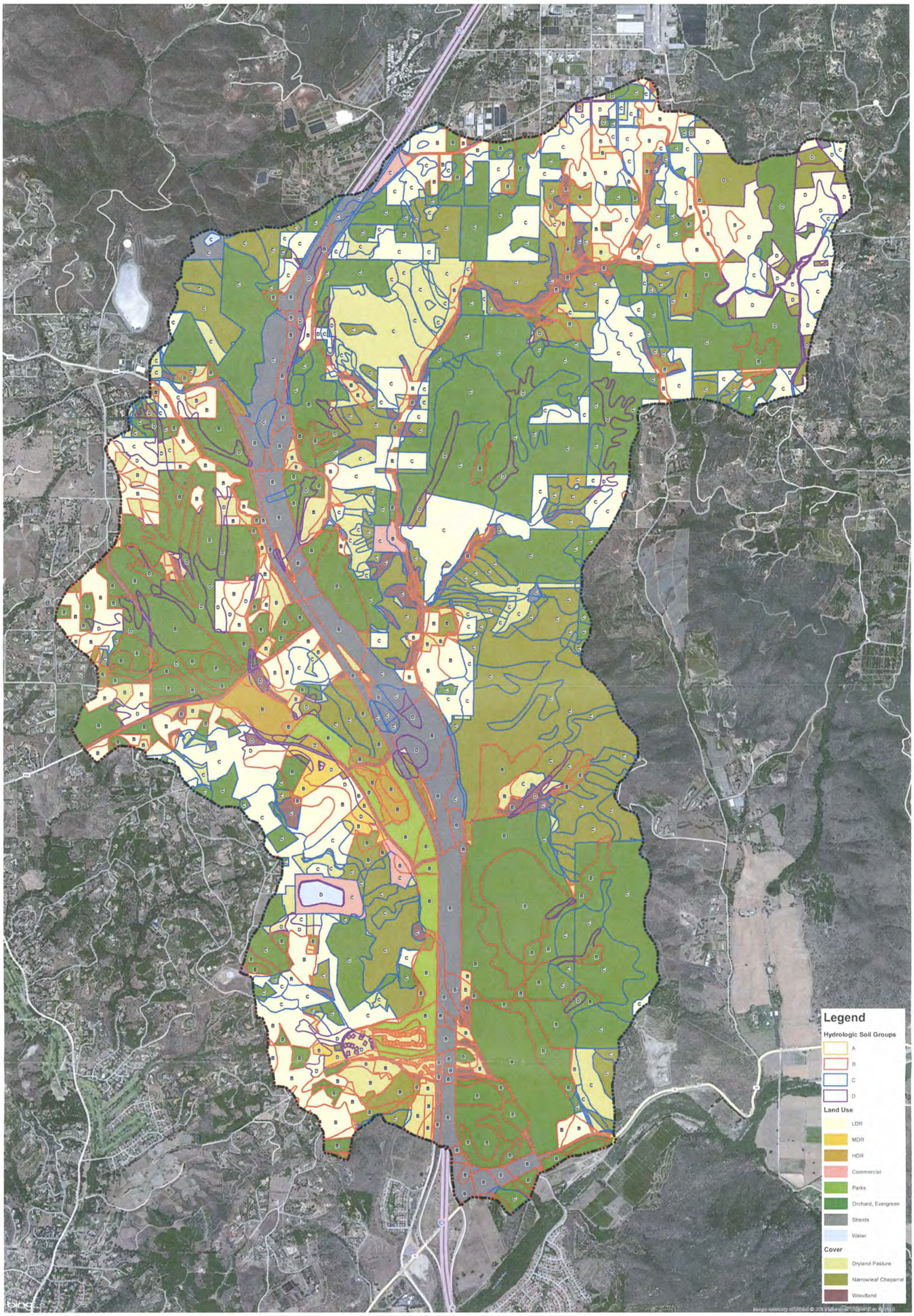
Pappas Investments

File Name: P:\3631GIS\MXD\3631_HydrologicGroups.mxd
Date: 09.21.09
Source: Aerial - 2008 DigitalGlobe - SanGIS, 2007

0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS



Campus Park West

Pre-Project Land Use / Vegetation Cover / Hydrologic Soil Groups

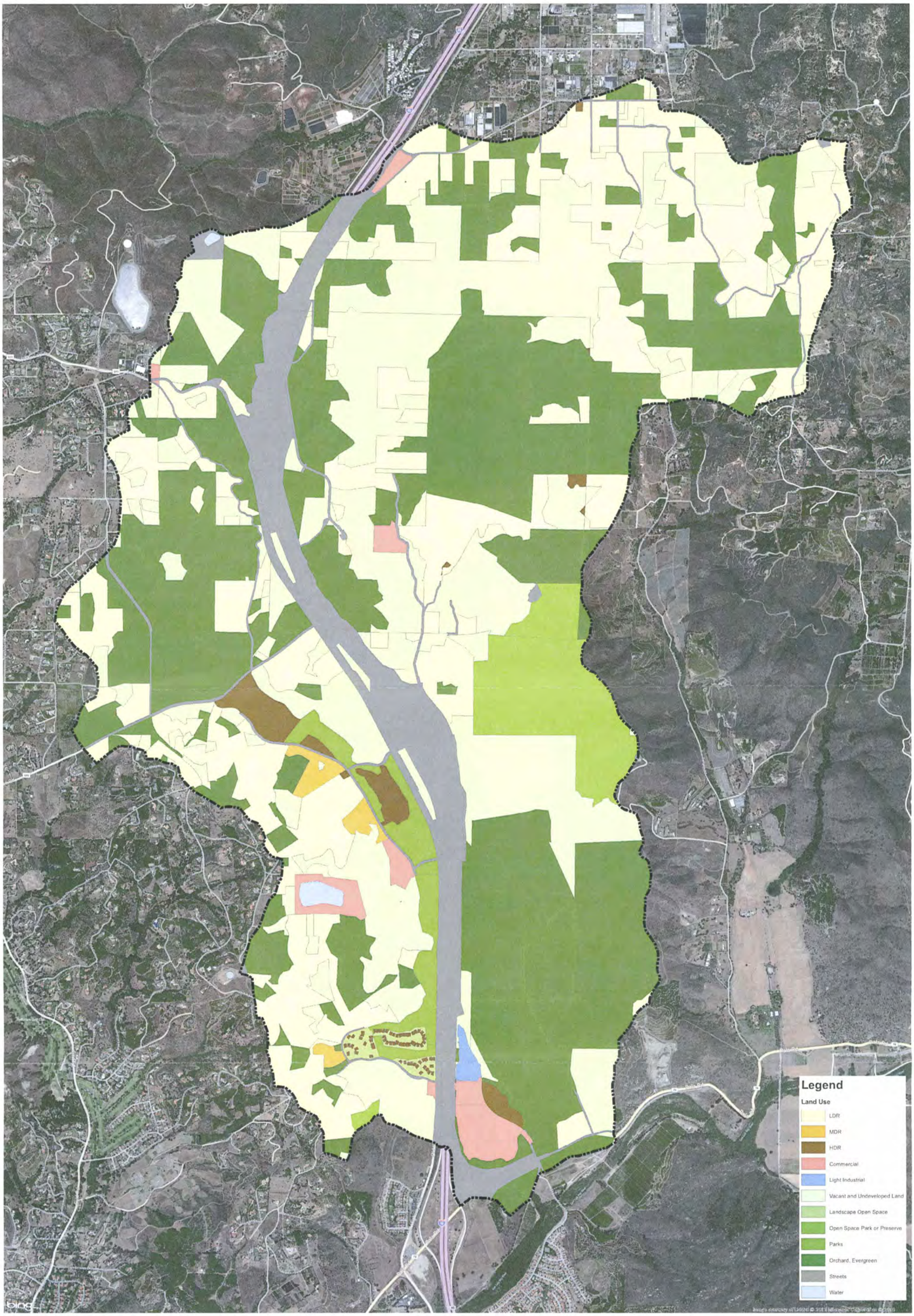
Pappas Investments

File Name: P:\363\GIS\MXD\363f_HydrologicGroups.mxd
Date: 09.21.09
Source: Aerial - 2008 DigitalGlobe - SanGIS, 2007

0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS



Campus Park West

Post-Project Land Use

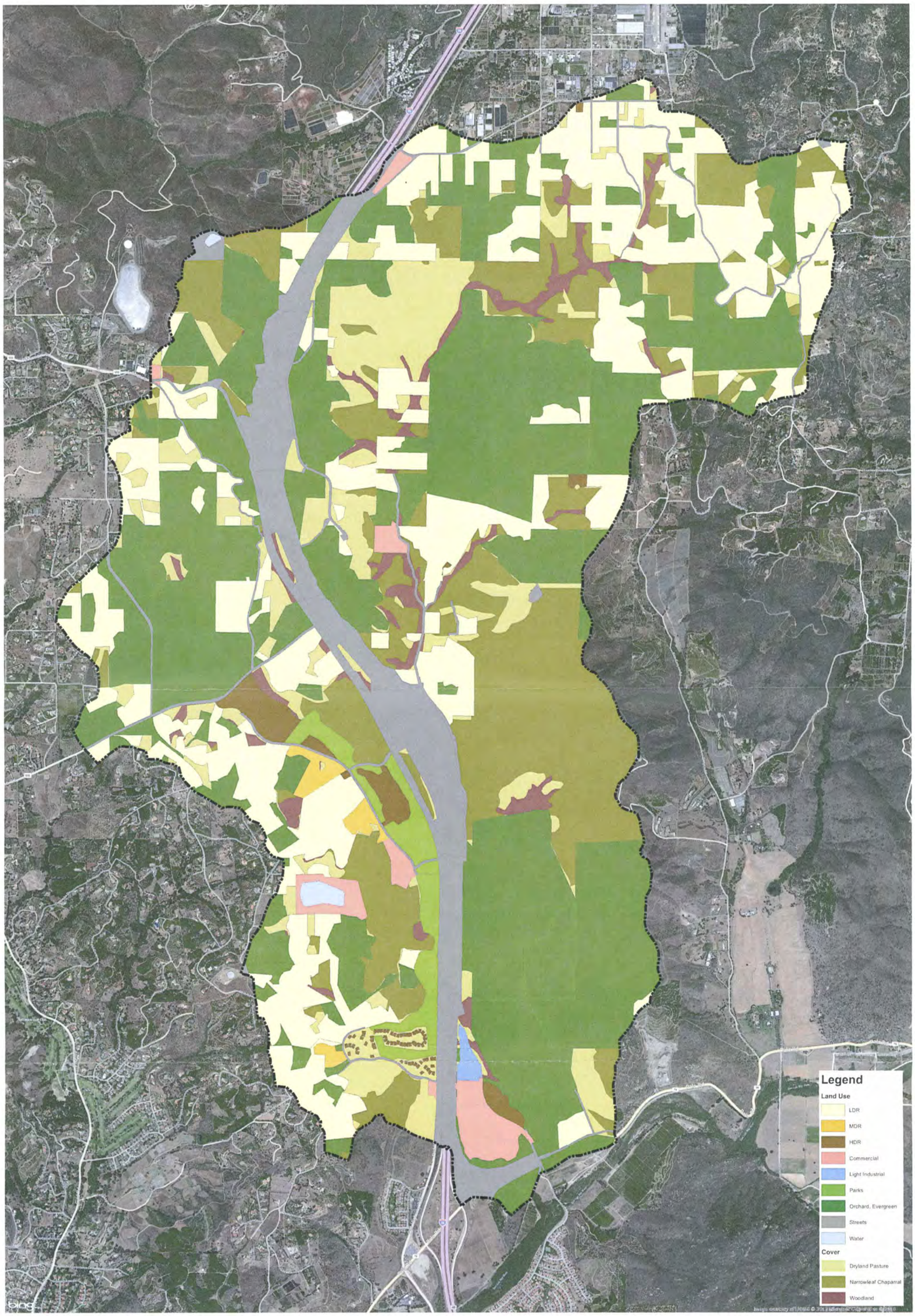
Pappas Investments

File Name: P:\363\GIS\MXD\361_HydrologicGroups.mxd
Date: 09.23.09
Source: Aerial - 2008 DigitalGlobe - SanGIS, 2007

0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS



Campus Park West

Post-Project Land Use / Vegetation Cover

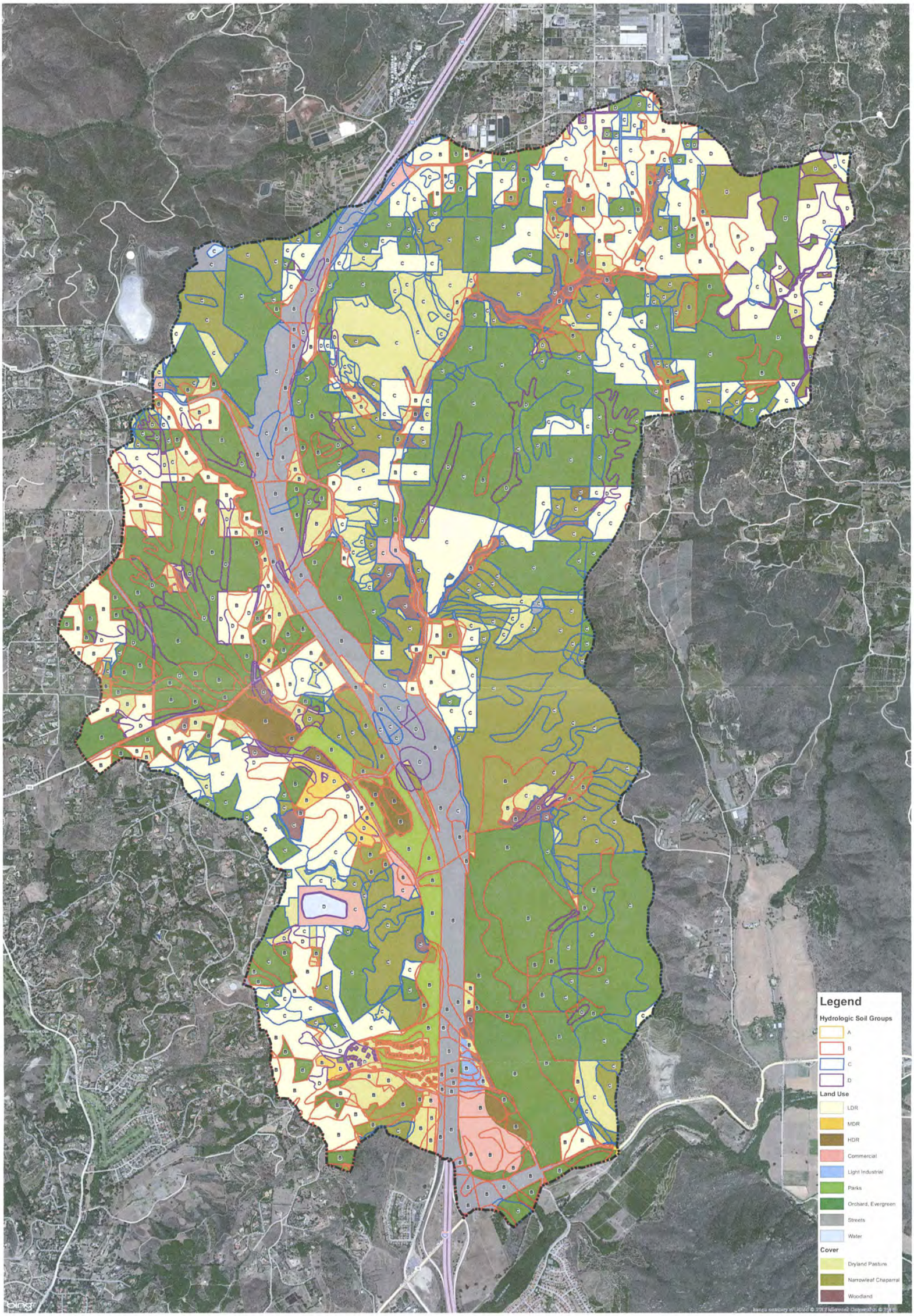
Pappas Investments

File Name: P:\363 1\GIS\MXD\363 1_HydrologicGroups.mxd
Date: 09.23.09
Source: Aerial - 2008 DigitalGlobe - SanGIS, 2007

0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS



Campus Park West **Post-Project Land Use / Vegetation Cover / Hydrologic Soil Groups**

Pappas Investments

File Name: P:\3631\GIS\MXD\3631_HydrologicGroups.mxd
Date: 09.23.09
Source: Aerial - 2008 DigitalGlobe - SanGIS, 2007

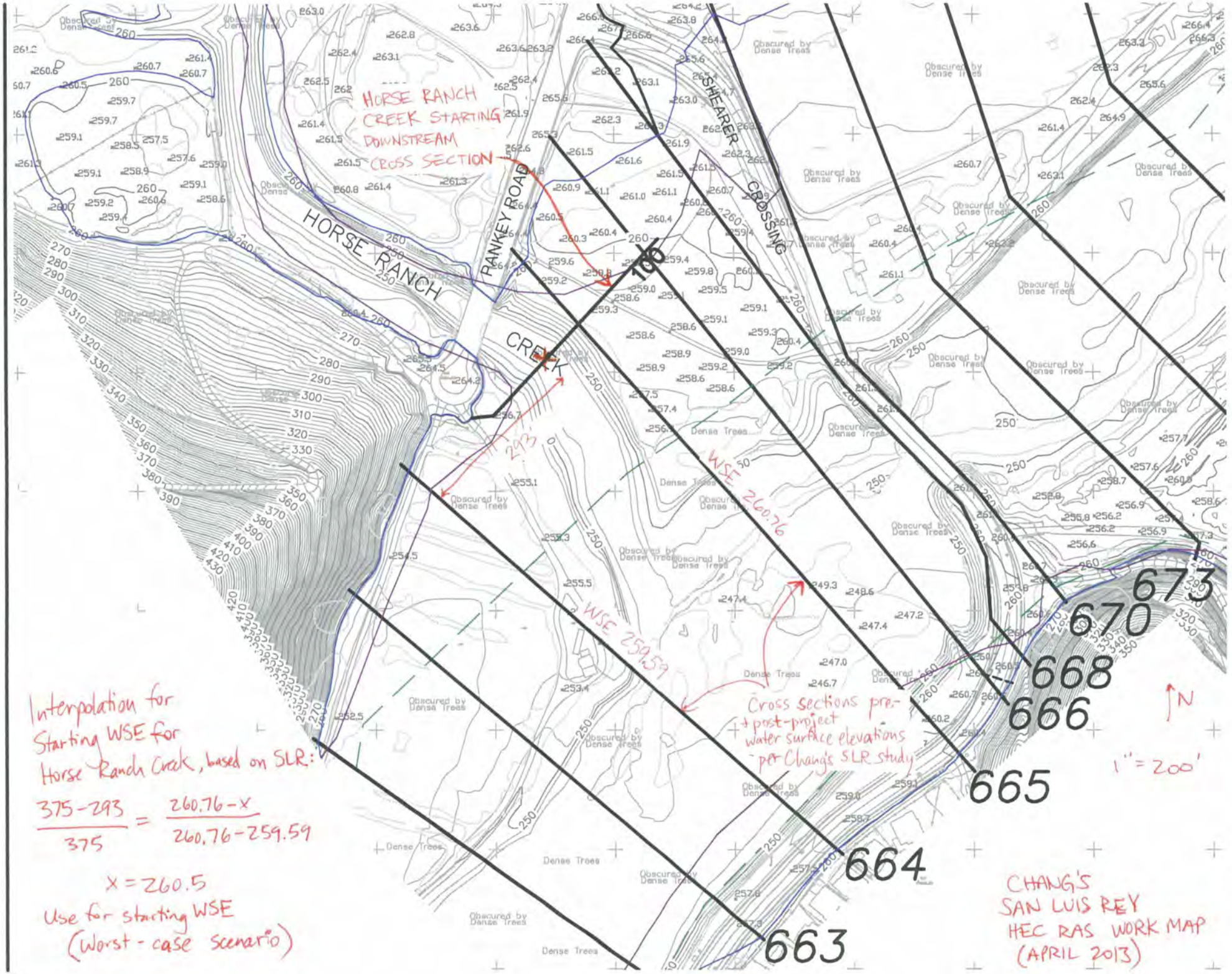
0 500 1,000 2,000 Feet

NORTH

PROJECT DESIGN CONSULTANTS

APPENDIX 3

Existing Conditions HEC-RAS Input Data


HORSE RANCH CREEK STARTING DOWNSTREAM CROSS SECTION
HORSE RANCH CREEK
RANKEY ROAD
SHEARER CROSSING
166
293'
WSE 260.76
WSE 259.59
673
670
668
666
665
664
663
N
1" = 200'
Cross sections pre- + post-project water surface elevations - per Chang's SLR study
Interpolation for Starting WSE for Horse Ranch Creek, based on SLR:
$\frac{375-293}{375} = \frac{260.76-x}{260.76-259.59}$
x = 260.5
Use for starting WSE (Worst-case scenario)
CHANG'S SAN LUIS REY HEC RAS WORK MAP (APRIL 2013)

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 3631_Horse_Ranch_Creek
Project File : 3631_Horse_Ranch_Creek.prj
Run Date and Time: 4/16/2013 9:55:34 AM

Project in English units

Project Description:
Flood Study for Horse Ranch Creek, NGVD 29, Cross sections taken looking
downstream

****

PLAN DATA

Plan Title: Exist cond
Plan File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.p07

Geometry Title: Existing Condition-2
Geometry File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.g09

Flow Title : 2003 County Method EX
Flow File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.f02

Plan Summary Information:
Number of: Cross Sections = 27 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

Flow Title: 2003 County Method EX
Flow File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.f02

Flow Data (cfs)

River	Reach	RS	PDC-Q100EX
HRC	Main	5608.249	8441

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
HRC	Main	PDC-Q100EX		Known WS = 260.5

GEOMETRY DATA

Geometry Title: Existing Condition-2
Geometry File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.g09

CROSS SECTION

RIVER: HRC
REACH: Main RS: 5608.249

INPUT
Description:
Station Elevation Data num= 116

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	304.73	11.04	304	13.3	303.8	13.81	303.77	17.74	303.45
19.52	303.34	24.98	302.93	27.99	302.76	29.64	302.65	41	302
50.22	301.12	64.61	300	64.79	299.98	79.78	298.61	88.62	297.73
89.38	297.66	116.94	294.78	124.03	294	143.32	292	154.29	291.25
156.33	291.23	161.85	291.12	168.29	291.06	173.37	290.95	175.94	290.92
177.15	290.93	180	290.87	183.03	290.95	184.6	290.92	191.78	290.97
198.83	291.14	211.18	291.34	219.17	291.4	228.53	291.35	230.1	291.32
234.28	291.34	238.95	291.21	243.58	291.16	270.57	290.47	272.31	290.45
273.92	290.41	275.83	290.39	277.5	290.35	278.51	290.34	284.8	290.32
286.12	290.29	292.43	290.28	292.85	290.27	294.5	290.28	296.25	290.25
297.85	290.28	298.73	290.26	342.65	290.32	359.58	290.13	365.9	290
444.19	290.2	445.04	290.19	454.2	290.21	454.79	290.2	473.92	290.2
474.49	290.19	489.86	290.17	491.48	290.18	525.71	290.03	526.97	290
582.95	289.32	630.38	289.15	631.7	289.13	655.87	289.18	657.9	289.14
713	288.63	729.88	288.6	740.29	288.53	783.7	288.37	817.65	288.28
868.94	288.08	873.71	288.06	882.22	288	922.44	287.85	936.64	287.84
965.86	287.75	982.45	287.72	1009.77	287.71	1039.27	287.68	1057.13	287.7
1095.93	287.81	1114.77	287.68	1119.12	287.67	1151.17	287.48	1173.21	287.63
1198.58	287.76	1205.59	287.79	1210.81	287.77	1217.18	287.73	1236.51	287.68
1269.95	287.79	1296.84	287.77	1336.42	287.8	1368.19	287.88	1381.79	287.93
1392.34	287.94	1397.83	288	1430.1	288.31	1440.6	288.36	1531.54	288.88
1561.02	289.05	1615.53	288.45	1664.74	288	1731.48	289.18	1736	290
1739.23	290.97	1742.52	292	1749.96	294	1756.3	296	1768.31	300
1849.97	300.17								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	525.71	.075	1736	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
525.71	1736	386.82	607.68	624.69	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	493.25304.7255		F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	290.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	290.66	Reach Len. (ft)	386.82	607.68	624.69
Crit W.S. (ft)	289.41	Flow Area (sq ft)	17.98	2855.75	0.71
E.G. Slope (ft/ft)	*0.007043	Area (sq ft)	121.14	2855.75	0.71
Q Total (cfs)	8441.00	Flow (cfs)	25.21	8415.10	0.69
Top Width (ft)	1474.85	Top Width (ft)	262.38	1210.29	2.18
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)	1.40	2.95	0.96
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	0.55	2.36	0.33
Conv. Total (cfs)	*100581.3	Conv. (cfs)	300.4	*100272.7	8.2
Length Wtd. (ft)	603.88	Wetted Per. (ft)	32.46	*1210.40	2.28
Min Ch El (ft)	287.48	Shear (lb/sq ft)	0.24	1.04	0.14
Alpha	1.00	Stream Power (lb/ft s)	0.34	3.06	0.13
Frctn Loss (ft)	4.22	Cum Volume (acre-ft)	70.16	391.22	54.12
C & E Loss (ft)	0.00	Cum SA (acres)	30.68	118.58	16.77

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 5000.613

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	310.86	9.72	310	30.27	308	53.4	306.05	53.94	306
79.95	304	89.41	303.37	107.3	302	113.15	301.83	119.32	301.46
137.63	300.21	140.43	300	159.37	298.41	162.89	298.29	167.21	298
199.68	297.59	202.58	297.48	232.53	296	267.6	294	276.28	293.84
297.08	292.87	300.3	292.75	316.97	292	324.98	291.99	352.47	291.23
356.75	291.21	368.46	290.67	369.1	290.63	373.36	290.59	376.74	290.51
383.32	290.42	389.54	290.23	393.89	290	415.99	289.44	425.12	289.34
425.89	289.32	435.45	289.34	443.41	289.49	452.68	289.52	456.6	289.58
470.09	289.5	482.97	289.02	499.84	288.59	510.92	288	524.17	287.52
556.51	286.68	571.04	286.21	584.13	286	750.67	285.23	821.72	285.46
855.28	285.31	1006.28	286	1276.91	284.96	1283.72	284.88	1289.31	284.85
1294.53	284.78	1335.39	284	1385.05	283.4	1396.08	283.36	1408.04	283.37
1425.23	283.46	1426.93	283.48	1470.24	283.59	1471.38	283.58	1508.02	283.63
1518.24	283.66	1546.32	283.71	1547.37	283.7	1562.72	283.69	1578.16	283.65
1618.18	283.24	1634.68	283.11	1635.54	283.14	1691.46	282.99	1797	282.91
1802.21	282.93	1834.71	283.18	1837.35	283.17	1877.56	283.39	1906.65	283.6
1908.64	283.61	1946.58	283.85	1955.94	283.89	2002.62	283.94	2027.86	284
2029.92	284	2208.42	284.95	2213.82	286	2216.83	286.83	2221.31	288
2223.85	288.72	2228.21	290	2237.55	298.3	2239.43	300	2239.79	300.64
2245.19	310	2246.77	311.21	2248.02	312	2250.66	314	2252.73	314.43
2258.9	316	2276	314.1	2276.39	314	2286.73	310	2291.99	307.83
2296.85	306	2301.06	304	2305.57	302	2309.35	300.47	2310.46	300
2313.17	298.59	2314.37	298	2320.67	296	2329.35	294	2343.93	292.11
2345.26	291.96	2404.33	291.22	2457	292	2487.35	294	2499.21	296
2509.14	298								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0     .06 1006.28    .075 2213.82     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      1006.28 2213.82           325.2  366.24  367.74             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   829.2310.8611       F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
*********************************************************************************************
* E.G. Elev (ft)         *  286.57  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.13  * Wt. n-Val.            *   0.060  *   0.075  *   0.060  *
* W.S. Elev (ft)         *  286.44  * Reach Len. (ft)       *  325.20  *  366.24  *  367.74  *
* Crit W.S. (ft)         *  285.07  * Flow Area (sq ft)     *  146.22  * 2816.73  *    0.35  *
* E.G. Slope (ft/ft)     *0.006938  * Area (sq ft)          *  373.66  * 2816.73  *    0.35  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *  265.47  * 8175.28  *    0.26  *
* Top Width (ft)         * 1651.43  * Top Width (ft)       *  442.30  * 1207.54  *    1.59  *
* Vel Total (ft/s)       *    2.85  * Avg. Vel. (ft/s)     *    1.82  *    2.90  *    0.73  *
* Max Chl Dpth (ft)      *    3.53  * Hydr. Depth (ft)     *    0.83  *    2.33  *    0.22  *
* Conv. Total (cfs)      *101337.1  * Conv. (cfs)          *  3187.0  * 98147.0  *     3.1  *
* Length Wtd. (ft)       *  365.55  * Wetted Per. (ft)     *  177.08  * 1207.67  *    1.65  *
* Min Ch El (ft)         *  282.91  * Shear (lb/sq ft)     *    0.36  *    1.01  *    0.09  *
* Alpha                  *    1.02  * Stream Power (lb/ft s) *  0.65  *    2.93  *    0.07  *
* Frctn Loss (ft)        *    3.62  * Cum Volume (acre-ft) *   67.96  *  351.65  *   54.11  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)       *   27.55  *  101.71  *   16.74  *
*********************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 4634.388

INPUT
Description:
Station Elevation Data    num=     115
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0   298.8   14.92     298   48.95  297.57   52.29  297.43   54.06  297.31
    55.1  297.23   56.72  297.14      73     296   75.71  295.77   77.14  295.67
   81.33  295.34   83.22  295.21   86.33  294.96   99.68     294  123.14     292
     139  290.91  150.76     290  173.63     288  204.83     286  276.91     284
  288.03  283.88  290.75   283.7  293.62  283.54  294.67  283.46  320.14     282
  335.46  282.01   341.8  282.11  344.17  282.09  379.67  282.43  455.34  282.45
  459.32  282.42  462.17  282.39  464.82  282.37  467.55  282.34  474.11  282.29
  477.49  282.26  482.44  282.27  483.21  282.26  527.58  282.13  535.09  282.09
  539.19  282.08  546.48  282.05   549.3  282.04  552.15  282.02  557.84     282
   576.6  281.99  593.35     282  708.31  281.93  714.42   281.9  719.56  281.87
  723.75  281.84  747.55   281.6  752.62  281.56  770.74  281.52  796.45  281.35
  804.65  281.32  821.95   281.2  824.98  281.17  829.02  281.15  915.12     280
   975.7  279.72 1006.16  279.61 1035.43  279.51  1039.6   279.5 1053.65  279.49
 1063.35   279.5  1076.7  279.51 1094.92  279.54 1096.98  279.55 1114.79  279.59
 1178.72  279.38 1203.23  279.52 1210.59  279.55 1272.45     280 1308.62  280.29
 1338.37  280.52 1354.61   280.7 1365.95   280.8 1396.74  281.06 1406.46  281.12
 1420.16  281.19 1425.11  281.21 1490.66  281.57 1498.43  281.56 1500.42  281.55
 1513.62  281.53 1520.79  281.52 1524.52   281.5 1599.21  281.67 1602.89  281.68
 1678.38  281.97 1684.86  281.98  1686.4     282 1758.78  281.86 1790.13  281.86
 1857.15  282.49 1866.94  282.52 1881.83  282.44 1892.63  282.68 1909.95   282.5
 1920.61  282.49 1941.32  283.09 1952.07     284 1954.13  284.32 1959.59     286
 1964.18  287.72 1964.98     288 1965.81  288.36 1969.82     290 1993.72  300.04
```

```
 1998.67     302 2003.35  303.94 2003.61  304.04 2009.75     306 2014.94  307.82

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  455.34    .075  1686.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        455.34  1686.4           279.85  292.35     293             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0  388.56298.8025       F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
*****************************************************************************************************
* E.G. Elev (ft)         *  282.94  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.20  * Wt. n-Val.            *   0.060  *   0.075  *   0.060  *
* W.S. Elev (ft)         *  282.74  * Reach Len. (ft)       *  279.85  *  292.35  *  293.00  *
* Crit W.S. (ft)         *  282.04  * Flow Area (sq ft)     *   19.87  * 2231.44  *  138.17  *
* E.G. Slope (ft/ft)     *0.015277  * Area (sq ft)          *   61.41  * 2231.44  *  138.17  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *   27.10  * 8123.47  *  290.43  *
* Top Width (ft)         * 1621.94  * Top Width (ft)       *  148.09  * 1231.06  *  242.79  *
* Vel Total (ft/s)       *    3.53  * Avg. Vel. (ft/s)     *    1.36  *    3.64  *    2.10  *
* Max Chl Dpth (ft)      *    3.36  * Hydr. Depth (ft)     *    0.30  *    1.81  *    0.57  *
* Conv. Total (cfs)      * 68292.3  * Conv. (cfs)          *   219.3  * 65723.3  *  2349.7  *
* Length Wtd. (ft)       *  292.33  * Wetted Per. (ft)     *   66.78  * 1231.08  *  242.80  *
* Min Ch El (ft)         *  279.38  * Shear (lb/sq ft)     *    0.28  *    1.73  *    0.54  *
* Alpha                  *    1.03  * Stream Power (lb/ft s) *  0.39  *    6.29  *    1.14  *
* Frctn Loss (ft)        *    2.66  * Cum Volume (acre-ft) *   66.34  *  330.43  *   53.52  *
* C & E Loss (ft)        *    0.03  * Cum SA (acres)       *   25.35  *   91.46  *   15.71  *
*****************************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 4342.055

INPUT
Description:
Station Elevation Data    num=     112
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0  297.91    7.93     296    17.6     294   27.85     292   29.76  291.65
   39.09     290   56.31     288   77.72     286  135.35     282  181.38  281.94
   225.4  281.24  233.94   281.2  239.64  281.06     249  281.03  255.26   280.9
   271.2  280.73  287.29  280.13  289.66     280   321.6  279.57  348.22  279.44
   426.5  278.88  430.24  278.84  439.04  278.77  444.84  278.75  450.31  278.74
  451.67  278.73  461.32  278.71  479.45  278.74  490.95  278.75  492.25  278.77
  530.64   278.9  560.84  278.74  561.62  278.73   568.8   278.7  577.56  278.67
  580.38  278.66  587.14  278.65  595.25  278.63  599.77  278.61  604.41   278.6
  606.66  278.59  611.58  278.57  616.62  278.55  620.56  278.54   625.8  278.52
  631.18   278.5  635.99  278.48  640.91  278.47  645.28  278.44  648.86  278.43
  665.19  278.38  702.12  278.27  704.62  278.26  713.91  278.23  757.62   278.2
  760.16  278.19  815.39     278  857.05  277.98   864.2  277.92  865.28  277.91
  878.33   277.8   884.4  277.74  905.47  277.57  910.46  277.55  935.37  277.58
  955.97  277.75  961.21   277.8  968.35  277.87  984.25  277.99  986.09     278
  986.24  277.99  988.37  277.96  991.28   277.9  997.76  277.69 1021.37  277.15
 1024.58  277.11 1034.82  277.09 1077.23  276.33 1100.03   276.4 1133.92  276.62
 1162.11  276.78 1200.67  277.04 1244.07  277.31 1293.03   277.9 1327.14  277.94
```

1357.82	277.97	1388.18	278	1398.51	278.05	1409.16	278.12	1442.61	278
1468.73	277.6	1485.94	276.9	1501.49	276.17	1509.48	276	1577.47	276.06
1578.21	276.07	1635.17	277.97	1636.27	278	1647.13	278.83	1655.14	279.78
1656.99	280	1658.99	280.66	1664.8	282.84	1668.61	284	1675.12	285.21
1679.75	286	1689.53	288	1696.28	289.86	1696.89	290	1698.1	290.63
1715.25	300	1728.6	305.12						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	321.6	.075	1655.14	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
321.6	1655.14	344.1	365.11	365.46	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	280.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	280.15	Reach Len. (ft)	344.10	365.11	365.46
Crit W.S. (ft)		Flow Area (sq ft)	11.86	3113.72	0.51
E.G. Slope (ft/ft)	0.006029	Area (sq ft)	11.86	3113.72	0.51
Q Total (cfs)	8441.00	Flow (cfs)	11.12	8429.52	0.36
Top Width (ft)	1370.69	Top Width (ft)	34.84	1333.54	2.30
Vel Total (ft/s)	2.70	Avg. Vel. (ft/s)	0.94	2.71	0.70
Max Chl Dpth (ft)	4.15	Hydr. Depth (ft)	0.34	2.33	0.22
Conv. Total (cfs)	108712.5	Conv. (cfs)	143.2	108564.6	4.6
Length Wtd. (ft)	365.06	Wetted Per. (ft)	34.85	1333.73	2.34
Min Ch El (ft)	276.00	Shear (lb/sq ft)	0.13	0.88	0.08
Alpha	1.00	Stream Power (lb/ft s)	0.12	2.38	0.06
Frctn Loss (ft)	3.23	Cum Volume (acre-ft)	66.10	312.49	53.06
C & E Loss (ft)	0.01	Cum SA (acres)	24.76	82.85	14.88

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3976.927

INPUT
Description:
Station Elevation Data num= 94

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	288.37	1.9	288.11	2.68	288.02	2.81	288	17.99	286.47
18.79	286.37	40.6	284.68	47.44	284.21	47.89	284.17	50.96	284
59.39	283.62	59.83	283.59	63.16	283.39	64.69	283.31	72.8	282.8
76.19	282.69	77.57	282.63	86.87	282	102.18	281.42	125.1	280
128.5	279.95	194.15	277.64	201.67	277.58	279.35	276	376.46	275.03
377.4	275.04	382.07	275.03	383.54	275.04	392.79	275.03	409.89	275.11
439.78	275.14	442.5	275.15	457.58	275.2	463.13	275.21	489.47	275.18
494.43	275.17	496.85	275.16	507.74	275.11	510.34	275.1	512.66	275.09
518.73	275.06	520.89	275.05	527.35	275.01	548.31	274.92	550.26	274.91
559.21	274.89	594.52	274.82	616.98	274.76	650.08	274.66	652.1	274.65
656.52	274.63	665.31	274.61	695.8	274.53	704.5	274.52	762.31	274.2
768.34	274.22	776.7	274.15	789.71	274.05	829.23	274	913.08	274.05
916.5	274.09	919.82	274.12	922.17	274.16	1024.5	274.74	1027.38	274.73
1106.84	274.52	1110.37	274.53	1197.53	274.57	1222.91	274.66	1315.6	275.37
1333.82	275.43	1350.44	275.64	1374.32	275.9	1376.51	275.91	1378.38	275.92
1384.91	276	1514.42	276.77	1534.12	278	1535.82	278.25	1540.34	278.66
1550.6	280	1563.3	282.32	1578.6	284.94	1586.47	286	1594.92	288

1599.02	288.54	1607.87	290	1609.43	290.38	1617.34	292	1628.41	294
1628.82	294.07	1634.97	295.45	1637.57	296	1641.15	296.59		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	279.35	.075	1514.42	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
279.35	1514.42	334.85	334.75	343.15	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	277.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	276.82	Reach Len. (ft)	334.85	334.75	343.15
Crit W.S. (ft)		Flow Area (sq ft)	16.68	2328.79	0.02
E.G. Slope (ft/ft)	0.014276	Area (sq ft)	16.68	2328.79	0.02
Q Total (cfs)	8441.00	Flow (cfs)	27.33	8413.67	0.01
Top Width (ft)	1276.44	Top Width (ft)	40.50	1235.07	0.86
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)	1.64	3.61	0.27
Max Chl Dpth (ft)	2.82	Hydr. Depth (ft)	0.41	1.89	0.03
Conv. Total (cfs)	70647.2	Conv. (cfs)	228.7	70418.4	0.1
Length Wtd. (ft)	335.54	Wetted Per. (ft)	40.51	1235.09	0.86
Min Ch El (ft)	274.00	Shear (lb/sq ft)	0.37	1.68	0.02
Alpha	1.01	Stream Power (lb/ft s)	0.60	6.07	0.01
Frctn Loss (ft)	2.75	Cum Volume (acre-ft)	65.99	289.68	53.05
C & E Loss (ft)	0.03	Cum SA (acres)	24.46	72.09	14.87

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3642.177

INPUT
Description:
Station Elevation Data num= 98

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	286.93	10.44	286	65.44	282	99.45	280	146.37	278
174.1	276	182.3	275.34	185.36	275.15	192.4	274.62	202.82	274
213.37	273.69	242.26	272.96	250.5	272.85	251.89	272.82	298.66	272
558.78	271.48	562.24	271.51	567.92	271.55	578.79	271.59	580.97	271.6
586.73	271.61	588.07	271.59	590.12	271.61	664.72	271.44	665.35	271.45
684.38	271.55	709.6	271.7	714.82	271.75	720.76	271.78	733.39	271.87
744.96	272	900	272.018	1001.77	272.03	1008.53	272.08	1012.19	272.11
1015.73	272.14	1023.46	272.21	1030.62	272.27	1143.5	272.54	1145.55	272.53
1146.64	272.54	1148.16	272.53	1149.44	272.54	1156.13	272.55	1166.79	272.58
1170.77	272.59	1174.72	272.6	1175.97	272.59	1185.52	272.61	1187.32	272.6
1237.84	272.51	1241.49	272.49	1243.23	272.48	1247.62	272.46	1258.1	272.42
1330.73	272.07	1336.79	272.1	1360.06	272.19	1361.24	272.2	1391.38	272.26
1434.16	272.38	1435.76	272.37	1460.58	272.41	1462.04	272.39	1510.46	272.3
1511.66	272.29	1526.14	272.3	1572.56	272.03	1610.9	272.04	1623.24	272.05
1683.71	271.96	1708.43	271.81	1740.08	272	1919.38	272.18	1924.18	272.16
1940.88	272.4	1948.93	272.35	1960.33	272.51	1964.9	272.48	2010.76	274
2171.31	274.11	2174.05	274.13	2314.91	276.01	2315.23	276.02	2424.07	278
2428.14	278.34	2443.28	280	2448.25	282	2452.53	283.06	2456.05	284
2458.94	285.22	2460.86	286	2461.33	286.21	2465.45	288	2468.69	289.07
2471.9	290	2474.83	290.89	2477.39	292				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	298.66	.075	1623.24	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
298.66	1623.24	258.15	290.25	300.25	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1871.42	2477.39	291.9999	F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	274.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	274.15	Reach Len. (ft)	258.15	290.25	300.25
Crit W.S. (ft)	273.01	Flow Area (sq ft)	120.57	2787.26	530.14
E.G. Slope (ft/ft)	0.005306	Area (sq ft)	120.57	2787.26	764.63
Q Total (cfs)	8441.00	Flow (cfs)	249.13	6605.59	1586.27
Top Width (ft)	1975.12	Top Width (ft)	98.34	1324.58	552.20
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	2.07	2.37	2.99
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)	1.23	2.10	2.14
Conv. Total (cfs)	115875.5	Conv. (cfs)	3420.0	90679.6	21775.9
Length Wtd. (ft)	290.71	Wetted Per. (ft)	98.36	1324.59	248.18
Min Ch El (ft)	271.44	Shear (lb/sq ft)	0.41	0.70	0.71
Alpha	1.03	Stream Power (lb/ft s)	0.84	1.65	2.12
Frctn Loss (ft)	1.56	Cum Volume (acre-ft)	65.46	270.03	50.04
C & E Loss (ft)	0.00	Cum SA (acres)	23.93	62.25	12.69

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3351.951

INPUT
Description:
Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	285.5	13.31	284	36.12	282	67.29	280	101.62	278
152.47	274	215.42	272.06	217.49	272	228.37	271.69	243.04	271.25
244.01	271.23	252.46	270.96	253.9	270.92	258.75	270.76	269.35	270.57
294.08	270	309.39	269.83	311.81	269.81	312.8	269.8	313.69	269.79
328.44	269.61	344.46	269.41	346.63	269.4	452.88	269.2	454.68	269.19
457.11	269.22	459.78	269.23	464.05	269.24	465.06	269.25	466.19	269.27
506.87	269.35	511.02	269.31	588.81	268.85	608.98	268.89	695.67	268.75
710.2	268.77	744.32	269	745.35	268.99	749.51	269	753	269.02
781.12	269.05	782.52	269.06	790.96	269.09	816.16	269.23	817.27	269.24
883.64	269.76	894.13	270	943	270.54	943.18	270.53	948.39	270.59
954.83	270.65	960.21	270.72	967.81	270.83	1005.28	270.47	1013.24	270.51
1060.38	270.65	1149.48	270.47	1159.35	270.42	1162.8	270.4	1166.46	270.39
1176.11	270.35	1198.61	270.37	1225.58	270	1375.87	271.98	1377.46	272
1378.28	272.16	1387.72	274	1421.83	272.97	1425.19	272.57	1430.32	272
1494	272.531	1637.91	273.73	1640.11	274	1652.81	275.98	1652.95	276
1653.1	276.03	1661.94	278	1667.37	278.98	1673.97	280	1690.83	285.7
1704.02	290	1710.4	291.86	1716	293.65	1720.61	295.06		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0     .06  215.42    .075    1494     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        215.42    1494           278.95   313.6  317.15             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
 1684.75 1720.61295.0604       F
```

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	272.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	272.58	Reach Len. (ft)	278.95	313.60	317.15
Crit W.S. (ft)	271.00	Flow Area (sq ft)	4.43	3121.69	0.16
E.G. Slope (ft/ft)	0.005400	Area (sq ft)	4.43	3121.69	0.16
Q Total (cfs)	8441.00	Flow (cfs)	3.29	8437.69	0.02
Top Width (ft)	1257.05	Top Width (ft)	16.95	1233.94	6.16
Vel Total (ft/s)	2.70	Avg. Vel. (ft/s)	0.74	2.70	0.16
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)	0.26	2.53	0.03
Conv. Total (cfs)	114865.0	Conv. (cfs)	44.8	114819.9	0.3
Length Wtd. (ft)	313.59	Wetted Per. (ft)	16.96	1234.09	6.16
Min Ch El (ft)	268.75	Shear (lb/sq ft)	0.09	0.85	0.01
Alpha	1.00	Stream Power (lb/ft s)	0.07	2.31	0.00
Frctn Loss (ft)	2.04	Cum Volume (acre-ft)	65.09	250.34	47.41
C & E Loss (ft)	0.00	Cum SA (acres)	23.59	53.73	10.77

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3038.374

INPUT
Description:
Station Elevation Data num= 124

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	283.15	23.75	280.6	28.99	280	30.64	279.9	31.47	279.86
40.77	279.32	69.71	278	105.45	276	132.43	274	141.27	272.9
147.74	272	158.93	270	170.9	268.22	172.22	268	181.13	267.9841
239.5	267.88	241.18	267.89	244.82	267.88	248.69	267.87	250.31	267.86
252.2	267.84	256.99	267.8	260.34	267.75	366.4	266.96	368.26	266.97
404.25	266.99	474.06	267.2	476.12	267.21	479.22	267.22	484.16	267.24
489.28	267.27	512.67	267.38	520.12	267.42	528.01	267.46	529.72	267.47
544.85	267.55	554.29	267.59	595.12	267.72	599.09	267.74	603.25	267.75
611.08	267.74	612.41	267.73	620.29	267.76	643.95	267.87	649.93	267.89
667.11	267.98	671.21	268	795.95	269.67	797.76	269.72	800.86	270
801.18	270.1	801.2	270.11	801.22	270.12	801.26	270.13	801.3	270.15
801.36	270.18	801.44	270.21	801.56	270.26	801.74	270.33	802.07	270.46
802.82	270.77	805.53	271.86	805.87	272	809.04	271.97	809.45	271.88
809.82	271.8	810.16	271.72	812.56	271.03	815.49	270	821.53	268.04
821.64	268	903.39	268.01	915.93	268.09	921.77	268.12	927.41	268.16
1076.9	268.11	1078.49	268.1	1082.49	268.09	1087.93	268.1	1092.79	268.12
1093.81	268.13	1098	268.15	1109.77	268.29	1120.04	268.36	1128.65	268.43
1211.64	270	1257.99	270.03	1258.11	270.06	1260.8	270.66	1265.58	271.73
1266.79	272	1273.52	273.42	1276.11	274	1282.41	273.14	1287.51	272
1291.29	271.2	1297.03	270	1304.52	268.46	1306.74	268	1315.15	268.06
1330.8	268.61	1339.49	268.92	1343.5	269.07	1368.34	270	1390.09	270.81
1390.38	270.85	1398.16	272	1402.95	273.35	1403.08	273.39	1408.84	275.02
1413.11	276.29	1418.64	278	1421.41	279.22	1422.97	280	1423.56	280.29

1426.82	282	1428.65	282.94	1433.52	285.36	1434.87	286	1435.47	286.28
1439.05	288	1439.93	288.39	1443.94	290	1445.57	290.63		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	158.93	.075	1390.38	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
158.93	1390.38	564.83	424.13	403.83	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	270.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.	0.060	0.075	
W.S. Elev (ft)	270.50	Reach Len. (ft)	564.83	424.13	403.83
Crit W.S. (ft)		Flow Area (sq ft)	0.70	2723.09	
E.G. Slope (ft/ft)	*0.008003	Area (sq ft)	0.70	2723.09	
Q Total (cfs)	8441.00	Flow (cfs)	0.61	8440.39	
Top Width (ft)	1179.20	Top Width (ft)	2.80	1176.40	
Vel Total (ft/s)	3.10	Avg. Vel. (ft/s)	0.87	3.10	
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)	0.25	2.31	
Conv. Total (cfs)	94357.2	Conv. (cfs)	6.8	94350.4	
Length Wtd. (ft)	425.23	Wetted Per. (ft)	2.84	1177.45	
Min Ch El (ft)	266.96	Shear (lb/sq ft)	0.12	1.16	
Alpha	1.00	Stream Power (lb/ft s)	0.11	3.58	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)	65.08	229.30	47.41
C & E Loss (ft)	0.03	Cum SA (acres)	23.52	45.05	10.74

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 2614.242

INPUT
Description:
Station Elevation Data num= 114

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	284.09	23.85	284.05	24	284	32.71	281.46	37.12	280.14
37.62	280	47.64	279.46	51	279.16	54.09	278.96	55.26	278.87
63.3	278.16	65.42	278	79.89	276.77	86.43	276	98.52	274
107.89	272.54	111.74	272	129.37	270	142.22	269.25	155.14	268.63
171.43	268	178.3	267.79	199.43	267.37	205.28	267.35	208.26	267.32
210.28	267.27	215.43	267.23	221.97	267.08	293.19	266.43	314.34	266.11
315.02	266.09	334.04	266	447.35	265.97	451.64	265.76	456.73	265.16
461.02	264.77	462.93	264.56	466.75	264	604.17	264.28	39 805.55	264.7
810.36	264.98	817.1	265.47	824.36	266	840.46	265.66	841.2	265.54
841.52	265.48	844.52	264.99	848.09	264.41	850.62	264	878.3	264.06
884.81	264.27	887.07	264.34	893.2	264.54	904.81	264.99	906.98	265.07
919.83	265.59	930.39	266	1221.37	266.45	1252.77	266.55	1255.58	266.56
1291.4	266.8	1296.66	266.82	1300.32	266.84	1358.35	267.05	1363.83	267.08
1437.45	267.14	1476.36	268	1513.81	267.97	1515.66	267.58	1515.69	267.57
1517.8	267.11	1518.45	266.96	1522.24	266	1525.79	264.43	1526.72	264
1534.45	263.52	1536.74	264	1537.23	264.1	1539.45	264.41	1539.74	264.39
1541.6	264.52	1543.19	264.64	1543.7	264.59	1544.9	264.73	1545.99	264.6
1550.98	264.79	1555.8	265.46	1559.37	266	1564.27	266.15	1565.13	266.16
1573.36	266.41	1584.82	266.74	1596.82	267.06	1601.45	267.12	1609.78	267.32
1612.16	267.38	1655.9	268	1661.55	268.01	1672	269.6	1674.38	269.99
1685.18	271.97	1685.89	272.08	1686.48	272.18	1697.66	274	1700.19	274.39
1711.5	276	1747.89	282	1752.11	282.64	1759.72	284	1770.23	285.58

```
 1773.52     286 1783.38  287.53 1786.71     288 1797.04  289.28

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  215.43    .075 1661.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        215.43 1661.55           566.01  580.32  596.25            .1       .3

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
************************************************************************************************
* E.G. Elev (ft)         *  269.67  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.04  * Wt. n-Val.            *   0.060  *   0.075  *   0.060  *
* W.S. Elev (ft)         *  269.64  * Reach Len. (ft)       *  566.01  *  580.32  *  596.25  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *  124.49  * 5432.16  *    8.70  *
* E.G. Slope (ft/ft)     *0.001020  * Area (sq ft)          *  124.49  * 5432.16  *    8.70  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)            *  132.36  * 8302.68  *    5.96  *
* Top Width (ft)         * 1536.64  * Top Width (ft)        *   79.85  * 1446.12  *   10.68  *
* Vel Total (ft/s)       *    1.52  * Avg. Vel. (ft/s)      *    1.06  *    1.53  *    0.68  *
* Max Chl Dpth (ft)      *    6.12  * Hydr. Depth (ft)      *    1.56  *    3.76  *    0.81  *
* Conv. Total (cfs)      *264248.3  * Conv. (cfs)           *  4143.6  *259918.1  *   186.6  *
* Length Wtd. (ft)       *  580.21  * Wetted Per. (ft)      *   79.89  * 1447.36  *   10.80  *
* Min Ch El (ft)         *  263.52  * Shear (lb/sq ft)      *    0.10  *    0.24  *    0.05  *
* Alpha                  *    1.01  * Stream Power (lb/ft s) *    0.11  *    0.37  *    0.04  *
* Frctn Loss (ft)        *    0.32  * Cum Volume (acre-ft)  *   64.26  *  189.60  *   47.37  *
* C & E Loss (ft)        *    0.00  * Cum SA (acres)        *   22.99  *   32.29  *   10.70  *
************************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 2033.954

INPUT
Description:
Station Elevation Data    num=      91
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0     280      57     270   67.21  269.97   89.55     268  114.16     266
     128 265.583  180.49     264     500 263.196     583 262.987  621.76  262.89
  632.77  262.26  637.19     262   667.3  262.05  677.53  262.49  678.87  262.57
  715.02  263.35  745.29     264  848.74  263.31  976.36     264 1166.66   263.5
 1167.98  263.37 1170.01  262.93  1172.3  262.78 1173.66  262.58 1174.34  262.52
 1177.25  262.37  1177.7  262.33 1181.67     262 1198.55  262.92 1204.15  263.34
 1213.03     264 1242.62  264.36 1264.45  264.51 1278.97  264.85 1284.69  264.92
 1291.21  265.08 1298.05  265.16  1300.1  265.19 1312.36  265.49 1320.28   265.6
 1322.69  265.67 1323.15  265.68 1332.87     266 1338.99  266.61 1339.21  266.64
 1339.45  266.67 1349.62     268 1364.42  267.24 1365.99  266.75 1368.33     266
 1374.53   264.1  1374.8     264 1375.74  263.71 1381.41     262 1385.36   260.8
 1388.05     260 1393.64   260.1 1399.81     262 1404.21  263.38 1406.39     264
  1409.3  264.15 1412.15   264.3 1413.94   264.4 1417.55  264.59 1430.01  265.27
 1437.46  265.61 1445.96     266 1455.18  267.57 1456.54  267.82 1457.47     268
 1458.91  268.44 1464.34     270 1465.62  270.41  1472.2  272.35 1476.79     274
 1480.29  275.59 1481.32     276 1484.62  277.46 1485.81     278 1486.18  278.16
 1494.18  281.71 1501.88  285.02 1505.02  286.33 1505.61  286.57 1509.19     288
 1509.29  288.01 1522.96  289.59 1523.99   289.7 1524.56  289.77 1526.58     290
 1549.68  291.52

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06     128    .075 1465.62     .06
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          128 1465.62           314.82  169.14  136.17            .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0  127.67                F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
************************************************************************************************
* E.G. Elev (ft)          *  269.35  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.02  * Wt. n-Val.             *   0.060  *   0.075  *          *
* W.S. Elev (ft)          *  269.33  * Reach Len. (ft)        *  314.82  *  169.14  *  136.17  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)      *    1.24  * 7409.50  *          *
* E.G. Slope (ft/ft)      *0.000337  * Area (sq ft)           *  116.51  * 7409.50  *          *
* Q Total (cfs)           * 8441.00  * Flow (cfs)             *    1.35  * 8439.65  *          *
* Top Width (ft)          * 1387.59  * Top Width (ft)         *   53.57  * 1334.02  *          *
* Vel Total (ft/s)        *    1.14  * Avg. Vel. (ft/s)       *    1.10  *    1.14  *          *
* Max Chl Dpth (ft)       *    9.33  * Hydr. Depth (ft)       *    3.75  *    5.55  *          *
* Conv. Total (cfs)       *459907.9  * Conv. (cfs)            *    73.8  *459834.1  *          *
* Length Wtd. (ft)        *  169.12  * Wetted Per. (ft)       *    0.33  * 1336.51  *          *
* Min Ch El (ft)          *  260.00  * Shear (lb/sq ft)       *    0.08  *    0.12  *          *
* Alpha                   *    1.00  * Stream Power (lb/ft s) *    0.09  *    0.13  *          *
* Frctn Loss (ft)         *    0.06  * Cum Volume (acre-ft)   *   62.70  *  104.06  *   47.31  *
* C & E Loss (ft)         *    0.00  * Cum SA (acres)         *   22.12  *   13.77  *   10.62  *
************************************************************************************************

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 1864

INPUT
Description:
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0     279      84     270   104.5     268   138.5     266     180     264
   384.4     263   733.4     264   766.6     262   875.1     262     897     261
   925.4     262    1320     264  1404.6     264  1432.4     260  1452.4     260
  1463.1     262  1488.4     264  1514.5     266    1532     270  1606.2     290

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
       0     .06   384.4    .075  1514.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          384.4  1514.5           303.12  147.21  135.57            .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0  420.39 278.548        F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
************************************************************************************************
* E.G. Elev (ft)          *  269.30  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.02  * Wt. n-Val.             *          *   0.075  *   0.060  *
* W.S. Elev (ft)          *  269.27  * Reach Len. (ft)        *  303.12  *  147.21  *  135.57  *
* Crit W.S. (ft)          *  264.21  * Flow Area (sq ft)      *          * 6846.60  *   23.43  *
* E.G. Slope (ft/ft)      *0.000335  * Area (sq ft)           * 1442.80  * 7070.50  *   23.43  *
* Q Total (cfs)           * 8441.00  * Flow (cfs)             *          * 8426.50  *   14.50  *
* Top Width (ft)          * 1437.36  * Top Width (ft)         *  292.94  * 1130.10  *   14.32  *
* Vel Total (ft/s)        *    1.23  * Avg. Vel. (ft/s)       *          *    1.23  *    0.62  *
* Max Chl Dpth (ft)       *    9.27  * Hydr. Depth (ft)       *          *    6.26  *    1.64  *
* Conv. Total (cfs)       *461215.6  * Conv. (cfs)            *          *460423.5  *   792.1  *
* Length Wtd. (ft)        *  158.61  * Wetted Per. (ft)       *          * 1094.84  *   14.69  *
* Min Ch El (ft)          *  260.00  * Shear (lb/sq ft)       *          *    0.13  *    0.03  *
```

* Alpha	* 1.00	* Stream Power (lb/ft s)	*	* 0.16	* 0.02	*		
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 57.06	* 75.95	* 47.27	*		
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 20.87	* 8.98	* 10.60	*		

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1717

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	281.4	44.3	280	164.31	264	208.61	263.4	391.59	264
398	264	414.12	264	440.08	262	601.4	262	929.55	264
939.9	264.3	950	264	968.47	262	986.36	260	1008.6	262
1163.82	262	1180.74	258	1200.55	262	1214.96	264	1222.63	264.689
1237.23	266	1249.12	268	1291.75	284	1307.01	286		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	398	.075	1222.63	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
398	1222.63	521	247.08	247.08	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	234	282	F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

* E.G. Elev (ft)	* 269.24	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.03	* Wt. n-Val.	* 0.060	* 0.075	* 0.060 *
* W.S. Elev (ft)	* 269.22	* Reach Len. (ft)	* 521.00	* 247.08	* 247.08 *
* Crit W.S. (ft)	* 263.91	* Flow Area (sq ft)	* 896.43	* 5584.38	* 84.89 *
* E.G. Slope (ft/ft)	*0.000324	* Area (sq ft)	* 1389.62	* 5584.38	* 84.89 *
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 1240.78	* 7124.77	* 75.46 *
* Top Width (ft)	* 1127.19	* Top Width (ft)	* 272.83	* 824.63	* 29.73 *
* Vel Total (ft/s)	* 1.29	* Avg. Vel. (ft/s)	* 1.38	* 1.28	* 0.89 *
* Max Chl Dpth (ft)	* 11.22	* Hydr. Depth (ft)	* 5.47	* 6.77	* 2.86 *
* Conv. Total (cfs)	*468639.3	* Conv. (cfs)	* 68887.2	*395562.7	* 4189.3 *
* Length Wtd. (ft)	* 350.58	* Wetted Per. (ft)	* 164.00	* 826.07	* 30.18 *
* Min Ch El (ft)	* 258.00	* Shear (lb/sq ft)	* 0.11	* 0.14	* 0.06 *
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 0.15	* 0.17	* 0.05 *
* Frctn Loss (ft)	* 0.23	* Cum Volume (acre-ft)	* 47.21	* 54.56	* 47.10 *
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 18.90	* 5.68	* 10.53 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1535

INPUT

Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	268.5	24.38	268	210.87	266	390.31	264.6	527.03	266
615.94	267.86	624.99	265.43	637.83	261.14	645.01	257.93	655.8	255.09
662.22	255.11	675.51	261.86	699.28	262.81	711.92	262.7	723.07	265.42
729.85	268.24	738.5	271.59	747.27	273.15	768.48	274	815.84	278

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	615.94	.075	675.51	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
615.94 675.51 51.85 51.85 51.85 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	78	272	F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	268.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	268.78	Reach Len. (ft)	3.37	3.37	3.37
Crit W.S. (ft)	266.94	Flow Area (sq ft)	1538.50	513.19	295.48
E.G. Slope (ft/ft)	0.001991	Area (sq ft)	1608.52	513.19	295.48
Q Total (cfs)	8441.00	Flow (cfs)	5137.81	1831.71	1471.48
Top Width (ft)	731.24	Top Width (ft)	615.94	59.57	55.73
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)	3.34	3.57	4.98
Max Chl Dpth (ft)	13.69	Hydr. Depth (ft)	2.86	8.61	5.30
Conv. Total (cfs)	189176.6	Conv. (cfs)	115146.7	41051.6	32978.3
Length Wtd. (ft)	3.37	Wetted Per. (ft)	537.98	63.26	56.74
Min Ch El (ft)	255.09	Shear (lb/sq ft)	0.36	1.01	0.65
Alpha	1.07	Stream Power (lb/ft s)	1.19	3.60	3.22
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	29.28	37.27	46.02
C & E Loss (ft)	0.00	Cum SA (acres)	13.58	3.17	10.29

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

BRIDGE

RIVER: HRC
REACH: Main RS: 1463.580

INPUT
Description:
Distance from Upstream XS = 3.37
Deck/Roadway Width = 46.24
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	268.5		24.38	268		210.87	266	
390.31	264.6		527.03	266		609.94	267.56	
609.94	270.51	0	624.9	271.05	266.56	682.41	273.11	268.57
702.73	273.84	269.31	725.65	274.66	270.14	727.05	274.71	0
746.69	275.34		768.48	274		815.84	278	

Upstream Bridge Cross Section Data
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
*******************************************************************************
      0   268.5   24.38     268  210.87     266  390.31   264.6  527.03     266
  615.94  267.86  624.99  265.43  637.83  261.14  645.01  257.93   655.8  255.09
  662.22  255.11  675.51  261.86  699.28  262.81  711.92   262.7  723.07  265.42
  729.85  268.24   738.5  271.59  747.27  273.15  768.48     274  815.84     278

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04  615.94    .075  675.51     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
        615.94  675.51            .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0      78     272       F

Downstream  Deck/Roadway Coordinates
    num=      17
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*******************************************************************************
       0  268.73           51.82     268          252.35     266
  367.53   264.6           517.4     266           583.2  267.58
   583.2  270.45          597.18  270.91       0  598.75  270.96  266.44
  643.46  272.49  267.95  698.91  274.48  269.96  701.39  274.57       0
  701.39  271.83          737.04   273.1          769.32     274
  798.23     276          815.84     280

Downstream Bridge Cross Section Data
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0  268.73   51.82     268  252.35     266  367.53   264.6   517.4     266
   583.2  267.58  590.38  267.48  598.97  264.51  607.26  262.97  614.73  259.44
  616.98  258.35  621.19  256.03  635.68  255.26  641.38  257.03  653.63  261.49
  662.88  262.22  695.69  266.32  702.23  268.99  709.06  272.56  737.04   273.1
  769.32     274  798.23     276  815.84     280

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04  590.38    .075  662.88     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
        590.38  662.88            .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0      69     272       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=  658.55    Downstream=  634.57
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     272
Downstream     num=       2
    Width   Elev    Width   Elev
```

```
*********************************
    1.25     250    1.25     272

Pier Data
Pier Station     Upstream=  690.95    Downstream=  666.97
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     273
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     273

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

BRIDGE OUTPUT  Profile #PDC-Q100EX
*************************************************************************************************
* E.G. US. (ft)          *     268.99  * Element               *Inside BR US *Inside BR DS *
* W.S. US. (ft)          *     268.78  * E.G. Elev (ft)        *     268.98  *     268.79  *
* Q Total (cfs)          *    8441.00  * W.S. Elev (ft)        *     268.73  *     268.45  *
* Q Bridge (cfs)         *    2327.43  * Crit W.S. (ft)        *     266.90  *     266.97  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *      13.64  *      13.19  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *       3.85  *       4.49  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)     *    2191.94  *    1880.08  *
* Weir Submerg           *             * Froude # Chl          *       0.25  *       0.29  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)  *    6656.12  *    6052.40  *
* Min El Weir Flow (ft)  *     264.61  * Hydr Depth (ft)       *       3.85  *       3.39  *
* Min El Prs (ft)        *     270.14  * W.P. Total (ft)       *     736.88  *     712.39  *
* Delta EG (ft)          *       0.23  * Conv. Total (cfs)     *  154130.9  *  114921.3  *
* Delta WS (ft)          *       0.30  * Top Width (ft)        *     647.67  *     603.93  *
* BR Open Area (sq ft)   *     683.00  * Frctn Loss (ft)       *       0.18  *       0.01  *
* BR Open Vel (ft/s)     *       3.57  * C & E Loss (ft)       *       0.01  *       0.02  *
* Coef of Q              *             * Shear Total (lb/sq ft) *       0.56  *       0.89  *
* Br Sel Method          *Energy only  * Power Total (lb/ft s)  *       2.14  *       3.99  *
*************************************************************************************************

Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 1434

INPUT
Description:
Station Elevation Data    num=      23
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*****************************************************************************
```

```
      0  268.73   51.82     268  252.35     266  367.53   264.6   517.4     266
  583.2  267.58  590.38  267.48  598.97  264.51  607.26  262.97  614.73  259.44
 616.98  258.35  621.19  256.03  635.68  255.26  641.38  257.03  653.63  261.49
 662.88  262.22  695.69  266.32  702.23  268.99  709.06  272.56  737.04   273.1
 769.32     274  798.23     276  815.84     280

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .04  590.38    .075  662.88     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        590.38  662.88           161.36  258.84     270             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0      69     272       F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
*************************************************************************************************
* E.G. Elev (ft)         *  268.77  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.28  * Wt. n-Val.            *   0.040  *   0.075  *   0.040  *
* W.S. Elev (ft)         *  268.48  * Reach Len. (ft)       *  161.36  *  258.84  *  270.00  *
* Crit W.S. (ft)         *  267.00  * Flow Area (sq ft)     * 1248.97  *  614.74  *  143.92  *
* E.G. Slope (ft/ft)     *0.003389  * Area (sq ft)          * 1266.97  *  614.74  *  143.92  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           * 4835.23  * 2859.82  *  745.95  *
* Top Width (ft)         *  683.38  * Top Width (ft)       *  572.77  *   72.50  *   38.11  *
* Vel Total (ft/s)       *    4.20  * Avg. Vel. (ft/s)     *    3.87  *    4.65  *    5.18  *
* Max Chl Dpth (ft)      *   13.22  * Hydr. Depth (ft)     *    2.40  *    8.48  *    3.78  *
* Conv. Total (cfs)      *145001.7  * Conv. (cfs)          * 83060.8  * 49126.8  * 12814.1  *
* Length Wtd. (ft)       *  207.01  * Wetted Per. (ft)     *  521.42  *   75.88  *   38.79  *
* Min Ch El (ft)         *  255.26  * Shear (lb/sq ft)     *    0.51  *    1.71  *    0.79  *
* Alpha                  *    1.03  * Stream Power (lb/ft s) *   1.96  *    7.97  *    4.07  *
* Frctn Loss (ft)        *    0.33  * Cum Volume (acre-ft) *   27.60  *   36.71  *   45.78  *
* C & E Loss (ft)        *    0.03  * Cum SA (acres)       *   12.88  *    3.16  *   10.25  *
*************************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 1200

INPUT
Description:
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**************************************************************************************
       0     269   11.83     266  155.95   264.1  258.32     264   268.2     264
  385.34   264.3  475.09     264  495.75     256  511.29     256  531.43     260
  681.78     259  763.16     260  851.66     270

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .04  475.09    .075  531.43     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        475.09  531.43           180  307.25     329             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      87               F
  591.43  851.66               F
```

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	268.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	268.22	Reach Len. (ft)	180.00	307.25	329.00
Crit W.S. (ft)		Flow Area (sq ft)	1561.49	565.28	504.88
E.G. Slope (ft/ft)	*0.000940	Area (sq ft)	1774.92	565.28	2318.21
Q Total (cfs)	8441.00	Flow (cfs)	4499.19	1562.73	2379.08
Top Width (ft)	832.77	Top Width (ft)	472.00	56.34	304.43
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)	2.88	2.76	4.71
Max Chl Dpth (ft)	12.22	Hydr. Depth (ft)	4.02	10.03	8.41
Conv. Total (cfs)	*275294.6	Conv. (cfs)	*146736.5	50966.9	77591.2
Length Wtd. (ft)	255.14	Wetted Per. (ft)	388.10	58.23	60.00
Min Ch El (ft)	256.00	Shear (lb/sq ft)	0.24	0.57	0.49
Alpha	1.18	Stream Power (lb/ft s)	0.68	1.58	2.33
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	21.96	33.21	38.14
C & E Loss (ft)	0.00	Cum SA (acres)	10.95	2.78	9.18

CROSS SECTION

RIVER: HRC
REACH: Main RS: 988

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	268	17.9	266	134.32	264.2	244.2	264.1	328	264
338.93	263.62	359.66	260.74	374.81	250.71	380.52	250.55	397.8	259.2
423.34	261.45	452.45	262	519.23	264	648.02	266	768.67	267.5
838.83	267.3	900.99	268	968.54	270				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	359.66	.075	397.8	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
359.66	397.8	231	197.03	197.03	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	92.5		F
548.55	968.54		F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	268.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	267.93	Reach Len. (ft)	231.00	197.03	197.03
Crit W.S. (ft)		Flow Area (sq ft)	1046.25	509.14	812.11
E.G. Slope (ft/ft)	*0.001223	Area (sq ft)	1249.59	509.14	1276.87
Q Total (cfs)	8441.00	Flow (cfs)	3374.72	1826.55	3239.73
Top Width (ft)	893.80	Top Width (ft)	359.00	38.14	496.66
Vel Total (ft/s)	3.57	Avg. Vel. (ft/s)	3.23	3.59	3.99
Max Chl Dpth (ft)	17.38	Hydr. Depth (ft)	3.92	13.35	5.39
Conv. Total (cfs)	*241401.0	Conv. (cfs)	96512.4	52236.7	92652.0
Length Wtd. (ft)	204.31	Wetted Per. (ft)	267.37	43.21	150.89
Min Ch El (ft)	250.55	Shear (lb/sq ft)	0.30	0.90	0.41
Alpha	1.03	Stream Power (lb/ft s)	0.96	3.23	1.64
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	15.71	29.42	24.57
C & E Loss (ft)	0.03	Cum SA (acres)	9.23	2.45	6.16

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 632

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	268	33.04	266	314.61	266	356.71	266	395.31	251.7
423.91	251.2	439.81	260	493.41	262	604.61	274		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	356.71	.075	439.81	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
356.71	439.81	100	100	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	274.5		F
552.31	604.61		F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	267.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	267.19	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	98.20	956.74	457.04
E.G. Slope (ft/ft)	0.003470	Area (sq ft)	398.41	956.74	457.04
Q Total (cfs)	8441.00	Flow (cfs)	241.90	5481.92	2717.18
Top Width (ft)	528.24	Top Width (ft)	343.40	83.10	101.74
Vel Total (ft/s)	5.58	Avg. Vel. (ft/s)	2.46	5.73	5.95
Max Chl Dpth (ft)	15.99	Hydr. Depth (ft)	1.19	11.51	4.49
Conv. Total (cfs)	143304.3	Conv. (cfs)	4106.7	93067.6	46130.1
Length Wtd. (ft)	100.00	Wetted Per. (ft)	82.21	87.94	102.05
Min Ch El (ft)	251.20	Shear (lb/sq ft)	0.26	2.36	0.97
Alpha	1.05	Stream Power (lb/ft s)	0.64	13.50	5.77
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	11.34	26.10	20.65
C & E Loss (ft)	0.07	Cum SA (acres)	7.37	2.17	4.80

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 627

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.09	32.56	269.82	83.48	269.28	132.92	268.7	188.15	268.06		
246.04	267.71	289.01	267.61	333.229	267.672	339.02	267.68	389.31	267.87		
405.77	262.37	434.27	252.2	483.63	251.57	511.72	265.64	532.5	267.2		
578.47	267.31	627.34	266.9	679.11	266.42	730.68	266.45	781.86	266.92		
834.85	267.77	880.54	268.64	932.38	269.76	1152.04	273				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	389.31	.04	532.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
389.31	532.5	99.67	99.67	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	404.74	267.37	F
511.97	1152.04	267.37	F

Skew Angle = 40

CROSS SECTION OUTPUT Profile #PDC-Q100EX

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	267.43		
Vel Head (ft)	0.73		
W.S. Elev (ft)	266.70		
Crit W.S. (ft)	260.30		
E.G. Slope (ft/ft)	0.001398		
Q Total (cfs)	8441.00		
Top Width (ft)	242.09		
Vel Total (ft/s)	6.85		
Max Chl Dpth (ft)	15.13		
Conv. Total (cfs)	225722.4		
Length Wtd. (ft)	1.00		
Min Ch El (ft)	251.57		
Alpha	1.00		
Frctn Loss (ft)	0.00		
C & E Loss (ft)	0.04		
Wt. n-Val.		0.040	
Reach Len. (ft)	1.00	1.00	1.00
Flow Area (sq ft)		1231.56	
Area (sq ft)		1262.56	21.33
Flow (cfs)		8441.00	
Top Width (ft)		133.03	109.05
Avg. Vel. (ft/s)		6.85	
Hydr. Depth (ft)		11.49	
Conv. (cfs)		225722.4	
Wetted Per. (ft)		112.38	
Shear (lb/sq ft)		0.96	
Stream Power (lb/ft s)		6.56	
Cum Volume (acre-ft)	10.89	23.55	20.10
Cum SA (acres)	6.98	1.93	4.56

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

BRIDGE

RIVER: HRC
REACH: Main RS: 561.3247

INPUT
Description:
Distance from Upstream XS = 1
Deck/Roadway Width = 97.06
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 24

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0 270.09		32.56 269.82		83.48 269.28	
132.92 268.7		188.15 268.06		246.04 267.71	
289.01 267.61		388.55 267.73		388.55 270.6	0
405.74 270.57	266.31	470.92 270.45	266.06	510.97 270.24	265.91
516.01 270.21	0	527.68 270.16		527.68 267.32	
578.47 267.31		627.34 266.9		679.11 266.42	
730.68 266.45		781.86 266.92		834.85 267.77	
880.54 268.64		932.38 269.76		1152.04 273	

Upstream Bridge Cross Section Data
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
      0  270.09   32.56  269.82   83.48  269.28  132.92   268.7  188.15  268.06
 246.04  267.71  289.01  267.61 333.229 267.672  339.02  267.68  389.31  267.87
 405.77  262.37  434.27   252.2  483.63  251.57  511.72  265.64   532.5   267.2
 578.47  267.31  627.34   266.9  679.11  266.42  730.68  266.45  781.86  266.92
 834.85  267.77  880.54  268.64  932.38  269.76 1152.04     273

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**************************************************
       0     .04  389.31     .04   532.5     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
       389.31   532.5            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  404.74  267.37       F
  511.97 1152.04  267.37       F
Skew Angle = 40

Downstream  Deck/Roadway Coordinates
    num=      24
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**********************************************************************************
       0  267.86           37.39  267.86           89.94  267.79
  143.44   267.6          195.52  267.43          248.21   267.3
   300.7  267.37          352.18  267.25          402.26  267.19
  451.32  266.99          451.32  269.65       0  471.02  269.59  265.25
   572.2  269.29  264.94  592.18  269.23       0  592.18  266.61
  665.39   266.4          714.75  266.18           765.9  266.31
  816.75  266.64          849.42   266.8          898.88  267.35
  948.16  267.82           998.2  268.31         1152.04     270

Downstream Bridge Cross Section Data
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  267.86   37.39  267.86   89.94  267.79  143.44   267.6  195.52  267.43
  248.21   267.3   300.7  267.37  352.18  267.25  402.26  267.19   453.2  265.82
   471.9  261.12  499.39  252.23  544.85  252.67  592.62  266.32  665.39   266.4
  714.75  266.18   765.9  266.31  816.75  266.64  849.42   266.8  898.88  267.35
  948.16  267.82   998.2  268.31 1152.04     270

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**************************************************
       0     .04  402.26     .04  592.62     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
       402.26  592.62            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  470.02  267.37       F
   573.2 1152.04  267.37       F
Skew Angle = 40

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=  439.26    Downstream=  504.39
```

```
Upstream      num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267
Downstream    num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267

Pier Data
Pier Station     Upstream=  471.88    Downstream=  539.85
Upstream      num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267
Downstream    num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum                Cd   =     1.2
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

BRIDGE OUTPUT  Profile #PDC-Q100EX
*************************************************************************************************
* E.G. US. (ft)          *     267.43  * Element               *Inside BR US *Inside BR DS *
* W.S. US. (ft)          *     266.70  * E.G. Elev (ft)        *     267.38  *     266.63  *
* Q Total (cfs)          *    8441.00  * W.S. Elev (ft)        *     266.50  *     265.53  *
* Q Bridge (cfs)         *    8441.00  * Crit W.S. (ft)        *     260.54  *     260.97  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *      14.93  *      13.30  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *       7.52  *       8.39  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)     *    1121.89  *    1006.02  *
* Weir Submerg           *             * Froude # Chl          *       0.39  *       0.45  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)  *    9362.46  *    8171.50  *
* Min El Weir Flow (ft)  *     267.38  * Hydr Depth (ft)       *             *             *
* Min El Prs (ft)        *     266.31  * W.P. Total (ft)       *     271.00  *     258.32  *
* Delta EG (ft)          *       0.90  * Conv. Total (cfs)     *  107451.2   *   92507.8   *
* Delta WS (ft)          *       1.08  * Top Width (ft)        *             *             *
* BR Open Area (sq ft)   *    1006.02  * Frctn Loss (ft)       *       0.69  *       0.01  *
* BR Open Vel (ft/s)     *       8.39  * C & E Loss (ft)       *       0.06  *       0.09  *
* Coef of Q              *             * Shear Total (lb/sq ft) *      1.59  *       2.02  *
* Br Sel Method          *Energy only  * Power Total (lb/ft s)  *     12.00  *      16.99  *
*************************************************************************************************

Note:    Momentum answer is not valid if the water surface is above the low chord or if there is weir
         flow.  The momentum answer has been disregarded.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.
```

CROSS SECTION

RIVER: HRC
REACH: Main RS: 472

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.86	37.39	267.86	89.94	267.79	143.44	267.6	195.52	267.43
248.21	267.3	300.7	267.37	352.18	267.25	402.26	267.19	453.2	265.82
471.9	261.12	499.39	252.23	544.85	252.67	592.62	266.32	665.39	266.4
714.75	266.18	765.9	266.31	816.75	266.64	849.42	266.8	898.88	267.35
948.16	267.82	998.2	268.31	1152.04	270				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	402.26	.04	592.62	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
402.26 592.62 104.13 104.13 104.13 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	470.02	267.37	F
573.2	1152.04	267.37	F

Skew Angle = 40

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	266.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.91	Wt. n-Val.		0.040	
W.S. Elev (ft)	265.62	Reach Len. (ft)	104.13	104.13	104.13
Crit W.S. (ft)	260.77	Flow Area (sq ft)		1105.03	
E.G. Slope (ft/ft)	0.001852	Area (sq ft)		1178.48	
Q Total (cfs)	8441.00	Flow (cfs)		8441.00	
Top Width (ft)	136.18	Top Width (ft)		136.18	
Vel Total (ft/s)	7.64	Avg. Vel. (ft/s)		7.64	
Max Chl Dpth (ft)	13.39	Hydr. Depth (ft)		10.71	
Conv. Total (cfs)	196169.0	Conv. (cfs)		196169.0	
Length Wtd. (ft)	104.13	Wetted Per. (ft)		105.78	
Min Ch El (ft)	252.23	Shear (lb/sq ft)		1.21	
Alpha	1.00	Stream Power (lb/ft s)		9.22	
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	10.89	21.12	20.10
C & E Loss (ft)	0.10	Cum SA (acres)	6.98	1.92	4.56

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 200

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266	54.4	263.3	180.89	263.15	344.76	262	447.22	261.5
526.58	262	537.83	262	567.42	260	600.76	251.91	615.28	251.91

```
  638.59     258  689.52     260  730.83     260  796.92     262  817.74     262
  839.96     260  874.14     260 1071.81     262 1116.03     265 1141.53     268

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  567.42    .075  638.59     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        567.42  638.59            234.6   234.6   234.6             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   542.6                F
   664.4 1141.53                F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
**********************************************************************************************
* E.G. Elev (ft)         *  266.08  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    1.23  * Wt. n-Val.             *   0.040  *   0.075  *   0.040  *
* W.S. Elev (ft)         *  264.85  * Reach Len. (ft)        *  234.60  *  234.60  *  234.60  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   99.65  *  715.36  *  163.81  *
* E.G. Slope (ft/ft)     *0.007872  * Area (sq ft)           * 1314.16  *  715.36  * 1886.02  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)             *  828.40  * 5762.70  * 1849.90  *
* Top Width (ft)         * 1090.78  * Top Width (ft)         *  544.32  *   71.17  *  475.28  *
* Vel Total (ft/s)       *    8.62  * Avg. Vel. (ft/s)       *    8.31  *    8.06  *   11.29  *
* Max Chl Dpth (ft)      *   12.94  * Hydr. Depth (ft)       *    4.01  *   10.05  *    6.35  *
* Conv. Total (cfs)      * 95136.0  * Conv. (cfs)            *  9336.7  * 64949.7  * 20849.6  *
* Length Wtd. (ft)       *  234.60  * Wetted Per. (ft)       *   24.88  *   72.92  *   25.83  *
* Min Ch El (ft)         *  251.91  * Shear (lb/sq ft)       *    1.97  *    4.82  *    3.12  *
* Alpha                  *    1.06  * Stream Power (lb/ft s) *   16.37  *   38.84  *   35.20  *
* Frctn Loss (ft)        *    1.13  * Cum Volume (acre-ft)   *    9.32  *   18.85  *   17.84  *
* C & E Loss (ft)        *    0.22  * Cum SA (acres)         *    6.33  *    1.67  *    3.99  *
**********************************************************************************************

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 167

INPUT
Description:
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0     266    48.6   263.3    91.1   263.2   288.9   263.8  425.42   262.8
  467.54   263.1  544.79   262.7  595.56     262  669.43  261.16  680.47  260.83
   683.3   255.7   691.3  251.95  708.49  250.62   724.3     250   727.5  252.55
  752.59  258.94  758.42     260  783.61     260  857.18   257.6 1013.15   259.1
 1060.44     260 1109.59     262 1130.12     264 1194.54     294

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  680.47    .075  752.59     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        680.47  752.59            140     192     236             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
```

```
      0  604.39     275       F
  855.97 1194.54 285.913       F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
************************************************************************************************
* E.G. Elev (ft)         *  264.73  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.49  * Wt. n-Val.            *   0.040  *   0.075  *   0.040  *
* W.S. Elev (ft)         *  264.24  * Reach Len. (ft)       *  140.00  *  192.00  *  236.00  *
* Crit W.S. (ft)         *  261.06  * Flow Area (sq ft)     *  212.19  *  797.87  *  526.95  *
* E.G. Slope (ft/ft)     *0.003244  * Area (sq ft)          *  811.62  *  797.87  * 1860.50  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)            *  889.47  * 4252.16  * 3299.37  *
* Top Width (ft)         * 1098.98  * Top Width (ft)        *  648.81  *   72.12  *  378.05  *
* Vel Total (ft/s)       *    5.49  * Avg. Vel. (ft/s)      *    4.19  *    5.33  *    6.26  *
* Max Chl Dpth (ft)      *   14.24  * Hydr. Depth (ft)      *    2.79  *   11.06  *    5.10  *
* Conv. Total (cfs)      *148198.3  * Conv. (cfs)           * 15616.4  * 74654.9  * 57926.9  *
* Length Wtd. (ft)       *  201.12  * Wetted Per. (ft)      *   76.09  *   77.74  *  103.51  *
* Min Ch El (ft)         *  250.00  * Shear (lb/sq ft)      *    0.56  *    2.08  *    1.03  *
* Alpha                  *    1.04  * Stream Power (lb/ft s) *    2.37  *   11.08  *    6.46  *
* Frctn Loss (ft)        *    0.76  * Cum Volume (acre-ft)  *    3.59  *   14.78  *    7.75  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)        *    3.11  *    1.29  *    1.70  *
************************************************************************************************

Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 120

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0   263.5  222.31     264  252.72     264     289   263.6  535.48     262
  589.08   261.5   634.1     262  646.38     262  654.25     260   662.5     256
  667.63     252  684.13  248.33  706.52     252  735.98     256  767.44     258
  806.53     262  924.31   282.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04   662.5    .075  735.98     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         662.5  735.98           309.76  309.76  309.76             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0  555.33               F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
************************************************************************************************
* E.G. Elev (ft)         *  263.96  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.62  * Wt. n-Val.            *   0.040  *   0.075  *   0.040  *
* W.S. Elev (ft)         *  263.33  * Reach Len. (ft)       *  309.76  *  309.76  *  309.76  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *  206.37  *  834.81  *  334.50  *
* E.G. Slope (ft/ft)     *0.004469  * Area (sq ft)          *  371.17  *  834.81  *  334.50  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)            *  787.49  * 5471.73  * 2181.78  *
* Top Width (ft)         *  483.80  * Top Width (ft)        *  332.12  *   73.48  *   78.20  *
* Vel Total (ft/s)       *    6.14  * Avg. Vel. (ft/s)      *    3.82  *    6.55  *    6.52  *
* Max Chl Dpth (ft)      *   15.00  * Hydr. Depth (ft)      *    1.93  *   11.36  *    4.28  *
* Conv. Total (cfs)      *126270.3  * Conv. (cfs)           * 11780.3  * 81852.5  * 32637.5  *
* Length Wtd. (ft)       *  309.76  * Wetted Per. (ft)      *  108.34  *   75.83  *   78.58  *
* Min Ch El (ft)         *  248.33  * Shear (lb/sq ft)      *    0.53  *    3.07  *    1.19  *
* Alpha                  *    1.07  * Stream Power (lb/ft s) *    2.03  *   20.13  *    7.75  *
```

* Frctn Loss (ft)	* 1.60	* Cum Volume (acre-ft)	* 1.69	* 11.18	* 1.81	*
* C & E Loss (ft)	* 0.11	* Cum SA (acres)	* 1.54	* 0.97	* 0.46	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 114.5

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	205.62	263.85	225.15	256.99	243.36	250.98	253.88	245.58
266.09	245.87	273.18	246.98	279.2	245.96	281.72	245.8	290.38	246.77
302.95	250.32	308.46	255.46	316.46	256.72	321.04	261.6	335.98	264.3
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	225.15	.075	308.46	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
225.15	308.46	6.21	6.21	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	225	264	F
315	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

* E.G. Elev (ft)	* 262.25	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.98	* Wt. n-Val.	* 0.040	* 0.075	* 0.040	*
* W.S. Elev (ft)	* 261.27	* Reach Len. (ft)	* 6.21	* 6.21	* 6.21	*
* Crit W.S. (ft)	* 255.62	* Flow Area (sq ft)	* 0.64	* 1028.02	* 34.62	*
* E.G. Slope (ft/ft)	*0.006049	* Area (sq ft)	* 26.06	* 1028.02	* 51.14	*
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 4.65	* 8135.02	* 301.32	*
* Top Width (ft)	* 107.76	* Top Width (ft)	* 12.18	* 83.31	* 12.27	*
* Vel Total (ft/s)	* 7.94	* Avg. Vel. (ft/s)	* 7.29	* 7.91	* 8.70	*
* Max Chl Dpth (ft)	* 15.69	* Hydr. Depth (ft)	* 4.25	* 12.34	* 5.29	*
* Conv. Total (cfs)	*108531.4	* Conv. (cfs)	* 59.8	*104597.3	* 3874.3	*
* Length Wtd. (ft)	* 6.21	* Wetted Per. (ft)	* 0.16	* 88.33	* 6.62	*
* Min Ch El (ft)	* 245.58	* Shear (lb/sq ft)	* 1.52	* 4.39	* 1.97	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 11.05	* 34.78	* 17.19	*
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 0.28	* 4.56	* 0.44	*
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.31	* 0.41	* 0.14	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 114

INPUT
Description:

```
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0     264  205.62  263.85  225.15  256.99  243.36  250.98  253.88  245.58
  266.09  245.87  273.18  246.98   279.2  245.96  281.72   245.8  290.38  246.77
  302.95  250.32  308.46  255.46  316.46  256.72  321.04   261.6  335.98   264.3
  400.51   263.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
       0     .04  225.15     .04  308.46     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        225.15  308.46            46.67   46.67   46.67             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     225     264       F
     315  400.51     264       F

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
*********************************************************************************************
* E.G. Elev (ft)         *  262.22  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    1.00  * Wt. n-Val.            *   0.040  *   0.040  *   0.040  *
* W.S. Elev (ft)         *  261.22  * Reach Len. (ft)       *    1.70  *    1.70  *    1.70  *
* Crit W.S. (ft)         *  255.62  * Flow Area (sq ft)     *    0.63  * 1024.13  *   34.31  *
* E.G. Slope (ft/ft)     *0.001804  * Area (sq ft)          *   25.49  * 1024.13  *   50.56  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *    2.49  * 8276.38  *  162.12  *
* Top Width (ft)         *  107.58  * Top Width (ft)       *   12.05  *   83.31  *   12.23  *
* Vel Total (ft/s)       *    7.97  * Avg. Vel. (ft/s)     *    3.95  *    8.08  *    4.72  *
* Max Chl Dpth (ft)      *   15.64  * Hydr. Depth (ft)     *    4.21  *   12.29  *    5.25  *
* Conv. Total (cfs)      *198760.9  * Conv. (cfs)          *    58.7  *194884.6  *  3817.5  *
* Length Wtd. (ft)       *    1.70  * Wetted Per. (ft)     *    0.16  *   88.33  *    6.62  *
* Min Ch El (ft)         *  245.58  * Shear (lb/sq ft)     *    0.45  *    1.31  *    0.58  *
* Alpha                  *    1.01  * Stream Power (lb/ft s) *  1.77  *   10.55  *    2.76  *
* Frctn Loss (ft)        *    0.00  * Cum Volume (acre-ft) *    0.28  *    4.41  *    0.43  *
* C & E Loss (ft)        *    0.04  * Cum SA (acres)       *    0.31  *    0.40  *    0.14  *
*********************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

BRIDGE


RIVER: HRC
REACH: Main               RS: 112

INPUT
Description: Pankey Rd (South) bridge
Distance from Upstream XS =     1.7
Deck/Roadway Width        =      42
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************************************
       0     264          205.62  263.85           209.7   264.1
   209.7  266.87          222.93  266.89       0  225.13  266.88  262.87
  260.35  266.81  262.79  262.93   266.8 262.785   291.6  266.77  262.73
  292.92  266.77  262.73     321  266.74  262.74  323.25  266.74       0
  336.02  266.68          336.02  264.07          400.51   263.9

Upstream Bridge Cross Section Data
Station Elevation Data    num=      16
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0     264  205.62  263.85  225.15  256.99  243.36  250.98  253.88  245.58
  266.09  245.87  273.18  246.98   279.2  245.96  281.72   245.8  290.38  246.77
  302.95  250.32  308.46  255.46  316.46  256.72  321.04   261.6  335.98   264.3
  400.51   263.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04  225.15     .04  308.46     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
       225.15  308.46            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     225     264        F
     315  400.51     264        F

Downstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*******************************************************************************
       0  265.19          188.32  264.32          211.26  264.14
  228.01  263.99          228.01  266.87       0  243.32  266.85  262.85
  273.89  266.81  262.81  301.36  266.78  262.75  313.03  266.76  262.73
  331.22  266.74 262.723  339.13  266.73  262.72  354.37  266.72       0
  354.37  263.77           357.8     264          400.51   263.9

Downstream Bridge Cross Section Data
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  265.19  188.31  264.32  218.36     264  235.52  262.44  243.32  258.91
  253.34  253.29  261.19  247.45  276.73     246   299.2  245.74  306.91  247.48
  316.55  253.65  324.36  255.37  338.49  260.73  353.93  263.77   357.8     264
  400.51   263.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04  243.32     .04  324.36     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
       243.32  324.36            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     250     264        F
     330  400.51     264        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 =     .95
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 =  3

Pier Data
Pier Station     Upstream=   242.2    Downstream=     266
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
      1.5     245     1.5     265
Downstream     num=       2
```

```
    Width   Elev    Width   Elev
*******************************
     1.5     245     1.5     265

Pier Data
Pier Station     Upstream=   270.2    Downstream=     294
Upstream     num=        2
    Width   Elev    Width   Elev
*******************************
     1.5     245     1.5     265
Downstream     num=        2
    Width   Elev    Width   Elev
*******************************
     1.5     245     1.5     265

Pier Data
Pier Station     Upstream=   298.2    Downstream=     322
Upstream     num=        2
    Width   Elev    Width   Elev
*******************************
     1.5     245     1.5     265
Downstream     num=        2
    Width   Elev    Width   Elev
*******************************
     1.5     245     1.5     265

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
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

BRIDGE OUTPUT  Profile #PDC-Q100EX
*********************************************************************************************
* E.G. US. (ft)          *     262.22  * Element               *Inside BR US *Inside BR DS *
* W.S. US. (ft)          *     261.22  * E.G. Elev (ft)        *     262.18  *     261.81  *
* Q Total (cfs)          *    8441.00  * W.S. Elev (ft)        *     261.04  *     260.26  *
* Q Bridge (cfs)         *    8441.00  * Crit W.S. (ft)        *     255.93  *     256.15  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *      15.46  *      14.52  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *       8.54  *       9.96  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)     *     988.15  *     847.14  *
* Weir Submerg           *             * Froude # Chl          *       0.44  *       0.51  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)  *    8578.55  *    7876.51  *
* Min El Weir Flow (ft)  *     264.01  * Hydr Depth (ft)       *      11.57  *      11.22  *
* Min El Prs (ft)        *     262.87  * W.P. Total (ft)       *     166.95  *     146.80  *
* Delta EG (ft)          *       0.51  * Conv. Total (cfs)     *   122168.7  *   101609.6  *
* Delta WS (ft)          *       0.89  * Top Width (ft)        *      90.90  *      89.66  *
* BR Open Area (sq ft)   *    1036.95  * Frctn Loss (ft)       *       0.24  *       0.01  *
* BR Open Vel (ft/s)     *       9.96  * C & E Loss (ft)       *       0.12  *       0.08  *
* Coef of Q              *             * Shear Total (lb/sq ft) *      1.76  *       2.49  *
* Br Sel Method          *Energy only  * Power Total (lb/ft s)  *     15.07  *      24.77  *
*********************************************************************************************

Warning: For the final momentum answer at the bridge, the upstream energy was computed lower than
         the downstream energy.  This is not physically possible, the momentum answer has been
         disregarded.
```

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 110

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48
316.55	253.65	324.36	255.37	338.49	260.73	353.93	263.77	357.8	264
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	243.32	.04	324.36	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
243.32	324.36	6.21	6.21	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	250	264	F
330	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	261.72		
Vel Head (ft)	1.38	Wt. n-Val.	0.040	0.040
W.S. Elev (ft)	260.34	Reach Len. (ft)	6.21	6.21	6.21
Crit W.S. (ft)	255.86	Flow Area (sq ft)	880.70	21.97
E.G. Slope (ft/ft)	*0.002613	Area (sq ft)	2.25	902.73	32.50
Q Total (cfs)	8441.00	Flow (cfs)	8342.23	98.77
Top Width (ft)	97.28	Top Width (ft)	3.15	81.04	13.09
Vel Total (ft/s)	9.35	Avg. Vel. (ft/s)	9.47	4.50
Max Chl Dpth (ft)	14.60	Hydr. Depth (ft)	11.84	3.90
Conv. Total (cfs)	*165143.7	Conv. (cfs)	*163211.3	1932.4
Length Wtd. (ft)	6.21	Wetted Per. (ft)	79.04	6.03
Min Ch El (ft)	245.74	Shear (lb/sq ft)	1.82	0.59
Alpha	1.02	Stream Power (lb/ft s)	17.21	2.67
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.27	3.44	0.39
C & E Loss (ft)	0.01	Cum SA (acres)	0.31	0.31	0.12

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 109.5

INPUT
Description:

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48
316.55	253.65	324.36	255.37	338.49	260.73	353.93	263.77	357.8	264
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	243.32	.075	324.36	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
243.32	324.36	108.78	108.78	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	250	264	F
330	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100EX

E.G. Elev (ft)	261.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.36	Wt. n-Val.		0.075	0.040
W.S. Elev (ft)	260.32	Reach Len. (ft)	108.78	108.78	108.78
Crit W.S. (ft)	255.88	Flow Area (sq ft)		879.26	21.86
E.G. Slope (ft/ft)	0.009051	Area (sq ft)	2.19	901.17	32.25
Q Total (cfs)	8441.00	Flow (cfs)		8258.67	182.33
Top Width (ft)	97.19	Top Width (ft)	3.11	81.04	13.04
Vel Total (ft/s)	9.37	Avg. Vel. (ft/s)		9.39	8.34
Max Chl Dpth (ft)	14.58	Hydr. Depth (ft)		11.82	3.88
Conv. Total (cfs)	88726.8	Conv. (cfs)		86810.3	1916.5
Length Wtd. (ft)	108.78	Wetted Per. (ft)		79.04	6.03
Min Ch El (ft)	245.74	Shear (lb/sq ft)		6.29	2.05
Alpha	1.00	Stream Power (lb/ft s)		59.04	17.08
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.27	3.31	0.38
C & E Loss (ft)	0.56	Cum SA (acres)	0.31	0.30	0.12

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 100

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	260.6	51.9	260	217.5	259.3	253	258	298.3	246
350.3	246	414.9	256	457.71	256.7	482.34	258	494.31	260
503.41	261								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	253	.075	414.9	.04

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

```
          253   414.9                0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #PDC-Q100EX
************************************************************************************************
* E.G. Elev (ft)         *  260.74  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.24  * Wt. n-Val.             *   0.040  *   0.075  *   0.040  *
* W.S. Elev (ft)         *  260.50  * Reach Len. (ft)        *          *          *          *
* Crit W.S. (ft)         *  253.31  * Flow Area (sq ft)      *  217.25  * 1752.75  *  274.34  *
* E.G. Slope (ft/ft)     *0.001814  * Area (sq ft)           *  217.25  * 1752.75  *  274.34  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)             *  317.78  * 7169.24  *  953.98  *
* Top Width (ft)         *  490.21  * Top Width (ft)         *  244.35  *  161.90  *   83.96  *
* Vel Total (ft/s)       *    3.76  * Avg. Vel. (ft/s)       *    1.46  *    4.09  *    3.48  *
* Max Chl Dpth (ft)      *   14.50  * Hydr. Depth (ft)       *    0.89  *   10.83  *    3.27  *
* Conv. Total (cfs)      *198190.6  * Conv. (cfs)            *  7461.4  *168330.3  * 22398.9  *
* Length Wtd. (ft)       *          * Wetted Per. (ft)       *  244.38  *  164.23  *   84.19  *
* Min Ch El (ft)         *  246.00  * Shear (lb/sq ft)       *    0.10  *    1.21  *    0.37  *
* Alpha                  *    1.11  * Stream Power (lb/ft s) *    0.15  *    4.94  *    1.28  *
* Frctn Loss (ft)        *          * Cum Volume (acre-ft)   *          *          *          *
* C & E Loss (ft)        *          * Cum SA (acres)         *          *          *          *
************************************************************************************************

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

SUMMARY OF MANNING'S N VALUES

River:HRC
*********************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *
*********************************************************************
*Main            *    5608.249    *      .06*     .075*      .06*
*Main            *    5000.613    *      .06*     .075*      .06*
*Main            *    4634.388    *      .06*     .075*      .06*
*Main            *    4342.055    *      .06*     .075*      .06*
*Main            *    3976.927    *      .06*     .075*      .06*
*Main            *    3642.177    *      .06*     .075*      .06*
*Main            *    3351.951    *      .06*     .075*      .06*
*Main            *    3038.374    *      .06*     .075*      .06*
*Main            *    2614.242    *      .06*     .075*      .06*
*Main            *    2033.954    *      .06*     .075*      .06*
*Main            *    1864        *      .06*     .075*      .06*
*Main            *    1717        *      .06*     .075*      .06*
*Main            *    1535        *      .04*     .075*      .04*
*Main            *    1463.580    *Bridge   *        *         *
*Main            *    1434        *      .04*     .075*      .04*
*Main            *    1200        *      .04*     .075*      .04*
*Main            *    988         *      .04*     .075*      .04*
*Main            *    632         *      .04*     .075*      .04*
*Main            *    627         *      .04*      .04*      .04*
*Main            *    561.3247    *Bridge   *        *         *
*Main            *    472         *      .04*      .04*      .04*
*Main            *    200         *      .04*     .075*      .04*
*Main            *    167         *      .04*     .075*      .04*
*Main            *    120         *      .04*     .075*      .04*
*Main            *    114.5       *      .04*     .075*      .04*
*Main            *    114         *      .04*      .04*      .04*
*Main            *    112         *Bridge   *        *         *
*Main            *    110         *      .04*      .04*      .04*
*Main            *    109.5       *      .04*     .075*      .04*
*Main            *    100         *      .04*     .075*      .04*
*********************************************************************

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

SUMMARY OF REACH LENGTHS

River: HRC
*********************************************************************
```

Reach	River Sta.	Left	Channel	Right
Main	5608.249	386.82	607.68	624.69
Main	5000.613	325.2	366.24	367.74
Main	4634.388	279.85	292.35	293
Main	4342.055	344.1	365.11	365.46
Main	3976.927	334.85	334.75	343.15
Main	3642.177	258.15	290.25	300.25
Main	3351.951	278.95	313.6	317.15
Main	3038.374	564.83	424.13	403.83
Main	2614.242	566.01	580.32	596.25
Main	2033.954	314.82	169.14	136.17
Main	1864	303.12	147.21	135.57
Main	1717	521	247.08	247.08
Main	1535	51.85	51.85	51.85
Main	1463.580	Bridge		
Main	1434	161.36	258.84	270
Main	1200	180	307.25	329
Main	988	231	197.03	197.03
Main	632	100	100	100
Main	627	99.67	99.67	99.67
Main	561.3247	Bridge		
Main	472	104.13	104.13	104.13
Main	200	234.6	234.6	234.6
Main	167	140	192	236
Main	120	309.76	309.76	309.76
Main	114.5	6.21	6.21	6.21
Main	114	46.67	46.67	46.67
Main	112	Bridge		
Main	110	6.21	6.21	6.21
Main	109.5	108.78	108.78	108.78
Main	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: HRC

Reach	River Sta.	Contr.	Expan.
Main	5608.249	.1	.3
Main	5000.613	.1	.3
Main	4634.388	.1	.3
Main	4342.055	.1	.3
Main	3976.927	.1	.3
Main	3642.177	.1	.3
Main	3351.951	.1	.3
Main	3038.374	.1	.3
Main	2614.242	.1	.3
Main	2033.954	.1	.3
Main	1864	.1	.3
Main	1717	.1	.3
Main	1535	.1	.3
Main	1463.580	Bridge	
Main	1434	.1	.3
Main	1200	.1	.3
Main	988	.1	.3
Main	632	.3	.5
Main	627	.3	.5
Main	561.3247	Bridge	
Main	472	.3	.5
Main	200	.1	.3
Main	167	.1	.3
Main	120	.3	.5
Main	114.5	.3	.5

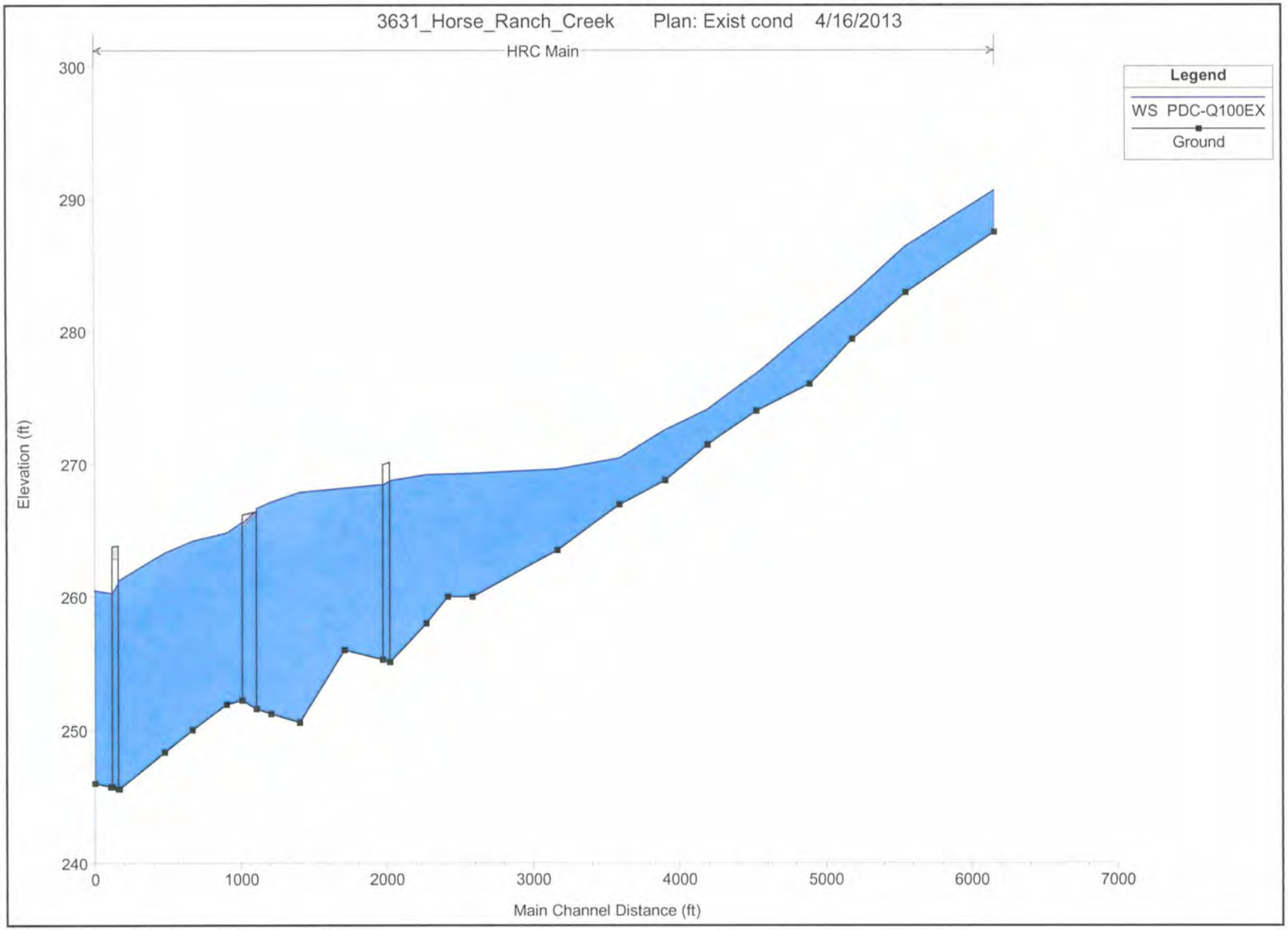
```
*Main           *    114     *       .3*       .5*
*Main           *    112     *Bridge   *         *
*Main           *    110     *       .3*       .5*
*Main           *    109.5   *       .3*       .5*
*Main           *    100     *       .1*       .3*
*****************************************************
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	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	5608.249	PDC-Q100EX	8441.00	287.48	290.66	289.41	290.79	0.007043	2.95	2874.45	1474.85	0.34
Main	5000.613	PDC-Q100EX	8441.00	282.91	286.44	285.07	286.57	0.006938	2.90	2963.29	1651.43	0.33
Main	4634.388	PDC-Q100EX	8441.00	279.38	282.74	282.04	282.94	0.015277	3.64	2389.48	1621.94	0.48
Main	4342.055	PDC-Q100EX	8441.00	276.00	280.15		280.26	0.006029	2.71	3126.10	1370.69	0.31
Main	3976.927	PDC-Q100EX	8441.00	274.00	276.82		277.03	0.014276	3.61	2345.50	1276.44	0.46
Main	3642.177	PDC-Q100EX	8441.00	271.44	274.15	273.01	274.25	0.005306	2.37	3437.97	1975.12	0.29
Main	3351.951	PDC-Q100EX	8441.00	268.75	272.58	271.00	272.70	0.005400	2.70	3126.27	1257.05	0.30
Main	3038.374	PDC-Q100EX	8441.00	266.96	270.50		270.65	0.008003	3.10	2723.79	1179.20	0.36
Main	2614.242	PDC-Q100EX	8441.00	263.52	269.64		269.67	0.001020	1.53	5565.35	1536.64	0.14
Main	2033.954	PDC-Q100EX	8441.00	260.00	269.33		269.35	0.000337	1.14	7410.74	1387.59	0.09
Main	1864	PDC-Q100EX	8441.00	260.00	269.27	264.21	269.30	0.000335	1.23	6870.03	1437.36	0.09
Main	1717	PDC-Q100EX	8441.00	258.00	269.22	263.91	269.24	0.000324	1.28	6565.70	1127.19	0.09
Main	1535	PDC-Q100EX	8441.00	255.09	268.78	266.94	268.99	0.001991	3.57	2347.17	731.24	0.21
Main	1463.580 Pankey Road		Bridge									
Main	1434	PDC-Q100EX	8441.00	255.26	268.48	267.00	268.77	0.003389	4.65	2007.63	683.38	0.28
Main	1200	PDC-Q100EX	8441.00	256.00	268.22		268.40	0.000940	2.76	2631.65	832.77	0.15
Main	988	PDC-Q100EX	8441.00	250.55	267.93		268.13	0.001223	3.59	2367.50	893.80	0.17
Main	632	PDC-Q100EX	8441.00	251.20	267.19		267.70	0.003470	5.73	1511.99	528.24	0.30
Main	627	PDC-Q100EX	8441.00	251.57	266.70	260.30	267.43	0.001398	6.85	1231.56	242.09	0.36
Main	561.3247 SR-76		Bridge									
Main	472	PDC-Q100EX	8441.00	252.23	265.62	260.77	266.53	0.001852	7.64	1105.03	136.18	0.41
Main	200	PDC-Q100EX	8441.00	251.91	264.85		266.08	0.007872	8.06	978.82	1090.78	0.45
Main	167	PDC-Q100EX	8441.00	250.00	264.24	261.06	264.73	0.003244	5.33	1537.01	1098.98	0.28
Main	120	PDC-Q100EX	8441.00	248.33	263.33		263.96	0.004469	6.55	1375.69	483.80	0.34
Main	114.5	PDC-Q100EX	8441.00	245.58	261.27	255.62	262.25	0.006049	7.91	1063.28	107.76	0.40
Main	114	PDC-Q100EX	8441.00	245.58	261.22	255.62	262.22	0.001804	8.08	1059.07	107.58	0.41
Main	112		Bridge									
Main	110	PDC-Q100EX	8441.00	245.74	260.34	255.86	261.72	0.002613	9.47	902.67	97.28	0.49
Main	109.5	PDC-Q100EX	8441.00	245.74	260.32	255.88	261.68	0.009051	9.39	901.13	97.19	0.48
Main	100	PDC-Q100EX	8441.00	246.00	260.50	253.31	260.74	0.001814	4.09	2244.34	490.21	0.22

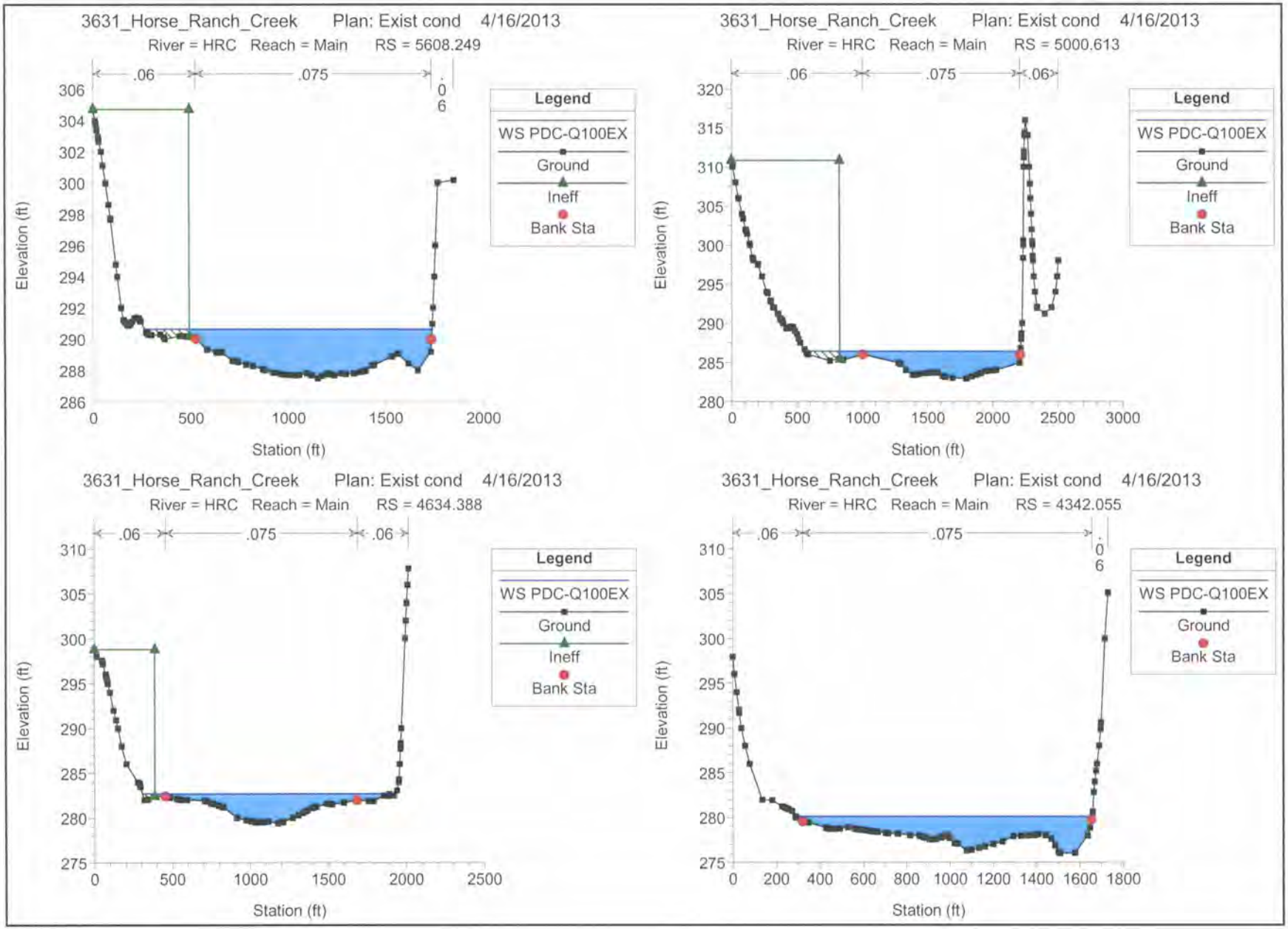
APPENDIX 4

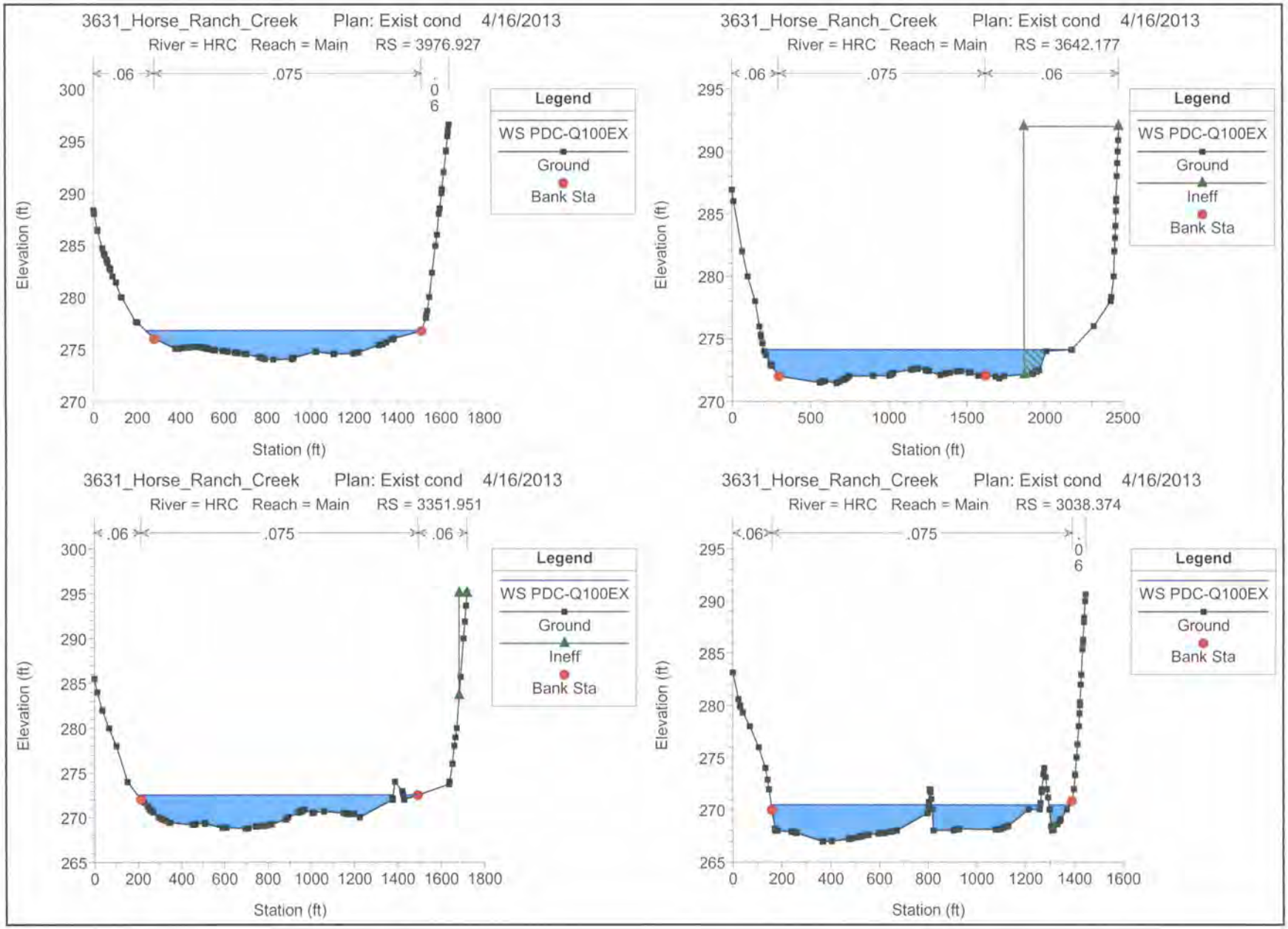
Existing Conditions HEC-RAS Cross Sections and Results

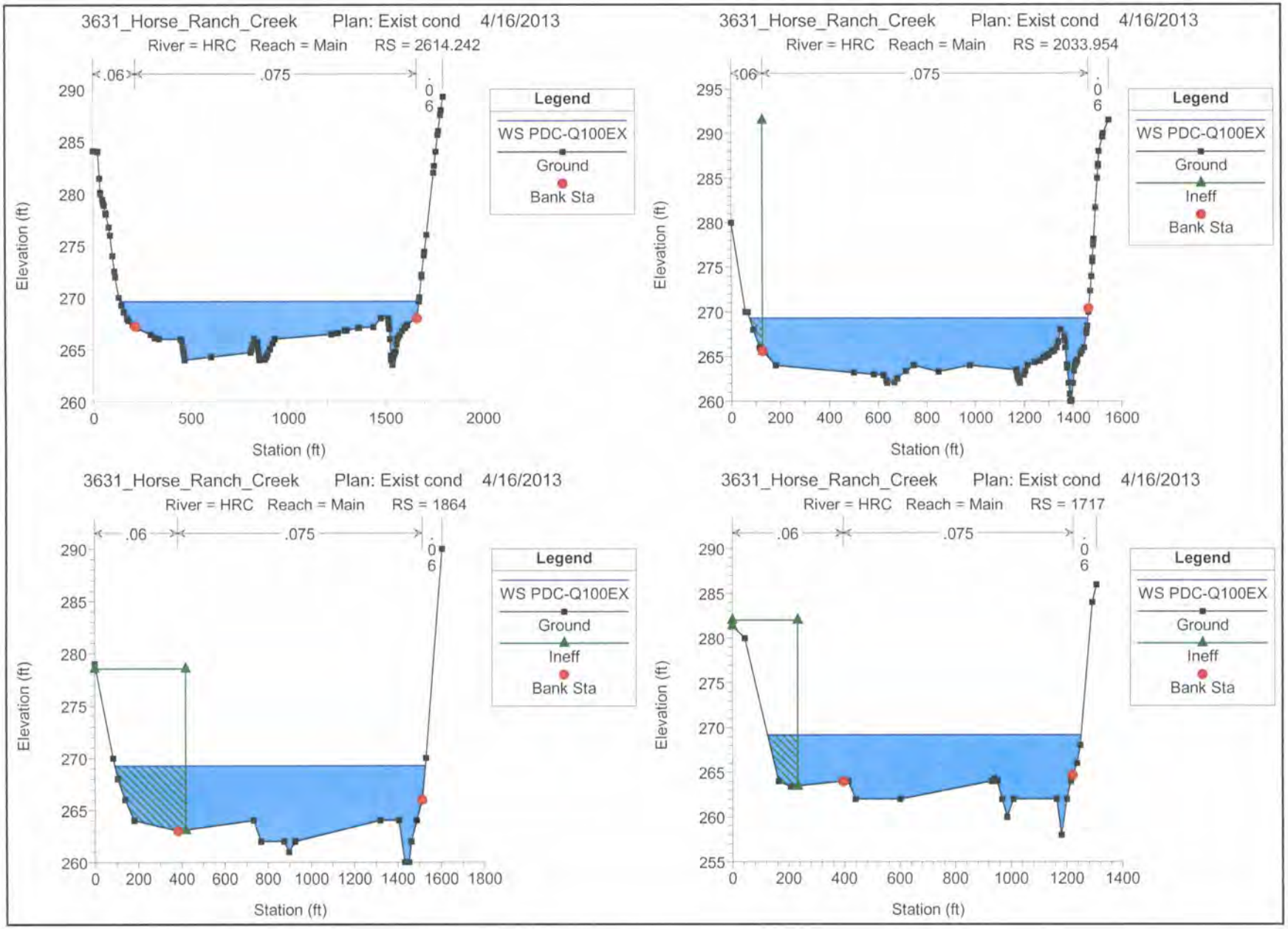

3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
HRC Main
Legend
WS PDC-Q100EX
Ground
Elevation (ft)
300
290
280
270
260
250
240
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

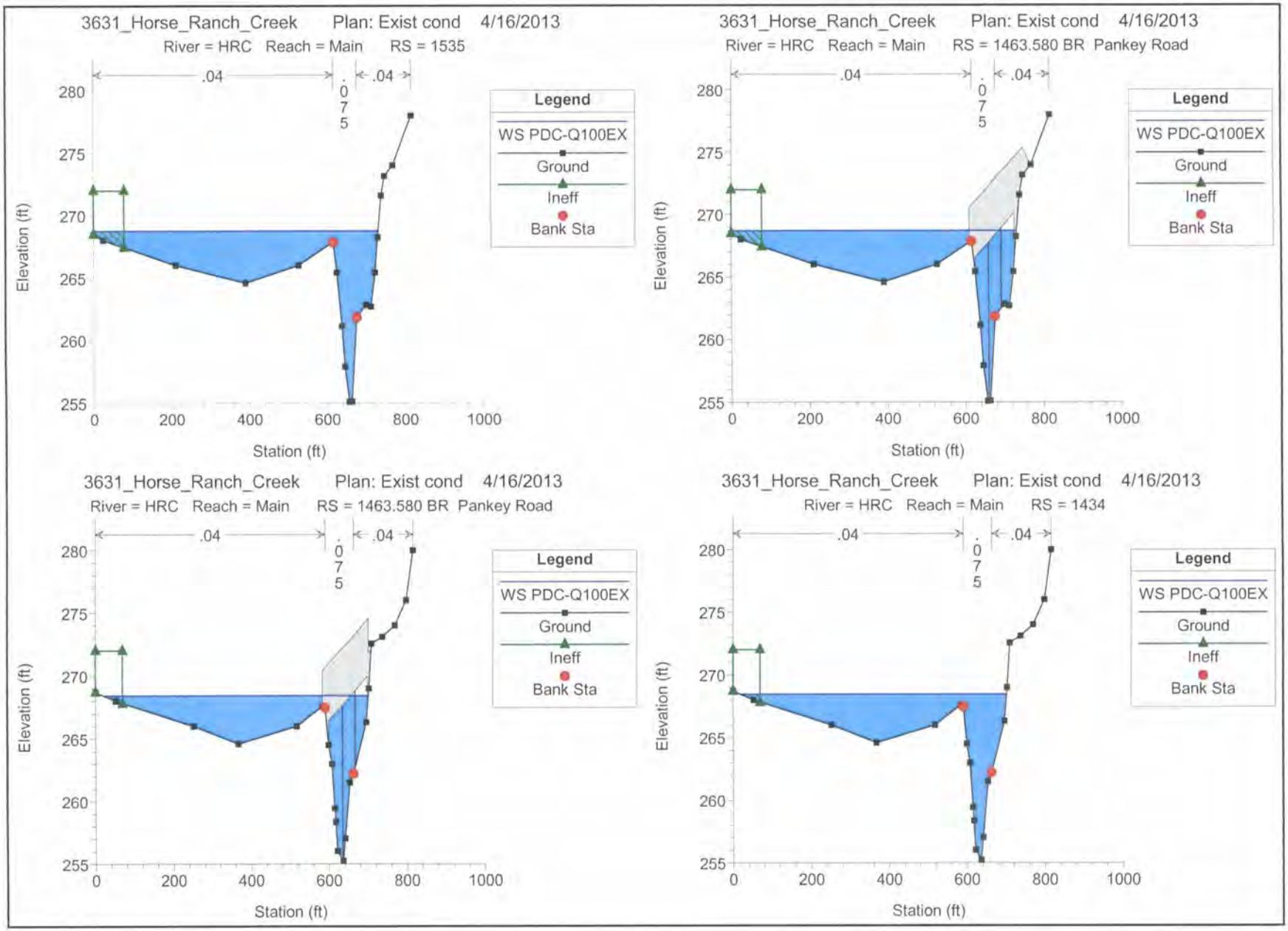
HEC-RAS Plan: EX River: HRC Reach: Main Profile: PDC-Q100EX

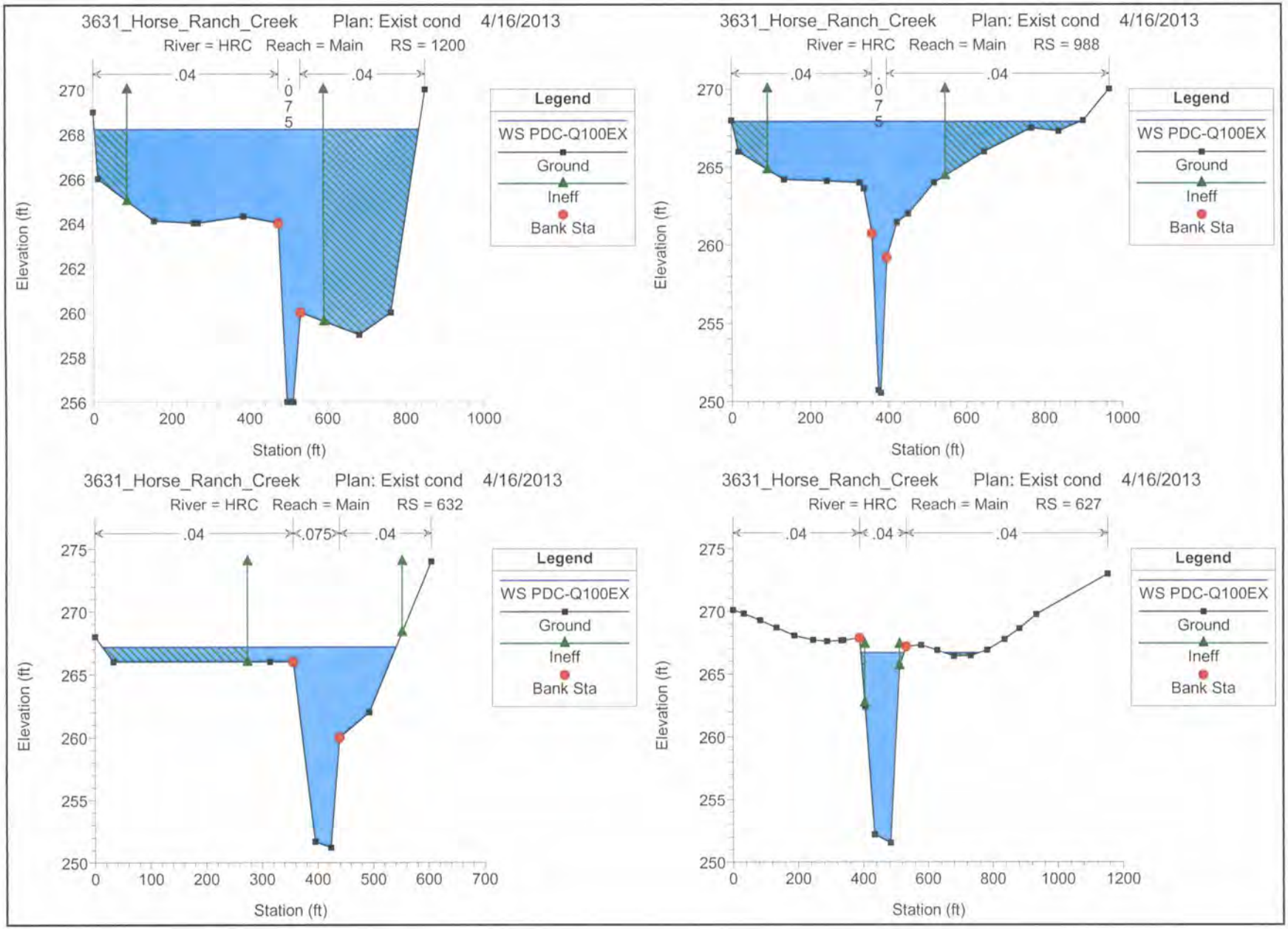
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	5608.249	PDC-Q100EX	8441.00	287.48	290.66	289.41	290.79	0.007043	2.95	2874.45	1474.85	0.34
Main	5000.613	PDC-Q100EX	8441.00	282.91	286.44	285.07	286.57	0.006938	2.90	2963.29	1651.43	0.33
Main	4634.388	PDC-Q100EX	8441.00	279.38	282.74	282.04	282.94	0.015277	3.64	2389.48	1621.94	0.48
Main	4342.055	PDC-Q100EX	8441.00	276.00	280.15		280.26	0.006029	2.71	3126.10	1370.69	0.31
Main	3976.927	PDC-Q100EX	8441.00	274.00	276.82		277.03	0.014276	3.61	2345.50	1276.44	0.46
Main	3642.177	PDC-Q100EX	8441.00	271.44	274.15	273.01	274.25	0.005306	2.37	3437.97	1975.12	0.29
Main	3351.951	PDC-Q100EX	8441.00	268.75	272.58	271.00	272.70	0.005400	2.70	3126.27	1257.05	0.30
Main	3038.374	PDC-Q100EX	8441.00	266.96	270.50		270.65	0.008003	3.10	2723.79	1179.20	0.36
Main	2614.242	PDC-Q100EX	8441.00	263.52	269.64		269.67	0.001020	1.53	5565.35	1536.64	0.14
Main	2033.954	PDC-Q100EX	8441.00	260.00	269.33		269.35	0.000337	1.14	7410.74	1387.59	0.09
Main	1864	PDC-Q100EX	8441.00	260.00	269.27	264.21	269.30	0.000335	1.23	6870.03	1437.36	0.09
Main	1717	PDC-Q100EX	8441.00	258.00	269.22	263.91	269.24	0.000324	1.28	6565.70	1127.19	0.09
Main	1535	PDC-Q100EX	8441.00	255.09	268.78	266.94	268.99	0.001991	3.57	2347.17	731.24	0.21
Main	1463.580 Pankey Road		Bridge									
Main	1434	PDC-Q100EX	8441.00	255.26	268.48	267.00	268.77	0.003389	4.65	2007.63	683.38	0.28
Main	1200	PDC-Q100EX	8441.00	256.00	268.22		268.40	0.000940	2.76	2631.65	832.77	0.15
Main	988	PDC-Q100EX	8441.00	250.55	267.93		268.13	0.001223	3.59	2367.50	893.80	0.17
Main	632	PDC-Q100EX	8441.00	251.20	267.19		267.70	0.003470	5.73	1511.99	528.24	0.30
Main	627	PDC-Q100EX	8441.00	251.57	266.70	260.30	267.43	0.001398	6.85	1231.56	242.09	0.36
Main	561.3247 SR-76		Bridge									
Main	472	PDC-Q100EX	8441.00	252.23	265.62	260.77	266.53	0.001852	7.64	1105.03	136.18	0.41
Main	200	PDC-Q100EX	8441.00	251.91	264.85		266.08	0.007872	8.06	978.82	1090.78	0.45
Main	167	PDC-Q100EX	8441.00	250.00	264.24	261.06	264.73	0.003244	5.33	1537.01	1098.98	0.28
Main	120	PDC-Q100EX	8441.00	248.33	263.33		263.96	0.004469	6.55	1375.69	483.80	0.34
Main	114.5	PDC-Q100EX	8441.00	245.58	261.27	255.62	262.25	0.006049	7.91	1063.28	107.76	0.40
Main	114	PDC-Q100EX	8441.00	245.58	261.22	255.62	262.22	0.001804	8.08	1059.07	107.58	0.41
Main	112		Bridge									
Main	110	PDC-Q100EX	8441.00	245.74	260.34	255.86	261.72	0.002613	9.47	902.67	97.28	0.49
Main	109.5	PDC-Q100EX	8441.00	245.74	260.32	255.88	261.68	0.009051	9.39	901.13	97.19	0.48
Main	100	PDC-Q100EX	8441.00	246.00	260.50	253.31	260.74	0.001814	4.09	2244.34	490.21	0.22

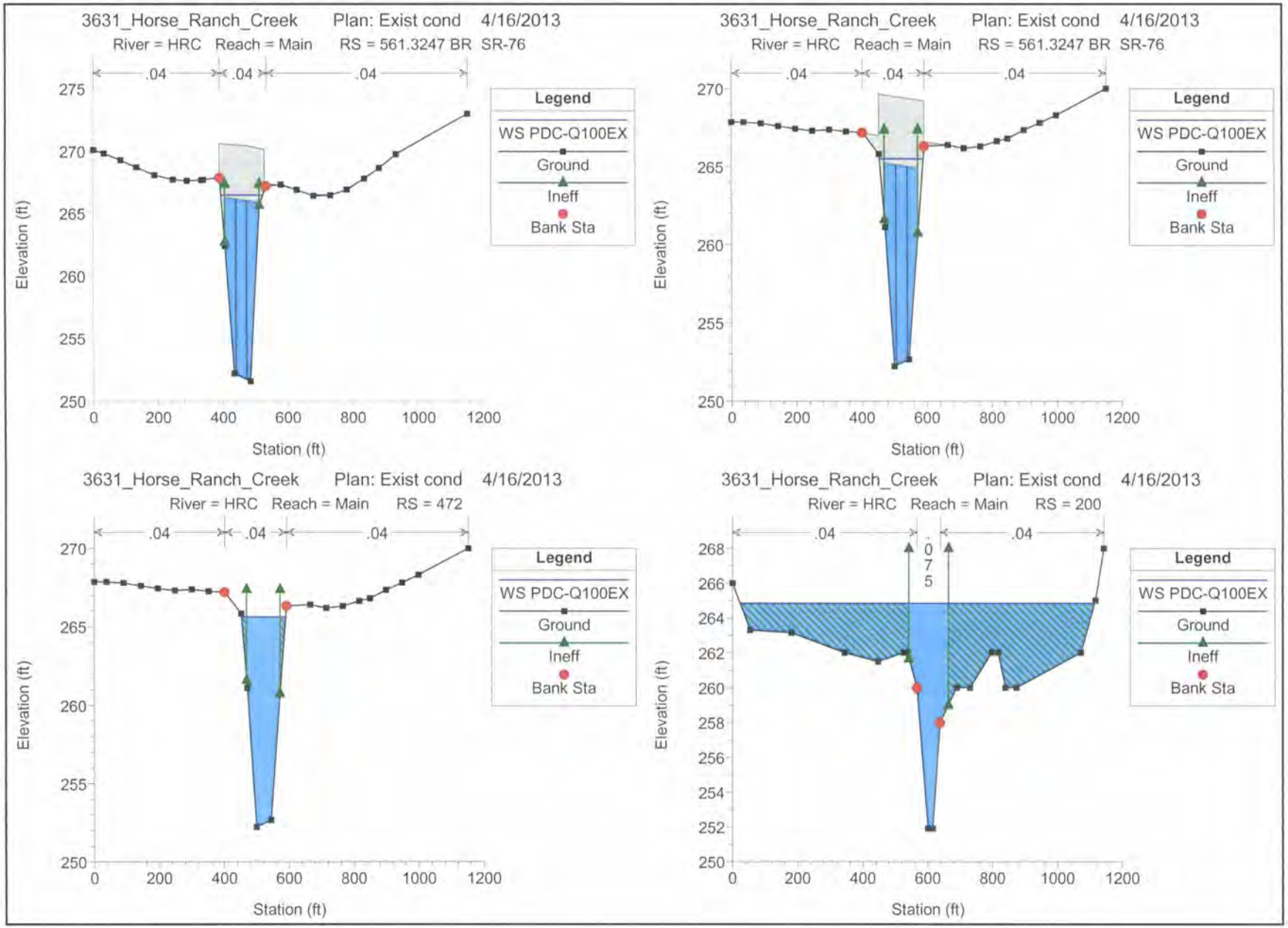

3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 5608.249
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 5000.613
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 4634.388
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 4342.055
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Bank Sta
Elevation (ft)
Station (ft)

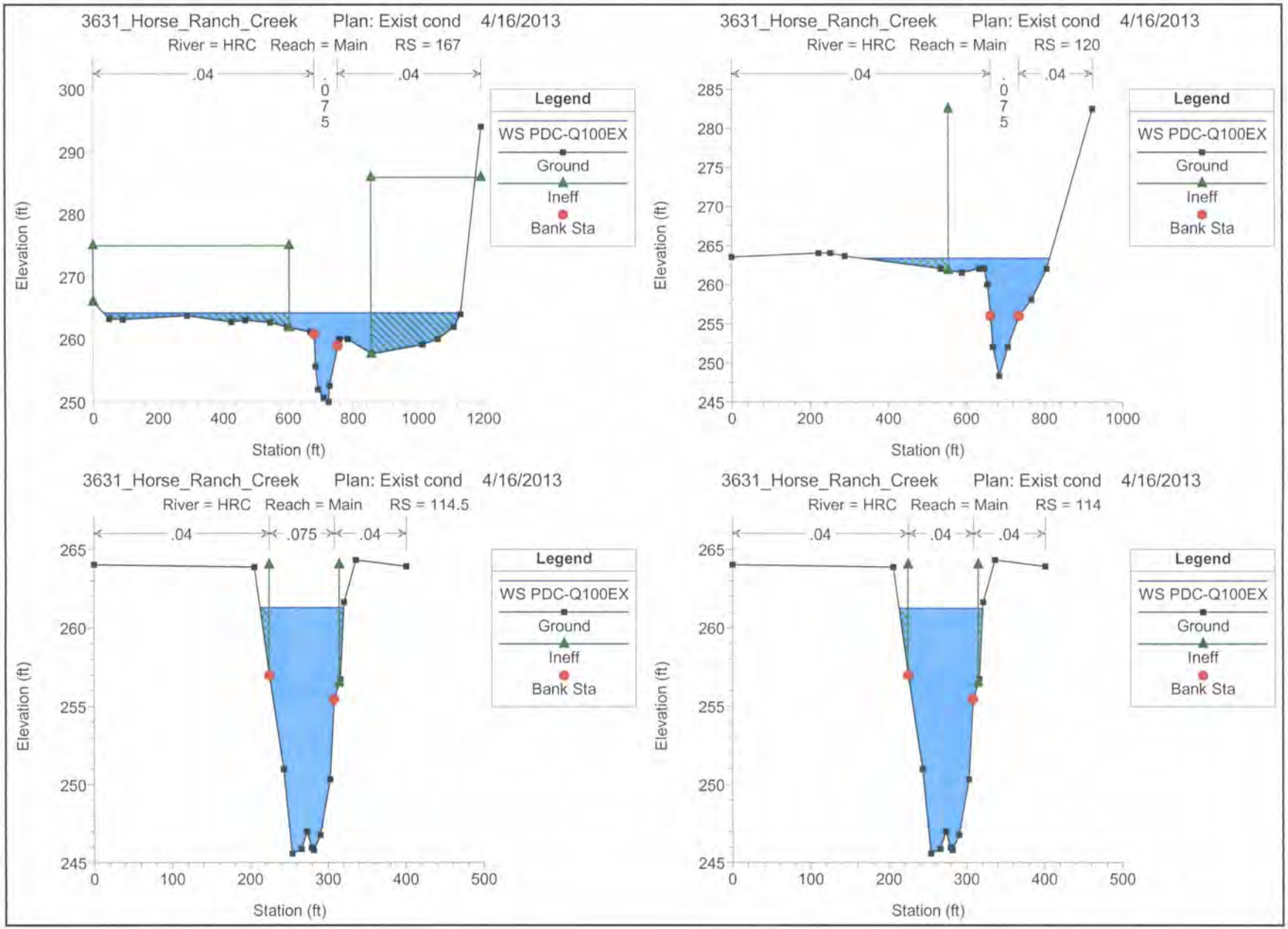

3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 3976.927
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 3642.177
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 3351.951
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 3038.374
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Bank Sta
Elevation (ft)
Station (ft)

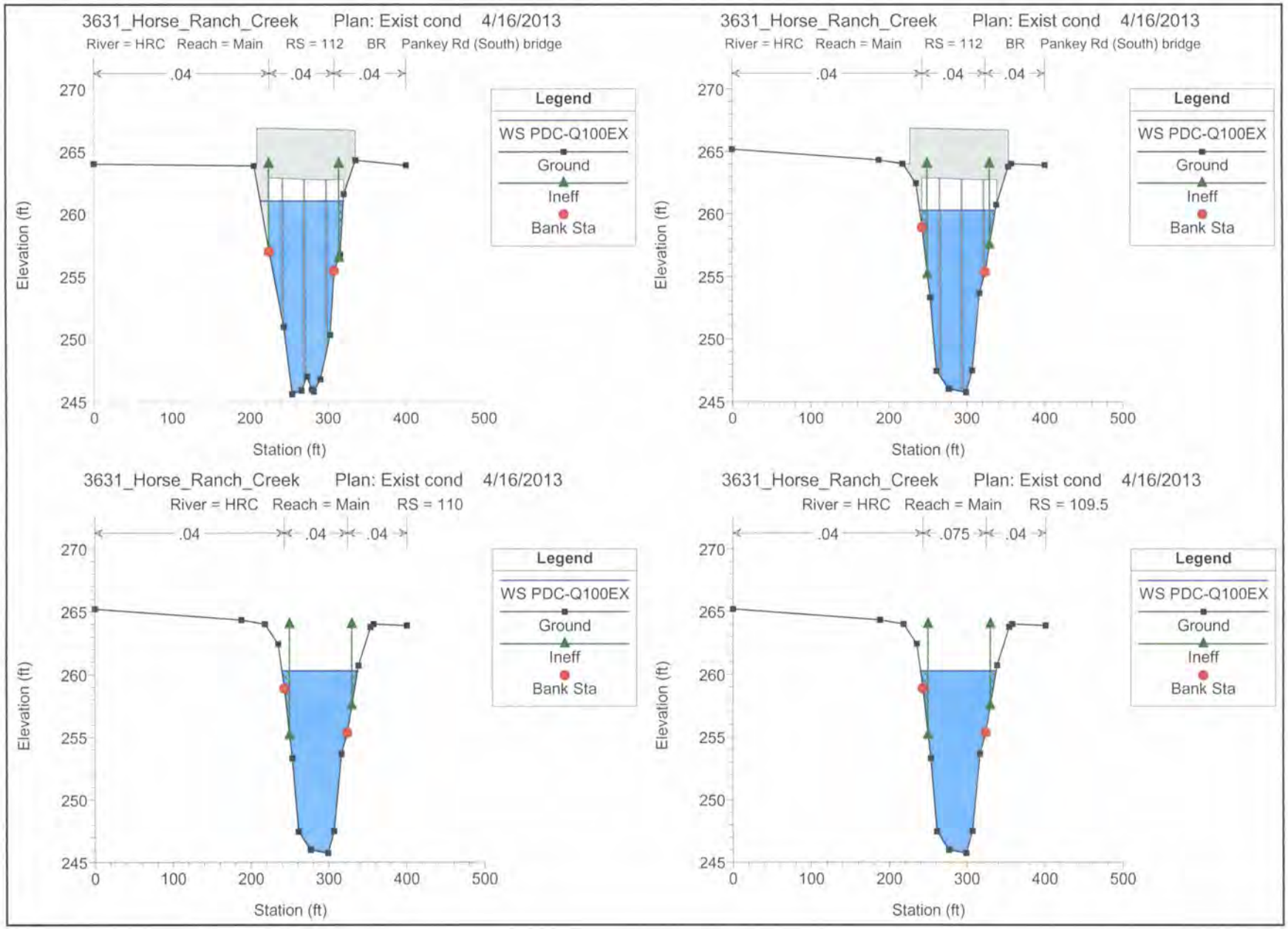

3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 2614.242
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 2033.954
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1864
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1717
.06
.075
.06
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

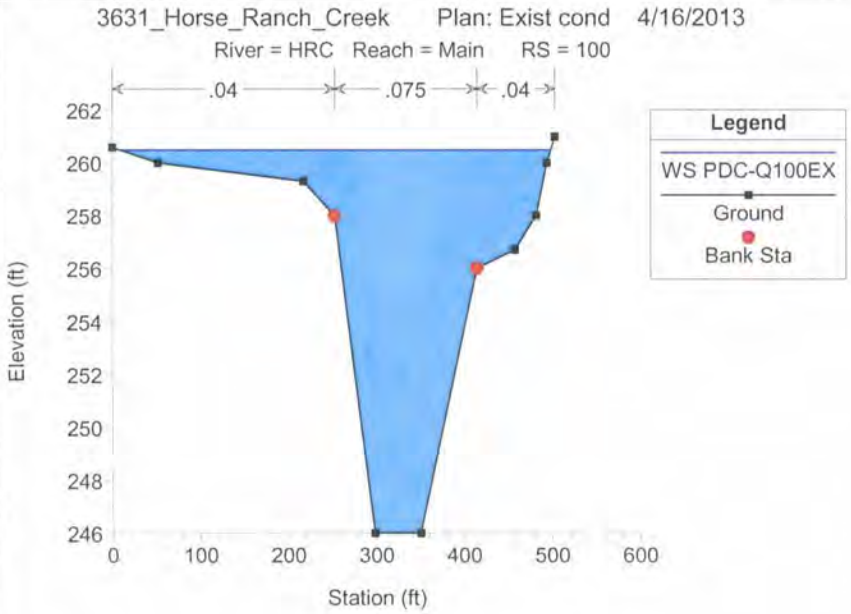

3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1535
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1463.580 BR Pankey Road
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1463.580 BR Pankey Road
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1434


3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 1200
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 988
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 632
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 627
.04
.04
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 561.3247 BR SR-76
.04 .04 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 561.3247 BR SR-76
.04 .04 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 472
.04 .04 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 200
.04 .075 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 167
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 120
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 114.5
.04
.075
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 114
.04
.04
.04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 112 BR Pankey Rd (South) bridge
.04 .04 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 112 BR Pankey Rd (South) bridge
.04 .04 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 110
.04 .04 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 109.5
.04 .075 .04
Legend
WS PDC-Q100EX
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Exist cond 4/16/2013
River = HRC Reach = Main RS = 100
.04
.075
.04
262
260
258
256
254
252
250
248
246
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
Legend
WS PDC-Q100EX
Ground
Bank Sta

APPENDIX 5

Proposed Conditions HEC-RAS Input Data

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 3631_Horse_Ranch_Creek
Project File : 3631_Horse_Ranch_Creek.prj
Run Date and Time: 4/16/2013 11:02:44 AM

Project in English units

Project Description:
Flood Study for Horse Ranch Creek, NGVD 29, Cross sections taken looking
downstream

****

PLAN DATA

Plan Title: Proposed Condition-(Widen SR76)
Plan File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.p05

Geometry Title: Proposed Condition-widen
Geometry File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.g07

Flow Title : 2003 County Method PR
Flow File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.f01

Plan Summary Information:
Number of: Cross Sections = 29 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

Flow Title: 2003 County Method PR
Flow File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.f01

Flow Data (cfs)

River	Reach	RS	PDC-Q100PR
HRC	Main	5608.249	8441

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
HRC	Main	PDC-Q100PR		Known WS = 260.5

GEOMETRY DATA

Geometry Title: Proposed Condition-widen
Geometry File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.g07

CROSS SECTION

RIVER: HRC
REACH: Main RS: 5608.249

INPUT
Description:
Station Elevation Data num= 116

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	304.73	11.04	304	13.3	303.8	13.81	303.77	17.74	303.45
19.52	303.34	24.98	302.93	27.99	302.76	29.64	302.65	41	302
50.22	301.12	64.61	300	64.79	299.98	79.78	298.61	88.62	297.73
89.38	297.66	116.94	294.78	124.03	294	143.32	292	154.29	291.25
156.33	291.23	161.85	291.12	168.29	291.06	173.37	290.95	175.94	290.92
177.15	290.93	180	290.87	183.03	290.95	184.6	290.92	191.78	290.97
198.83	291.14	211.18	291.34	219.17	291.4	228.53	291.35	230.1	291.32
234.28	291.34	238.95	291.21	243.58	291.16	270.57	290.47	272.31	290.45
273.92	290.41	275.83	290.39	277.5	290.35	278.51	290.34	284.8	290.32
286.12	290.29	292.43	290.28	292.85	290.27	294.5	290.28	296.25	290.25
297.85	290.28	298.73	290.26	342.65	290.32	359.58	290.13	365.9	290
444.19	290.2	445.04	290.19	454.2	290.21	454.79	290.2	473.92	290.2
474.49	290.19	489.86	290.17	491.48	290.18	525.71	290.03	526.97	290
582.95	289.32	630.38	289.15	631.7	289.13	655.87	289.18	657.9	289.14
713	288.63	729.88	288.6	740.29	288.53	783.7	288.37	817.65	288.28
868.94	288.08	873.71	288.06	882.22	288	922.44	287.85	936.64	287.84
965.86	287.75	982.45	287.72	1009.77	287.71	1039.27	287.68	1057.13	287.7
1095.93	287.81	1114.77	287.68	1119.12	287.67	1151.17	287.48	1173.21	287.63
1198.58	287.76	1205.59	287.79	1210.81	287.77	1217.18	287.73	1236.51	287.68
1269.95	287.79	1296.84	287.77	1336.42	287.8	1368.19	287.88	1381.79	287.93
1392.34	287.94	1397.83	288	1430.1	288.31	1440.6	288.36	1531.54	288.88
1561.02	289.05	1615.53	288.45	1664.74	288	1731.48	289.18	1736	290
1739.23	290.97	1742.52	292	1749.96	294	1756.3	296	1768.31	300
1849.97	300.17								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	525.71	.075	1736	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
525.71	1736	386.82	607.68	624.69	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	493.25	304.7255	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	290.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	290.66	Reach Len. (ft)	386.82	607.68	624.69
Crit W.S. (ft)	289.41	Flow Area (sq ft)	18.01	2856.82	0.72
E.G. Slope (ft/ft)	*0.007034	Area (sq ft)	121.38	2856.82	0.72
Q Total (cfs)	8441.00	Flow (cfs)	25.26	8415.05	0.69
Top Width (ft)	1474.89	Top Width (ft)	262.42	1210.29	2.18
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)	1.40	2.95	0.96
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	0.55	2.36	0.33
Conv. Total (cfs)	*100644.8	Conv. (cfs)	301.2	*100335.3	8.2
Length Wtd. (ft)	603.88	Wetted Per. (ft)	32.46	1210.40	2.28
Min Ch El (ft)	287.48	Shear (lb/sq ft)	0.24	1.04	0.14
Alpha	1.00	Stream Power (lb/ft s)	0.34	3.05	0.13
Frctn Loss (ft)	4.22	Cum Volume (acre-ft)	73.84	487.96	36.73
C & E Loss (ft)	0.00	Cum SA (acres)	23.61	119.56	8.68

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 5000.613

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	310.86	9.72	310	30.27	308	53.4	306.05	53.94	306
79.95	304	89.41	303.37	107.3	302	113.15	301.83	119.32	301.46
137.63	300.21	140.43	300	159.37	298.41	162.89	298.29	167.21	298
199.68	297.59	202.58	297.48	232.53	296	267.6	294	276.28	293.84
297.08	292.87	300.3	292.75	316.97	292	324.98	291.99	352.47	291.23
356.75	291.21	368.46	290.67	369.1	290.63	373.36	290.59	376.74	290.51
383.32	290.42	389.54	290.23	393.89	290	415.99	289.44	425.12	289.34
425.89	289.32	435.45	289.34	443.41	289.49	452.68	289.52	456.6	289.58
470.09	289.5	482.97	289.02	499.84	288.59	510.92	288	524.17	287.52
556.51	286.68	571.04	286.21	584.13	286	750.67	285.23	821.72	285.46
855.28	285.31	1006.28	286	1276.91	284.96	1283.72	284.88	1289.31	284.85
1294.53	284.78	1335.39	284	1385.05	283.4	1396.08	283.36	1408.04	283.37
1425.23	283.46	1426.93	283.48	1470.24	283.59	1471.38	283.58	1508.02	283.63
1518.24	283.66	1546.32	283.71	1547.37	283.7	1562.72	283.69	1578.16	283.65
1618.18	283.24	1634.68	283.11	1635.54	283.14	1691.46	282.99	1797	282.91
1802.21	282.93	1834.71	283.18	1837.35	283.17	1877.56	283.39	1906.65	283.6
1908.64	283.61	1946.58	283.85	1955.94	283.89	2002.62	283.94	2027.86	284
2029.92	284	2208.42	284.95	2213.82	286	2216.83	286.83	2221.31	288
2223.85	288.72	2228.21	290	2237.55	298.3	2239.43	300	2239.79	300.64
2245.19	310	2246.77	311.21	2248.02	312	2250.66	314	2252.73	314.43
2258.9	316	2276	314.1	2276.39	314	2286.73	310	2291.99	307.83
2296.85	306	2301.06	304	2305.57	302	2309.35	300.47	2310.46	300
2313.17	298.59	2314.37	298	2320.67	296	2329.35	294	2343.93	292.11
2345.26	291.96	2404.33	291.22	2457	292	2487.35	294	2499.21	296
2509.14	298								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
      0     .06 1006.28    .075 2213.82     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      1006.28 2213.82            325.2  366.24  367.74             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
      0   829.2310.8611       F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*********************************************************************************************
* E.G. Elev (ft)          *  286.57  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.13  * Wt. n-Val.            *   0.060  *   0.075  *   0.060  *
* W.S. Elev (ft)          *  286.44  * Reach Len. (ft)       *  325.20  *  366.24  *  367.74  *
* Crit W.S. (ft)          *  285.07  * Flow Area (sq ft)     *  145.96  * 2814.96  *    0.35  *
* E.G. Slope (ft/ft)      *0.006954  * Area (sq ft)          *  373.02  * 2814.96  *    0.35  *
* Q Total (cfs)           * 8441.00  * Flow (cfs)           *  264.98  * 8175.77  *    0.25  *
* Top Width (ft)          * 1651.38  * Top Width (ft)       *  442.26  * 1207.54  *    1.58  *
* Vel Total (ft/s)        *    2.85  * Avg. Vel. (ft/s)     *    1.82  *    2.90  *    0.73  *
* Max Chl Dpth (ft)       *    3.53  * Hydr. Depth (ft)     *    0.82  *    2.33  *    0.22  *
* Conv. Total (cfs)       *101225.0  * Conv. (cfs)          *  3177.6  * 98044.3  *     3.0  *
* Length Wtd. (ft)        *  365.53  * Wetted Per. (ft)     *  177.08  * 1207.67  *    1.64  *
* Min Ch El (ft)          *  282.91  * Shear (lb/sq ft)     *    0.36  *    1.01  *    0.09  *
* Alpha                   *    1.02  * Stream Power (lb/ft s) *    0.65  *    2.94  *    0.07  *
* Frctn Loss (ft)         *    3.57  * Cum Volume (acre-ft)  *   71.65  *  448.40  *   36.73  *
* C & E Loss (ft)         *    0.01  * Cum SA (acres)        *   20.48  *  102.69  *    8.65  *
*********************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 4634.388

INPUT
Description:
Station Elevation Data    num=      97
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0   298.8   14.92     298   48.95  297.57   52.29  297.43   54.06  297.31
    55.1  297.23   56.72  297.14      73     296   75.71  295.77   77.14  295.67
   81.33  295.34   83.22  295.21   86.33  294.96   99.68     294  123.14     292
     139  290.91  150.76     290  173.63     288  204.83     286  276.91     284
  288.03  283.88  290.75   283.7  293.62  283.54  294.67  283.46  320.14     282
  335.46  282.01   341.8  282.11  344.17  282.09  379.67  282.43  455.34  282.45
  459.32  282.42  462.17  282.39  464.82  282.37  467.55  282.34  474.11  282.29
  477.49  282.26  482.44  282.27  483.21  282.26  527.58  282.13  535.09  282.09
  539.19  282.08  546.48  282.05   549.3  282.04  552.15  282.02  557.84     282
   576.6  281.99  593.35     282  708.31  281.93  714.42   281.9  719.56  281.87
  723.75  281.84  747.55   281.6  752.62  281.56  770.74  281.52  796.45  281.35
  804.65  281.32  821.95   281.2  824.98  281.17  829.02  281.15  915.12     280
   975.7  279.72 1006.16  279.61 1035.43  279.51  1039.6   279.5 1053.65  279.49
 1063.35   279.5  1076.7  279.51 1094.92  279.54 1096.98  279.55 1114.79  279.59
 1178.72  279.38 1203.23  279.52 1210.59  279.55 1272.45     280 1308.62  280.29
 1338.37  280.52 1354.61   280.7 1365.95   280.8 1396.74  281.06 1406.46  281.12
 1420.16  281.19 1425.11  281.21 1490.66  281.57 1498.43  281.56 1500.42  281.55
 1513.62  281.53 1520.79  281.52 1524.52   281.5 1599.21  281.67 1602.89  281.68
 1678.38  281.97 1684.86  281.98  1686.4     282 1758.78     282  1782.7   291.9
    1994   291.9 2014.94     303

Manning's n Values       num=       3
```

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	455.34	.075	1686.4	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
455.34 1686.4 279.85 292.35 293 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	388.56	298.8025	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	282.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	282.78	Reach Len. (ft)	279.85	292.35	293.00
Crit W.S. (ft)	282.02	Flow Area (sq ft)	22.42	2278.59	56.97
E.G. Slope (ft/ft)	*0.014750	Area (sq ft)	67.09	2278.59	56.97
Q Total (cfs)	8441.00	Flow (cfs)	32.58	8265.03	143.39
Top Width (ft)	1454.07	Top Width (ft)	148.75	1231.06	74.26
Vel Total (ft/s)	3.58	Avg. Vel. (ft/s)	1.45	3.63	2.52
Max Chl Dpth (ft)	3.40	Hydr. Depth (ft)	0.34	1.85	0.77
Conv. Total (cfs)	69503.0	Conv. (cfs)	268.3	68054.0	1180.7
Length Wtd. (ft)	292.32	Wetted Per. (ft)	66.78	1231.08	74.41
Min Ch El (ft)	279.38	Shear (lb/sq ft)	0.31	1.70	0.70
Alpha	1.01	Stream Power (lb/ft s)	0.45	6.18	1.77
Frctn Loss (ft)	2.73	Cum Volume (acre-ft)	70.00	426.98	36.48
C & E Loss (ft)	0.03	Cum SA (acres)	18.27	92.44	8.33

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 4342.055

INPUT
Description:
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	297.91	7.93	296	17.6	294	27.85	292	29.76	291.65
39.09	290	56.31	288	77.72	286	135.35	282	181.38	281.94
225.4	281.24	233.94	281.2	239.64	281.06	249	281.03	255.26	280.9
271.2	280.73	287.29	280.13	289.66	280	321.6	279.57	348.22	279.44
426.5	278.88	430.24	278.84	439.04	278.77	444.84	278.75	450.31	278.74
451.67	278.73	461.32	278.71	479.45	278.74	490.95	278.75	492.25	278.77
530.64	278.9	560.84	278.74	561.62	278.73	568.8	278.7	577.56	278.67
580.38	278.66	587.14	278.65	595.25	278.63	599.77	278.61	604.41	278.6
606.66	278.59	611.58	278.57	616.62	278.55	620.56	278.54	625.8	278.52
631.18	278.5	635.99	278.48	640.91	278.47	645.28	278.44	648.86	278.43
665.19	278.38	702.12	278.27	704.62	278.26	713.91	278.23	757.62	278.2
760.16	278.19	815.39	278	857.05	277.98	864.2	277.92	865.28	277.91
878.33	277.8	884.4	277.74	905.47	277.57	910.46	277.55	935.37	277.58
955.97	277.75	961.21	277.8	968.35	277.87	984.25	277.99	986.09	278
986.24	277.99	988.37	277.96	991.28	277.9	997.76	277.69	1021.37	277.15
1024.58	277.11	1034.82	277.09	1077.23	276.33	1100.03	276.4	1133.92	276.62
1162.11	276.78	1200.67	277.04	1244.07	277.31	1293.03	277.9	1327.14	277.94
1357.82	277.97	1388.18	278	1398.51	278.05	1409.16	278.12	1442.61	278
1468.73	277.6	1485.94	276.9	1501.49	276.17	1509.48	276	1577.47	276.06
1578.21	276.07	1635.17	277.97	1636.27	278	1647.13	278.83	1655.14	279.78

1656.99	280	1658.99	280.66	1664.8	282.84	1668.61	284	1675.12	285.21		
1679.75	286	1689.53	288	1696.28	289.86	1696.89	290	1698.1	290.63		
1707.6	291.6	1728.6	291.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	321.6	.075	1655.14	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
321.6	1655.14	344.1	365.11	365.46	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	280.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	280.10	Reach Len. (ft)	344.10	365.11	365.46
Crit W.S. (ft)		Flow Area (sq ft)	10.29	3052.68	0.41
E.G. Slope (ft/ft)	0.006443	Area (sq ft)	10.29	3052.68	0.41
Q Total (cfs)	8441.00	Flow (cfs)	9.25	8431.48	0.27
Top Width (ft)	1369.54	Top Width (ft)	33.84	1333.54	2.17
Vel Total (ft/s)	2.76	Avg. Vel. (ft/s)	0.90	2.76	0.65
Max Chl Dpth (ft)	4.10	Hydr. Depth (ft)	0.30	2.29	0.19
Conv. Total (cfs)	105159.1	Conv. (cfs)	115.3	105040.5	3.4
Length Wtd. (ft)	365.05	Wetted Per. (ft)	33.84	1333.73	2.20
Min Ch El (ft)	276.00	Shear (lb/sq ft)	0.12	0.92	0.08
Alpha	1.00	Stream Power (lb/ft s)	0.11	2.54	0.05
Frctn Loss (ft)	3.08	Cum Volume (acre-ft)	69.75	409.09	36.29
C & E Loss (ft)	0.01	Cum SA (acres)	17.69	83.84	8.07

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3976.927

INPUT
Description:
Station Elevation Data num= 91

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	288.37	1.9	288.11	2.68	288.02	2.81	288	17.99	286.47
18.79	286.37	40.6	284.68	47.44	284.21	47.89	284.17	50.96	284
59.39	283.62	59.83	283.59	63.16	283.39	64.69	283.31	72.8	282.8
76.19	282.69	77.57	282.63	86.87	282	102.18	281.42	125.1	280
128.5	279.95	194.15	277.64	201.67	277.58	279.35	276	376.46	275.03
377.4	275.04	382.07	275.03	383.54	275.04	392.79	275.03	409.89	275.11
439.78	275.14	442.5	275.15	457.58	275.2	463.13	275.21	489.47	275.18
494.43	275.17	496.85	275.16	507.74	275.11	510.34	275.1	512.66	275.09
518.73	275.06	520.89	275.05	527.35	275.01	548.31	274.92	550.26	274.91
559.21	274.89	594.52	274.82	616.98	274.76	650.08	274.66	652.1	274.65
656.52	274.63	665.31	274.61	695.8	274.53	704.5	274.52	762.31	274.2
768.34	274.22	776.7	274.15	789.71	274.05	829.23	274	913.08	274.05
916.5	274.09	919.82	274.12	922.17	274.16	1024.5	274.74	1027.38	274.73
1106.84	274.52	1110.37	274.53	1197.53	274.57	1222.91	274.66	1315.6	275.37
1333.82	275.43	1350.44	275.64	1374.32	275.9	1376.51	275.91	1378.38	275.92
1384.91	276	1514.42	276.77	1534.12	278	1535.82	278.25	1540.34	278.66
1550.6	280	1563.3	282.32	1578.6	284.94	1586.47	286	1594.92	288
1599.02	288.54	1607.87	290	1609.43	290.38	1617.34	292	1628.41	294
1641.15	294								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
*********************************************
       0     .06  279.35    .075 1514.42     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        279.35 1514.42           334.85  334.75  343.15             .1       .3
```

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	277.12	Element	Left OB	Channel	Right OB	
Vel Head (ft)	0.18	Wt. n-Val.	0.060	0.075	0.060	
W.S. Elev (ft)	276.95	Reach Len. (ft)	334.85	334.75	343.15	
Crit W.S. (ft)		Flow Area (sq ft)	21.99	2479.45	0.25	
E.G. Slope (ft/ft)	0.011561	Area (sq ft)	21.99	2479.45	0.25	
Q Total (cfs)	8441.00	Flow (cfs)	35.54	8405.33	0.13	
Top Width (ft)	1284.39	Top Width (ft)	46.50	1235.07	2.82	
Vel Total (ft/s)	3.37	Avg. Vel. (ft/s)	1.62	3.39	0.53	
Max Chl Dpth (ft)	2.95	Hydr. Depth (ft)	0.47	2.01	0.09	
Conv. Total (cfs)	78505.1	Conv. (cfs)	330.5	78173.4	1.2	
Length Wtd. (ft)	335.01	Wetted Per. (ft)	46.51	1235.09	2.82	
Min Ch El (ft)	274.00	Shear (lb/sq ft)	0.34	1.45	0.06	
Alpha	1.01	Stream Power (lb/ft s)	0.55	4.91	0.03	
Frctn Loss (ft)	2.75	Cum Volume (acre-ft)	69.63	385.91	36.29	
C & E Loss (ft)	0.02	Cum SA (acres)	17.37	73.07	8.05	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3642.177

INPUT
Description:
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	286.93	10.44	286	65.44	282	99.45	280	146.37	278
174.1	276	182.3	275.34	185.36	275.15	192.4	274.62	202.82	274
213.37	273.69	242.26	272.96	250.5	272.85	251.89	272.82	298.66	272
558.78	271.48	562.24	271.51	567.92	271.55	578.79	271.59	580.97	271.6
586.73	271.61	588.07	271.59	590.12	271.61	664.72	271.44	665.35	271.45
684.38	271.55	709.6	271.7	714.82	271.75	720.76	271.78	733.39	271.87
744.96	272	900	272.018	1001.77	272.03	1008.53	272.08	1012.19	272.11
1015.73	272.14	1023.46	272.21	1030.62	272.27	1143.5	272.54	1145.55	272.53
1146.64	272.54	1148.16	272.53	1149.44	272.54	1156.13	272.55	1166.79	272.58
1170.77	272.59	1174.72	272.6	1175.97	272.59	1185.52	272.61	1187.32	272.6
1237.84	272.51	1241.49	272.49	1243.23	272.48	1247.62	272.46	1258.1	272.42
1330.73	272.07	1336.79	272.1	1360.06	272.19	1361.24	272.2	1391.38	272.26
1434.16	272.38	1435.76	272.37	1460.58	272.41	1462.04	272.39	1510.46	272.3
1511.66	272.29	1526.14	272.3	1572.56	272.03	1610.9	272.04	1623.24	272.05
1683.71	271.96	1693	272	1753.2	300	2388.4	298	2477.39	292

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	298.66	.075	1623.24	.06

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        298.66 1623.24           258.15  290.25  300.25             .1       .3
```

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	274.35	Element	Left OB	Channel	Right OB	
Vel Head (ft)	0.11	Wt. n-Val.	0.060	0.075	0.060	

W.S. Elev (ft)	274.24	Reach Len. (ft)	258.15	290.25	300.25
Crit W.S. (ft)		Flow Area (sq ft)	129.43	2905.70	161.39
E.G. Slope (ft/ft)	*0.006147	Area (sq ft)	129.43	2905.70	161.39
Q Total (cfs)	8441.00	Flow (cfs)	298.74	7620.23	522.03
Top Width (ft)	1498.99	Top Width (ft)	99.84	1324.58	74.57
Vel Total (ft/s)	2.64	Avg. Vel. (ft/s)	2.31	2.62	3.23
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	1.30	2.19	2.16
Conv. Total (cfs)	*107660.7	Conv. (cfs)	3810.3	97192.2	6658.2
Length Wtd. (ft)	289.98	Wetted Per. (ft)	99.87	1324.59	75.07
Min Ch El (ft)	271.44	Shear (lb/sq ft)	0.50	0.84	0.83
Alpha	1.01	Stream Power (lb/ft s)	1.15	2.21	2.67
Frctn Loss (ft)	1.60	Cum Volume (acre-ft)	69.04	365.22	35.65
C & E Loss (ft)	0.00	Cum SA (acres)	16.81	63.24	7.75

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3351.951

INPUT
Description:
Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	285.5	13.31	284	36.12	282	67.29	280	101.62	278
152.47	274	215.42	272.06	217.49	272	228.37	271.69	243.04	271.25
244.01	271.23	252.46	270.96	253.9	270.92	258.75	270.76	269.35	270.57
294.08	270	309.39	269.83	311.81	269.81	312.8	269.8	313.69	269.79
328.44	269.61	344.46	269.41	346.63	269.4	452.88	269.2	454.68	269.19
457.11	269.22	459.78	269.23	464.05	269.24	465.06	269.25	466.19	269.27
506.87	269.35	511.02	269.31	588.81	268.85	608.98	268.89	695.67	268.75
710.2	268.77	744.32	269	745.35	268.99	749.51	269	753	269.02
781.12	269.05	782.52	269.06	790.96	269.09	816.16	269.23	817.27	269.24
883.64	269.76	894.13	270	943	270.54	943.18	270.53	948.39	270.59
954.83	270.65	960.21	270.72	967.81	270.83	1005.28	270.47	1013.24	270.51
1060.38	270.65	1149.48	270.47	1159.35	270.42	1162.8	270.4	1166.46	270.39
1176.11	270.35	1198.61	270.37	1225.58	270	1375.87	271.98	1377.46	272
1378.28	272.16	1387.72	274	1421.83	272.97	1425.19	272.57	1430.32	272
1494	272.531	1637.91	273.73	1640.11	274	1652.81	275.98	1652.95	276
1653.1	276.03	1661.94	278	1667.37	278.98	1673.97	280	1690.83	285.7
1704.02	290	1710.4	291.86	1716	293.65	1720.61	295.06		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	215.42	.075	1494	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
215.42 1494 278.95 313.6 317.15 .1 .3
Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1684.75	1720.61	295.0604	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	272.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.060	0.075	0.060
W.S. Elev (ft)	272.64	Reach Len. (ft)	278.95	313.60	317.15
Crit W.S. (ft)	271.00	Flow Area (sq ft)	5.48	3194.58	0.73
E.G. Slope (ft/ft)	*0.005003	Area (sq ft)	5.48	3194.58	0.73
Q Total (cfs)	8441.00	Flow (cfs)	4.21	8436.60	0.19
Top Width (ft)	1266.85	Top Width (ft)	18.86	1234.74	13.24

* Vel Total (ft/s)	*	2.64	* Avg. Vel. (ft/s)	*	0.77	*	2.64	*	0.25	*
* Max Chl Dpth (ft)	*	3.89	* Hydr. Depth (ft)	*	0.29	*	2.59	*	0.06	*
* Conv. Total (cfs)	*	119333.0	* Conv. (cfs)	*	59.6	*	119270.8	*	2.6	*
* Length Wtd. (ft)	*	313.57	* Wetted Per. (ft)	*	18.87	*	1234.90	*	13.25	*
* Min Ch El (ft)	*	268.75	* Shear (lb/sq ft)	*	0.09	*	0.81	*	0.02	*
* Alpha	*	1.00	* Stream Power (lb/ft s)	*	0.07	*	2.13	*	0.00	*
* Frctn Loss (ft)	*	0.92	* Cum Volume (acre-ft)	*	68.64	*	344.89	*	35.09	*
* C & E Loss (ft)	*	0.01	* Cum SA (acres)	*	16.46	*	54.71	*	7.45	*

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3038.374

INPUT
Description:
Station Elevation Data num= 124

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	283.15	23.75	280.6	28.99	280	30.64	279.9	31.47	279.86
40.77	279.32	69.71	278	105.45	276	132.43	274	141.27	272.9
147.74	272	158.93	270	170.9	268.22	172.22	268	181.13	267.9841
239.5	267.88	241.18	267.89	244.82	267.88	248.69	267.87	250.31	267.86
252.2	267.84	256.99	267.8	260.34	267.75	366.4	266.96	368.26	266.97
404.25	266.99	474.06	267.2	476.12	267.21	479.22	267.22	484.16	267.24
489.28	267.27	512.67	267.38	520.12	267.42	528.01	267.46	529.72	267.47
544.85	267.55	554.29	267.59	595.12	267.72	599.09	267.74	603.25	267.75
611.08	267.74	612.41	267.73	620.29	267.76	643.95	267.87	649.93	267.89
667.11	267.98	671.21	268	795.95	269.67	797.76	269.72	800.86	270
801.18	270.1	801.2	270.11	801.22	270.12	801.26	270.13	801.3	270.15
801.36	270.18	801.44	270.21	801.56	270.26	801.74	270.33	802.07	270.46
802.82	270.77	805.53	271.86	805.87	272	809.04	271.97	809.45	271.88
809.82	271.8	810.16	271.72	812.56	271.03	815.49	270	821.53	268.04
821.64	268	903.39	268.01	915.93	268.09	921.77	268.12	927.41	268.16
1076.9	268.11	1078.49	268.1	1082.49	268.09	1087.93	268.1	1092.79	268.12
1093.81	268.13	1098	268.15	1109.77	268.29	1120.04	268.36	1128.65	268.43
1211.64	270	1257.99	270.03	1258.11	270.06	1260.8	270.66	1265.58	271.73
1266.79	272	1273.52	273.42	1276.11	274	1282.41	273.14	1287.51	272
1291.29	271.2	1297.03	270	1304.52	268.46	1306.74	268	1315.15	268.06
1330.8	268.61	1339.49	268.92	1343.5	269.07	1368.34	270	1390.09	270.81
1390.38	270.85	1398.16	272	1402.95	273.35	1403.08	273.39	1408.84	275.02
1413.11	276.29	1418.64	278	1421.41	279.22	1422.97	280	1423.56	280.29
1426.82	282	1428.65	282.94	1433.52	285.36	1434.87	286	1435.47	286.28
1439.05	288	1439.93	288.39	1443.94	290	1445.57	290.63		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	158.93	.075	1390.38	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
158.93	1390.38	564.83	424.13	403.83	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	*	271.82	* Element	*	Left OB	*	Channel	*	Right OB	*
* Vel Head (ft)	*	0.06	* Wt. n-Val.	*	0.060	*	0.075	*	0.060	*
* W.S. Elev (ft)	*	271.76	* Reach Len. (ft)	*	564.83	*	424.13	*	403.83	*
* Crit W.S. (ft)	*		* Flow Area (sq ft)	*	8.63	*	4221.51	*	2.78	*

* E.G. Slope (ft/ft)	*0.001911	* Area (sq ft)	* 8.63	* 4221.51	* 2.78	*
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 8.48	* 8430.76	* 1.76	*
* Top Width (ft)	* 1219.71	* Top Width (ft)	* 9.83	* 1203.75	* 6.13	*
* Vel Total (ft/s)	* 1.99	* Avg. Vel. (ft/s)	* 0.98	* 2.00	* 0.63	*
* Max Chl Dpth (ft)	* 4.80	* Hydr. Depth (ft)	* 0.88	* 3.51	* 0.45	*
* Conv. Total (cfs)	*193104.5	* Conv. (cfs)	* 193.9	*192870.3	* 40.3	*
* Length Wtd. (ft)	* 426.20	* Wetted Per. (ft)	* 9.98	* 1205.51	* 6.20	*
* Min Ch El (ft)	* 266.96	* Shear (lb/sq ft)	* 0.10	* 0.42	* 0.05	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 0.10	* 0.83	* 0.03	*
* Frctn Loss (ft)	* 0.23	* Cum Volume (acre-ft)	* 68.60	* 318.20	* 35.08	*
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 16.36	* 45.93	* 7.38	*

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 2614.242

INPUT
Description:
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	284.09	23.85	284.05	24	284	32.71	281.46	37.12	280.14
37.62	280	47.64	279.46	51	279.16	54.09	278.96	55.26	278.87
63.3	278.16	65.42	278	79.89	276.77	86.43	276	98.52	274
107.89	272.54	111.74	272	129.37	270	142.22	269.25	155.14	268.63
171.43	268	178.3	267.79	199.43	267.37	205.28	267.35	208.26	267.32
210.28	267.27	215.43	267.23	221.97	267.08	293.19	266.43	314.34	266.11
315.02	266.09	334.04	266	447.35	265.97	451.64	265.76	456.73	265.16
461.02	264.77	462.93	264.56	466.75	264	604.172	64.2839	805.55	264.7
810.36	264.98	817.1	265.47	824.36	266	840.46	265.66	841.2	265.54
841.52	265.48	844.52	264.99	848.09	264.41	850.62	264	878.3	264.06
884.81	264.27	887.07	264.34	893.2	264.54	904.81	264.99	906.98	265.07
919.83	265.59	930.39	266	1221.37	266.45	1252.77	266.55	1255.58	266.56
1291.4	266.8	1296.66	266.82	1300.32	266.84	1358.35	267.05	1363.83	267.08
1437.45	267.14	1476.36	268	1513.81	267.97	1515.66	267.58	1515.69	267.57
1517.8	267.11	1518.45	266.96	1522.24	266	1525.79	264.43	1526.72	264
1534.45	263.52	1536.74	264	1537.23	264.1	1539.45	264.41	1539.74	264.39
1541.6	264.52	1543.19	264.64	1543.7	264.59	1544.9	264.73	1545.99	264.6
1550.98	264.79	1555.8	265.46	1559.37	266	1564.27	266.15	1565.13	266.16
1573.36	266.41	1584.82	266.74	1596.82	267.06	1601.45	267.12	1609.78	267.32
1612.16	267.38	1655.9	268	1661.55	268.01	1672	269.6	1674.38	269.99
1685.18	271.97	1685.89	272.08	1686.48	272.18	1697.66	274	1700.19	274.39
1711.5	276	1747.89	282	1752.11	282.64	1759.72	284	1770.23	285.58
1772.04	286	1797.04	286.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	215.43	.075	1661.55	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
215.43	1661.55	566.01	580.32	596.25	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 271.57	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.02	* Wt. n-Val.	* 0.060	* 0.075	* 0.060	*
* W.S. Elev (ft)	* 271.56	* Reach Len. (ft)	* 566.01	* 580.32	* 596.25	*
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 299.49	* 8211.64	* 39.70	*
* E.G. Slope (ft/ft)	*0.000249	* Area (sq ft)	* 299.49	* 8211.64	* 39.70	*

* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 243.48	* 8174.28	* 23.24	*
* Top Width (ft)	* 1567.32	* Top Width (ft)	* 99.81	* 1446.12	* 21.39	*
* Vel Total (ft/s)	* 0.99	* Avg. Vel. (ft/s)	* 0.81	* 1.00	* 0.59	*
* Max Chl Dpth (ft)	* 8.04	* Hydr. Depth (ft)	* 3.00	* 5.68	* 1.86	*
* Conv. Total (cfs)	*534412.6	* Conv. (cfs)	* 15415.1	*517526.2	* 1471.3	*
* Length Wtd. (ft)	* 580.14	* Wetted Per. (ft)	* 99.95	* 1447.36	* 21.68	*
* Min Ch El (ft)	* 263.52	* Shear (lb/sq ft)	* 0.05	* 0.09	* 0.03	*
* Alpha	* 1.01	* Stream Power (lb/ft s)	* 0.04	* 0.09	* 0.02	*
* Frctn Loss (ft)	* 0.10	* Cum Volume (acre-ft)	* 66.60	* 257.67	* 34.88	*
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 15.65	* 33.03	* 7.25	*

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 2033.954

INPUT
Description:
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	275.6	4.15	275.02	13.53	274.18	13.67	274.17	14.6	274.06
15.46	274	35.67	272.86	43.13	272.28	45.9	272.27	46.88	272
48.91	271.74	53.93	271.19	60	270.627	66.77	270	67.21	269.97
89.55	268	114.16	266	128	265.583	180.49	264	500	263.196
583	262.987	621.76	262.89	632.77	262.26	637.19	262	667.3	262.05
677.53	262.49	678.87	262.57	715.02	263.35	745.29	264	848.74	263.31
976.36	264	1166.66	263.5	1167.98	263.37	1170.01	262.93	1172.3	262.78
1173.66	262.58	1174.34	262.52	1177.25	262.37	1177.7	262.33	1181.67	262
1198.55	262.92	1204.15	263.34	1213.03	264	1242.62	264.36	1264.45	264.51
1278.97	264.85	1284.69	264.92	1291.21	265.08	1298.05	265.16	1300.1	265.19
1312.36	265.49	1320.28	265.6	1322.69	265.67	1323.15	265.68	1332.87	266
1338.99	266.61	1339.21	266.64	1339.45	266.67	1349.62	268	1364.42	267.24
1365.99	266.75	1368.33	266	1374.53	264.1	1374.8	264	1375.74	263.71
1381.41	262	1385.36	260.8	1388.05	260	1393.64	260.1	1399.81	262
1404.21	263.38	1406.39	264	1409.3	264.15	1412.15	264.3	1413.94	264.4
1417.55	264.59	1430.01	265.27	1437.46	265.61	1445.96	266	1455.18	267.57
1456.54	267.82	1457.47	268	1458.91	268.44	1464.34	270	1465.62	270.41
1472.2	272.35	1476.79	274	1480.29	275.59	1481.4	276	1549.68	276

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	128	.075	1465.62	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
128	1465.62	314.82	169.14	136.17	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	178		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 271.48	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.01	* Wt. n-Val.	*	* 0.075	* 0.060
* W.S. Elev (ft)	* 271.46	* Reach Len. (ft)	* 314.82	* 169.14	* 136.17
* Crit W.S. (ft)	*	* Flow Area (sq ft)	*	* 9926.62	* 1.89
* E.G. Slope (ft/ft)	*0.000121	* Area (sq ft)	* 255.93	*10258.38	* 1.89
* Q Total (cfs)	* 8441.00	* Flow (cfs)	*	* 8440.67	* 0.33
* Top Width (ft)	* 1417.77	* Top Width (ft)	* 76.57	* 1337.62	* 3.58
* Vel Total (ft/s)	* 0.85	* Avg. Vel. (ft/s)	*	* 0.85	* 0.17
* Max Chl Dpth (ft)	* 11.46	* Hydr. Depth (ft)	*	* 7.71	* 0.53

* Conv. Total (cfs)	*766487.3	* Conv. (cfs)	*	*766457.6	* 29.6	*
* Length Wtd. (ft)	* 169.07	* Wetted Per. (ft)	*	* 1290.24	* 3.73	*
* Min Ch El (ft)	* 260.00	* Shear (lb/sq ft)	*	* 0.06	* 0.00	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	*	* 0.05	* 0.00	*
* Frctn Loss (ft)	* 0.02	* Cum Volume (acre-ft)	* 62.99	* 134.64	* 34.60	*
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 14.51	* 14.49	* 7.08	*

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1864

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	279	84	270	104.5	268	138.5	266	180	264
384.4	263	733.4	264	766.6	262	875.1	262	897	261
925.4	262	1320	264	1404.6	264	1432.4	260	1452.4	260
1463.1	262	1488.4	264	1514.5	266	1532	270	1550	276
1606.2	276								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	384.4	.075	1514.5	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
384.4	1514.5	303.12	145.5	135.57	.1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	521	278.548	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 271.45	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.02	* Wt. n-Val.	*	* 0.075	* 0.060 *
* W.S. Elev (ft)	* 271.44	* Reach Len. (ft)	* 303.12	* 145.50	* 135.57 *
* Crit W.S. (ft)	* 264.27	* Flow Area (sq ft)	*	* 8390.69	* 63.24 *
* E.G. Slope (ft/ft)	*0.000149	* Area (sq ft)	* 2099.90	* 9516.45	* 63.24 *
* Q Total (cfs)	* 8441.00	* Flow (cfs)	*	* 8402.95	* 38.05 *
* Top Width (ft)	* 1465.72	* Top Width (ft)	* 313.81	* 1130.10	* 21.81 *
* Vel Total (ft/s)	* 1.00	* Avg. Vel. (ft/s)	*	* 1.00	* 0.60 *
* Max Chl Dpth (ft)	* 11.44	* Hydr. Depth (ft)	*	* 8.45	* 2.90 *
* Conv. Total (cfs)	*692202.3	* Conv. (cfs)	*	*689082.4	* 3119.9 *
* Length Wtd. (ft)	* 145.37	* Wetted Per. (ft)	*	* 994.23	* 22.50 *
* Min Ch El (ft)	* 260.00	* Shear (lb/sq ft)	*	* 0.08	* 0.03 *
* Alpha	* 1.00	* Stream Power (lb/ft s)	*	* 0.08	* 0.02 *
* Frctn Loss (ft)	* 0.03	* Cum Volume (acre-ft)	* 54.48	* 96.24	* 34.50 *
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 13.10	* 9.70	* 7.04 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1717

INPUT

Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	281.4	44.3	280	164.31	264	208.61	263.4	391.59	264
398	264	414.12	264	440.08	262	601.4	262	929.55	264
939.9	264.3	950	264	968.47	262	986.36	260	1008.6	262
1163.82	262	1180.74	258	1200.55	262	1214.96	264	1222.63	264.689
1237.23	266	1249.12	268	1274.3	276	1307.01	276		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	398	.075	1222.63	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
398 1222.63 130 115.1 115.1 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	607	282	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	271.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.		0.075	0.060
W.S. Elev (ft)	271.38	Reach Len. (ft)	130.00	115.10	115.10
Crit W.S. (ft)	264.30	Flow Area (sq ft)		5468.36	158.36
E.G. Slope (ft/ft)	0.000317	Area (sq ft)	1998.51	7371.52	158.36
Q Total (cfs)	8441.00	Flow (cfs)		8259.87	181.13
Top Width (ft)	1150.86	Top Width (ft)	289.08	824.63	37.14
Vel Total (ft/s)	1.50	Avg. Vel. (ft/s)		1.51	1.14
Max Chl Dpth (ft)	13.38	Hydr. Depth (ft)		8.88	4.26
Conv. Total (cfs)	474167.8	Conv. (cfs)		463992.8	10174.9
Length Wtd. (ft)	115.10	Wetted Per. (ft)		616.99	37.89
Min Ch El (ft)	258.00	Shear (lb/sq ft)		0.18	0.08
Alpha	1.00	Stream Power (lb/ft s)		0.26	0.09
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	40.22	68.04	34.15
C & E Loss (ft)	0.01	Cum SA (acres)	11.00	6.43	6.95

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1690

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	275.6	33.3	274	46.8	272	65.7	270	138.6	266
402.5	264	797.5	264	928.3	264	953.7	260	995.5	258
999.9	257.4	1004.9	258	1021.8	262	1044.3	266	1070.3	270
1081.3	272	1093.3	276						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	402.5	.075	1044.3	.06

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

```
        402.5  1044.3              165   131.9   131.9             .3       .5
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
       0     722                F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
```

E.G. Elev (ft)	271.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.075	0.060
W.S. Elev (ft)	271.20	Reach Len. (ft)	165.00	131.90	131.90
Crit W.S. (ft)		Flow Area (sq ft)		2706.64	87.11
E.G. Slope (ft/ft)	*0.001406	Area (sq ft)	1875.68	5006.51	87.11
Q Total (cfs)	8441.00	Flow (cfs)		8286.51	154.49
Top Width (ft)	1022.52	Top Width (ft)	348.12	641.80	32.59
Vel Total (ft/s)	3.02	Avg. Vel. (ft/s)		3.06	1.77
Max Chl Dpth (ft)	13.80	Hydr. Depth (ft)		8.40	2.67
Conv. Total (cfs)	*225099.0	Conv. (cfs)		*220979.3	4119.7
Length Wtd. (ft)	132.80	Wetted Per. (ft)		323.56	33.00
Min Ch El (ft)	257.40	Shear (lb/sq ft)		0.73	0.23
Alpha	1.01	Stream Power (lb/ft s)		2.25	0.41
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	34.44	51.69	33.83
C & E Loss (ft)	0.12	Cum SA (acres)	10.05	4.49	6.85

```
CROSS SECTION


RIVER: HRC
REACH: Main               RS: 1630

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0  274.45    33.4     272    80.4     266   455.4   264.3   576.4     264
     808     264     824     256   862.7  255.09   869.2  255.11   882.4  261.86
   906.1  262.81   918.8   262.7     930  265.42   936.8  268.24   945.5  271.59
   954.3  273.15  1008.2     276

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
       0     .04     808     .04   882.4     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          808   882.4             27.6    27.6    27.6             .3       .5
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
       0   790.6                F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
```

E.G. Elev (ft)	271.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	270.54	Reach Len. (ft)	27.60	27.60	27.60
Crit W.S. (ft)		Flow Area (sq ft)	113.77	1008.33	397.92
E.G. Slope (ft/ft)	*0.000960	Area (sq ft)	4388.82	1008.33	397.92
Q Total (cfs)	8441.00	Flow (cfs)	457.87	6396.41	1586.72
Top Width (ft)	897.92	Top Width (ft)	763.15	74.40	60.37
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	4.02	6.34	3.99
Max Chl Dpth (ft)	15.45	Hydr. Depth (ft)	6.54	13.55	6.59
Conv. Total (cfs)	*272447.1	Conv. (cfs)	14778.6	*206454.5	51214.0
Length Wtd. (ft)	27.60	Wetted Per. (ft)	17.40	77.93	61.70
Min Ch El (ft)	255.09	Shear (lb/sq ft)	0.39	0.78	0.39
Alpha	1.11	Stream Power (lb/ft s)	1.58	4.92	1.54
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	22.58	42.58	33.09

* C & E Loss (ft)	* 0.08	* Cum SA (acres)	* 7.94	* 3.41	* 6.71	*

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1530

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	274.06	53.1	276.46	102.8	278.26	161.1	280.06	217.3	281.26
283.1	282.1	345.6	282.26	409.2	281.96	519.8	280.96	527	280
542	270	556	256	582.12	255.19	616.9	255.19	626.3	255.19
658	256	692	279	797.6	278.36	913.5	277.66		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	556	.04	658	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
556	658	128.1	128.1	128.1	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	545		F
670	913.5		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 270.97	* Element	* Left OB	* Channel	* Right OB	*
* Vel Head (ft)	* 0.37	* Wt. n-Val.	* 0.040	* 0.040	* 0.040	*
* W.S. Elev (ft)	* 270.60	* Reach Len. (ft)	* 7.30	* 7.30	* 7.30	*
* Crit W.S. (ft)	* 261.33	* Flow Area (sq ft)	* 100.14	* 1548.80	* 126.54	*
* E.G. Slope (ft/ft)	*0.000479	* Area (sq ft)	* 106.73	* 1548.80	* 157.64	*
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 281.84	* 7722.69	* 436.47	*
* Top Width (ft)	* 138.49	* Top Width (ft)	* 14.91	* 102.00	* 21.59	*
* Vel Total (ft/s)	* 4.75	* Avg. Vel. (ft/s)	* 2.81	* 4.99	* 3.45	*
* Max Chl Dpth (ft)	* 15.41	* Hydr. Depth (ft)	* 9.10	* 15.18	* 10.55	*
* Conv. Total (cfs)	*385554.3	* Conv. (cfs)	* 12873.4	*352744.5	* 19936.5	*
* Length Wtd. (ft)	* 7.30	* Wetted Per. (ft)	* 15.56	* 102.02	* 14.49	*
* Min Ch El (ft)	* 255.19	* Shear (lb/sq ft)	* 0.19	* 0.45	* 0.26	*
* Alpha	* 1.05	* Stream Power (lb/ft s)	* 0.54	* 2.27	* 0.90	*
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	* 21.15	* 41.77	* 32.92	*
* C & E Loss (ft)	*	* Cum SA (acres)	* 7.70	* 3.35	* 6.69	*

BRIDGE

RIVER: HRC
REACH: Main RS: 1463.580

INPUT
Description:
Distance from Upstream XS = 7.3
Deck/Roadway Width = 111
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 15

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	274.06	53.1	276.46	102.8	278.26
161.1	280.06	217.3	281.26	283.1	282.1

```
   345.6  282.26           409.2  281.96       0   519.8  280.96   273.9
   553.5  280.66   273.7   559.5   280.6   273.6   670.6  279.56  272.56
   680.6  279.46   272.5   797.6  278.36       0   913.5  277.66

Upstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  274.06    53.1  276.46   102.8  278.26   161.1  280.06   217.3  281.26
   283.1   282.1   345.6  282.26   409.2  281.96   519.8  280.96     527     280
     542     270     556     256  582.12  255.19   616.9  255.19   626.3  255.19
     658     256     692     279   797.6  278.36   913.5  277.66

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
       0     .04     556     .04     658     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
           556     658             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     545               F
     670   913.5               F

Downstream  Deck/Roadway Coordinates
    num=      16
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**********************************************************************************
       0   271.4              99   275.6             205  279.66
   264.9  281.26           276.7  281.46           315.9  282.06
   361.2  282.46           413.7  282.46       0     481  281.86   274.4
   547.4  281.16  274.16   566.9     281     274   664.8  280.02  273.02
   672.8  279.86  272.86   757.6  278.96   272.4     843  278.16       0
   902.2  277.96

Downstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0   271.4      99   275.6     205  279.66   264.9  281.26   276.7  281.46
   315.9  282.06   361.2  282.46   413.7  282.46     481  281.86     513     280
     552     256   564.5  255.3    601.6   255.3   626.6  254.57     669     256
     702     278   757.6  278.96     843  278.16   902.2  277.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
       0     .04     552     .04     669     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
           552     669             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     535               F
     680   902.2               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= 575 Downstream= 589
Upstream num= 2

Width	Elev	Width	Elev
1.25	250	1.25	274

Downstream num= 2

Width	Elev	Width	Elev
1.25	250	1.25	274

Pier Data
Pier Station Upstream= 623 Downstream= 633
Upstream num= 2

Width	Elev	Width	Elev
1.25	250	1.25	274

Downstream num= 2

Width	Elev	Width	Elev
1.25	250	1.25	274

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 1.2
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

BRIDGE OUTPUT Profile #PDC-Q100PR

E.G. US. (ft)	270.97	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	270.60	E.G. Elev (ft)	270.95	269.68
Q Total (cfs)	8441.00	W.S. Elev (ft)	270.58	269.35
Q Bridge (cfs)	8441.00	Crit W.S. (ft)	261.41	260.74
Q Weir (cfs)		Max Chl Dpth (ft)	15.39	14.78
Weir Sta Lft (ft)		Vel Total (ft/s)	4.87	4.54
Weir Sta Rgt (ft)		Flow Area (sq ft)	1734.45	1858.37
Weir Submerg		Froude # Chl	0.22	0.22
Weir Max Depth (ft)		Specif Force (cu ft)	13921.20	13751.50
Min El Weir Flow (ft)	279.79	Hydr Depth (ft)	14.16	13.04
Min El Prs (ft)	273.80	W.P. Total (ft)	190.69	204.97
Delta EG (ft)	1.30	Conv. Total (cfs)	282047.5	301416.6
Delta WS (ft)	1.25	Top Width (ft)	135.93	156.23
BR Open Area (sq ft)	2049.39	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.87	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.51	0.44
Br Sel Method	Momentum	Power Total (lb/ft s)	2.48	2.02

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1430

INPUT

Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	271.4	99	275.6	205	279.66	264.9	281.26	276.7	281.46
315.9	282.06	361.2	282.46	413.7	282.46	481	281.86	513	280
552	256	564.5	255.3	601.6	255.3	626.6	254.57	669	256
702	278	757.6	278.96	843	278.16	902.2	277.96		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	552	.04	669	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
552 669 155.55 155.55 155.55 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	535		F
680	902.2		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	269.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.32	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	269.35	Reach Len. (ft)	155.55	155.55	155.55
Crit W.S. (ft)		Flow Area (sq ft)	138.03	1649.28	106.52
E.G. Slope (ft/ft)	0.000464	Area (sq ft)	144.81	1649.28	133.67
Q Total (cfs)	8441.00	Flow (cfs)	400.84	7697.64	342.52
Top Width (ft)	158.72	Top Width (ft)	21.69	117.00	20.03
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)	2.90	4.67	3.22
Max Chl Dpth (ft)	14.78	Hydr. Depth (ft)	8.12	14.10	9.68
Conv. Total (cfs)	391925.6	Conv. (cfs)	18611.7	357410.3	15903.6
Length Wtd. (ft)	155.55	Wetted Per. (ft)	19.96	117.05	13.22
Min Ch El (ft)	254.57	Shear (lb/sq ft)	0.20	0.41	0.23
Alpha	1.04	Stream Power (lb/ft s)	0.58	1.90	0.75
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	20.78	37.17	32.49
C & E Loss (ft)	0.14	Cum SA (acres)	7.64	3.04	6.63

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1200

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	271.3	123	276.3	194	270	234	265.5	258.32	264
268.2	264	385.34	264.3	475.09	264	495.75	256	511.29	256
531.43	260	651	259.5	694	275	851.66	276.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	475.09	.075	531.43	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
475.09 531.43 270 307.25 329 .1 .3
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent

0	432.9	F
591.43	851.66	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	269.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	268.60	Reach Len. (ft)	270.00	307.25	329.00
Crit W.S. (ft)		Flow Area (sq ft)	190.92	586.72	523.27
E.G. Slope (ft/ft)	0.002928	Area (sq ft)	1101.29	586.72	1172.43
Q Total (cfs)	8441.00	Flow (cfs)	1049.94	2934.47	4456.59
Top Width (ft)	469.75	Top Width (ft)	268.61	56.34	144.80
Vel Total (ft/s)	6.49	Avg. Vel. (ft/s)	5.50	5.00	8.52
Max Chl Dpth (ft)	12.60	Hydr. Depth (ft)	4.53	10.41	8.72
Conv. Total (cfs)	155989.3	Conv. (cfs)	19402.9	54228.8	82357.6
Length Wtd. (ft)	311.29	Wetted Per. (ft)	42.19	58.23	60.00
Min Ch El (ft)	256.00	Shear (lb/sq ft)	0.83	1.84	1.59
Alpha	1.21	Stream Power (lb/ft s)	4.55	9.21	13.58
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)	18.56	33.18	30.16
C & E Loss (ft)	0.10	Cum SA (acres)	7.13	2.73	6.33

CROSS SECTION

RIVER: HRC
REACH: Main RS: 988

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.4	41	268	134.32	264.2	244.2	264.1	328	264
338.93	263.62	359.66	260.74	374.81	250.71	380.52	250.55	397.8	259.2
423.34	261.45	452.45	262	506.1	263.9	532.9	274	545.4	274
555.7	269	751.7	269	762.12	274	968.5	276.6		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	359.66	.075	397.8	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
359.66	397.8	197.03	197.03	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	268.2		F
532.9	968.5		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	268.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	268.01	Reach Len. (ft)	197.03	197.03	197.03
Crit W.S. (ft)		Flow Area (sq ft)	404.69	512.44	673.46
E.G. Slope (ft/ft)	0.002402	Area (sq ft)	1101.92	512.44	673.46
Q Total (cfs)	8441.00	Flow (cfs)	1982.94	2587.92	3870.14
Top Width (ft)	476.23	Top Width (ft)	318.88	38.14	119.21
Vel Total (ft/s)	5.31	Avg. Vel. (ft/s)	4.90	5.05	5.75
Max Chl Dpth (ft)	17.46	Hydr. Depth (ft)	4.42	13.44	5.65
Conv. Total (cfs)	172222.6	Conv. (cfs)	40458.2	52801.6	78962.9
Length Wtd. (ft)	197.03	Wetted Per. (ft)	91.67	43.21	120.10
Min Ch El (ft)	250.55	Shear (lb/sq ft)	0.66	1.78	0.84
Alpha	1.02	Stream Power (lb/ft s)	3.24	8.98	4.83
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	11.73	29.30	23.19
C & E Loss (ft)	0.02	Cum SA (acres)	5.30	2.40	5.33

CROSS SECTION

RIVER: HRC
REACH: Main RS: 632

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.57	33.04	266	314.61	266	356.71	266	395.31	251.7
423.91	251.2	439.81	260	493.41	262	604.61	274		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	356.71	.075	439.81	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
356.71	439.81	78.3	78.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	314.6		F
552.31	604.61		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	267.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	267.39	Reach Len. (ft)	78.30	78.30	78.30
Crit W.S. (ft)		Flow Area (sq ft)	58.55	973.01	477.14
E.G. Slope (ft/ft)	0.003279	Area (sq ft)	456.98	973.01	477.14
Q Total (cfs)	8441.00	Flow (cfs)	155.13	5481.24	2804.63
Top Width (ft)	520.37	Top Width (ft)	333.72	83.10	103.55
Vel Total (ft/s)	5.59	Avg. Vel. (ft/s)	2.65	5.63	5.88
Max Chl Dpth (ft)	16.19	Hydr. Depth (ft)	1.39	11.71	4.61
Conv. Total (cfs)	147407.5	Conv. (cfs)	2709.1	95720.5	48978.0
Length Wtd. (ft)	78.30	Wetted Per. (ft)	42.11	87.94	103.88
Min Ch El (ft)	251.20	Shear (lb/sq ft)	0.28	2.27	0.94
Alpha	1.03	Stream Power (lb/ft s)	0.75	12.76	5.53
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	8.20	25.94	20.58
C & E Loss (ft)	0.08	Cum SA (acres)	3.83	2.12	4.83

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 627.1

INPUT
Description: Widened SR-76
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.56	30.4	270.18	81.4	269.46	130.9	268.69	186	268.01
243.9	267.38	286.9	267.28	336.9	267.34	386.4	267.39	392.7	262.54
418.4	252.41	469.5	251.76	493.4	265.81	526.4	266.97	576.4	266.97
625.2	266.56	677	266.11	728.7	266.2	779.9	266.8	832.79	267.77
878.7	269.03	930.7	269.84	1152.6	273.75				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	386.4	.04	526.4	.04

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

386.4	526.4	121.4	121.4	121.4	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	391.7	267.37	F
491	1152.6	267.37	F

Skew Angle = 40

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	267.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.		0.040	
W.S. Elev (ft)	266.86	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)	260.48	Flow Area (sq ft)		1188.91	
E.G. Slope (ft/ft)	0.001435	Area (sq ft)		1216.99	87.52
Q Total (cfs)	8441.00	Flow (cfs)		8441.00	
Top Width (ft)	329.85	Top Width (ft)		136.18	193.67
Vel Total (ft/s)	7.10	Avg. Vel. (ft/s)		7.10	
Max Chl Dpth (ft)	15.10	Hydr. Depth (ft)		11.97	
Conv. Total (cfs)	222799.5	Conv. (cfs)		222799.5	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		104.93	
Min Ch El (ft)	251.76	Shear (lb/sq ft)		1.02	
Alpha	1.00	Stream Power (lb/ft s)		7.21	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	7.79	23.97	20.08
C & E Loss (ft)	0.07	Cum SA (acres)	3.53	1.93	4.56

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

BRIDGE

RIVER: HRC
REACH: Main RS: 561.3247

INPUT
Description:
Distance from Upstream XS = 1
Deck/Roadway Width = 119.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 23

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	270.56		30.4	270.18		81.4	269.46	
130.9	268.69		186	268.01		243.9	267.38	
286.9	267.28		336.9	267.34		386.4	267.39	
386.4	270.26	0	392.7	270.2	265.99	490	269.94	265.73
526.4	269.81	0	526.4	266.97		576.4	266.97	
625.2	266.56		677	266.11		728.7	266.2	
779.9	266.8		832.79	267.77		878.7	269.03	
930.7	269.84		1152.6	273.75				

Upstream Bridge Cross Section Data
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.56	30.4	270.18	81.4	269.46	130.9	268.69	186	268.01

```
   243.9  267.38   286.9  267.28   336.9  267.34   386.4  267.39   392.7  262.54
   418.4  252.41   469.5  251.76   493.4  265.81   526.4  266.97   576.4  266.97
   625.2  266.56     677  266.11   728.7   266.2   779.9   266.8  832.79  267.77
   878.7  269.03   930.7  269.84  1152.6  273.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04   386.4     .04   526.4     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
         386.4   526.4            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   391.7  267.37       F
     491  1152.6  267.37       F
Skew Angle = 40

Downstream  Deck/Roadway Coordinates
    num=      24
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*******************************************************************************
       0  267.86           37.39  267.86           89.94  267.79
  143.44   267.6          195.52  267.43          248.21   267.3
   300.7  267.37          352.18  267.25          402.26  267.19
  451.32  266.99          451.32  269.65       0  471.02  269.59  265.25
   572.2  269.29  264.94  592.18  269.23       0  592.18  266.61
  665.39   266.4          714.75  266.18           765.9  266.31
  816.75  266.64          849.42   266.8          898.88  267.35
  948.16  267.82           998.2  268.31         1152.04     270

Downstream Bridge Cross Section Data
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0  267.86   37.39  267.86   89.94  267.79  143.44   267.6  195.52  267.43
  248.21   267.3   300.7  267.37  352.18  267.25  402.26  267.19   453.2  265.82
   471.9  261.12  499.39  252.23  544.85  252.67  592.62  266.32  665.39   266.4
  714.75  266.18   765.9  266.31  816.75  266.64  849.42   266.8  898.88  267.35
  948.16  267.82   998.2  268.31 1152.04     270

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0     .04  402.26     .04  592.62     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
         402.26  592.62           .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  470.02  267.37       F
   573.2 1152.04  267.37       F
Skew Angle = 40

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=  423.14    Downstream=  500.85
Upstream     num=       2
```

```
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267

Pier Data
Pier Station     Upstream=  455.86    Downstream=  533.56
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     1.5     250     1.5     267

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
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

BRIDGE OUTPUT  Profile #PDC-Q100PR
*************************************************************************************************
* E.G. US. (ft)          *     267.64  * Element               *Inside BR US *Inside BR DS *
* W.S. US. (ft)          *     266.86  * E.G. Elev (ft)        *     267.57  *     266.62  *
* Q Total (cfs)          *    8441.00  * W.S. Elev (ft)        *     266.56  *     265.53  *
* Q Bridge (cfs)         *    8441.00  * Crit W.S. (ft)        *     260.73  *     260.97  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *      14.80  *      13.30  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *       8.08  *       8.39  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)     *    1044.12  *    1005.83  *
* Weir Submerg           *             * Froude # Chl          *       0.42  *       0.45  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)  *    9217.88  *    8164.94  *
* Min El Weir Flow (ft)  *     267.38  * Hydr Depth (ft)       *             *             *
* Min El Prs (ft)        *     265.99  * W.P. Total (ft)       *     254.27  *     258.57  *
* Delta EG (ft)          *       1.12  * Conv. Total (cfs)     *    99463.0  *    92419.0  *
* Delta WS (ft)          *       1.24  * Top Width (ft)        *             *             *
* BR Open Area (sq ft)   *    1005.83  * Frctn Loss (ft)       *       0.93  *       0.00  *
* BR Open Vel (ft/s)     *       8.39  * C & E Loss (ft)       *       0.02  *       0.09  *
* Coef of Q              *             * Shear Total (lb/sq ft) *      1.85  *       2.03  *
* Br Sel Method          *Energy only  * Power Total (lb/ft s)  *     14.93  *      17.00  *
*************************************************************************************************

Note:    Momentum answer is not valid if the water surface is above the low chord or if there is weir
         flow.  The momentum answer has been disregarded.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

CROSS SECTION
```

RIVER: HRC
REACH: Main RS: 472

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.86	37.39	267.86	89.94	267.79	143.44	267.6	195.52	267.43
248.21	267.3	300.7	267.37	352.18	267.25	402.26	267.19	453.2	265.82
471.9	261.12	499.39	252.23	544.85	252.67	592.62	266.32	665.39	266.4
714.75	266.18	765.9	266.31	816.75	266.64	849.42	266.8	898.88	267.35
948.16	267.82	998.2	268.31	1152.04	270				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	402.26	.04	592.62	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
402.26 592.62 104.13 104.13 104.13 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	470.02	267.37	F
573.2	1152.04	267.37	F

Skew Angle = 40

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	266.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.91	Wt. n-Val.		0.040	
W.S. Elev (ft)	265.62	Reach Len. (ft)	104.13	104.13	104.13
Crit W.S. (ft)	260.77	Flow Area (sq ft)		1104.76	
E.G. Slope (ft/ft)	*0.001853	Area (sq ft)		1178.12	
Q Total (cfs)	8441.00	Flow (cfs)		8441.00	
Top Width (ft)	136.16	Top Width (ft)		136.16	
Vel Total (ft/s)	7.64	Avg. Vel. (ft/s)		7.64	
Max Chl Dpth (ft)	13.39	Hydr. Depth (ft)		10.71	
Conv. Total (cfs)	*196088.9	Conv. (cfs)		*196088.9	
Length Wtd. (ft)	104.13	Wetted Per. (ft)		105.78	
Min Ch El (ft)	252.23	Shear (lb/sq ft)		1.21	
Alpha	1.00	Stream Power (lb/ft s)		9.23	
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	7.79	21.11	20.08
C & E Loss (ft)	0.10	Cum SA (acres)	3.53	1.92	4.56

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 200

INPUT
Description: (Alternative #1 is filled in w/in east IE flow area)
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	266	54.4	263.3	180.89	263.15	344.76	262	447.22	261.5
526.58	262	537.83	262	567.42	260	600.76	251.91	615.28	251.91
638.59	258	689.52	260	730.83	260	796.92	262	817.74	262

```
  839.96     260  874.14     260 1071.81     262 1116.03     265 1141.53     268

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  567.42    .075  638.59     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        567.42  638.59            234.6   234.6   234.6             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   542.6                F
   664.4 1141.53                F
```

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	266.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.23	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	264.85	Reach Len. (ft)	234.60	234.60	234.60
Crit W.S. (ft)		Flow Area (sq ft)	99.55	715.08	163.71
E.G. Slope (ft/ft)	0.007885	Area (sq ft)	1312.05	715.08	1884.18
Q Total (cfs)	8441.00	Flow (cfs)	827.75	5763.72	1849.53
Top Width (ft)	1090.64	Top Width (ft)	544.24	71.17	475.23
Vel Total (ft/s)	8.63	Avg. Vel. (ft/s)	8.31	8.06	11.30
Max Chl Dpth (ft)	12.94	Hydr. Depth (ft)	4.01	10.05	6.34
Conv. Total (cfs)	95058.1	Conv. (cfs)	9321.7	64908.0	20828.4
Length Wtd. (ft)	234.60	Wetted Per. (ft)	24.88	72.92	25.83
Min Ch El (ft)	251.91	Shear (lb/sq ft)	1.97	4.83	3.12
Alpha	1.06	Stream Power (lb/ft s)	16.38	38.91	35.25
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)	6.22	18.85	17.82
C & E Loss (ft)	0.22	Cum SA (acres)	2.88	1.67	3.99

```
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 167

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
   182.7     270   467.3     268   511.7   267.8   525.5   262.3  546.96     262
  620.83  261.16  631.87  260.83   634.7   255.7   642.7  251.95  659.89  250.62
   675.7     250   678.9  252.55  703.99  258.94  709.82     260  735.01     260
  808.58   257.6  964.55   259.1 1011.84     260 1060.99     262 1081.52     264
 1145.94     294

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   182.7     .04  631.87    .075  703.99     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        631.87  703.99            140.01     192  236.01             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   182.7  555.79     275        F
```

807.37 1145.94 285.913 F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	264.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	264.23	Reach Len. (ft)	140.01	192.00	236.01
Crit W.S. (ft)	261.06	Flow Area (sq ft)	211.63	797.34	526.19
E.G. Slope (ft/ft)	*0.003257	Area (sq ft)	281.21	797.34	1857.73
Q Total (cfs)	8441.00	Flow (cfs)	887.31	4255.77	3297.92
Top Width (ft)	561.37	Top Width (ft)	111.22	72.12	378.03
Vel Total (ft/s)	5.50	Avg. Vel. (ft/s)	4.19	5.34	6.27
Max Chl Dpth (ft)	14.23	Hydr. Depth (ft)	2.78	11.06	5.09
Conv. Total (cfs)	*147909.0	Conv. (cfs)	15548.1	74572.5	57788.3
Length Wtd. (ft)	201.03	Wetted Per. (ft)	76.09	77.74	103.51
Min Ch El (ft)	250.00	Shear (lb/sq ft)	0.57	2.09	1.03
Alpha	1.04	Stream Power (lb/ft s)	2.37	11.13	6.48
Frctn Loss (ft)	0.76	Cum Volume (acre-ft)	1.93	14.78	7.75
C & E Loss (ft)	0.01	Cum SA (acres)	1.11	1.29	1.70

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 120

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
123.5	270	542.7	266	555.1	261.6	589.08	261.5	634.1	262
646.38	262	654.25	260	662.5	256	667.63	252	684.13	248.33
706.52	252	735.98	256	767.44	258	806.53	262	924.31	282.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
123.5	.04	662.5	.075	735.98	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
662.5	735.98	309.76	309.76	.3	.5

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	263.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	263.33	Reach Len. (ft)	309.76	309.76	309.76
Crit W.S. (ft)		Flow Area (sq ft)	214.80	834.92	334.62
E.G. Slope (ft/ft)	*0.004438	Area (sq ft)	214.80	834.92	334.62
Q Total (cfs)	8441.00	Flow (cfs)	812.03	5453.75	2175.22
Top Width (ft)	263.97	Top Width (ft)	112.28	73.48	78.21
Vel Total (ft/s)	6.10	Avg. Vel. (ft/s)	3.78	6.53	6.50
Max Chl Dpth (ft)	15.00	Hydr. Depth (ft)	1.91	11.36	4.28
Conv. Total (cfs)	*126713.9	Conv. (cfs)	12189.9	81870.1	32653.8
Length Wtd. (ft)	309.76	Wetted Per. (ft)	113.75	75.83	78.59
Min Ch El (ft)	248.33	Shear (lb/sq ft)	0.52	3.05	1.18
Alpha	1.07	Stream Power (lb/ft s)	1.98	19.93	7.67
Frctn Loss (ft)	1.60	Cum Volume (acre-ft)	1.14	11.18	1.81
C & E Loss (ft)	0.11	Cum SA (acres)	0.75	0.97	0.46

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 114.5

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	205.62	263.85	225.15	256.99	243.36	250.98	253.88	245.58
266.09	245.87	273.18	246.98	279.2	245.96	281.72	245.8	290.38	246.77
302.95	250.32	308.46	255.46	316.46	256.72	321.04	261.6	335.98	264.3
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	225.15	.075	308.46	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
225.15	308.46	6.21	6.21	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	225	264	F
315	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	262.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.98	Wt. n-Val.	0.040	0.075	0.040
W.S. Elev (ft)	261.27	Reach Len. (ft)	6.21	6.21	6.21
Crit W.S. (ft)	255.62	Flow Area (sq ft)	0.64	1028.02	34.62
E.G. Slope (ft/ft)	0.006049	Area (sq ft)	26.06	1028.02	51.14
Q Total (cfs)	8441.00	Flow (cfs)	4.65	8135.02	301.32
Top Width (ft)	107.76	Top Width (ft)	12.18	83.31	12.27
Vel Total (ft/s)	7.94	Avg. Vel. (ft/s)	7.29	7.91	8.70
Max Chl Dpth (ft)	15.69	Hydr. Depth (ft)	4.25	12.34	5.29
Conv. Total (cfs)	108531.4	Conv. (cfs)	59.8	104597.3	3874.3
Length Wtd. (ft)	6.21	Wetted Per. (ft)	0.16	88.33	6.62
Min Ch El (ft)	245.58	Shear (lb/sq ft)	1.52	4.39	1.97
Alpha	1.00	Stream Power (lb/ft s)	11.05	34.78	17.19
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.28	4.56	0.44
C & E Loss (ft)	0.01	Cum SA (acres)	0.31	0.41	0.14

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 114

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	205.62	263.85	225.15	256.99	243.36	250.98	253.88	245.58
266.09	245.87	273.18	246.98	279.2	245.96	281.72	245.8	290.38	246.77

```
  302.95  250.32  308.46  255.46  316.46  256.72  321.04   261.6  335.98   264.3
  400.51   263.9

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  225.15     .04  308.46     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        225.15  308.46            46.67   46.67   46.67             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     225     264       F
     315  400.51     264       F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*************************************************************************************************
* E.G. Elev (ft)          *  262.22  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    1.00  * Wt. n-Val.             *   0.040  *   0.040  *   0.040  *
* W.S. Elev (ft)          *  261.22  * Reach Len. (ft)        *    1.70  *    1.70  *    1.70  *
* Crit W.S. (ft)          *  255.62  * Flow Area (sq ft)      *    0.63  * 1024.13  *   34.31  *
* E.G. Slope (ft/ft)      *0.001804  * Area (sq ft)           *   25.49  * 1024.13  *   50.56  *
* Q Total (cfs)           * 8441.00  * Flow (cfs)             *    2.49  * 8276.38  *  162.12  *
* Top Width (ft)          *  107.58  * Top Width (ft)         *   12.05  *   83.31  *   12.23  *
* Vel Total (ft/s)        *    7.97  * Avg. Vel. (ft/s)       *    3.95  *    8.08  *    4.72  *
* Max Chl Dpth (ft)       *   15.64  * Hydr. Depth (ft)       *    4.21  *   12.29  *    5.25  *
* Conv. Total (cfs)       *198760.9  * Conv. (cfs)            *    58.7  *194884.6  *  3817.5  *
* Length Wtd. (ft)        *    1.70  * Wetted Per. (ft)       *    0.16  *   88.33  *    6.62  *
* Min Ch El (ft)          *  245.58  * Shear (lb/sq ft)       *    0.45  *    1.31  *    0.58  *
* Alpha                   *    1.01  * Stream Power (lb/ft s) *    1.77  *   10.55  *    2.76  *
* Frctn Loss (ft)         *    0.00  * Cum Volume (acre-ft)   *    0.28  *    4.41  *    0.43  *
* C & E Loss (ft)         *    0.04  * Cum SA (acres)         *    0.31  *    0.40  *    0.14  *
*************************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

BRIDGE


RIVER: HRC
REACH: Main               RS: 112

INPUT
Description: Pankey Rd (South) bridge
Distance from Upstream XS =     1.7
Deck/Roadway Width        =      42
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************************************
       0     264          205.62  263.85           209.7   264.1
   209.7  266.87          222.93  266.89       0   225.13  266.88  262.87
  260.35  266.81  262.79  262.93   266.8 262.785   291.6  266.77  262.73
  292.92  266.77  262.73     321  266.74  262.74  323.25  266.74       0
  336.02  266.68          336.02  264.07          400.51   263.9

Upstream Bridge Cross Section Data
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*************************************************************************************
       0     264  205.62  263.85  225.15  256.99  243.36  250.98  253.88  245.58
  266.09  245.87  273.18  246.98   279.2  245.96  281.72   245.8  290.38  246.77
  302.95  250.32  308.46  255.46  316.46  256.72  321.04   261.6  335.98   264.3
```

```
  400.51   263.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  225.15     .04  308.46     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
        225.15  308.46             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     225     264       F
     315  400.51     264       F

Downstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************************************
       0  265.19          188.32  264.32          211.26  264.14
  228.01  263.99          228.01  266.87       0  243.32  266.85  262.85
  273.89  266.81  262.81  301.36  266.78  262.75  313.03  266.76  262.73
  331.22  266.74 262.723  339.13  266.73  262.72  354.37  266.72       0
  354.37  263.77           357.8     264          400.51   263.9

Downstream Bridge Cross Section Data
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0  265.19  188.31  264.32  218.36     264  235.52  262.44  243.32  258.91
  253.34  253.29  261.19  247.45  276.73     246   299.2  245.74  306.91  247.48
  316.55  253.65  324.36  255.37  338.49  260.73  353.93  263.77   357.8     264
  400.51   263.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  243.32     .04  324.36     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
        243.32  324.36             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     250     264       F
     330  400.51     264       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 =     .95
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 =  3

Pier Data
Pier Station     Upstream=   242.2    Downstream=     266
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
      1.5     245     1.5     265
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
      1.5     245     1.5     265

Pier Data
```

Pier Station Upstream= 270.2 Downstream= 294
Upstream num= 2

Width	Elev	Width	Elev
1.5	245	1.5	265

Downstream num= 2

Width	Elev	Width	Elev
1.5	245	1.5	265

Pier Data
Pier Station Upstream= 298.2 Downstream= 322
Upstream num= 2

Width	Elev	Width	Elev
1.5	245	1.5	265

Downstream num= 2

Width	Elev	Width	Elev
1.5	245	1.5	265

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 1.2
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

BRIDGE OUTPUT Profile #PDC-Q100PR

E.G. US. (ft)	262.22	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	261.22	E.G. Elev (ft)	262.18	261.81
Q Total (cfs)	8441.00	W.S. Elev (ft)	261.04	260.26
Q Bridge (cfs)	8441.00	Crit W.S. (ft)	255.93	256.15
Q Weir (cfs)		Max Chl Dpth (ft)	15.46	14.52
Weir Sta Lft (ft)		Vel Total (ft/s)	8.54	9.96
Weir Sta Rgt (ft)		Flow Area (sq ft)	988.15	847.14
Weir Submerg		Froude # Chl	0.44	0.51
Weir Max Depth (ft)		Specif Force (cu ft)	8578.55	7876.51
Min El Weir Flow (ft)	264.01	Hydr Depth (ft)	11.57	11.22
Min El Prs (ft)	262.87	W.P. Total (ft)	166.95	146.80
Delta EG (ft)	0.51	Conv. Total (cfs)	122168.7	101609.6
Delta WS (ft)	0.89	Top Width (ft)	90.90	89.66
BR Open Area (sq ft)	1036.95	Frctn Loss (ft)	0.24	0.01
BR Open Vel (ft/s)	9.96	C & E Loss (ft)	0.12	0.08
Coef of Q		Shear Total (lb/sq ft)	1.76	2.49
Br Sel Method	Energy only	Power Total (lb/ft s)	15.07	24.77

Warning: For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy. This is not physically possible, the momentum answer has been disregarded.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,

energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 110

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48
316.55	253.65	324.36	255.37	338.49	260.73	353.93	263.77	357.8	264
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	243.32	.04	324.36	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
243.32	324.36	6.21	6.21	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	250	264	F
330	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	261.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.38	Wt. n-Val.		0.040	0.040
W.S. Elev (ft)	260.34	Reach Len. (ft)	6.21	6.21	6.21
Crit W.S. (ft)	255.86	Flow Area (sq ft)		880.70	21.97
E.G. Slope (ft/ft)	*0.002613	Area (sq ft)	2.25	902.73	32.50
Q Total (cfs)	8441.00	Flow (cfs)		8342.23	98.77
Top Width (ft)	97.28	Top Width (ft)	3.15	81.04	13.09
Vel Total (ft/s)	9.35	Avg. Vel. (ft/s)		9.47	4.50
Max Chl Dpth (ft)	14.60	Hydr. Depth (ft)		11.84	3.90
Conv. Total (cfs)	*165143.7	Conv. (cfs)		*163211.3	1932.4
Length Wtd. (ft)	6.21	Wetted Per. (ft)		79.04	6.03
Min Ch El (ft)	245.74	Shear (lb/sq ft)		1.82	0.59
Alpha	1.02	Stream Power (lb/ft s)		17.21	2.67
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.27	3.44	0.39
C & E Loss (ft)	0.01	Cum SA (acres)	0.31	0.31	0.12

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 109.5

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48

```
  316.55  253.65  324.36  255.37  338.49  260.73  353.93  263.77   357.8     264
  400.51   263.9

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04  243.32    .075  324.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        243.32  324.36           108.78  108.78  108.78             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     250     264       F
     330  400.51     264       F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*************************************************************************************************
* E.G. Elev (ft)          *  261.68  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    1.36  * Wt. n-Val.             *          *   0.075  *   0.040  *
* W.S. Elev (ft)          *  260.32  * Reach Len. (ft)        *  108.78  *  108.78  *  108.78  *
* Crit W.S. (ft)          *  255.88  * Flow Area (sq ft)      *          *  879.26  *   21.86  *
* E.G. Slope (ft/ft)      *0.009051  * Area (sq ft)           *    2.19  *  901.17  *   32.25  *
* Q Total (cfs)           * 8441.00  * Flow (cfs)             *          * 8258.67  *  182.33  *
* Top Width (ft)          *   97.19  * Top Width (ft)         *    3.11  *   81.04  *   13.04  *
* Vel Total (ft/s)        *    9.37  * Avg. Vel. (ft/s)       *          *    9.39  *    8.34  *
* Max Chl Dpth (ft)       *   14.58  * Hydr. Depth (ft)       *          *   11.82  *    3.88  *
* Conv. Total (cfs)       * 88726.8  * Conv. (cfs)            *          * 86810.3  *  1916.5  *
* Length Wtd. (ft)        *  108.78  * Wetted Per. (ft)       *          *   79.04  *    6.03  *
* Min Ch El (ft)          *  245.74  * Shear (lb/sq ft)       *          *    6.29  *    2.05  *
* Alpha                   *    1.00  * Stream Power (lb/ft s) *          *   59.04  *   17.08  *
* Frctn Loss (ft)         *    0.38  * Cum Volume (acre-ft)   *    0.27  *    3.31  *    0.38  *
* C & E Loss (ft)         *    0.56  * Cum SA (acres)         *    0.31  *    0.30  *    0.12  *
*************************************************************************************************

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 100

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0   260.6    51.9     260   217.5   259.3     253     258   298.3     246
   350.3     246   414.9     256  457.71   256.7  482.34     258  494.31     260
  503.41     261

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04     253    .075   414.9     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           253   414.9                 0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*************************************************************************************************
* E.G. Elev (ft)          *  260.74  * Element                *  Left OB *  Channel * Right OB *
```

Vel Head (ft)	0.24	Wt. n-Val.	0.040	0.075	0.040	
W.S. Elev (ft)	260.50	Reach Len. (ft)				
Crit W.S. (ft)	253.31	Flow Area (sq ft)	217.25	1752.75	274.34	
E.G. Slope (ft/ft)	0.001814	Area (sq ft)	217.25	1752.75	274.34	
Q Total (cfs)	8441.00	Flow (cfs)	317.78	7169.24	953.98	
Top Width (ft)	490.21	Top Width (ft)	244.35	161.90	83.96	
Vel Total (ft/s)	3.76	Avg. Vel. (ft/s)	1.46	4.09	3.48	
Max Chl Dpth (ft)	14.50	Hydr. Depth (ft)	0.89	10.83	3.27	
Conv. Total (cfs)	198190.6	Conv. (cfs)	7461.4	168330.3	22398.9	
Length Wtd. (ft)		Wetted Per. (ft)	244.38	164.23	84.19	
Min Ch El (ft)	246.00	Shear (lb/sq ft)	0.10	1.21	0.37	
Alpha	1.11	Stream Power (lb/ft s)	0.15	4.94	1.28	
Frctn Loss (ft)		Cum Volume (acre-ft)				
C & E Loss (ft)		Cum SA (acres)				

SUMMARY OF MANNING'S N VALUES

River:HRC

Reach	River Sta.	n1	n2	n3
Main	5608.249	.06	.075	.06
Main	5000.613	.06	.075	.06
Main	4634.388	.06	.075	.06
Main	4342.055	.06	.075	.06
Main	3976.927	.06	.075	.06
Main	3642.177	.06	.075	.06
Main	3351.951	.06	.075	.06
Main	3038.374	.06	.075	.06
Main	2614.242	.06	.075	.06
Main	2033.954	.06	.075	.06
Main	1864	.06	.075	.06
Main	1717	.06	.075	.06
Main	1690	.06	.075	.06
Main	1630	.04	.04	.04
Main	1530	.04	.04	.04
Main	1463.580	Bridge		
Main	1430	.04	.04	.04
Main	1200	.04	.075	.04
Main	988	.04	.075	.04
Main	632	.04	.075	.04
Main	627.1	.04	.04	.04
Main	561.3247	Bridge		
Main	472	.04	.04	.04
Main	200	.04	.075	.04
Main	167	.04	.075	.04
Main	120	.04	.075	.04
Main	114.5	.04	.075	.04
Main	114	.04	.04	.04
Main	112	Bridge		
Main	110	.04	.04	.04
Main	109.5	.04	.075	.04
Main	100	.04	.075	.04

SUMMARY OF REACH LENGTHS

River: HRC

Reach	River Sta.	Left	Channel	Right
Main	5608.249	386.82	607.68	624.69

*Main	*	5000.613	* 325.2*	366.24*	367.74*
*Main	*	4634.388	* 279.85*	292.35*	293*
*Main	*	4342.055	* 344.1*	365.11*	365.46*
*Main	*	3976.927	* 334.85*	334.75*	343.15*
*Main	*	3642.177	* 258.15*	290.25*	300.25*
*Main	*	3351.951	* 278.95*	313.6*	317.15*
*Main	*	3038.374	* 564.83*	424.13*	403.83*
*Main	*	2614.242	* 566.01*	580.32*	596.25*
*Main	*	2033.954	* 314.82*	169.14*	136.17*
*Main	*	1864	* 303.12*	145.5*	135.57*
*Main	*	1717	* 130*	115.1*	115.1*
*Main	*	1690	* 165*	131.9*	131.9*
*Main	*	1630	* 27.6*	27.6*	27.6*
*Main	*	1530	* 128.1*	128.1*	128.1*
*Main	*	1463.580	*Bridge *	*	*
*Main	*	1430	* 155.55*	155.55*	155.55*
*Main	*	1200	* 270*	307.25*	329*
*Main	*	988	* 197.03*	197.03*	197.03*
*Main	*	632	* 78.3*	78.3*	78.3*
*Main	*	627.1	* 121.4*	121.4*	121.4*
*Main	*	561.3247	*Bridge *	*	*
*Main	*	472	* 104.13*	104.13*	104.13*
*Main	*	200	* 234.6*	234.6*	234.6*
*Main	*	167	* 140.01*	192*	236.01*
*Main	*	120	* 309.76*	309.76*	309.76*
*Main	*	114.5	* 6.21*	6.21*	6.21*
*Main	*	114	* 46.67*	46.67*	46.67*
*Main	*	112	*Bridge *	*	*
*Main	*	110	* 6.21*	6.21*	6.21*
*Main	*	109.5	* 108.78*	108.78*	108.78*
*Main	*	100	* 0*	0*	0*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: HRC

Reach	River Sta.	Contr.	Expan.
*Main	* 5608.249*	.1*	.3*
*Main	* 5000.613*	.1*	.3*
*Main	* 4634.388*	.1*	.3*
*Main	* 4342.055*	.1*	.3*
*Main	* 3976.927*	.1*	.3*
*Main	* 3642.177*	.1*	.3*
*Main	* 3351.951*	.1*	.3*
*Main	* 3038.374*	.1*	.3*
*Main	* 2614.242*	.1*	.3*
*Main	* 2033.954*	.1*	.3*
*Main	* 1864 *	.1*	.3*
*Main	* 1717 *	.1*	.3*
*Main	* 1690 *	.3*	.5*
*Main	* 1630 *	.3*	.5*
*Main	* 1530 *	.3*	.5*
*Main	* 1463.580*Bridge *	*	
*Main	* 1430 *	.3*	.5*
*Main	* 1200 *	.1*	.3*
*Main	* 988 *	.3*	.5*
*Main	* 632 *	.3*	.5*
*Main	* 627.1 *	.3*	.5*
*Main	* 561.3247*Bridge *	*	
*Main	* 472 *	.3*	.5*
*Main	* 200 *	.1*	.3*
*Main	* 167 *	.1*	.3*
*Main	* 120 *	.3*	.5*

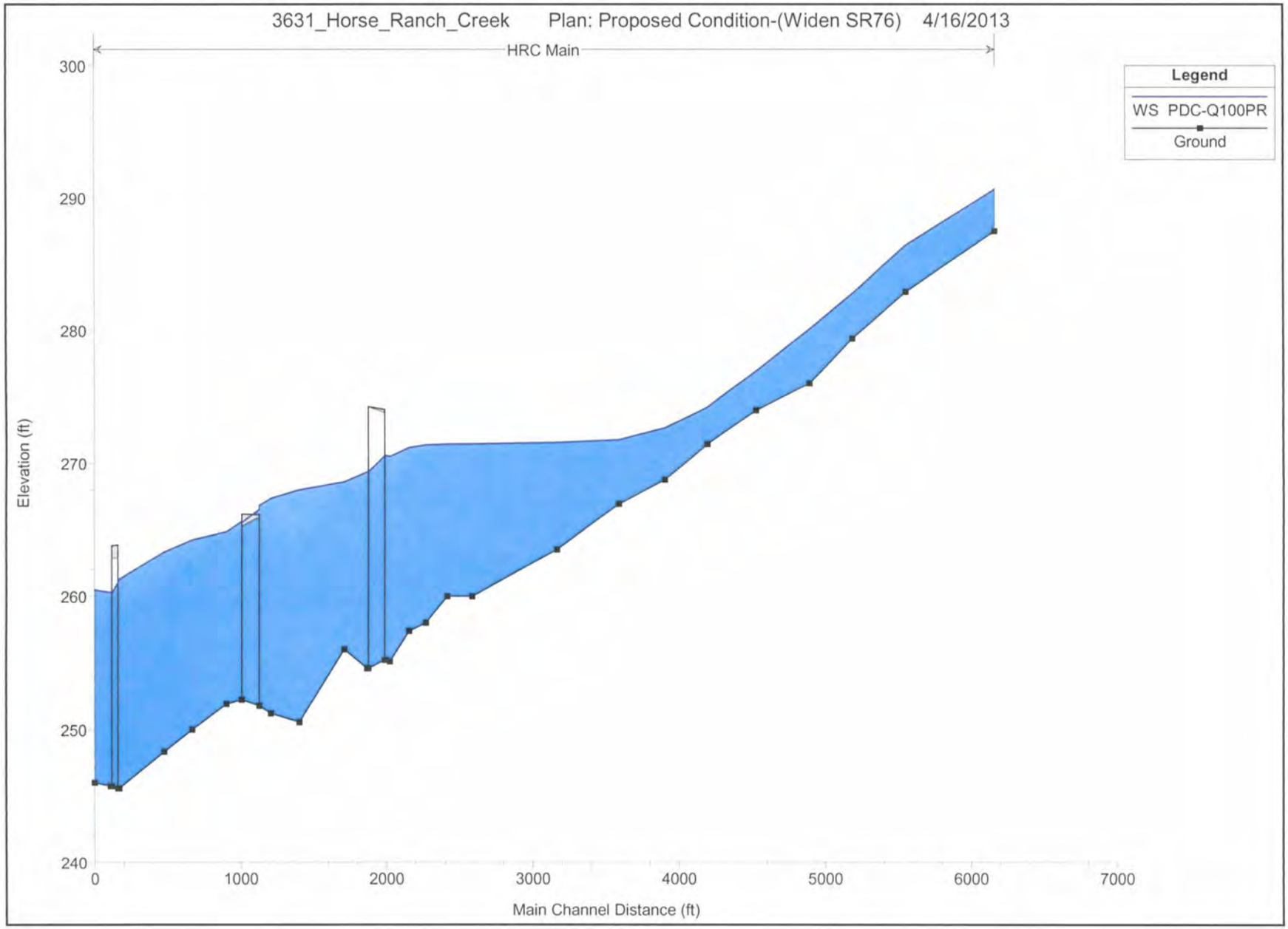
```
*Main           *    114.5   *       .3*       .5*
*Main           *    114     *       .3*       .5*
*Main           *    112     *Bridge   *         *
*Main           *    110     *       .3*       .5*
*Main           *    109.5   *       .3*       .5*
*Main           *    100     *       .1*       .3*
*********************************************************
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	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	5608.249	PDC-Q100PR	8441.00	287.48	290.66	289.41	290.79	0.007034	2.95	2875.55	1474.89	0.34
Main	5000.613	PDC-Q100PR	8441.00	282.91	286.44	285.07	286.57	0.006954	2.90	2961.26	1651.38	0.34
Main	4634.388	PDC-Q100PR	8441.00	279.38	282.78	282.02	282.98	0.014750	3.63	2357.99	1454.07	0.47
Main	4342.055	PDC-Q100PR	8441.00	276.00	280.10		280.22	0.006443	2.76	3063.38	1369.54	0.32
Main	3976.927	PDC-Q100PR	8441.00	274.00	276.95		277.12	0.011561	3.39	2501.68	1284.39	0.42
Main	3642.177	PDC-Q100PR	8441.00	271.44	274.24		274.35	0.006147	2.62	3196.53	1498.99	0.31
Main	3351.951	PDC-Q100PR	8441.00	268.75	272.64	271.00	272.75	0.005003	2.64	3200.79	1266.85	0.29
Main	3038.374	PDC-Q100PR	8441.00	266.96	271.76		271.82	0.001911	2.00	4232.92	1219.71	0.19
Main	2614.242	PDC-Q100PR	8441.00	263.52	271.56		271.57	0.000249	1.00	8550.83	1567.32	0.07
Main	2033.954	PDC-Q100PR	8441.00	260.00	271.46		271.48	0.000121	0.85	9928.50	1417.77	0.05
Main	1864	PDC-Q100PR	8441.00	260.00	271.44	264.27	271.45	0.000149	1.00	8453.94	1465.72	0.06
Main	1717	PDC-Q100PR	8441.00	258.00	271.38	264.30	271.42	0.000317	1.51	5626.72	1150.86	0.09
Main	1690	PDC-Q100PR	8441.00	257.40	271.20		271.34	0.001406	3.06	2793.75	1022.52	0.19
Main	1630	PDC-Q100PR	8441.00	255.09	270.54		271.07	0.000960	6.34	1520.03	897.92	0.30
Main	1530	PDC-Q100PR	8441.00	255.19	270.60	261.33	270.97	0.000479	4.99	1775.48	138.49	0.23
Main	1463.580 Pankey Road		Bridge									
Main	1430	PDC-Q100PR	8441.00	254.57	269.35		269.67	0.000464	4.67	1893.83	158.72	0.22
Main	1200	PDC-Q100PR	8441.00	256.00	268.60		269.38	0.002928	5.00	1300.90	469.75	0.27
Main	988	PDC-Q100PR	8441.00	250.55	268.01		268.46	0.002402	5.05	1590.59	476.23	0.24
Main	632	PDC-Q100PR	8441.00	251.20	267.39		267.89	0.003279	5.63	1508.70	520.37	0.29
Main	627.1	PDC-Q100PR	8441.00	251.76	266.86	260.48	267.64	0.001435	7.10	1188.91	329.85	0.36
Main	561.3247 SR-76		Bridge									
Main	472	PDC-Q100PR	8441.00	252.23	265.62	260.77	266.52	0.001853	7.64	1104.76	136.16	0.41
Main	200	PDC-Q100PR	8441.00	251.91	264.85		266.08	0.007885	8.06	978.35	1090.64	0.45
Main	167	PDC-Q100PR	8441.00	250.00	264.23	261.06	264.72	0.003257	5.34	1535.16	561.37	0.28
Main	120	PDC-Q100PR	8441.00	248.33	263.33		263.95	0.004438	6.53	1384.33	263.97	0.34
Main	114.5	PDC-Q100PR	8441.00	245.58	261.27	255.62	262.25	0.006049	7.91	1063.28	107.76	0.40
Main	114	PDC-Q100PR	8441.00	245.58	261.22	255.62	262.22	0.001804	8.08	1059.07	107.58	0.41
Main	112		Bridge									
Main	110	PDC-Q100PR	8441.00	245.74	260.34	255.86	261.72	0.002613	9.47	902.67	97.28	0.49
Main	109.5	PDC-Q100PR	8441.00	245.74	260.32	255.88	261.68	0.009051	9.39	901.13	97.19	0.48
Main	100	PDC-Q100PR	8441.00	246.00	260.50	253.31	260.74	0.001814	4.09	2244.34	490.21	0.22

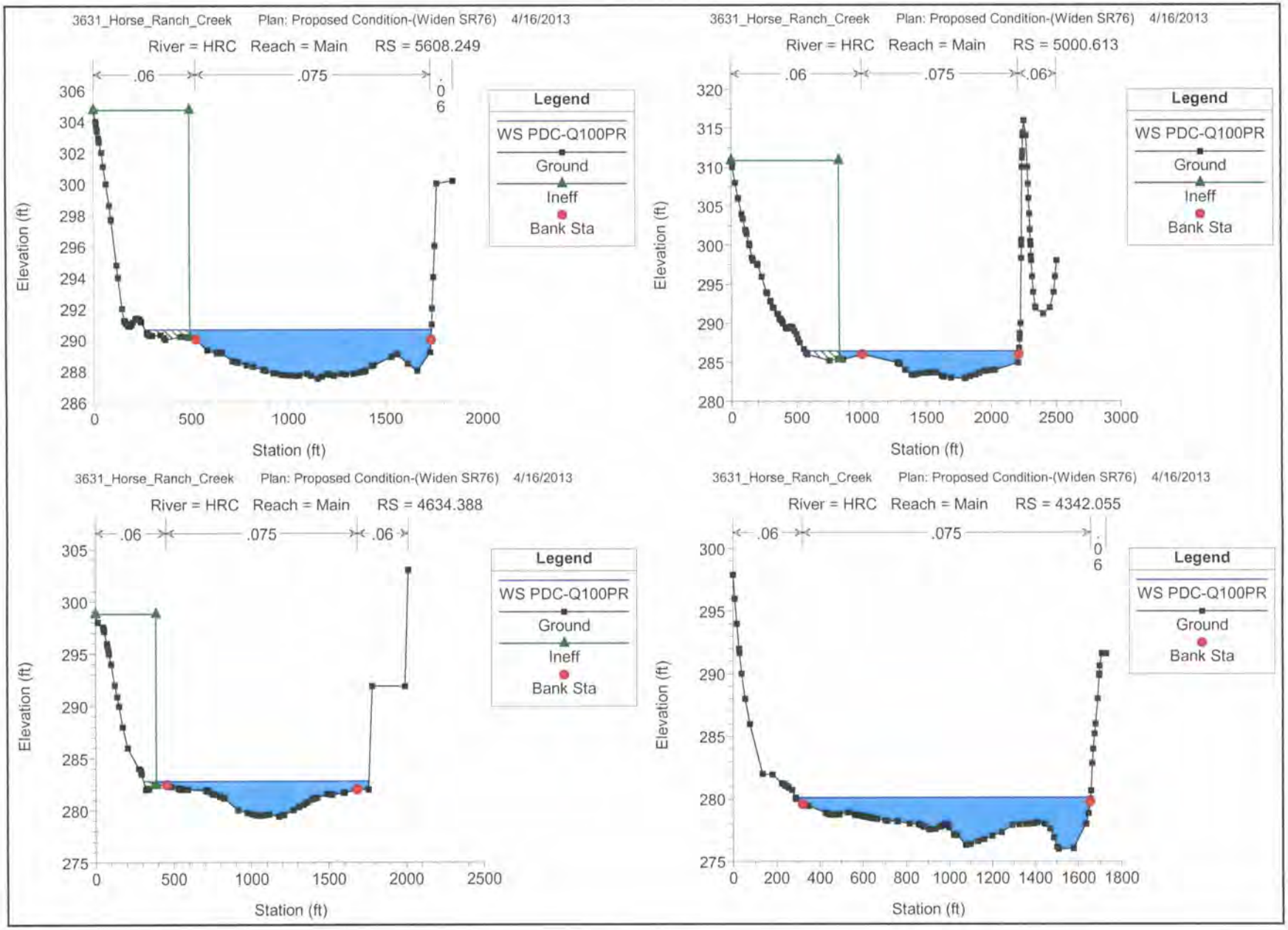
APPENDIX 6

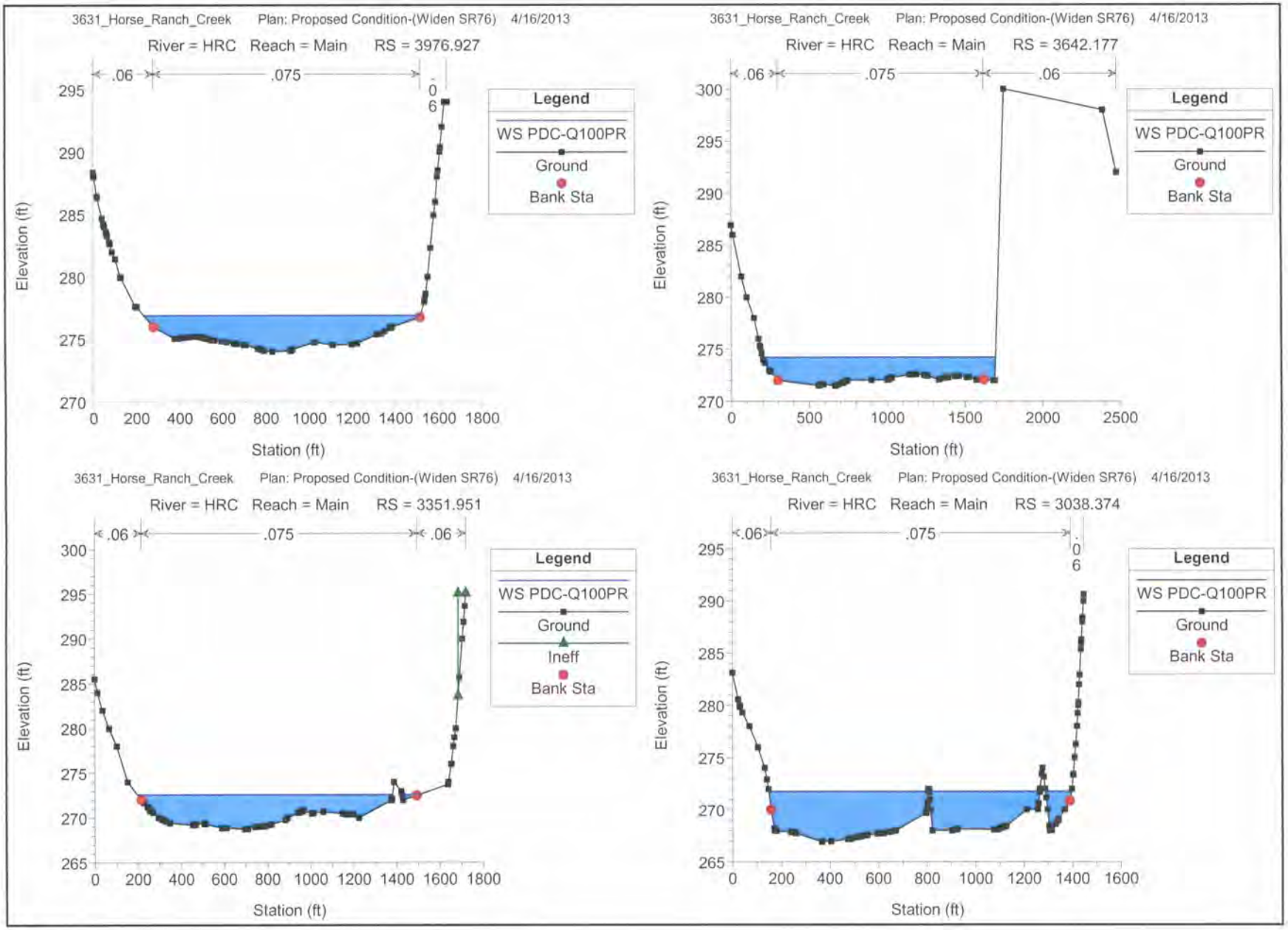
Proposed Conditions HEC-RAS Cross Sections and Results

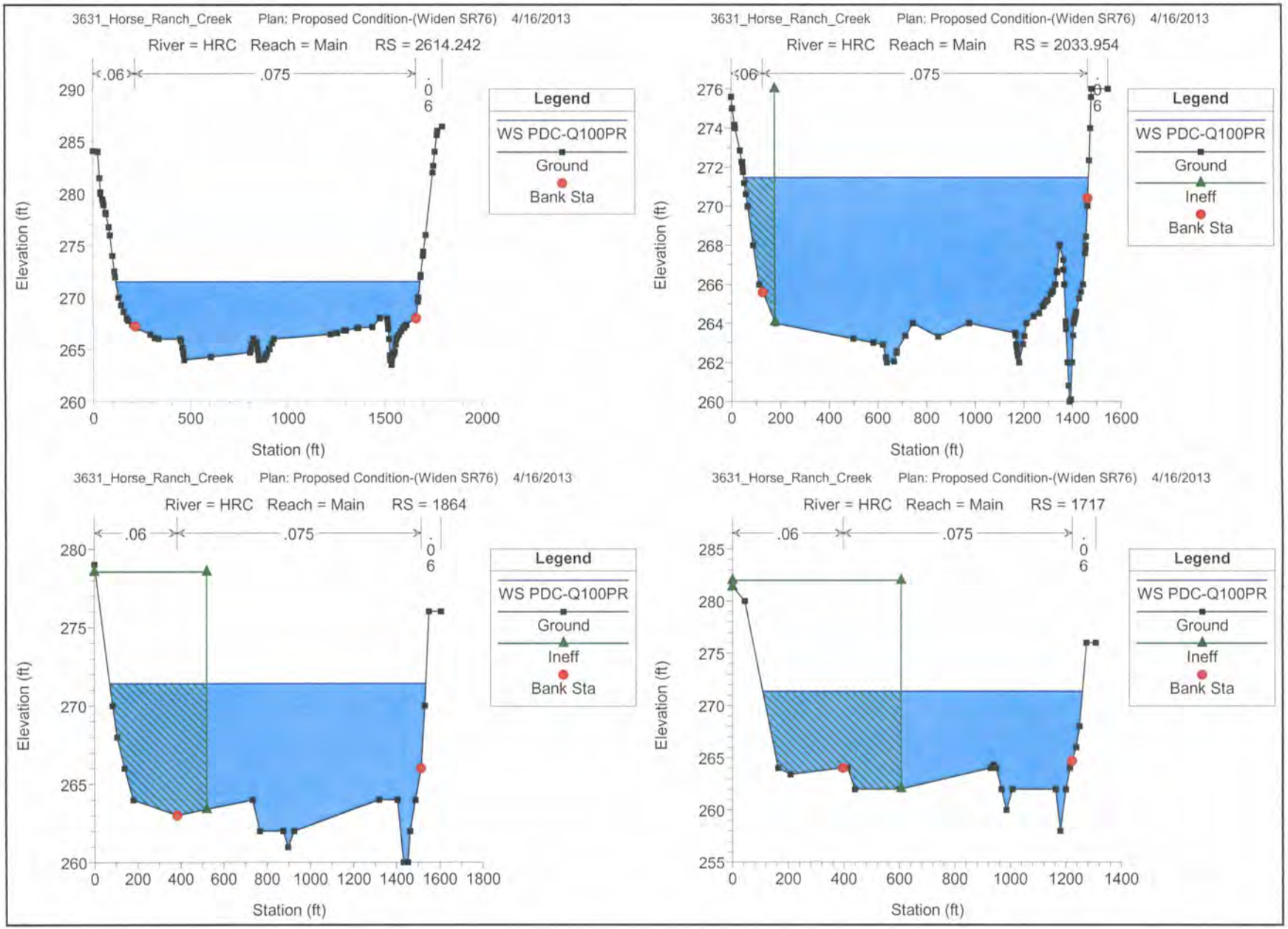

3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
HRC Main
Legend
WS PDC-Q100PR
Ground
Elevation (ft)
300
290
280
270
260
250
240
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

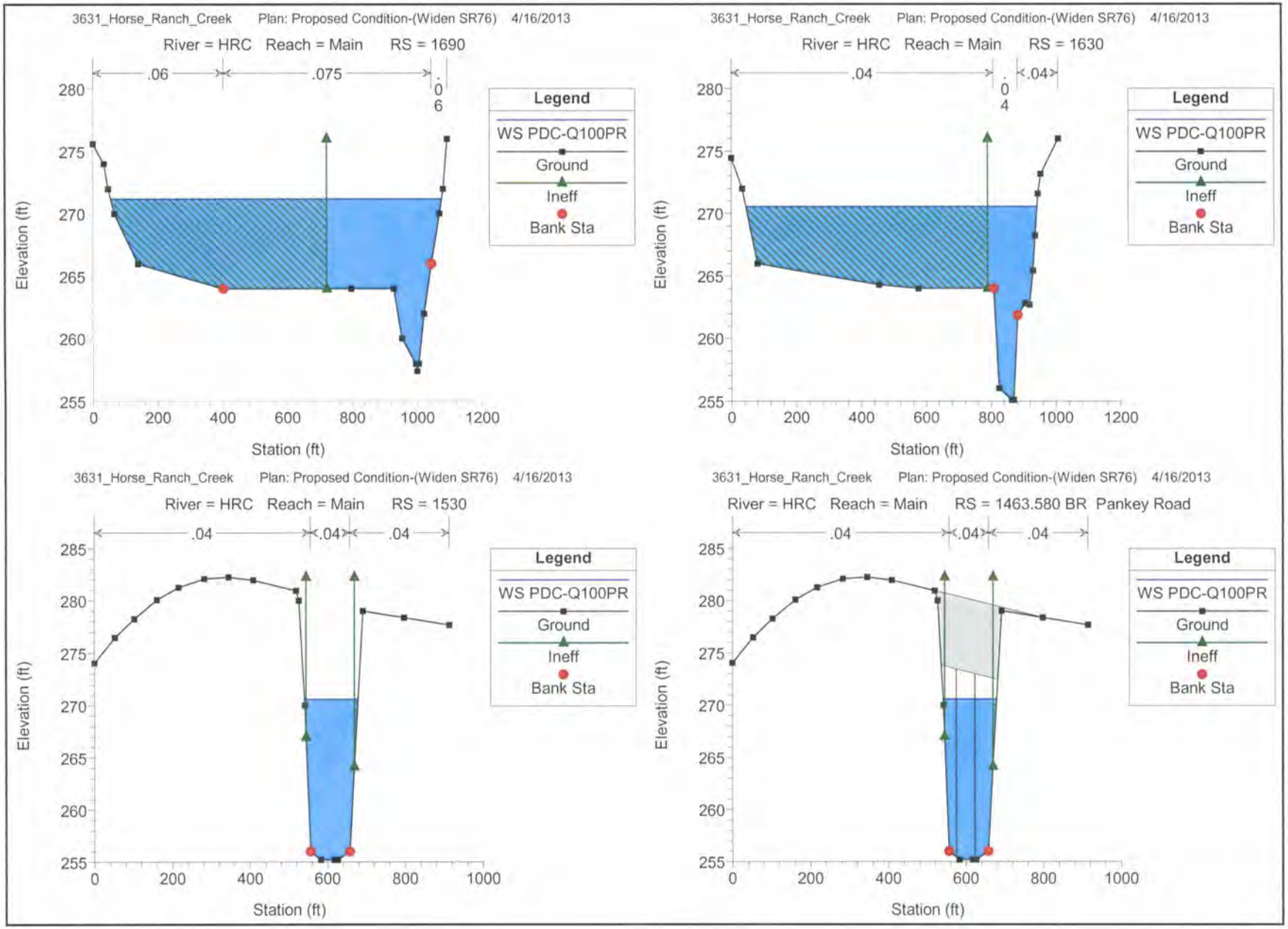
HEC-RAS Plan: PR River: HRC Reach: Main Profile: PDC-Q100PR

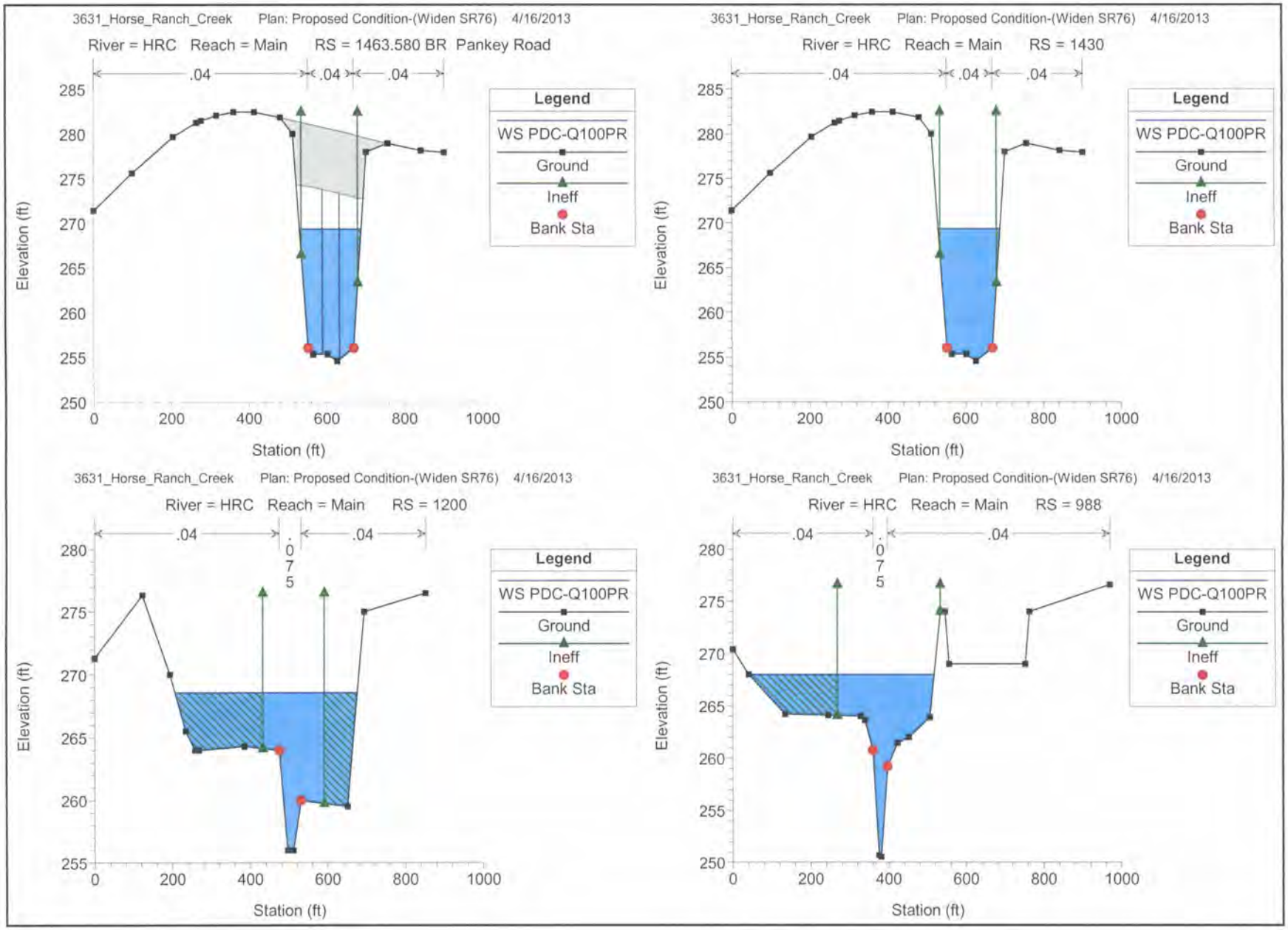
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	5608.249	PDC-Q100PR	8441.00	287.48	290.66	289.41	290.79	0.007034	2.95	2875.55	1474.89	0.34
Main	5000.613	PDC-Q100PR	8441.00	282.91	286.44	285.07	286.57	0.006954	2.90	2961.26	1651.38	0.34
Main	4634.388	PDC-Q100PR	8441.00	279.38	282.78	282.02	282.98	0.014750	3.63	2357.99	1454.07	0.47
Main	4342.055	PDC-Q100PR	8441.00	276.00	280.10		280.22	0.006443	2.76	3063.38	1369.54	0.32
Main	3976.927	PDC-Q100PR	8441.00	274.00	276.95		277.12	0.011561	3.39	2501.68	1284.39	0.42
Main	3642.177	PDC-Q100PR	8441.00	271.44	274.24		274.35	0.006147	2.62	3196.53	1498.99	0.31
Main	3351.951	PDC-Q100PR	8441.00	268.75	272.64	271.00	272.75	0.005003	2.64	3200.79	1266.85	0.29
Main	3038.374	PDC-Q100PR	8441.00	266.96	271.76		271.82	0.001911	2.00	4232.92	1219.71	0.19
Main	2614.242	PDC-Q100PR	8441.00	263.52	271.56		271.57	0.000249	1.00	8550.83	1567.32	0.07
Main	2033.954	PDC-Q100PR	8441.00	260.00	271.46		271.48	0.000121	0.85	9928.50	1417.77	0.05
Main	1864	PDC-Q100PR	8441.00	260.00	271.44	264.27	271.45	0.000149	1.00	8453.94	1465.72	0.06
Main	1717	PDC-Q100PR	8441.00	258.00	271.38	264.30	271.42	0.000317	1.51	5626.72	1150.86	0.09
Main	1690	PDC-Q100PR	8441.00	257.40	271.20		271.34	0.001406	3.06	2793.75	1022.52	0.19
Main	1630	PDC-Q100PR	8441.00	255.09	270.54		271.07	0.000960	6.34	1520.03	897.92	0.30
Main	1530	PDC-Q100PR	8441.00	255.19	270.60	261.33	270.97	0.000479	4.99	1775.48	138.49	0.23
Main	1463.580 Pankey Road		Bridge									
Main	1430	PDC-Q100PR	8441.00	254.57	269.35		269.67	0.000464	4.67	1893.83	158.72	0.22
Main	1200	PDC-Q100PR	8441.00	256.00	268.60		269.38	0.002928	5.00	1300.90	469.75	0.27
Main	988	PDC-Q100PR	8441.00	250.55	268.01		268.46	0.002402	5.05	1590.59	476.23	0.24
Main	632	PDC-Q100PR	8441.00	251.20	267.39		267.89	0.003279	5.63	1508.70	520.37	0.29
Main	627.1	PDC-Q100PR	8441.00	251.76	266.86	260.48	267.64	0.001435	7.10	1188.91	329.85	0.36
Main	561.3247 SR-76		Bridge									
Main	472	PDC-Q100PR	8441.00	252.23	265.62	260.77	266.52	0.001853	7.64	1104.76	136.16	0.41
Main	200	PDC-Q100PR	8441.00	251.91	264.85		266.08	0.007885	8.06	978.35	1090.64	0.45
Main	167	PDC-Q100PR	8441.00	250.00	264.23	261.06	264.72	0.003257	5.34	1535.16	561.37	0.28
Main	120	PDC-Q100PR	8441.00	248.33	263.33		263.95	0.004438	6.53	1384.33	263.97	0.34
Main	114.5	PDC-Q100PR	8441.00	245.58	261.27	255.62	262.25	0.006049	7.91	1063.28	107.76	0.40
Main	114	PDC-Q100PR	8441.00	245.58	261.22	255.62	262.22	0.001804	8.08	1059.07	107.58	0.41
Main	112		Bridge									
Main	110	PDC-Q100PR	8441.00	245.74	260.34	255.86	261.72	0.002613	9.47	902.67	97.28	0.49
Main	109.5	PDC-Q100PR	8441.00	245.74	260.32	255.88	261.68	0.009051	9.39	901.13	97.19	0.48
Main	100	PDC-Q100PR	8441.00	246.00	260.50	253.31	260.74	0.001814	4.09	2244.34	490.21	0.22

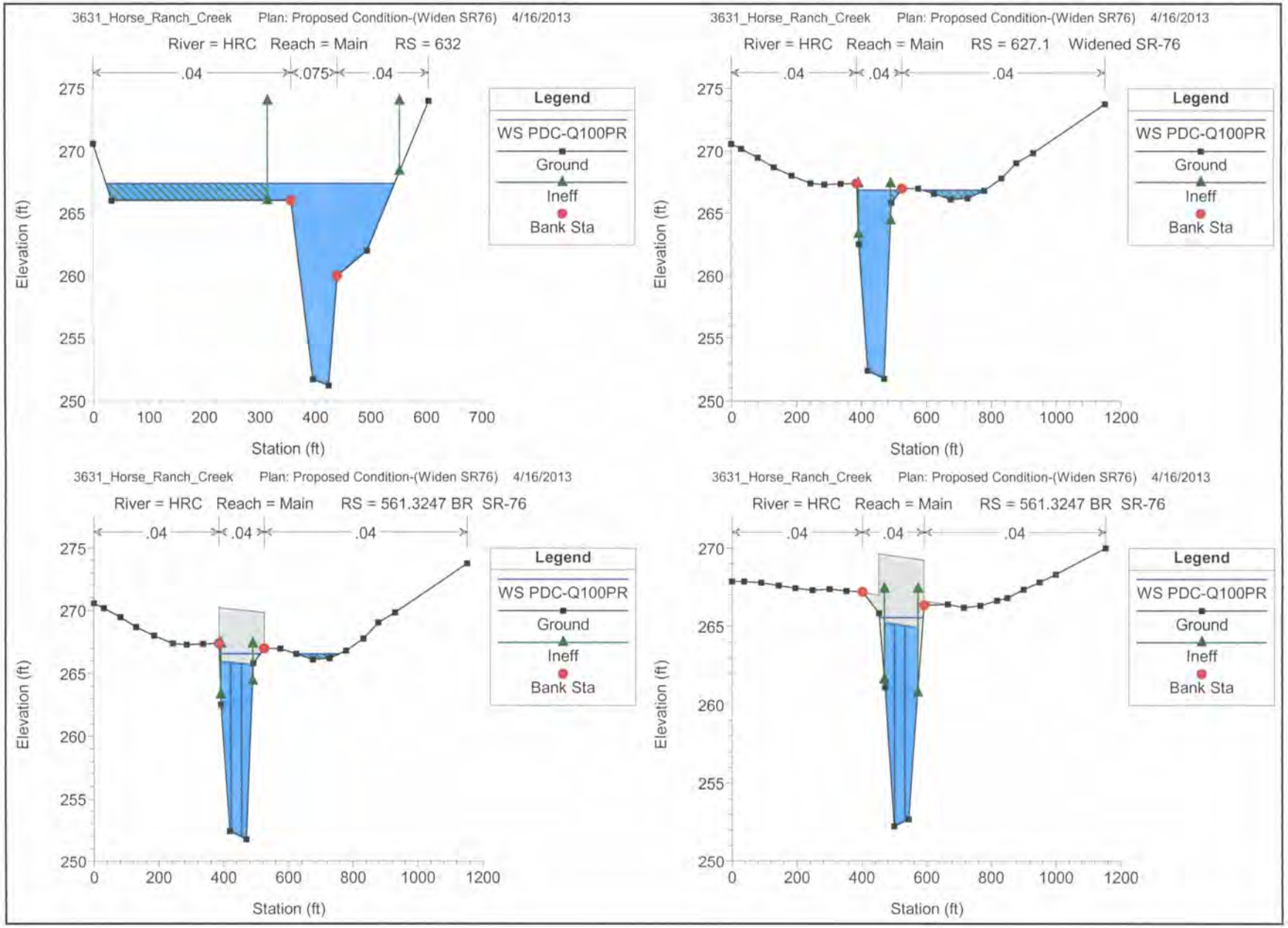

3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 5608.249
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 5000.613
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 4634.388
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 4342.055
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)

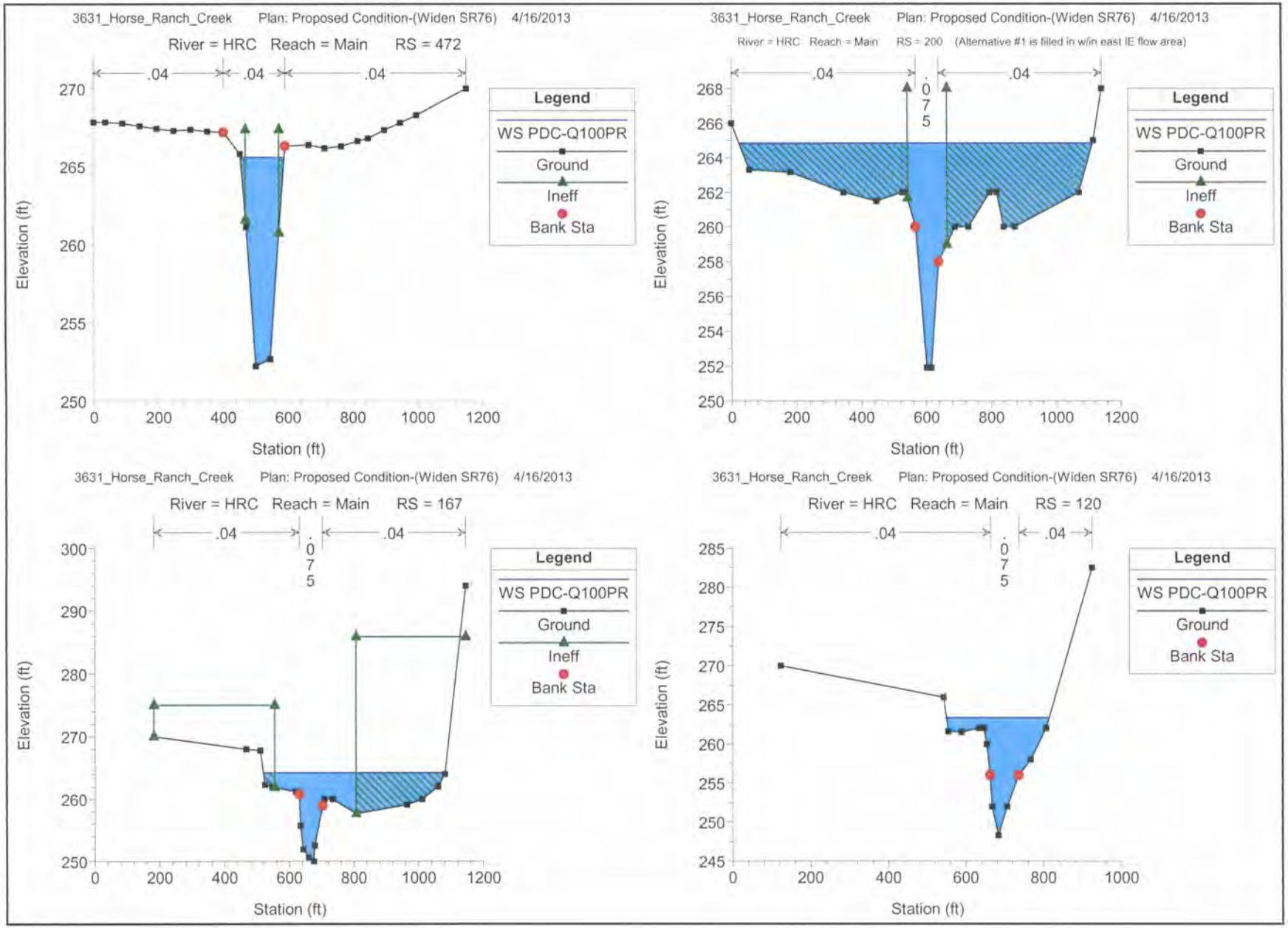

3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 3976.927
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 3642.177
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 3351.951
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 3038.374
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)

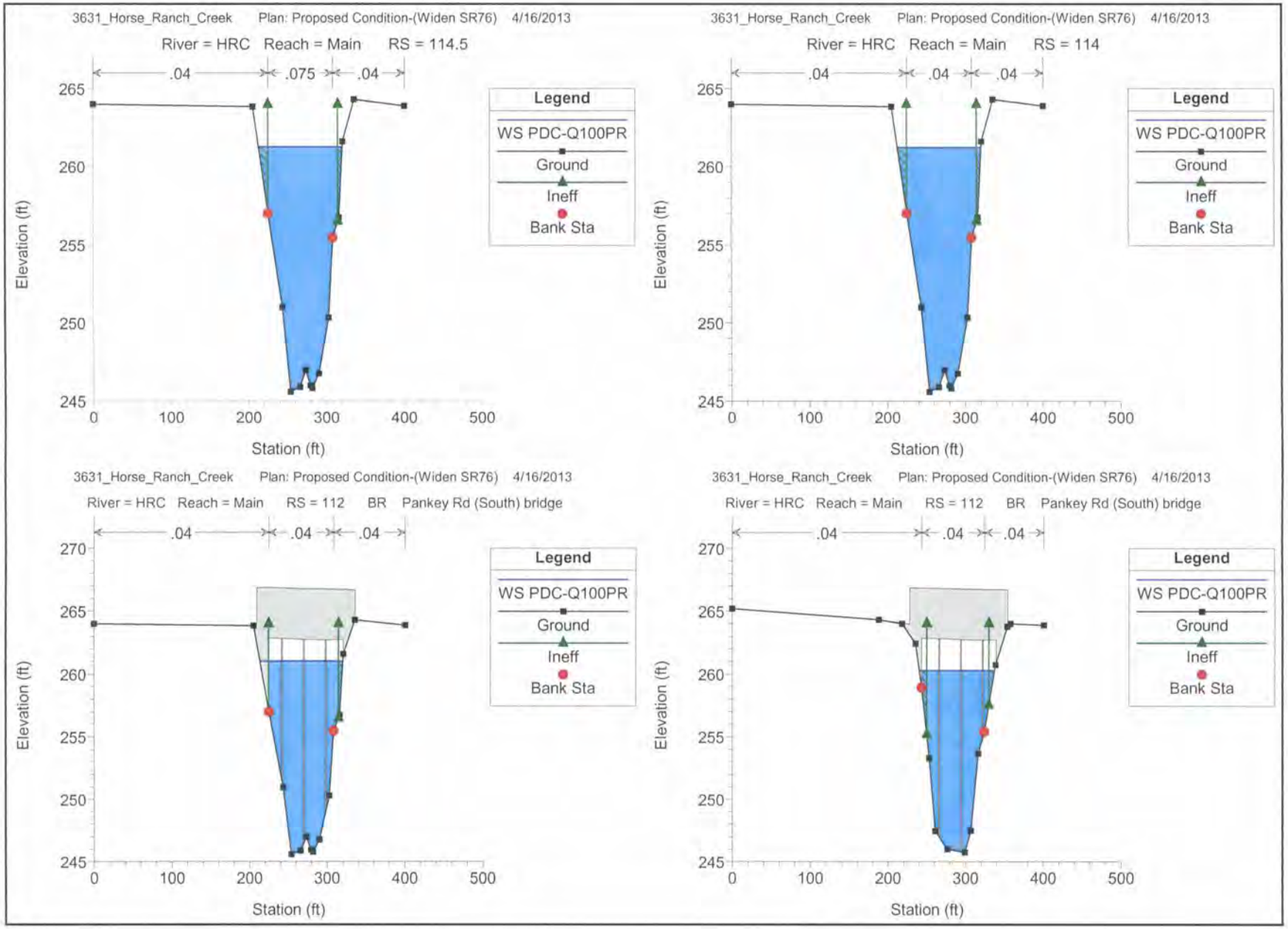

3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 2614.242
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 2033.954
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1864
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1717
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

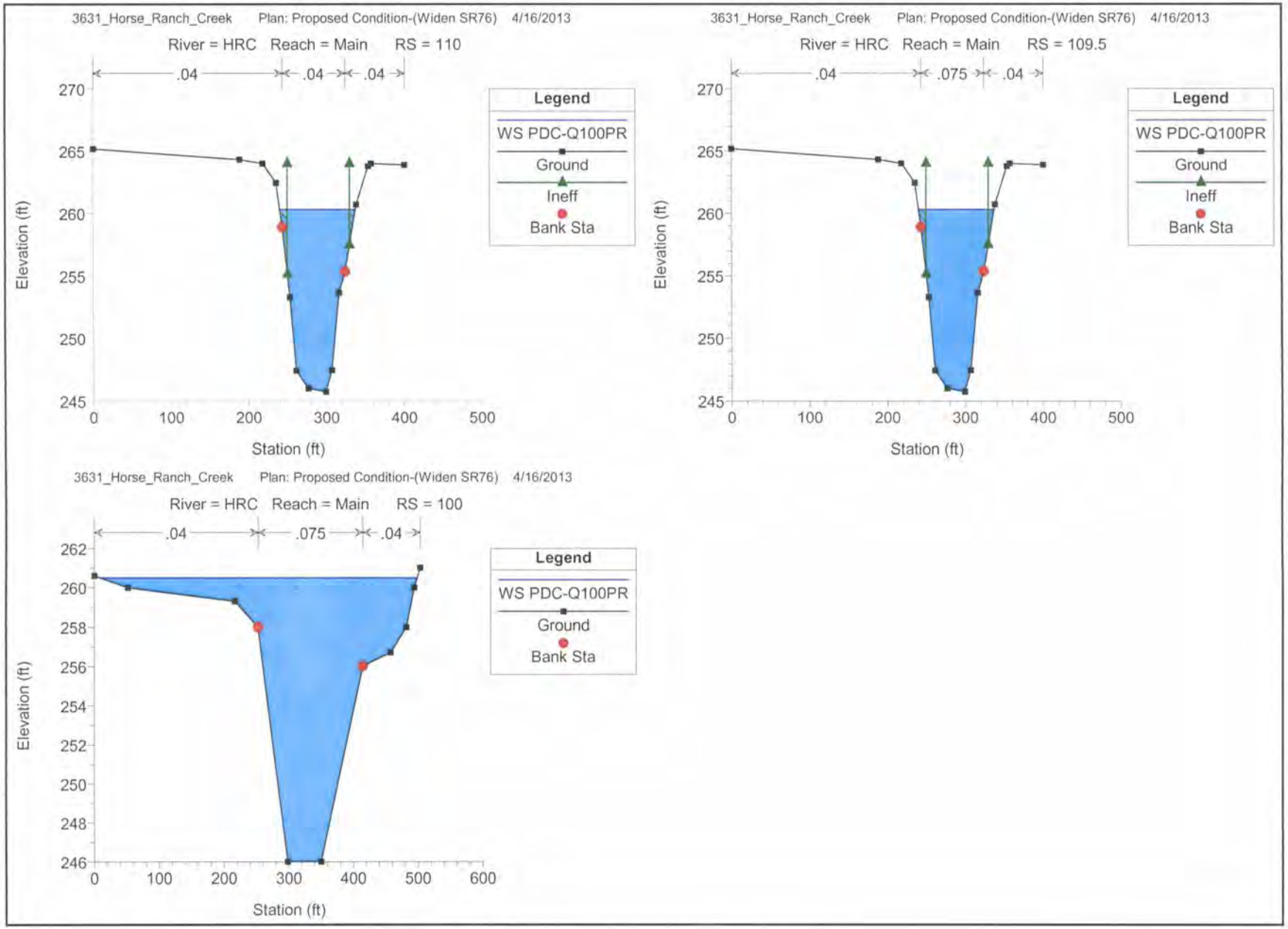

3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1690
.06
.075
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1630
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1530
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1463.580 BR Pankey Road
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1463.580 BR Pankey Road
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1430
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 1200
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 988
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 632
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 627.1 Widened SR-76
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 561.3247 BR SR-76
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 561.3247 BR SR-76
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 472
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 200 (Alternative #1 is filled in w/in east IE flow area)
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 167
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 120
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 114.5
.04 .075 .04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 114
.04 .04 .04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 112 BR Pankey Rd (South) bridge
.04 .04 .04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 112 BR Pankey Rd (South) bridge
.04 .04 .04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 110
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 109.5
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Condition-(Widen SR76) 4/16/2013
River = HRC Reach = Main RS = 100
.04
.075
.04
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX 7

Proposed Condition (Capacity/Worst Case)
HEC-RAS Input Data

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 3631_Horse_Ranch_Creek
Project File : 3631_Horse_Ranch_Creek.prj
Run Date and Time: 4/16/2013 6:10:29 PM

Project in English units

Project Description:
Flood Study for Horse Ranch Creek, NGVD 29, Cross sections taken looking
downstream

****

PLAN DATA

Plan Title: Proposed Cond (Cap check - Worst Case)
Plan File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.p02

Geometry Title: Proposed Condition-Capacity-WorstCase
Geometry File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.g02

Flow Title : 2003 County Method PR
Flow File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.f01

Plan Summary Information:
Number of: Cross Sections = 29 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

Flow Title: 2003 County Method PR
Flow File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.f01

Flow Data (cfs)

River	Reach	RS	PDC-Q100PR
HRC	Main	5608.249	8441

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
HRC	Main	PDC-Q100PR		Known WS = 260.5

GEOMETRY DATA

Geometry Title: Proposed Condition-Capacity-WorstCase
Geometry File : p:\3631\ENGR\REPORTS\DRAIN\HYDRA\HEC_RAS\3631_Horse_Ranch_Creek.g02

CROSS SECTION

RIVER: HRC
REACH: Main RS: 5608.249

INPUT
Description:
Station Elevation Data num= 116

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	304.73	11.04	304	13.3	303.8	13.81	303.77	17.74	303.45
19.52	303.34	24.98	302.93	27.99	302.76	29.64	302.65	41	302
50.22	301.12	64.61	300	64.79	299.98	79.78	298.61	88.62	297.73
89.38	297.66	116.94	294.78	124.03	294	143.32	292	154.29	291.25
156.33	291.23	161.85	291.12	168.29	291.06	173.37	290.95	175.94	290.92
177.15	290.93	180	290.87	183.03	290.95	184.6	290.92	191.78	290.97
198.83	291.14	211.18	291.34	219.17	291.4	228.53	291.35	230.1	291.32
234.28	291.34	238.95	291.21	243.58	291.16	270.57	290.47	272.31	290.45
273.92	290.41	275.83	290.39	277.5	290.35	278.51	290.34	284.8	290.32
286.12	290.29	292.43	290.28	292.85	290.27	294.5	290.28	296.25	290.25
297.85	290.28	298.73	290.26	342.65	290.32	359.58	290.13	365.9	290
444.19	290.2	445.04	290.19	454.2	290.21	454.79	290.2	473.92	290.2
474.49	290.19	489.86	290.17	491.48	290.18	525.71	290.03	526.97	290
582.95	289.32	630.38	289.15	631.7	289.13	655.87	289.18	657.9	289.14
713	288.63	729.88	288.6	740.29	288.53	783.7	288.37	817.65	288.28
868.94	288.08	873.71	288.06	882.22	288	922.44	287.85	936.64	287.84
965.86	287.75	982.45	287.72	1009.77	287.71	1039.27	287.68	1057.13	287.7
1095.93	287.81	1114.77	287.68	1119.12	287.67	1151.17	287.48	1173.21	287.63
1198.58	287.76	1205.59	287.79	1210.81	287.77	1217.18	287.73	1236.51	287.68
1269.95	287.79	1296.84	287.77	1336.42	287.8	1368.19	287.88	1381.79	287.93
1392.34	287.94	1397.83	288	1430.1	288.31	1440.6	288.36	1531.54	288.88
1561.02	289.05	1615.53	288.45	1664.74	288	1731.48	289.18	1736	290
1739.23	290.97	1742.52	292	1749.96	294	1756.3	296	1768.31	300
1849.97	300.17								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	525.71	.15	1736	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
525.71	1736	386.82	607.68 624.69	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	493.25	304.7255	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	291.90	Element	Left OB	Channel	Right OB	
Vel Head (ft)	0.06	Wt. n-Val.	0.075	0.150	0.075	
W.S. Elev (ft)	291.84	Reach Len. (ft)	386.82	607.68	624.69	
Crit W.S. (ft)	289.41	Flow Area (sq ft)	56.37	4286.84	5.57	
E.G. Slope (ft/ft)	0.007071	Area (sq ft)	512.46	4286.84	5.57	
Q Total (cfs)	8441.00	Flow (cfs)	135.66	8296.77	8.57	
Top Width (ft)	1596.31	Top Width (ft)	380.01	1210.29	6.00	
Vel Total (ft/s)	1.94	Avg. Vel. (ft/s)	2.41	1.94	1.54	
Max Chl Dpth (ft)	4.36	Hydr. Depth (ft)	1.74	3.54	0.93	
Conv. Total (cfs)	100384.3	Conv. (cfs)	1613.3	98669.0	101.9	
Length Wtd. (ft)	595.52	Wetted Per. (ft)	32.46	1210.40	6.28	
Min Ch El (ft)	287.48	Shear (lb/sq ft)	0.77	1.56	0.39	
Alpha	1.00	Stream Power (lb/ft s)	1.84	3.03	0.60	
Frctn Loss (ft)	4.47	Cum Volume (acre-ft)	108.64	625.17	57.80	
C & E Loss (ft)	0.00	Cum SA (acres)	28.28	120.15	13.22	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 5000.613

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	310.86	9.72	310	30.27	308	53.4	306.05	53.94	306
79.95	304	89.41	303.37	107.3	302	113.15	301.83	119.32	301.46
137.63	300.21	140.43	300	159.37	298.41	162.89	298.29	167.21	298
199.68	297.59	202.58	297.48	232.53	296	267.6	294	276.28	293.84
297.08	292.87	300.3	292.75	316.97	292	324.98	291.99	352.47	291.23
356.75	291.21	368.46	290.67	369.1	290.63	373.36	290.59	376.74	290.51
383.32	290.42	389.54	290.23	393.89	290	415.99	289.44	425.12	289.34
425.89	289.32	435.45	289.34	443.41	289.49	452.68	289.52	456.6	289.58
470.09	289.5	482.97	289.02	499.84	288.59	510.92	288	524.17	287.52
556.51	286.68	571.04	286.21	584.13	286	750.67	285.23	821.72	285.46
855.28	285.31	1006.28	286	1276.91	284.96	1283.72	284.88	1289.31	284.85
1294.53	284.78	1335.39	284	1385.05	283.4	1396.08	283.36	1408.04	283.37
1425.23	283.46	1426.93	283.48	1470.24	283.59	1471.38	283.58	1508.02	283.63
1518.24	283.66	1546.32	283.71	1547.37	283.7	1562.72	283.69	1578.16	283.65
1618.18	283.24	1634.68	283.11	1635.54	283.14	1691.46	282.99	1797	282.91
1802.21	282.93	1834.71	283.18	1837.35	283.17	1877.56	283.39	1906.65	283.6
1908.64	283.61	1946.58	283.85	1955.94	283.89	2002.62	283.94	2027.86	284
2029.92	284	2208.42	284.95	2213.82	286	2216.83	286.83	2221.31	288
2223.85	288.72	2228.21	290	2237.55	298.3	2239.43	300	2239.79	300.64
2245.19	310	2246.77	311.21	2248.02	312	2250.66	314	2252.73	314.43
2258.9	316	2276	314.1	2276.39	314	2286.73	310	2291.99	307.83
2296.85	306	2301.06	304	2305.57	302	2309.35	300.47	2310.46	300
2313.17	298.59	2314.37	298	2320.67	296	2329.35	294	2343.93	292.11
2345.26	291.96	2404.33	291.22	2457	292	2487.35	294	2499.21	296
2509.14	298								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0    .075 1006.28     .15 2213.82    .075

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1006.28 2213.82           325.2  366.24  367.74            .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   829.2310.8611       F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*********************************************************************************************
* E.G. Elev (ft)         *  287.42  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.06  * Wt. n-Val.            *   0.075  *   0.150  *   0.075  *
* W.S. Elev (ft)         *  287.36  * Reach Len. (ft)       *  325.20  *  366.24  *  367.74  *
* Crit W.S. (ft)         *  285.07  * Flow Area (sq ft)     *  309.34  * 3929.08  *    3.38  *
* E.G. Slope (ft/ft)     *0.007996  * Area (sq ft)          *  795.97  * 3929.08  *    3.38  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *  794.88  * 7641.64  *    4.48  *
* Top Width (ft)         * 1688.52  * Top Width (ft)       *  475.94  * 1207.54  *    5.04  *
* Vel Total (ft/s)       *    1.99  * Avg. Vel. (ft/s)     *    2.57  *    1.94  *    1.33  *
* Max Chl Dpth (ft)      *    4.45  * Hydr. Depth (ft)     *    1.75  *    3.25  *    0.67  *
* Conv. Total (cfs)      * 94398.4  * Conv. (cfs)          *  8889.4  * 85458.9  *    50.1  *
* Length Wtd. (ft)       *  363.76  * Wetted Per. (ft)     *  177.08  * 1207.67  *    5.22  *
* Min Ch El (ft)         *  282.91  * Shear (lb/sq ft)     *    0.87  *    1.62  *    0.32  *
* Alpha                  *    1.02  * Stream Power (lb/ft s) *  2.24  *    3.16  *    0.43  *
* Frctn Loss (ft)        *    3.55  * Cum Volume (acre-ft) *  102.83  *  567.86  *   57.74  *
* C & E Loss (ft)        *    0.00  * Cum SA (acres)       *   24.48  *  103.28  *   13.14  *
*********************************************************************************************

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 4634.388

INPUT
Description:
Station Elevation Data    num=      97
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0   298.8   14.92     298   48.95  297.57   52.29  297.43   54.06  297.31
    55.1  297.23   56.72  297.14      73     296   75.71  295.77   77.14  295.67
   81.33  295.34   83.22  295.21   86.33  294.96   99.68     294  123.14     292
     139  290.91  150.76     290  173.63     288  204.83     286  276.91     284
  288.03  283.88  290.75   283.7  293.62  283.54  294.67  283.46  320.14     282
  335.46  282.01   341.8  282.11  344.17  282.09  379.67  282.43  455.34  282.45
  459.32  282.42  462.17  282.39  464.82  282.37  467.55  282.34  474.11  282.29
  477.49  282.26  482.44  282.27  483.21  282.26  527.58  282.13  535.09  282.09
  539.19  282.08  546.48  282.05   549.3  282.04  552.15  282.02  557.84     282
   576.6  281.99  593.35     282  708.31  281.93  714.42   281.9  719.56  281.87
  723.75  281.84  747.55   281.6  752.62  281.56  770.74  281.52  796.45  281.35
  804.65  281.32  821.95   281.2  824.98  281.17  829.02  281.15  915.12     280
   975.7  279.72 1006.16  279.61 1035.43  279.51  1039.6   279.5 1053.65  279.49
 1063.35   279.5  1076.7  279.51 1094.92  279.54 1096.98  279.55 1114.79  279.59
 1178.72  279.38 1203.23  279.52 1210.59  279.55 1272.45     280 1308.62  280.29
 1338.37  280.52 1354.61   280.7 1365.95   280.8 1396.74  281.06 1406.46  281.12
 1420.16  281.19 1425.11  281.21 1490.66  281.57 1498.43  281.56 1500.42  281.55
 1513.62  281.53 1520.79  281.52 1524.52   281.5 1599.21  281.67 1602.89  281.68
 1678.38  281.97 1684.86  281.98  1686.4     282 1758.78     282  1782.7   291.9
    1994   291.9 2014.94     303

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
```

```
       0    .075  455.34     .15  1686.4    .075

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        455.34  1686.4           279.85  292.35     293             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0  388.56298.8025       F
```

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	283.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.075	0.150	0.075
W.S. Elev (ft)	283.79	Reach Len. (ft)	279.85	292.35	293.00
Crit W.S. (ft)	282.02	Flow Area (sq ft)	90.03	3524.83	133.38
E.G. Slope (ft/ft)	0.012209	Area (sq ft)	226.53	3524.83	133.38
Q Total (cfs)	8441.00	Flow (cfs)	240.52	7779.56	420.92
Top Width (ft)	1473.70	Top Width (ft)	165.94	1231.06	76.70
Vel Total (ft/s)	2.25	Avg. Vel. (ft/s)	2.67	2.21	3.16
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)	1.35	2.86	1.74
Conv. Total (cfs)	76392.1	Conv. (cfs)	2176.7	70406.0	3809.4
Length Wtd. (ft)	292.12	Wetted Per. (ft)	66.78	1231.08	77.06
Min Ch El (ft)	279.38	Shear (lb/sq ft)	1.03	2.18	1.32
Alpha	1.02	Stream Power (lb/ft s)	2.75	4.82	4.16
Frctn Loss (ft)	2.62	Cum Volume (acre-ft)	99.01	536.52	57.16
C & E Loss (ft)	0.01	Cum SA (acres)	22.09	93.03	12.80

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 4342.055

INPUT
Description:
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	297.91	7.93	296	17.6	294	27.85	292	29.76	291.65
39.09	290	56.31	288	77.72	286	135.35	282	181.38	281.94
225.4	281.24	233.94	281.2	239.64	281.06	249	281.03	255.26	280.9
271.2	280.73	287.29	280.13	289.66	280	321.6	279.57	348.22	279.44
426.5	278.88	430.24	278.84	439.04	278.77	444.84	278.75	450.31	278.74
451.67	278.73	461.32	278.71	479.45	278.74	490.95	278.75	492.25	278.77
530.64	278.9	560.84	278.74	561.62	278.73	568.8	278.7	577.56	278.67
580.38	278.66	587.14	278.65	595.25	278.63	599.77	278.61	604.41	278.6
606.66	278.59	611.58	278.57	616.62	278.55	620.56	278.54	625.8	278.52
631.18	278.5	635.99	278.48	640.91	278.47	645.28	278.44	648.86	278.43
665.19	278.38	702.12	278.27	704.62	278.26	713.91	278.23	757.62	278.2
760.16	278.19	815.39	278	857.05	277.98	864.2	277.92	865.28	277.91
878.33	277.8	884.4	277.74	905.47	277.57	910.46	277.55	935.37	277.58
955.97	277.75	961.21	277.8	968.35	277.87	984.25	277.99	986.09	278
986.24	277.99	988.37	277.96	991.28	277.9	997.76	277.69	1021.37	277.15
1024.58	277.11	1034.82	277.09	1077.23	276.33	1100.03	276.4	1133.92	276.62
1162.11	276.78	1200.67	277.04	1244.07	277.31	1293.03	277.9	1327.14	277.94
1357.82	277.97	1388.18	278	1398.51	278.05	1409.16	278.12	1442.61	278
1468.73	277.6	1485.94	276.9	1501.49	276.17	1509.48	276	1577.47	276.06
1578.21	276.07	1635.17	277.97	1636.27	278	1647.13	278.83	1655.14	279.78
1656.99	280	1658.99	280.66	1664.8	282.84	1668.61	284	1675.12	285.21
1679.75	286	1689.53	288	1696.28	289.86	1696.89	290	1698.1	290.63
1707.6	291.6	1728.6	291.6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	321.6	.15	1655.14	.075

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

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
321.6	1655.14		344.1	365.11	365.46	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	281.25		
Vel Head (ft)	0.05		
W.S. Elev (ft)	281.20		
Crit W.S. (ft)			
E.G. Slope (ft/ft)	*0.006864		
Q Total (cfs)	8441.00		
Top Width (ft)	1426.33		
Vel Total (ft/s)	1.84		
Max Chl Dpth (ft)	5.20		
Conv. Total (cfs)	*101880.4		
Length Wtd. (ft)	364.75		
Min Ch El (ft)	276.00		
Alpha	1.00		
Frctn Loss (ft)	3.28		
C & E Loss (ft)	0.00		
Wt. n-Val.		0.075	0.150	0.075
Reach Len. (ft)		344.10	365.11	365.46
Flow Area (sq ft)		69.41	4509.24	4.53
Area (sq ft)		69.41	4509.24	4.53
Flow (cfs)		97.62	8336.84	6.54
Top Width (ft)		87.51	1333.54	5.28
Avg. Vel. (ft/s)		1.41	1.85	1.44
Hydr. Depth (ft)		0.79	3.38	0.86
Conv. (cfs)		1178.3	*100623.1	79.0
Wetted Per. (ft)		87.53	1333.73	5.50
Shear (lb/sq ft)		0.34	1.45	0.35
Stream Power (lb/ft s)		0.48	2.68	0.51
Cum Volume (acre-ft)		98.06	509.56	56.70
Cum SA (acres)		21.27	84.42	12.52

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3976.927

INPUT
Description:
Station Elevation Data num= 91

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	288.37	1.9	288.11	2.68	288.02	2.81	288	17.99	286.47
18.79	286.37	40.6	284.68	47.44	284.21	47.89	284.17	50.96	284
59.39	283.62	59.83	283.59	63.16	283.39	64.69	283.31	72.8	282.8
76.19	282.69	77.57	282.63	86.87	282	102.18	281.42	125.1	280
128.5	279.95	194.15	277.64	201.67	277.58	279.35	276	376.46	275.03
377.4	275.04	382.07	275.03	383.54	275.04	392.79	275.03	409.89	275.11
439.78	275.14	442.5	275.15	457.58	275.2	463.13	275.21	489.47	275.18
494.43	275.17	496.85	275.16	507.74	275.11	510.34	275.1	512.66	275.09
518.73	275.06	520.89	275.05	527.35	275.01	548.31	274.92	550.26	274.91
559.21	274.89	594.52	274.82	616.98	274.76	650.08	274.66	652.1	274.65
656.52	274.63	665.31	274.61	695.8	274.53	704.5	274.52	762.31	274.2
768.34	274.22	776.7	274.15	789.71	274.05	829.23	274	913.08	274.05
916.5	274.09	919.82	274.12	922.17	274.16	1024.5	274.74	1027.38	274.73
1106.84	274.52	1110.37	274.53	1197.53	274.57	1222.91	274.66	1315.6	275.37
1333.82	275.43	1350.44	275.64	1374.32	275.9	1376.51	275.91	1378.38	275.92
1384.91	276	1514.42	276.77	1534.12	278	1535.82	278.25	1540.34	278.66
1550.6	280	1563.3	282.32	1578.6	284.94	1586.47	286	1594.92	288
1599.02	288.54	1607.87	290	1609.43	290.38	1617.34	292	1628.41	294
1641.15	294								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	279.35	.15	1514.42	.075

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

```
       279.35 1514.42           334.85  334.75  343.15            .1       .3

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*****************************************************************************************
* E.G. Elev (ft)         *  277.97  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.08  * Wt. n-Val.            *   0.075  *   0.150  *   0.075  *
* W.S. Elev (ft)         *  277.89  * Reach Len. (ft)       *  334.85  *  334.75  *  343.15  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   88.42  * 3645.28  *   10.04  *
* E.G. Slope (ft/ft)     *0.012291  * Area (sq ft)          *   88.42  * 3645.28  *   10.04  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *  188.70  * 8237.34  *   14.96  *
* Top Width (ft)         * 1345.30  * Top Width (ft)       *   92.30  * 1235.07  *   17.93  *
* Vel Total (ft/s)       *    2.25  * Avg. Vel. (ft/s)     *    2.13  *    2.26  *    1.49  *
* Max Chl Dpth (ft)      *    3.89  * Hydr. Depth (ft)     *    0.96  *    2.95  *    0.56  *
* Conv. Total (cfs)      * 76137.0  * Conv. (cfs)          *  1702.1  * 74300.0  *   135.0  *
* Length Wtd. (ft)       *  335.14  * Wetted Per. (ft)     *   92.32  * 1235.09  *   17.97  *
* Min Ch El (ft)         *  274.00  * Shear (lb/sq ft)     *    0.73  *    2.26  *    0.43  *
* Alpha                  *    1.00  * Stream Power (lb/ft s) *  1.57  *    5.12  *    0.64  *
* Frctn Loss (ft)        *    2.47  * Cum Volume (acre-ft)  *   97.44  *  475.39  *   56.63  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)        *   20.56  *   73.66  *   12.42  *
*****************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 3642.177

INPUT
Description:
Station Elevation Data    num=      75
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
       0  286.93   10.44     286   65.44     282   99.45     280  146.37     278
   174.1     276   182.3  275.34  185.36  275.15   192.4  274.62  202.82     274
  213.37  273.69  242.26  272.96   250.5  272.85  251.89  272.82  298.66     272
  558.78  271.48  562.24  271.51  567.92  271.55  578.79  271.59  580.97  271.6
  586.73  271.61  588.07  271.59  590.12  271.61  664.72  271.44  665.35  271.45
  684.38  271.55   709.6   271.7  714.82  271.75  720.76  271.78  733.39  271.87
  744.96     272     900 272.018 1001.77  272.03 1008.53  272.08 1012.19  272.11
 1015.73  272.14 1023.46  272.21 1030.62  272.27  1143.5  272.54 1145.55  272.53
 1146.64  272.54 1148.16  272.53 1149.44  272.54 1156.13  272.55 1166.79  272.58
 1170.77  272.59 1174.72   272.6 1175.97  272.59 1185.52  272.61 1187.32   272.6
 1237.84  272.51 1241.49  272.49 1243.23  272.48 1247.62  272.46  1258.1  272.42
 1330.73  272.07 1336.79   272.1 1360.06  272.19 1361.24   272.2 1391.38  272.26
 1434.16  272.38 1435.76  272.37 1460.58  272.41 1462.04  272.39 1510.46   272.3
 1511.66  272.29 1526.14   272.3 1572.56  272.03  1610.9  272.04 1623.24  272.05
 1683.71  271.96    1693     272  1753.2     300  2388.4     298 2477.39     292

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0    .075  298.66     .15 1623.24    .075

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        298.66 1623.24           258.15  290.25  300.25            .1       .3

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*****************************************************************************************
* E.G. Elev (ft)         *  275.50  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.05  * Wt. n-Val.            *   0.075  *   0.150  *   0.075  *
* W.S. Elev (ft)         *  275.44  * Reach Len. (ft)       *  258.15  *  290.25  *  300.25  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *  261.07  * 4504.35  *  252.96  *
```

* E.G. Slope (ft/ft)	*0.004892	* Area (sq ft)	* 261.07	* 4504.35	* 252.96	*
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 615.19	* 7057.33	* 768.47	*
* Top Width (ft)	* 1519.41	* Top Width (ft)	* 117.66	* 1324.58	* 77.17	*
* Vel Total (ft/s)	* 1.68	* Avg. Vel. (ft/s)	* 2.36	* 1.57	* 3.04	*
* Max Chl Dpth (ft)	* 4.00	* Hydr. Depth (ft)	* 2.22	* 3.40	* 3.28	*
* Conv. Total (cfs)	*120685.9	* Conv. (cfs)	* 8795.7	*100902.8	* 10987.3	*
* Length Wtd. (ft)	* 289.47	* Wetted Per. (ft)	* 117.73	* 1324.59	* 77.93	*
* Min Ch El (ft)	* 271.44	* Shear (lb/sq ft)	* 0.68	* 1.04	* 0.99	*
* Alpha	* 1.17	* Stream Power (lb/ft s)	* 1.60	* 1.63	* 3.01	*
* Frctn Loss (ft)	* 1.31	* Cum Volume (acre-ft)	* 96.09	* 444.08	* 55.60	*
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 19.76	* 63.82	* 12.05	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3351.951

INPUT
Description:
Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	285.5	13.31	284	36.12	282	67.29	280	101.62	278
152.47	274	215.42	272.06	217.49	272	228.37	271.69	243.04	271.25
244.01	271.23	252.46	270.96	253.9	270.92	258.75	270.76	269.35	270.57
294.08	270	309.39	269.83	311.81	269.81	312.8	269.8	313.69	269.79
328.44	269.61	344.46	269.41	346.63	269.4	452.88	269.2	454.68	269.19
457.11	269.22	459.78	269.23	464.05	269.24	465.06	269.25	466.19	269.27
506.87	269.35	511.02	269.31	588.81	268.85	608.98	268.89	695.67	268.75
710.2	268.77	744.32	269	745.35	268.99	749.51	269	753	269.02
781.12	269.05	782.52	269.06	790.96	269.09	816.16	269.23	817.27	269.24
883.64	269.76	894.13	270	943	270.54	943.18	270.53	948.39	270.59
954.83	270.65	960.21	270.72	967.81	270.83	1005.28	270.47	1013.24	270.51
1060.38	270.65	1149.48	270.47	1159.35	270.42	1162.8	270.4	1166.46	270.39
1176.11	270.35	1198.61	270.37	1225.58	270	1375.87	271.98	1377.46	272
1378.28	272.16	1387.72	274	1421.83	272.97	1425.19	272.57	1430.32	272
1494	272.531	1637.91	273.73	1640.11	274	1652.81	275.98	1652.95	276
1653.1	276.03	1661.94	278	1667.37	278.98	1673.97	280	1690.83	285.7
1704.02	290	1710.4	291.86	1716	293.65	1720.61	295.06		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	215.42	.15	1494	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
215.42	1494	278.95	313.6 317.15	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1684.75	1720.61	295.0604	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 274.18	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.04	* Wt. n-Val.	* 0.075	* 0.150	* 0.075 *
* W.S. Elev (ft)	* 274.14	* Reach Len. (ft)	* 278.95	* 313.60	* 317.15 *
* Crit W.S. (ft)	* 271.00	* Flow Area (sq ft)	* 69.93	* 5075.36	* 145.78 *
* E.G. Slope (ft/ft)	*0.004193	* Area (sq ft)	* 69.93	* 5075.36	* 145.78 *
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 94.43	* 8160.60	* 185.97 *
* Top Width (ft)	* 1490.30	* Top Width (ft)	* 64.72	* 1278.58	* 147.00 *
* Vel Total (ft/s)	* 1.60	* Avg. Vel. (ft/s)	* 1.35	* 1.61	* 1.28 *
* Max Chl Dpth (ft)	* 5.39	* Hydr. Depth (ft)	* 1.08	* 3.97	* 0.99 *

* Conv. Total (cfs)	*130354.9	* Conv. (cfs)	* 1458.4	*126024.6	* 2871.9	*
* Length Wtd. (ft)	* 313.37	* Wetted Per. (ft)	* 64.75	* 1278.91	* 147.03	*
* Min Ch El (ft)	* 268.75	* Shear (lb/sq ft)	* 0.28	* 1.04	* 0.26	*
* Alpha	* 1.00	* Stream Power (lb/ft s)	* 0.38	* 1.67	* 0.33	*
* Frctn Loss (ft)	* 1.00	* Cum Volume (acre-ft)	* 95.11	* 412.16	* 54.22	*
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 19.21	* 55.15	* 11.28	*

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 3038.374

INPUT
Description:
Station Elevation Data num= 124

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	283.15	23.75	280.6	28.99	280	30.64	279.9	31.47	279.86
40.77	279.32	69.71	278	105.45	276	132.43	274	141.27	272.9
147.74	272	158.93	270	170.9	268.22	172.22	268	181.132	67.9841
239.5	267.88	241.18	267.89	244.82	267.88	248.69	267.87	250.31	267.86
252.2	267.84	256.99	267.8	260.34	267.75	366.4	266.96	368.26	266.97
404.25	266.99	474.06	267.2	476.12	267.21	479.22	267.22	484.16	267.24
489.28	267.27	512.67	267.38	520.12	267.42	528.01	267.46	529.72	267.47
544.85	267.55	554.29	267.59	595.12	267.72	599.09	267.74	603.25	267.75
611.08	267.74	612.41	267.73	620.29	267.76	643.95	267.87	649.93	267.89
667.11	267.98	671.21	268	795.95	269.67	797.76	269.72	800.86	270
801.18	270.1	801.2	270.11	801.22	270.12	801.26	270.13	801.3	270.15
801.36	270.18	801.44	270.21	801.56	270.26	801.74	270.33	802.07	270.46
802.82	270.77	805.53	271.86	805.87	272	809.04	271.97	809.45	271.88
809.82	271.8	810.16	271.72	812.56	271.03	815.49	270	821.53	268.04
821.64	268	903.39	268.01	915.93	268.09	921.77	268.12	927.41	268.16
1076.9	268.11	1078.49	268.1	1082.49	268.09	1087.93	268.1	1092.79	268.12
1093.81	268.13	1098	268.15	1109.77	268.29	1120.04	268.36	1128.65	268.43
1211.64	270	1257.99	270.03	1258.11	270.06	1260.8	270.66	1265.58	271.73
1266.79	272	1273.52	273.42	1276.11	274	1282.41	273.14	1287.51	272
1291.29	271.2	1297.03	270	1304.52	268.46	1306.74	268	1315.15	268.06
1330.8	268.61	1339.49	268.92	1343.5	269.07	1368.34	270	1390.09	270.81
1390.38	270.85	1398.16	272	1402.95	273.35	1403.08	273.39	1408.84	275.02
1413.11	276.29	1418.64	278	1421.41	279.22	1422.97	280	1423.56	280.29
1426.82	282	1428.65	282.94	1433.52	285.36	1434.87	286	1435.47	286.28
1439.05	288	1439.93	288.39	1443.94	290	1445.57	290.63		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	158.93	.15	1390.38	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
158.93	1390.38	564.83	424.13 403.83	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 273.17	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.03	* Wt. n-Val.	* 0.075	* 0.150	* 0.075 *
* W.S. Elev (ft)	* 273.14	* Reach Len. (ft)	* 564.83	* 424.13	* 403.83 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 28.65	* 5902.09	* 15.65 *
* E.G. Slope (ft/ft)	*0.002524	* Area (sq ft)	* 28.65	* 5902.09	* 15.65 *
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 36.42	* 8386.05	* 18.53 *
* Top Width (ft)	* 1252.66	* Top Width (ft)	* 19.59	* 1221.24	* 11.83 *

* Vel Total (ft/s)	*	1.42	* Avg. Vel. (ft/s)	*	1.27	*	1.42	*	1.18	*
* Max Chl Dpth (ft)	*	6.18	* Hydr. Depth (ft)	*	1.46	*	4.83	*	1.32	*
* Conv. Total (cfs)	*168027.0		* Conv. (cfs)	*	725.1	*166933.1		*	368.8	*
* Length Wtd. (ft)	*	428.20	* Wetted Per. (ft)	*	19.85	* 1223.37		*	12.07	*
* Min Ch El (ft)	*	266.96	* Shear (lb/sq ft)	*	0.23	*	0.76	*	0.20	*
* Alpha	*	1.00	* Stream Power (lb/ft s)	*	0.29	*	1.08	*	0.24	*
* Frctn Loss (ft)	*	0.41	* Cum Volume (acre-ft)	*	94.80	*	372.64	*	53.64	*
* C & E Loss (ft)	*	0.01	* Cum SA (acres)	*	18.94	*	46.15	*	10.70	*

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 2614.242

INPUT
Description:
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	284.09	23.85	284.05	24	284	32.71	281.46	37.12	280.14
37.62	280	47.64	279.46	51	279.16	54.09	278.96	55.26	278.87
63.3	278.16	65.42	278	79.89	276.77	86.43	276	98.52	274
107.89	272.54	111.74	272	129.37	270	142.22	269.25	155.14	268.63
171.43	268	178.3	267.79	199.43	267.37	205.28	267.35	208.26	267.32
210.28	267.27	215.43	267.23	221.97	267.08	293.19	266.43	314.34	266.11
315.02	266.09	334.04	266	447.35	265.97	451.64	265.76	456.73	265.16
461.02	264.77	462.93	264.56	466.75	264	604.172	64.2839	805.55	264.7
810.36	264.98	817.1	265.47	824.36	266	840.46	265.66	841.2	265.54
841.52	265.48	844.52	264.99	848.09	264.41	850.62	264	878.3	264.06
884.81	264.27	887.07	264.34	893.2	264.54	904.81	264.99	906.98	265.07
919.83	265.59	930.39	266	1221.37	266.45	1252.77	266.55	1255.58	266.56
1291.4	266.8	1296.66	266.82	1300.32	266.84	1358.35	267.05	1363.83	267.08
1437.45	267.14	1476.36	268	1513.81	267.97	1515.66	267.58	1515.69	267.57
1517.8	267.11	1518.45	266.96	1522.24	266	1525.79	264.43	1526.72	264
1534.45	263.52	1536.74	264	1537.23	264.1	1539.45	264.41	1539.74	264.39
1541.6	264.52	1543.19	264.64	1543.7	264.59	1544.9	264.73	1545.99	264.6
1550.98	264.79	1555.8	265.46	1559.37	266	1564.27	266.15	1565.13	266.16
1573.36	266.41	1584.82	266.74	1596.82	267.06	1601.45	267.12	1609.78	267.32
1612.16	267.38	1655.9	268	1661.55	268.01	1672	269.6	1674.38	269.99
1685.18	271.97	1685.89	272.08	1686.48	272.18	1697.66	274	1700.19	274.39
1711.5	276	1747.89	282	1752.11	282.64	1759.72	284	1770.23	285.58
1772.04	286	1797.04	286.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	215.43	.15	1661.55	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
215.43	1661.55	566.01	580.32	596.25	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	*	272.76	* Element	*	Left OB	*	Channel	*	Right OB	*
* Vel Head (ft)	*	0.01	* Wt. n-Val.	*	0.075	*	0.150	*	0.075	*
* W.S. Elev (ft)	*	272.75	* Reach Len. (ft)	*	566.01	*	580.32	*	596.25	*
* Crit W.S. (ft)	*		* Flow Area (sq ft)	*	423.66	*	9927.85	*	69.14	*
* E.G. Slope (ft/ft)	*0.000498		* Area (sq ft)	*	423.66	*	9927.85	*	69.14	*
* Q Total (cfs)	*	8441.00	* Flow (cfs)	*	462.81	*	7923.38	*	54.81	*
* Top Width (ft)	*	1583.39	* Top Width (ft)	*	108.86	*	1446.12	*	28.41	*
* Vel Total (ft/s)	*	0.81	* Avg. Vel. (ft/s)	*	1.09	*	0.80	*	0.79	*

* Max Chl Dpth (ft)	*	9.23	* Hydr. Depth (ft)	*	3.89	*	6.87	*	2.43	*
* Conv. Total (cfs)	*	378234.4	* Conv. (cfs)	*	20738.4	*	355040.1	*	2456.0	*
* Length Wtd. (ft)	*	579.98	* Wetted Per. (ft)	*	109.09	*	1447.36	*	28.80	*
* Min Ch El (ft)	*	263.52	* Shear (lb/sq ft)	*	0.12	*	0.21	*	0.07	*
* Alpha	*	1.02	* Stream Power (lb/ft s)	*	0.13	*	0.17	*	0.06	*
* Frctn Loss (ft)	*	0.23	* Cum Volume (acre-ft)	*	91.87	*	295.58	*	53.24	*
* C & E Loss (ft)	*	0.00	* Cum SA (acres)	*	18.11	*	33.17	*	10.51	*

CROSS SECTION

RIVER: HRC
REACH: Main RS: 2033.954

INPUT
Description:
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	275.6	4.15	275.02	13.53	274.18	13.67	274.17	14.6	274.06
15.46	274	35.67	272.86	43.13	272.28	45.9	272.27	46.88	272
48.91	271.74	53.93	271.19	60	270.627	66.77	270	67.21	269.97
89.55	268	114.16	266	128	265.583	180.49	264	500	263.196
583	262.987	621.76	262.89	632.77	262.26	637.19	262	667.3	262.05
677.53	262.49	678.87	262.57	715.02	263.35	745.29	264	848.74	263.31
976.36	264	1166.66	263.5	1167.98	263.37	1170.01	262.93	1172.3	262.78
1173.66	262.58	1174.34	262.52	1177.25	262.37	1177.7	262.33	1181.67	262
1198.55	262.92	1204.15	263.34	1213.03	264	1242.62	264.36	1264.45	264.51
1278.97	264.85	1284.69	264.92	1291.21	265.08	1298.05	265.16	1300.1	265.19
1312.36	265.49	1320.28	265.6	1322.69	265.67	1323.15	265.68	1332.87	266
1338.99	266.61	1339.21	266.64	1339.45	266.67	1349.62	268	1364.42	267.24
1365.99	266.75	1368.33	266	1374.53	264.1	1374.8	264	1375.74	263.71
1381.41	262	1385.36	260.8	1388.05	260	1393.64	260.1	1399.81	262
1404.21	263.38	1406.39	264	1409.3	264.15	1412.15	264.3	1413.94	264.4
1417.55	264.59	1430.01	265.27	1437.46	265.61	1445.96	266	1455.18	267.57
1456.54	267.82	1457.47	268	1458.91	268.44	1464.34	270	1465.62	270.41
1472.2	272.35	1476.79	274	1480.29	275.59	1481.4	276	1549.68	276

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	128	.15	1465.62	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
128	1465.62	314.82	169.14	136.17	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	178		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	*	272.53	* Element	*	Left OB	*	Channel	*	Right OB	*
* Vel Head (ft)	*	0.01	* Wt. n-Val.	*		*	0.150	*	0.075	*
* W.S. Elev (ft)	*	272.52	* Reach Len. (ft)	*	314.82	*	169.14	*	136.17	*
* Crit W.S. (ft)	*		* Flow Area (sq ft)	*		*	11286.11	*	7.54	*
* E.G. Slope (ft/ft)	*	0.000316	* Area (sq ft)	*	341.83	*	11670.67	*	7.54	*
* Q Total (cfs)	*	8441.00	* Flow (cfs)	*		*	8438.30	*	2.70	*
* Top Width (ft)	*	1432.63	* Top Width (ft)	*	87.96	*	1337.62	*	7.05	*
* Vel Total (ft/s)	*	0.75	* Avg. Vel. (ft/s)	*		*	0.75	*	0.36	*
* Max Chl Dpth (ft)	*	12.52	* Hydr. Depth (ft)	*		*	8.77	*	1.07	*
* Conv. Total (cfs)	*	474790.5	* Conv. (cfs)	*		*	474638.7	*	151.8	*
* Length Wtd. (ft)	*	168.98	* Wetted Per. (ft)	*		*	1290.24	*	7.36	*
* Min Ch El (ft)	*	260.00	* Shear (lb/sq ft)	*		*	0.17	*	0.02	*
* Alpha	*	1.00	* Stream Power (lb/ft s)	*		*	0.13	*	0.01	*
* Frctn Loss (ft)	*	0.06	* Cum Volume (acre-ft)	*	86.89	*	151.71	*	52.72	*
* C & E Loss (ft)	*	0.00	* Cum SA (acres)	*	16.83	*	14.63	*	10.27	*

****

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1864

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	279	84	270	104.5	268	138.5	266	180	264
384.4	263	733.4	264	766.6	262	875.1	262	897	261
925.4	262	1320	264	1404.6	264	1432.4	260	1452.4	260
1463.1	262	1488.4	264	1514.5	266	1532	270	1550	276
1606.2	276								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	384.4	.15	1514.5	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
384.4	1514.5	303.12	145.5	135.57	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	521	278.548	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	272.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.150	0.075
W.S. Elev (ft)	272.46	Reach Len. (ft)	303.12	145.50	135.57
Crit W.S. (ft)	264.27	Flow Area (sq ft)		9403.29	87.03
E.G. Slope (ft/ft)	0.000403	Area (sq ft)	2424.59	10668.27	87.03
Q Total (cfs)	8441.00	Flow (cfs)		8362.98	78.02
Top Width (ft)	1478.29	Top Width (ft)	323.32	1130.10	24.87
Vel Total (ft/s)	0.89	Avg. Vel. (ft/s)		0.89	0.90
Max Chl Dpth (ft)	12.46	Hydr. Depth (ft)		9.46	3.50
Conv. Total (cfs)	420479.3	Conv. (cfs)		416592.7	3886.6
Length Wtd. (ft)	145.26	Wetted Per. (ft)		994.23	25.72
Min Ch El (ft)	260.00	Shear (lb/sq ft)		0.24	0.09
Alpha	1.00	Stream Power (lb/ft s)		0.21	0.08
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	76.90	108.34	52.57
C & E Loss (ft)	0.00	Cum SA (acres)	15.35	9.83	10.22

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1717

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	281.4	44.3	280	164.31	264	208.61	263.4	391.59	264
398	264	414.12	264	440.08	262	601.4	262	929.55	264

```
   939.9   264.3     950     264  968.47     262  986.36     260  1008.6     262
 1163.82     262 1180.74     258 1200.55     262 1214.96     264 1222.63 264.689
 1237.23     266 1249.12     268  1274.3     276 1307.01     276

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .075     398     .15 1222.63    .075

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          398 1222.63              130   115.1   115.1             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     607     282          F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
************************************************************************************************
* E.G. Elev (ft)         *  272.38  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.03  * Wt. n-Val.            *          *   0.150  *   0.075  *
* W.S. Elev (ft)         *  272.36  * Reach Len. (ft)       *  130.00  *  115.10  *  115.10  *
* Crit W.S. (ft)         *  264.30  * Flow Area (sq ft)     *          * 6066.00  *  195.90  *
* E.G. Slope (ft/ft)     *0.000866  * Area (sq ft)          * 2282.67  * 8172.04  *  195.90  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *          * 8117.44  *  323.56  *
* Top Width (ft)         * 1161.19  * Top Width (ft)       *  296.36  *  824.63  *   40.20  *
* Vel Total (ft/s)       *    1.35  * Avg. Vel. (ft/s)     *          *    1.34  *    1.65  *
* Max Chl Dpth (ft)      *   14.36  * Hydr. Depth (ft)     *          *    9.85  *    4.87  *
* Conv. Total (cfs)      *286767.9  * Conv. (cfs)          *          *275775.5  * 10992.4  *
* Length Wtd. (ft)       *  115.10  * Wetted Per. (ft)     *          *  616.99  *   41.10  *
* Min Ch El (ft)         *  258.00  * Shear (lb/sq ft)     *          *    0.53  *    0.26  *
* Alpha                  *    1.01  * Stream Power (lb/ft s) *        *    0.71  *    0.43  *
* Frctn Loss (ft)        *    0.18  * Cum Volume (acre-ft)  *   60.52  *   76.87  *   52.13  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)        *   13.19  *    6.57  *   10.12  *
************************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 1690

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*************************************************************************************
       0   275.6    33.3     274    46.8     272    65.7     270   138.6     266
   402.5     264   797.5     264   928.3     264   953.7     260   995.5     258
   999.9   257.4  1004.9     258  1021.8     262  1044.3     266  1070.3     270
  1081.3     272  1093.3     276

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .075   402.5     .15  1044.3    .075

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        402.5  1044.3              165   131.9   131.9             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     722               F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
```

E.G. Elev (ft)	272.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.150	0.075
W.S. Elev (ft)	272.08	Reach Len. (ft)	165.00	131.90	131.90
Crit W.S. (ft)		Flow Area (sq ft)		2989.78	117.85
E.G. Slope (ft/ft)	*0.003886	Area (sq ft)	2185.14	5570.32	117.85
Q Total (cfs)	8441.00	Flow (cfs)		8129.98	311.02
Top Width (ft)	1035.25	Top Width (ft)	356.22	641.80	37.23
Vel Total (ft/s)	2.72	Avg. Vel. (ft/s)		2.72	2.64
Max Chl Dpth (ft)	14.68	Hydr. Depth (ft)		9.28	3.17
Conv. Total (cfs)	*135406.4	Conv. (cfs)		*130417.1	4989.3
Length Wtd. (ft)	132.88	Wetted Per. (ft)		323.56	37.73
Min Ch El (ft)	257.40	Shear (lb/sq ft)		2.24	0.76
Alpha	1.00	Stream Power (lb/ft s)		6.10	2.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	53.85	58.72	51.72
C & E Loss (ft)	0.10	Cum SA (acres)	12.22	4.63	10.01

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1630

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	274.45	33.4	272	80.4	266	455.4	264.3	576.4	264
808	264	824	256	862.7	255.09	869.2	255.11	882.4	261.86
906.1	262.81	918.8	262.7	930	265.42	936.8	268.24	945.5	271.59
954.3	273.15	1008.2	276						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	808	.04	882.4	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
808	882.4	27.6	27.6	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	790.6		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	271.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	271.46	Reach Len. (ft)	27.60	27.60	27.60
Crit W.S. (ft)		Flow Area (sq ft)	129.77	1076.73	454.51
E.G. Slope (ft/ft)	*0.000737	Area (sq ft)	5093.66	1076.73	454.51
Q Total (cfs)	8441.00	Flow (cfs)	499.55	6252.54	1688.91
Top Width (ft)	907.51	Top Width (ft)	770.35	74.40	62.76
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)	3.85	5.81	3.72
Max Chl Dpth (ft)	16.37	Hydr. Depth (ft)	7.46	14.47	7.24
Conv. Total (cfs)	*310930.6	Conv. (cfs)	18401.3	*230317.0	62212.4
Length Wtd. (ft)	27.60	Wetted Per. (ft)	17.40	77.93	64.26
Min Ch El (ft)	255.09	Shear (lb/sq ft)	0.34	0.64	0.33
Alpha	1.11	Stream Power (lb/ft s)	1.32	3.69	1.21
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	40.06	48.65	50.85
C & E Loss (ft)	0.06	Cum SA (acres)	10.08	3.55	9.86

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1530

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	274.06	53.1	276.46	102.8	278.26	161.1	280.06	217.3	281.26
283.1	282.1	345.6	282.26	409.2	281.96	519.8	280.96	527	280
542	270	556	256	582.12	255.19	616.9	255.19	626.3	255.19
658	256	692	279	797.6	278.36	913.5	277.66		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	556	.04	658	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
556	658	128.1	128.1	128.1	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	545		F
670	913.5		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	271.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.32	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	271.50	Reach Len. (ft)	7.30	7.30	7.30
Crit W.S. (ft)	261.33	Flow Area (sq ft)	110.04	1640.58	137.34
E.G. Slope (ft/ft)	0.000392	Area (sq ft)	120.75	1640.58	177.66
Q Total (cfs)	8441.00	Flow (cfs)	298.34	7690.05	452.60
Top Width (ft)	141.17	Top Width (ft)	16.26	102.00	22.92
Vel Total (ft/s)	4.47	Avg. Vel. (ft/s)	2.71	4.69	3.30
Max Chl Dpth (ft)	16.31	Hydr. Depth (ft)	10.00	16.08	11.44
Conv. Total (cfs)	426183.5	Conv. (cfs)	15063.2	388268.5	22851.8
Length Wtd. (ft)	7.30	Wetted Per. (ft)	15.56	102.02	14.49
Min Ch El (ft)	255.19	Shear (lb/sq ft)	0.17	0.39	0.23
Alpha	1.04	Stream Power (lb/ft s)	0.47	1.85	0.77
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	38.41	47.79	50.65
C & E Loss (ft)	0.00	Cum SA (acres)	9.83	3.49	9.84

BRIDGE

RIVER: HRC
REACH: Main RS: 1463.580

INPUT
Description:
Distance from Upstream XS = 7.3
Deck/Roadway Width = 111
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 15

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0 274.06		53.1 276.46		102.8 278.26			
161.1 280.06		217.3 281.26		283.1 282.1			
345.6 282.26		409.2 281.96	0	519.8 280.96	273.9		
553.5 280.66	273.7	559.5 280.6	273.6	670.6 279.56	272.56		
680.6 279.46	272.5	797.6 278.36	0	913.5 277.66			

Upstream Bridge Cross Section Data
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	274.06	53.1	276.46	102.8	278.26	161.1	280.06	217.3	281.26
283.1	282.1	345.6	282.26	409.2	281.96	519.8	280.96	527	280
542	270	556	256	582.12	255.19	616.9	255.19	626.3	255.19
658	256	692	279	797.6	278.36	913.5	277.66		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	556	.04	658	.04

Bank Sta: Left Right Coeff Contr. Expan.
556 658 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	545		F
670	913.5		F

Downstream Deck/Roadway Coordinates
num= 16

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	271.4		99	275.6		205	279.66	
264.9	281.26		276.7	281.46		315.9	282.06	
361.2	282.46		413.7	282.46	0	481	281.86	274.4
547.4	281.16	274.16	566.9	281	274	664.8	280.02	273.02
672.8	279.86	272.86	757.6	278.96	272.4	843	278.16	0
902.2	277.96							

Downstream Bridge Cross Section Data
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	271.4	99	275.6	205	279.66	264.9	281.26	276.7	281.46
315.9	282.06	361.2	282.46	413.7	282.46	481	281.86	513	280
552	256	564.5	255.3	601.6	255.3	626.6	254.57	669	256
702	278	757.6	278.96	843	278.16	902.2	277.96		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	552	.04	669	.04

Bank Sta: Left Right Coeff Contr. Expan.
552 669 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	535		F
680	902.2		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= 575 Downstream= 589
Upstream num= 2

```
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     274
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     274

Pier Data
Pier Station     Upstream=     623    Downstream=     633
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     274
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
    1.25     250    1.25     274

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
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

BRIDGE OUTPUT  Profile #PDC-Q100PR
*****************************************************************************************
* E.G. US. (ft)          *     271.83  * Element               *Inside BR US *Inside BR DS *
* W.S. US. (ft)          *     271.50  * E.G. Elev (ft)        *     271.82  *     271.71  *
* Q Total (cfs)          *    8441.00  * W.S. Elev (ft)        *     271.50  *     271.47  *
* Q Bridge (cfs)         *    8441.00  * Crit W.S. (ft)        *     261.41  *     260.74  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *      16.31  *      16.90  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *       4.57  *       3.91  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)     *    1846.60  *    2160.63  *
* Weir Submerg           *             * Froude # Chl          *       0.20  *       0.17  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)  *   15481.75  *   17844.97  *
* Min El Weir Flow (ft)  *     279.79  * Hydr Depth (ft)       *      15.07  *      15.16  *
* Min El Prs (ft)        *     273.80  * W.P. Total (ft)       *     194.35  *     213.46  *
* Delta EG (ft)          *       0.12  * Conv. Total (cfs)     *   308736.8  *   376017.4  *
* Delta WS (ft)          *       0.03  * Top Width (ft)        *     138.65  *     162.86  *
* BR Open Area (sq ft)   *    2049.39  * Frctn Loss (ft)       *       0.07  *       0.00  *
* BR Open Vel (ft/s)     *       4.57  * C & E Loss (ft)       *       0.04  *       0.00  *
* Coef of Q              *             * Shear Total (lb/sq ft) *       0.44  *       0.32  *
* Br Sel Method          *Energy only  * Power Total (lb/ft s)  *       2.03  *       1.24  *
*****************************************************************************************

Note:    Momentum answer is not valid if the water surface is above the low chord or if there is weir
         flow.  The momentum answer has been disregarded.

CROSS SECTION


RIVER: HRC
REACH: Main              RS: 1430

INPUT
```

Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	271.4	99	275.6	205	279.66	264.9	281.26	276.7	281.46
315.9	282.06	361.2	282.46	413.7	282.46	481	281.86	513	280
552	256	564.5	255.3	601.6	255.3	626.6	254.57	669	256
702	278	757.6	278.96	843	278.16	902.2	277.96		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	552	.04	669	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
552 669 155.55 155.55 155.55 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	535		F
680	902.2		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	271.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	271.47	Reach Len. (ft)	155.55	155.55	155.55
Crit W.S. (ft)		Flow Area (sq ft)	174.08	1897.33	129.84
E.G. Slope (ft/ft)	0.000284	Area (sq ft)	194.52	1897.33	179.50
Q Total (cfs)	8441.00	Flow (cfs)	461.65	7606.61	372.74
Top Width (ft)	167.01	Top Width (ft)	26.80	117.00	23.21
Vel Total (ft/s)	3.83	Avg. Vel. (ft/s)	2.65	4.01	2.87
Max Chl Dpth (ft)	16.90	Hydr. Depth (ft)	10.24	16.22	11.80
Conv. Total (cfs)	500939.9	Conv. (cfs)	27397.3	451422.0	22120.7
Length Wtd. (ft)	155.55	Wetted Per. (ft)	19.96	117.05	13.22
Min Ch El (ft)	254.57	Shear (lb/sq ft)	0.15	0.29	0.17
Alpha	1.04	Stream Power (lb/ft s)	0.41	1.15	0.50
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	37.95	42.69	50.12
C & E Loss (ft)	0.07	Cum SA (acres)	9.77	3.18	9.77

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 1200

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	271.3	123	276.3	194	270	234	265.5	258.32	264
268.2	264	385.34	264.3	475.09	264	495.75	256	511.29	256
531.43	260	651	259.5	694	275	851.66	276.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	475.09	.15	531.43	.075

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
475.09 531.43 270 307.25 329 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	432.9		F
591.43	851.66		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	271.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.	0.075	0.150	0.075
W.S. Elev (ft)	271.04	Reach Len. (ft)	270.00	307.25	329.00
Crit W.S. (ft)		Flow Area (sq ft)	294.11	724.52	670.02
E.G. Slope (ft/ft)	0.004479	Area (sq ft)	1786.15	724.52	1534.90
Q Total (cfs)	8441.00	Flow (cfs)	1423.12	2579.30	4438.59
Top Width (ft)	500.76	Top Width (ft)	292.83	56.34	151.59
Vel Total (ft/s)	5.00	Avg. Vel. (ft/s)	4.84	3.56	6.62
Max Chl Dpth (ft)	15.04	Hydr. Depth (ft)	6.97	12.86	11.17
Conv. Total (cfs)	126122.6	Conv. (cfs)	21263.7	38539.0	66319.9
Length Wtd. (ft)	309.81	Wetted Per. (ft)	42.19	58.23	60.00
Min Ch El (ft)	256.00	Shear (lb/sq ft)	1.95	3.48	3.12
Alpha	1.24	Stream Power (lb/ft s)	9.43	12.39	20.69
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)	34.41	38.01	47.06
C & E Loss (ft)	0.06	Cum SA (acres)	9.20	2.87	9.46

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 988

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.4	41	268	134.32	264.2	244.2	264.1	328	264
338.93	263.62	359.66	260.74	374.81	250.71	380.52	250.55	397.8	259.2
423.34	261.45	452.45	262	506.1	263.9	532.9	274	545.4	274
555.7	269	751.7	269	762.12	274	968.5	276.6		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	359.66	.15	397.8	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
359.66	397.8	197.03	197.03	197.03	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	268.2		F
532.9	968.5		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	270.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.27	Wt. n-Val.	0.075	0.150	0.075
W.S. Elev (ft)	269.94	Reach Len. (ft)	197.03	197.03	197.03
Crit W.S. (ft)		Flow Area (sq ft)	581.18	586.04	908.44
E.G. Slope (ft/ft)	0.003646	Area (sq ft)	1749.05	586.04	1095.02
Q Total (cfs)	8441.00	Flow (cfs)	2381.84	1993.82	4065.34
Top Width (ft)	714.23	Top Width (ft)	351.85	38.14	324.24
Vel Total (ft/s)	4.07	Avg. Vel. (ft/s)	4.10	3.40	4.48
Max Chl Dpth (ft)	19.39	Hydr. Depth (ft)	6.35	15.37	7.31
Conv. Total (cfs)	139785.2	Conv. (cfs)	39443.8	33018.2	67323.2

* Length Wtd. (ft)	* 197.03	* Wetted Per. (ft)	* 91.67	* 43.21	* 125.57 *
* Min Ch El (ft)	* 250.55	* Shear (lb/sq ft)	* 1.44	* 3.09	* 1.65 *
* Alpha	* 1.04	* Stream Power (lb/ft s)	* 5.92	* 10.51	* 7.37 *
* Frctn Loss (ft)	* 0.94	* Cum Volume (acre-ft)	* 23.45	* 33.39	* 37.13 *
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 7.20	* 2.53	* 7.66 *

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 632

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.57	33.04	266	314.61	266	356.71	266	395.31	251.7
423.91	251.2	439.81	260	493.41	262	604.61	274		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.075	356.71	.15	439.81	.075

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
356.71	439.81	78.3	78.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	314.6		F
552.31	604.61		F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

* E.G. Elev (ft)	* 269.25	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.33	* Wt. n-Val.	* 0.075	* 0.150	* 0.075 *
* W.S. Elev (ft)	* 268.92	* Reach Len. (ft)	* 78.30	* 78.30	* 78.30 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 122.97	* 1100.16	* 644.95 *
* E.G. Slope (ft/ft)	*0.006519	* Area (sq ft)	* 976.05	* 1100.16	* 646.42 *
* Q Total (cfs)	* 8441.00	* Flow (cfs)	* 401.90	* 4741.88	* 3297.22 *
* Top Width (ft)	* 545.61	* Top Width (ft)	* 344.78	* 83.10	* 117.73 *
* Vel Total (ft/s)	* 4.52	* Avg. Vel. (ft/s)	* 3.27	* 4.31	* 5.11 *
* Max Chl Dpth (ft)	* 17.72	* Hydr. Depth (ft)	* 2.92	* 13.24	* 5.73 *
* Conv. Total (cfs)	*104547.1	* Conv. (cfs)	* 4977.8	* 58731.2	* 40838.2 *
* Length Wtd. (ft)	* 78.30	* Wetted Per. (ft)	* 42.11	* 87.94	* 112.88 *
* Min Ch El (ft)	* 251.20	* Shear (lb/sq ft)	* 1.19	* 5.09	* 2.33 *
* Alpha	* 1.04	* Stream Power (lb/ft s)	* 3.88	* 21.94	* 11.89 *
* Frctn Loss (ft)	* 0.13	* Cum Volume (acre-ft)	* 17.29	* 29.58	* 33.19 *
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 5.63	* 2.26	* 6.66 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 627.1

INPUT
Description: Widened SR-76
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
*****************************************************************************
       0  270.56    30.4  270.18    81.4  269.46   130.9  268.69     186  268.01
   243.9  267.38   286.9  267.28   336.9  267.34   386.4  267.39   392.7  262.54
   418.4  252.41   469.5  251.76   493.4  265.81   526.4  266.97   576.4  266.97
   625.2  266.56     677  266.11   728.7   266.2   779.9   266.8  832.79  267.77
   878.7  269.03   930.7  269.84  1152.6  273.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .04   386.4     .04   526.4     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         386.4   526.4             121.4   121.4   121.4             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   391.7  267.37       F
     491  1152.6  267.37       F
Skew Angle = 40

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*****************************************************************************************
* E.G. Elev (ft)         *  269.10  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.30  * Wt. n-Val.            *   0.040  *   0.040  *   0.040  *
* W.S. Elev (ft)         *  268.81  * Reach Len. (ft)       *    1.00  *    1.00  *    1.00  *
* Crit W.S. (ft)         *  260.48  * Flow Area (sq ft)     *  299.82  * 1489.26  *  674.96  *
* E.G. Slope (ft/ft)     *0.000742  * Area (sq ft)          *  299.82  * 1489.26  *  674.96  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *  330.95  * 7040.33  * 1069.72  *
* Top Width (ft)         *  747.22  * Top Width (ft)       *  263.04  *  140.00  *  344.19  *
* Vel Total (ft/s)       *    3.43  * Avg. Vel. (ft/s)     *    1.10  *    4.73  *    1.58  *
* Max Chl Dpth (ft)      *   17.05  * Hydr. Depth (ft)     *    1.14  *   10.64  *    1.96  *
* Conv. Total (cfs)      *309961.5  * Conv. (cfs)          * 12152.8  *258527.7  * 39281.0  *
* Length Wtd. (ft)       *    1.00  * Wetted Per. (ft)     *  263.05  *  147.42  *  344.22  *
* Min Ch El (ft)         *  251.76  * Shear (lb/sq ft)     *    0.05  *    0.47  *    0.09  *
* Alpha                  *    1.62  * Stream Power (lb/ft s) *  0.06  *    2.21  *    0.14  *
* Frctn Loss (ft)        *    0.00  * Cum Volume (acre-ft) *   16.14  *   27.25  *   32.01  *
* C & E Loss (ft)        *    0.02  * Cum SA (acres)       *    5.08  *    2.06  *    6.24  *
*****************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

BRIDGE


RIVER: HRC
REACH: Main               RS: 561.3247

INPUT
Description:
Distance from Upstream XS =       1
Deck/Roadway Width        =   119.5
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      23
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************************************
       0  270.56            30.4  270.18            81.4  269.46
   130.9  268.69             186  268.01           243.9  267.38
   286.9  267.28           336.9  267.34           386.4  267.39
   386.4  270.26       0   392.7   270.2  265.99     490  269.94  265.73
   526.4  269.81       0   526.4  266.97           576.4  266.97
   625.2  266.56           677  266.11           728.7   266.2
   779.9   266.8         832.79  267.77           878.7  269.03
   930.7  269.84         1152.6  273.75
```

Upstream Bridge Cross Section Data
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	270.56	30.4	270.18	81.4	269.46	130.9	268.69	186	268.01
243.9	267.38	286.9	267.28	336.9	267.34	386.4	267.39	392.7	262.54
418.4	252.41	469.5	251.76	493.4	265.81	526.4	266.97	576.4	266.97
625.2	266.56	677	266.11	728.7	266.2	779.9	266.8	832.79	267.77
878.7	269.03	930.7	269.84	1152.6	273.75				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	386.4	.04	526.4	.04

Bank Sta: Left Right Coeff Contr. Expan.
386.4 526.4 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	391.7	267.37	F
491	1152.6	267.37	F

Skew Angle = 40

Downstream Deck/Roadway Coordinates
num= 24

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	267.86		37.39	267.86		89.94	267.79	
143.44	267.6		195.52	267.43		248.21	267.3	
300.7	267.37		352.18	267.25		402.26	267.19	
451.32	266.99		451.32	269.65	0	471.02	269.59	265.25
572.2	269.29	264.94	592.18	269.23	0	592.18	266.61	
665.39	266.4		714.75	266.18		765.9	266.31	
816.75	266.64		849.42	266.8		898.88	267.35	
948.16	267.82		998.2	268.31		1152.04	270	

Downstream Bridge Cross Section Data
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.86	37.39	267.86	89.94	267.79	143.44	267.6	195.52	267.43
248.21	267.3	300.7	267.37	352.18	267.25	402.26	267.19	453.2	265.82
471.9	261.12	499.39	252.23	544.85	252.67	592.62	266.32	665.39	266.4
714.75	266.18	765.9	266.31	816.75	266.64	849.42	266.8	898.88	267.35
948.16	267.82	998.2	268.31	1152.04	270				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	402.26	.04	592.62	.04

Bank Sta: Left Right Coeff Contr. Expan.
402.26 592.62 .3 .5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	0		F

Skew Angle = 40

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= 423.14 Downstream= 500.85
Upstream num= 2

Width	Elev	Width	Elev
1.5	250	1.5	267

Downstream num= 2

Width	Elev	Width	Elev
1.5	250	1.5	267

Pier Data
Pier Station Upstream= 455.86 Downstream= 533.56
Upstream num= 2

Width	Elev	Width	Elev
1.5	250	1.5	267

Downstream num= 2

Width	Elev	Width	Elev
1.5	250	1.5	267

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 1.2
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

BRIDGE OUTPUT Profile #PDC-Q100PR

E.G. US. (ft)	269.10	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	268.81	E.G. Elev (ft)	269.08	268.58
Q Total (cfs)	8441.00	W.S. Elev (ft)	268.72	268.13
Q Bridge (cfs)	5725.33	Crit W.S. (ft)	260.73	260.97
Q Weir (cfs)		Max Chl Dpth (ft)	16.96	15.90
Weir Sta Lft (ft)		Vel Total (ft/s)	4.30	4.61
Weir Sta Rgt (ft)		Flow Area (sq ft)	1964.65	1831.12
Weir Submerg		Froude # Chl	0.20	0.22
Weir Max Depth (ft)		Specif Force (cu ft)	11433.12	10469.45
Min El Weir Flow (ft)	267.38	Hydr Depth (ft)	3.28	2.18
Min El Prs (ft)	265.99	W.P. Total (ft)	855.54	1100.80
Delta EG (ft)	0.61	Conv. Total (cfs)	146640.9	119350.1
Delta WS (ft)	0.60	Top Width (ft)	598.16	839.28
BR Open Area (sq ft)	1005.83	Frctn Loss (ft)	0.48	0.00
BR Open Vel (ft/s)	5.69	C & E Loss (ft)	0.02	0.08
Coef of Q		Shear Total (lb/sq ft)	0.48	0.52
Br Sel Method	Energy only	Power Total (lb/ft s)	2.04	2.39

Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than

0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 472

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	267.86	37.39	267.86	89.94	267.79	143.44	267.6	195.52	267.43
248.21	267.3	300.7	267.37	352.18	267.25	402.26	267.19	453.2	265.82
471.9	261.12	499.39	252.23	544.85	252.67	592.62	266.32	665.39	266.4
714.75	266.18	765.9	266.31	816.75	266.64	849.42	266.8	898.88	267.35
948.16	267.82	998.2	268.31	1152.04	270				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	402.26	.04	592.62	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
402.26	592.62	104.13	104.13	104.13	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	0		F

Skew Angle = 40

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	268.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	268.21	Reach Len. (ft)	104.13	104.13	104.13
Crit W.S. (ft)		Flow Area (sq ft)	283.49	1625.38	561.57
E.G. Slope (ft/ft)	0.000886	Area (sq ft)	283.49	1625.38	561.57
Q Total (cfs)	8441.00	Flow (cfs)	248.14	7408.14	784.72
Top Width (ft)	988.00	Top Width (ft)	402.26	190.36	395.38
Vel Total (ft/s)	3.42	Avg. Vel. (ft/s)	0.88	4.56	1.40
Max Chl Dpth (ft)	15.98	Hydr. Depth (ft)	0.70	8.54	1.42
Conv. Total (cfs)	283530.1	Conv. (cfs)	8335.0	248836.6	26358.6
Length Wtd. (ft)	104.13	Wetted Per. (ft)	402.61	194.28	395.39
Min Ch El (ft)	252.23	Shear (lb/sq ft)	0.04	0.46	0.08
Alpha	1.58	Stream Power (lb/ft s)	0.03	2.11	0.11
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	15.41	24.31	30.38
C & E Loss (ft)	0.20	Cum SA (acres)	4.16	1.99	5.23

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 200

INPUT
Description: (Alternative #1 is filled in w/in east IE flow area)
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
      0     266    54.4   263.3  180.89  263.15  344.76     262  447.22   261.5
 526.58     262  537.83     262  567.42     260  600.76  251.91  615.28  251.91
 638.59     258  689.52     260  730.83     260  796.92     262  817.74     262
 839.96     260  874.14     260 1071.81     262 1116.03     265 1141.53     268

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06  567.42     .15  638.59     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        567.42  638.59            234.6   234.6   234.6             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   542.6                F
   664.4 1141.53                F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*****************************************************************************************************
* E.G. Elev (ft)         *  268.08  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.94  * Wt. n-Val.             *   0.060  *   0.150  *   0.060  *
* W.S. Elev (ft)         *  267.14  * Reach Len. (ft)        *  234.60  *  234.60  *  234.60  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *  156.39  *  878.08  *  222.82  *
* E.G. Slope (ft/ft)     *0.010570  * Area (sq ft)           * 2598.22  *  878.08  * 2996.90  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)             * 1356.42  * 4698.23  * 2386.35  *
* Top Width (ft)         * 1134.22  * Top Width (ft)         *  567.42  *   71.17  *  495.63  *
* Vel Total (ft/s)       *    6.71  * Avg. Vel. (ft/s)       *    8.67  *    5.35  *   10.71  *
* Max Chl Dpth (ft)      *   15.23  * Hydr. Depth (ft)       *    6.30  *   12.34  *    8.63  *
* Conv. Total (cfs)      * 82102.0  * Conv. (cfs)            * 13193.3  * 45697.7  * 23211.0  *
* Length Wtd. (ft)       *  234.60  * Wetted Per. (ft)       *   24.88  *   72.92  *   25.83  *
* Min Ch El (ft)         *  251.91  * Shear (lb/sq ft)       *    4.15  *    7.95  *    5.69  *
* Alpha                  *    1.34  * Stream Power (lb/ft s) *   35.98  *   42.52  *   60.97  *
* Frctn Loss (ft)        *    1.33  * Cum Volume (acre-ft)   *   11.96  *   21.32  *   26.13  *
* C & E Loss (ft)        *    0.19  * Cum SA (acres)         *    3.00  *    1.67  *    4.16  *
*****************************************************************************************************

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 167

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**************************************************************************************
   182.7     270   467.3     268   511.7   267.8   525.5   262.3  546.96     262
  620.83  261.16  631.87  260.83   634.7   255.7   642.7  251.95  659.89  250.62
   675.7     250   678.9  252.55  703.99  258.94  709.82     260  735.01     260
  808.58   257.6  964.55   259.1 1011.84     260 1060.99     262 1081.52     264
 1145.94     294

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   182.7     .06  631.87     .15  703.99     .06

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

```
       631.87  703.99          140.01     192  236.01            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   182.7  555.79     275       F
  807.37 1145.94 285.913       F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
************************************************************************************************
* E.G. Elev (ft)          *  266.56  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.32  * Wt. n-Val.             *   0.060  *   0.150  *   0.060  *
* W.S. Elev (ft)          *  266.24  * Reach Len. (ft)        *  140.01  *  192.00  *  236.01  *
* Crit W.S. (ft)          *  260.87  * Flow Area (sq ft)      *  364.49  *  942.25  *  733.90  *
* E.G. Slope (ft/ft)      *0.003535  * Area (sq ft)           *  509.74  *  942.25  * 2621.61  *
* Q Total (cfs)           * 8441.00  * Flow (cfs)             * 1525.01  * 2928.09  * 3987.90  *
* Top Width (ft)          *  570.73  * Top Width (ft)         *  116.26  *   72.12  *  382.35  *
* Vel Total (ft/s)        *    4.14  * Avg. Vel. (ft/s)       *    4.18  *    3.11  *    5.43  *
* Max Chl Dpth (ft)       *   16.24  * Hydr. Depth (ft)       *    4.79  *   13.07  *    7.10  *
* Conv. Total (cfs)       *141979.3  * Conv. (cfs)            * 25651.0  * 49251.0  * 67077.3  *
* Length Wtd. (ft)        *  199.06  * Wetted Per. (ft)       *   76.09  *   77.74  *  103.51  *
* Min Ch El (ft)          *  250.00  * Shear (lb/sq ft)       *    1.06  *    2.67  *    1.56  *
* Alpha                   *    1.20  * Stream Power (lb/ft s) *    4.42  *    8.31  *    8.50  *
* Frctn Loss (ft)         *    0.81  * Cum Volume (acre-ft)   *    3.59  *   16.42  *   11.00  *
* C & E Loss (ft)         *    0.00  * Cum SA (acres)         *    1.16  *    1.29  *    1.80  *
************************************************************************************************

Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 120

INPUT
Description:
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**************************************************************************
   123.5     270   542.7     266   555.1   261.6  589.08   261.5   634.1     262
  646.38     262  654.25     260   662.5     256  667.63     252  684.13  248.33
  706.52     252  735.98     256  767.44     258  806.53     262  924.31   282.5

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
   123.5     .06   662.5     .15  735.98     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          662.5  735.98           309.76  309.76  309.76            .3       .5

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
************************************************************************************************
* E.G. Elev (ft)          *  265.74  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.31  * Wt. n-Val.             *   0.060  *   0.150  *   0.060  *
* W.S. Elev (ft)          *  265.43  * Reach Len. (ft)        *  309.76  *  309.76  *  309.76  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)      *  456.79  *  989.22  *  511.51  *
* E.G. Slope (ft/ft)      *0.004789  * Area (sq ft)           *  456.79  *  989.22  *  511.51  *
* Q Total (cfs)           * 8441.00  * Flow (cfs)             * 1908.22  * 3758.08  * 2774.71  *
* Top Width (ft)          *  281.95  * Top Width (ft)         *  118.20  *   73.48  *   90.27  *
* Vel Total (ft/s)        *    4.31  * Avg. Vel. (ft/s)       *    4.18  *    3.80  *    5.42  *
* Max Chl Dpth (ft)       *   17.10  * Hydr. Depth (ft)       *    3.86  *   13.46  *    5.67  *
* Conv. Total (cfs)       *121974.3  * Conv. (cfs)            * 27574.1  * 54305.0  * 40095.1  *
* Length Wtd. (ft)        *  309.76  * Wetted Per. (ft)       *  120.03  *   75.83  *   90.84  *
* Min Ch El (ft)          *  248.33  * Shear (lb/sq ft)       *    1.14  *    3.90  *    1.68  *
* Alpha                   *    1.08  * Stream Power (lb/ft s) *    4.75  *   14.82  *    9.13  *
* Frctn Loss (ft)         *    2.63  * Cum Volume (acre-ft)   *    2.04  *   12.16  *    2.51  *
```

```
* C & E Loss (ft)        *    0.17  * Cum SA (acres)         *    0.79  *    0.97  *    0.52  *
*****************************************************************************************

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 114.5

INPUT
Description:
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
       0     264  205.62  263.85  225.15  256.99  243.36  250.98  253.88  245.58
  266.09  245.87  273.18  246.98   279.2  245.96  281.72   245.8  290.38  246.77
  302.95  250.32  308.46  255.46  316.46  256.72  321.04   261.6  335.98   264.3
  400.51   263.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  225.15     .15  308.46     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        225.15  308.46             6.21    6.21    6.21             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     225     264          F
     315  400.51     264          F

CROSS SECTION OUTPUT  Profile #PDC-Q100PR
*****************************************************************************************
* E.G. Elev (ft)         *  262.94  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)          *    0.89  * Wt. n-Val.            *   0.060  *   0.150  *   0.060  *
* W.S. Elev (ft)         *  262.05  * Reach Len. (ft)       *    6.21  *    6.21  *    6.21  *
* Crit W.S. (ft)         *  255.62  * Flow Area (sq ft)     *    0.76  * 1093.16  *   39.73  *
* E.G. Slope (ft/ft)     *0.018999  * Area (sq ft)          *   36.45  * 1093.16  *   61.48  *
* Q Total (cfs)          * 8441.00  * Flow (cfs)           *    7.28  * 7985.82  *  447.90  *
* Top Width (ft)         *  112.79  * Top Width (ft)       *   14.41  *   83.31  *   15.07  *
* Vel Total (ft/s)       *    7.45  * Avg. Vel. (ft/s)     *    9.65  *    7.31  *   11.27  *
* Max Chl Dpth (ft)      *   16.47  * Hydr. Depth (ft)     *    5.03  *   13.12  *    6.08  *
* Conv. Total (cfs)      * 61239.7  * Conv. (cfs)          *    52.8  * 57937.3  *  3249.5  *
* Length Wtd. (ft)       *    6.21  * Wetted Per. (ft)     *    0.16  *   88.33  *    6.62  *
* Min Ch El (ft)         *  245.58  * Shear (lb/sq ft)     *    5.63  *   14.68  *    7.12  *
* Alpha                  *    1.03  * Stream Power (lb/ft s) *  54.34  *  107.23  *   80.24  *
* Frctn Loss (ft)        *    0.02  * Cum Volume (acre-ft)  *    0.29  *    4.76  *    0.47  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)        *    0.32  *    0.41  *    0.15  *
*****************************************************************************************

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: HRC
REACH: Main               RS: 114
```

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	205.62	263.85	225.15	256.99	243.36	250.98	253.88	245.58
266.09	245.87	273.18	246.98	279.2	245.96	281.72	245.8	290.38	246.77
302.95	250.32	308.46	255.46	316.46	256.72	321.04	261.6	335.98	264.3
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	225.15	.04	308.46	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
225.15	308.46	46.67	46.67	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	225	264	F
315	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	262.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.87	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	262.04	Reach Len. (ft)	1.70	1.70	1.70
Crit W.S. (ft)	255.62	Flow Area (sq ft)	0.75	1091.95	39.64
E.G. Slope (ft/ft)	*0.001448	Area (sq ft)	36.24	1091.95	61.26
Q Total (cfs)	8441.00	Flow (cfs)	3.00	8253.23	184.76
Top Width (ft)	112.67	Top Width (ft)	14.37	83.31	14.99
Vel Total (ft/s)	7.45	Avg. Vel. (ft/s)	3.99	7.56	4.66
Max Chl Dpth (ft)	16.46	Hydr. Depth (ft)	5.02	13.11	6.06
Conv. Total (cfs)	*221799.0	Conv. (cfs)	78.9	*216865.2	4854.9
Length Wtd. (ft)	1.70	Wetted Per. (ft)	0.16	88.33	6.62
Min Ch El (ft)	245.58	Shear (lb/sq ft)	0.43	1.12	0.54
Alpha	1.01	Stream Power (lb/ft s)	1.71	8.45	2.52
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.28	4.60	0.46
C & E Loss (ft)	0.03	Cum SA (acres)	0.31	0.40	0.14

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

BRIDGE

RIVER: HRC
REACH: Main RS: 112

INPUT
Description: Pankey Rd (South) bridge
Distance from Upstream XS = 1.7
Deck/Roadway Width = 42
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	264		205.62	263.85		209.7	264.1	
209.7	266.87		222.93	266.89	0	225.13	266.88	262.87
260.35	266.81	262.79	262.93	266.8	262.785	291.6	266.77	262.73
292.92	266.77	262.73	321	266.74	262.74	323.25	266.74	0
336.02	266.68		336.02	264.07		400.51	263.9	

Upstream Bridge Cross Section Data
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	264	205.62	263.85	225.15	256.99	243.36	250.98	253.88	245.58
266.09	245.87	273.18	246.98	279.2	245.96	281.72	245.8	290.38	246.77
302.95	250.32	308.46	255.46	316.46	256.72	321.04	261.6	335.98	264.3
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	225.15	.04	308.46	.04

Bank Sta: Left Right Coeff Contr. Expan.
225.15 308.46 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	225	264	F
315	400.51	264	F

Downstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	265.19		188.32	264.32		211.26	264.14	
228.01	263.99		228.01	266.87	0	243.32	266.85	262.85
273.89	266.81	262.81	301.36	266.78	262.75	313.03	266.76	262.73
331.22	266.74	262.723	339.13	266.73	262.72	354.37	266.72	0
354.37	263.77		357.8	264		400.51	263.9	

Downstream Bridge Cross Section Data
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48
316.55	253.65	324.36	255.37	338.49	260.73	353.93	263.77	357.8	264
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	243.32	.04	324.36	.04

Bank Sta: Left Right Coeff Contr. Expan.
243.32 324.36 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	250	264	F
330	400.51	264	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 = .95
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 = 3

Pier Data
Pier Station Upstream= 242.2 Downstream= 266
Upstream num= 2

Width	Elev	Width	Elev

```
*********************************
     1.5     245     1.5     265
Downstream     num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     245     1.5     265

Pier Data
Pier Station     Upstream=   270.2    Downstream=     294
Upstream     num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     245     1.5     265
Downstream     num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     245     1.5     265

Pier Data
Pier Station     Upstream=   298.2    Downstream=     322
Upstream     num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     245     1.5     265
Downstream     num=        2
    Width   Elev    Width   Elev
*********************************
     1.5     245     1.5     265

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
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

BRIDGE OUTPUT  Profile #PDC-Q100PR
*************************************************************************************************
* E.G. US. (ft)          *     262.91  * Element               *Inside BR US *Inside BR DS *
* W.S. US. (ft)          *     262.04  * E.G. Elev (ft)        *     262.87  *     262.59  *
* Q Total (cfs)          *    8441.00  * W.S. Elev (ft)        *     261.89  *     261.29  *
* Q Bridge (cfs)         *    8441.00  * Crit W.S. (ft)        *     255.93  *     256.15  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *      16.31  *      15.55  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *       7.96  *       9.13  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)     *    1060.44  *     924.55  *
* Weir Submerg           *             * Froude # Chl          *       0.40  *       0.45  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)  *    9292.21  *    8563.14  *
* Min El Weir Flow (ft)  *     264.01  * Hydr Depth (ft)       *      12.42  *      12.25  *
* Min El Prs (ft)        *     262.87  * W.P. Total (ft)       *     172.87  *     152.95  *
* Delta EG (ft)          *       0.40  * Conv. Total (cfs)     *   134555.3  *   114134.1  *
* Delta WS (ft)          *       0.69  * Top Width (ft)        *      91.39  *      91.64  *
* BR Open Area (sq ft)   *    1036.95  * Frctn Loss (ft)       *       0.19  *       0.01  *
* BR Open Vel (ft/s)     *       9.13  * C & E Loss (ft)       *       0.09  *       0.07  *
* Coef of Q              *             * Shear Total (lb/sq ft) *      1.51  *       2.06  *
* Br Sel Method          *Energy only  * Power Total (lb/ft s)  *     12.00  *      18.84  *
*************************************************************************************************
```

Warning: For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy. This is not physically possible, the momentum answer has been disregarded.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 110

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48
316.55	253.65	324.36	255.37	338.49	260.73	353.93	263.77	357.8	264
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	243.32	.04	324.36	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
243.32	324.36	6.21	6.21	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	250	264	F
330	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	262.51		
Vel Head (ft)	1.16		
W.S. Elev (ft)	261.35		
Crit W.S. (ft)	255.86		
E.G. Slope (ft/ft)	0.001975		
Q Total (cfs)	8441.00		
Top Width (ft)	103.69		
Vel Total (ft/s)	8.58		
Max Chl Dpth (ft)	15.61		
Conv. Total (cfs)	189928.0		
Length Wtd. (ft)	6.21		
Min Ch El (ft)	245.74		
Alpha	1.02		
Frctn Loss (ft)	0.03		
C & E Loss (ft)	0.00		
Wt. n-Val.		0.040	0.040
Reach Len. (ft)	6.21	6.21	6.21
Flow Area (sq ft)		955.88	27.68
Area (sq ft)	6.56	984.68	47.55
Flow (cfs)		8314.84	126.16
Top Width (ft)	5.38	81.04	17.26
Avg. Vel. (ft/s)		8.70	4.56
Hydr. Depth (ft)		12.85	4.91
Conv. (cfs)		187089.4	2838.7
Wetted Per. (ft)		79.04	6.03
Shear (lb/sq ft)		1.49	0.57
Stream Power (lb/ft s)		12.97	2.58
Cum Volume (acre-ft)	0.28	3.56	0.41
Cum SA (acres)	0.31	0.31	0.13

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 109.5

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	265.19	188.31	264.32	218.36	264	235.52	262.44	243.32	258.91
253.34	253.29	261.19	247.45	276.73	246	299.2	245.74	306.91	247.48
316.55	253.65	324.36	255.37	338.49	260.73	353.93	263.77	357.8	264
400.51	263.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	243.32	.15	324.36	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
243.32	324.36	108.78	108.78	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	250	264	F
330	400.51	264	F

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	262.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.16	Wt. n-Val.		0.150	0.060
W.S. Elev (ft)	261.32	Reach Len. (ft)	108.78	108.78	108.78
Crit W.S. (ft)	255.89	Flow Area (sq ft)		953.79	27.52
E.G. Slope (ft/ft)	0.026778	Area (sq ft)	6.41	982.39	47.06
Q Total (cfs)	8441.00	Flow (cfs)		8134.28	306.72
Top Width (ft)	103.48	Top Width (ft)	5.32	81.04	17.12
Vel Total (ft/s)	8.60	Avg. Vel. (ft/s)		8.53	11.15
Max Chl Dpth (ft)	15.58	Hydr. Depth (ft)		12.83	4.88
Conv. Total (cfs)	51582.6	Conv. (cfs)		49708.2	1874.4
Length Wtd. (ft)	108.78	Wetted Per. (ft)		79.04	6.03
Min Ch El (ft)	245.74	Shear (lb/sq ft)		20.17	7.63
Alpha	1.01	Stream Power (lb/ft s)		172.05	85.00
Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	0.28	3.42	0.40
C & E Loss (ft)	0.46	Cum SA (acres)	0.31	0.30	0.13

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: HRC
REACH: Main RS: 100

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	260.6	51.9	260	217.5	259.3	253	258	298.3	246
350.3	246	414.9	256	457.71	256.7	482.34	258	494.31	260
503.41	261								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	253	.15	414.9	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
253	414.9	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PDC-Q100PR

E.G. Elev (ft)	260.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.060	0.150	0.060
W.S. Elev (ft)	260.50	Reach Len. (ft)			
Crit W.S. (ft)	253.31	Flow Area (sq ft)	217.25	1752.75	274.34
E.G. Slope (ft/ft)	0.006578	Area (sq ft)	217.25	1752.75	274.34
Q Total (cfs)	8441.00	Flow (cfs)	403.45	6826.41	1211.14
Top Width (ft)	490.21	Top Width (ft)	244.35	161.90	83.96
Vel Total (ft/s)	3.76	Avg. Vel. (ft/s)	1.86	3.89	4.41
Max Chl Dpth (ft)	14.50	Hydr. Depth (ft)	0.89	10.83	3.27
Conv. Total (cfs)	104072.0	Conv. (cfs)	4974.3	84165.1	14932.6
Length Wtd. (ft)		Wetted Per. (ft)	244.38	164.23	84.19
Min Ch El (ft)	246.00	Shear (lb/sq ft)	0.37	4.38	1.34
Alpha	1.08	Stream Power (lb/ft s)	0.68	17.07	5.91
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:HRC

Reach	River Sta.	n1	n2	n3
Main	5608.249	.075	.15	.075
Main	5000.613	.075	.15	.075
Main	4634.388	.075	.15	.075
Main	4342.055	.075	.15	.075
Main	3976.927	.075	.15	.075
Main	3642.177	.075	.15	.075
Main	3351.951	.075	.15	.075
Main	3038.374	.075	.15	.075
Main	2614.242	.075	.15	.075
Main	2033.954	.075	.15	.075
Main	1864	.075	.15	.075
Main	1717	.075	.15	.075
Main	1690	.075	.15	.075
Main	1630	.04	.04	.04
Main	1530	.04	.04	.04
Main	1463.580	Bridge		
Main	1430	.04	.04	.04
Main	1200	.075	.15	.075
Main	988	.075	.15	.075
Main	632	.075	.15	.075
Main	627.1	.04	.04	.04
Main	561.3247	Bridge		
Main	472	.04	.04	.04
Main	200	.06	.15	.06
Main	167	.06	.15	.06
Main	120	.06	.15	.06
Main	114.5	.06	.15	.06
Main	114	.04	.04	.04
Main	112	Bridge		
Main	110	.04	.04	.04
Main	109.5	.06	.15	.06
Main	100	.06	.15	.06

SUMMARY OF REACH LENGTHS

River: HRC

Reach	River Sta.	Left	Channel	Right
Main	5608.249	386.82	607.68	624.69
Main	5000.613	325.2	366.24	367.74
Main	4634.388	279.85	292.35	293
Main	4342.055	344.1	365.11	365.46
Main	3976.927	334.85	334.75	343.15
Main	3642.177	258.15	290.25	300.25
Main	3351.951	278.95	313.6	317.15
Main	3038.374	564.83	424.13	403.83
Main	2614.242	566.01	580.32	596.25
Main	2033.954	314.82	169.14	136.17
Main	1864	303.12	145.5	135.57
Main	1717	130	115.1	115.1
Main	1690	165	131.9	131.9
Main	1630	27.6	27.6	27.6
Main	1530	128.1	128.1	128.1
Main	1463.580	Bridge		
Main	1430	155.55	155.55	155.55
Main	1200	270	307.25	329
Main	988	197.03	197.03	197.03
Main	632	78.3	78.3	78.3
Main	627.1	121.4	121.4	121.4
Main	561.3247	Bridge		
Main	472	104.13	104.13	104.13
Main	200	234.6	234.6	234.6
Main	167	140.01	192	236.01
Main	120	309.76	309.76	309.76
Main	114.5	6.21	6.21	6.21
Main	114	46.67	46.67	46.67
Main	112	Bridge		
Main	110	6.21	6.21	6.21
Main	109.5	108.78	108.78	108.78
Main	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: HRC

Reach	River Sta.	Contr.	Expan.
Main	5608.249	.1	.3
Main	5000.613	.1	.3
Main	4634.388	.1	.3
Main	4342.055	.1	.3
Main	3976.927	.1	.3
Main	3642.177	.1	.3
Main	3351.951	.1	.3
Main	3038.374	.1	.3
Main	2614.242	.1	.3
Main	2033.954	.1	.3
Main	1864	.1	.3
Main	1717	.1	.3
Main	1690	.3	.5
Main	1630	.3	.5
Main	1530	.3	.5
Main	1463.580	Bridge	

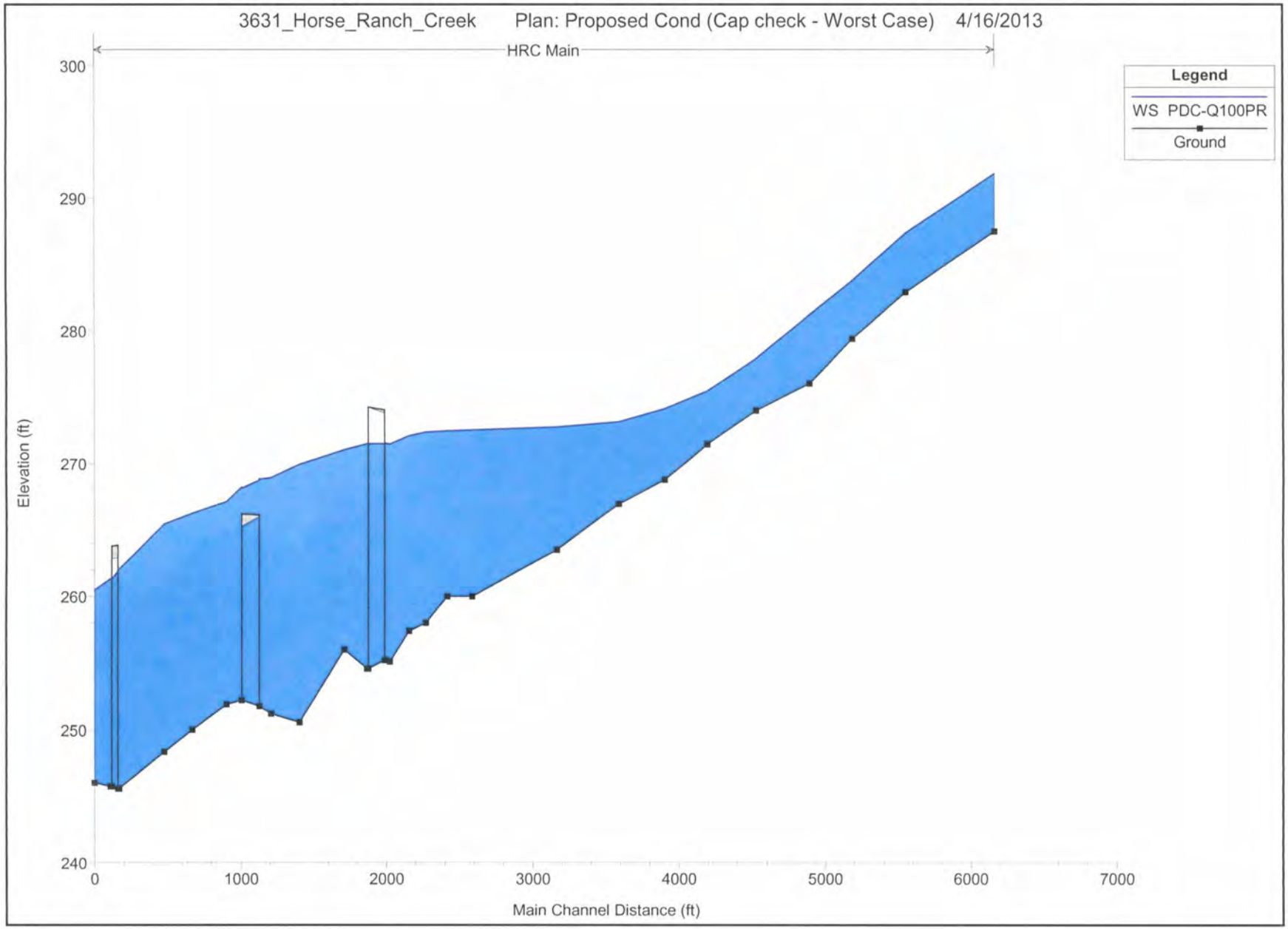
*Main	* 1430	*	.3*	.5*
*Main	* 1200	*	.1*	.3*
*Main	* 988	*	.3*	.5*
*Main	* 632	*	.3*	.5*
*Main	* 627.1	*	.3*	.5*
*Main	* 561.3247	*Bridge	*	*
*Main	* 472	*	.3*	.5*
*Main	* 200	*	.1*	.3*
*Main	* 167	*	.1*	.3*
*Main	* 120	*	.3*	.5*
*Main	* 114.5	*	.3*	.5*
*Main	* 114	*	.3*	.5*
*Main	* 112	*Bridge	*	*
*Main	* 110	*	.3*	.5*
*Main	* 109.5	*	.3*	.5*
*Main	* 100	*	.1*	.3*

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	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	5608.249	PDC-Q100PR	8441.00	287.48	291.84	289.41	291.90	0.007071	1.94	4348.77	1596.31	0.18
Main	5000.613	PDC-Q100PR	8441.00	282.91	287.36	285.07	287.42	0.007996	1.94	4241.80	1688.52	0.19
Main	4634.388	PDC-Q100PR	8441.00	279.38	283.79	282.02	283.87	0.012209	2.21	3748.24	1473.70	0.23
Main	4342.055	PDC-Q100PR	8441.00	276.00	281.20		281.25	0.006864	1.85	4583.19	1426.33	0.18
Main	3976.927	PDC-Q100PR	8441.00	274.00	277.89		277.97	0.012291	2.26	3743.74	1345.30	0.23
Main	3642.177	PDC-Q100PR	8441.00	271.44	275.44		275.50	0.004892	1.57	5018.38	1519.41	0.15
Main	3351.951	PDC-Q100PR	8441.00	268.75	274.14	271.00	274.18	0.004193	1.61	5291.07	1490.30	0.14
Main	3038.374	PDC-Q100PR	8441.00	266.96	273.14		273.17	0.002524	1.42	5946.40	1252.66	0.11
Main	2614.242	PDC-Q100PR	8441.00	263.52	272.75		272.76	0.000498	0.80	10420.65	1583.39	0.05
Main	2033.954	PDC-Q100PR	8441.00	260.00	272.52		272.53	0.000316	0.75	11293.65	1432.63	0.04
Main	1864	PDC-Q100PR	8441.00	260.00	272.46	264.27	272.47	0.000403	0.89	9490.33	1478.29	0.05
Main	1717	PDC-Q100PR	8441.00	258.00	272.36	264.30	272.38	0.000866	1.34	6261.90	1161.19	0.08
Main	1690	PDC-Q100PR	8441.00	257.40	272.08		272.19	0.003886	2.72	3107.63	1035.25	0.16
Main	1630	PDC-Q100PR	8441.00	255.09	271.46		271.90	0.000737	5.81	1661.01	907.51	0.27
Main	1530	PDC-Q100PR	8441.00	255.19	271.50	261.33	271.83	0.000392	4.69	1887.96	141.17	0.21
Main	1463.580 Pankey Road		Bridge									
Main	1430	PDC-Q100PR	8441.00	254.57	271.47		271.71	0.000284	4.01	2201.25	167.01	0.18
Main	1200	PDC-Q100PR	8441.00	256.00	271.04		271.52	0.004479	3.56	1688.65	500.76	0.17
Main	988	PDC-Q100PR	8441.00	250.55	269.94		270.21	0.003646	3.40	2075.66	714.23	0.15
Main	632	PDC-Q100PR	8441.00	251.20	268.92		269.25	0.006519	4.31	1868.08	545.61	0.21
Main	627.1	PDC-Q100PR	8441.00	251.76	268.81	260.48	269.10	0.000742	4.73	2464.04	747.22	0.26
Main	561.3247 SR-76		Bridge									
Main	472	PDC-Q100PR	8441.00	252.23	268.21		268.50	0.000886	4.56	2470.44	988.00	0.27
Main	200	PDC-Q100PR	8441.00	251.91	267.14		268.08	0.010570	5.35	1257.29	1134.22	0.27
Main	167	PDC-Q100PR	8441.00	250.00	266.24	260.87	266.56	0.003535	3.11	2040.64	570.73	0.15
Main	120	PDC-Q100PR	8441.00	248.33	265.43		265.74	0.004789	3.80	1957.51	281.95	0.18
Main	114.5	PDC-Q100PR	8441.00	245.58	262.05	255.62	262.94	0.018999	7.31	1133.64	112.79	0.36
Main	114	PDC-Q100PR	8441.00	245.58	262.04	255.62	262.91	0.001448	7.56	1132.34	112.67	0.37
Main	112		Bridge									
Main	110	PDC-Q100PR	8441.00	245.74	261.35	255.86	262.51	0.001975	8.70	983.56	103.69	0.43
Main	109.5	PDC-Q100PR	8441.00	245.74	261.32	255.89	262.48	0.026778	8.53	981.30	103.48	0.42
Main	100	PDC-Q100PR	8441.00	246.00	260.50	253.31	260.74	0.006578	3.89	2244.34	490.21	0.21

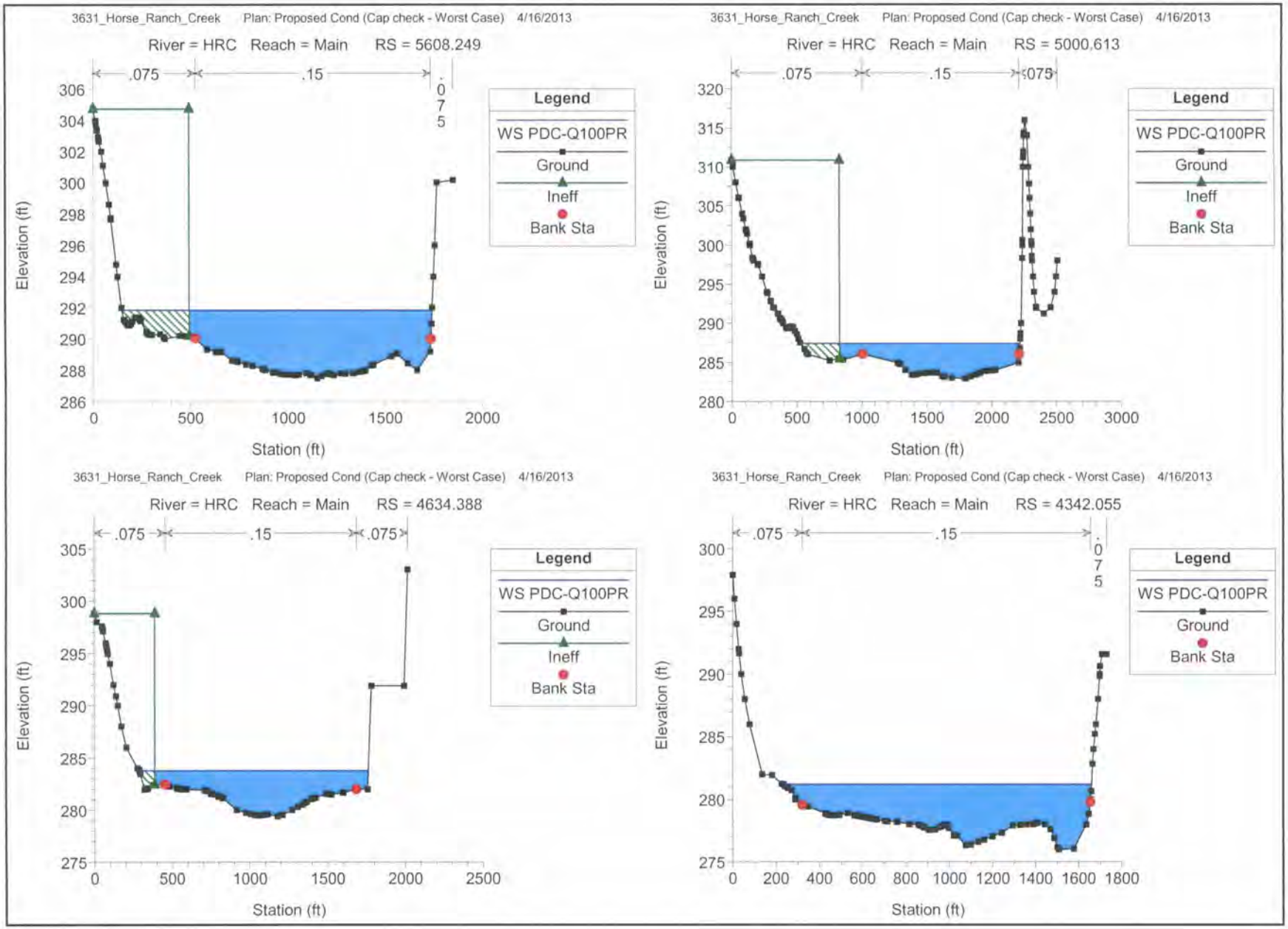
APPENDIX 8

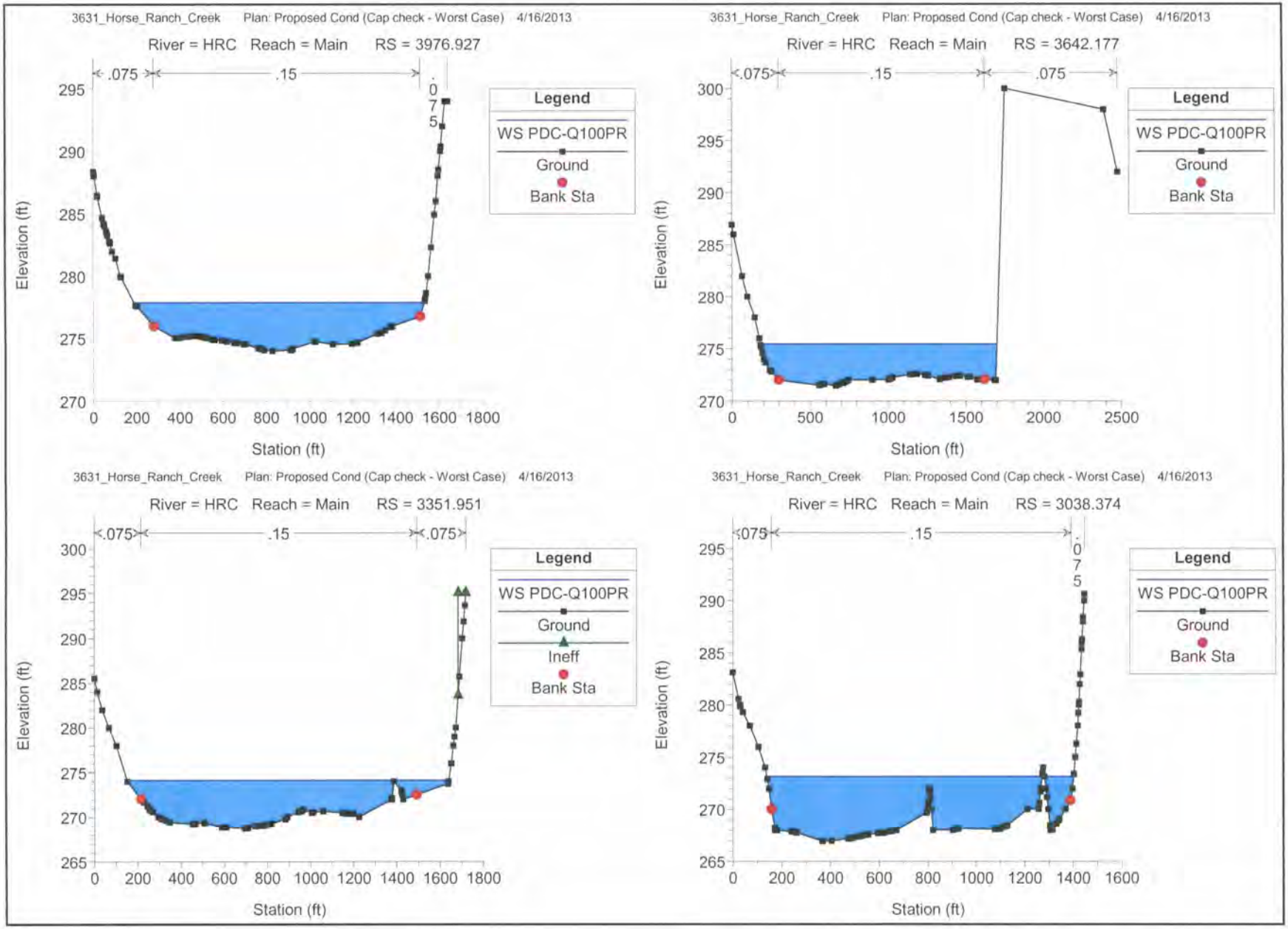
Proposed Condition (Capacity/Worst Case)
HEC-RAS Cross Sections and Results

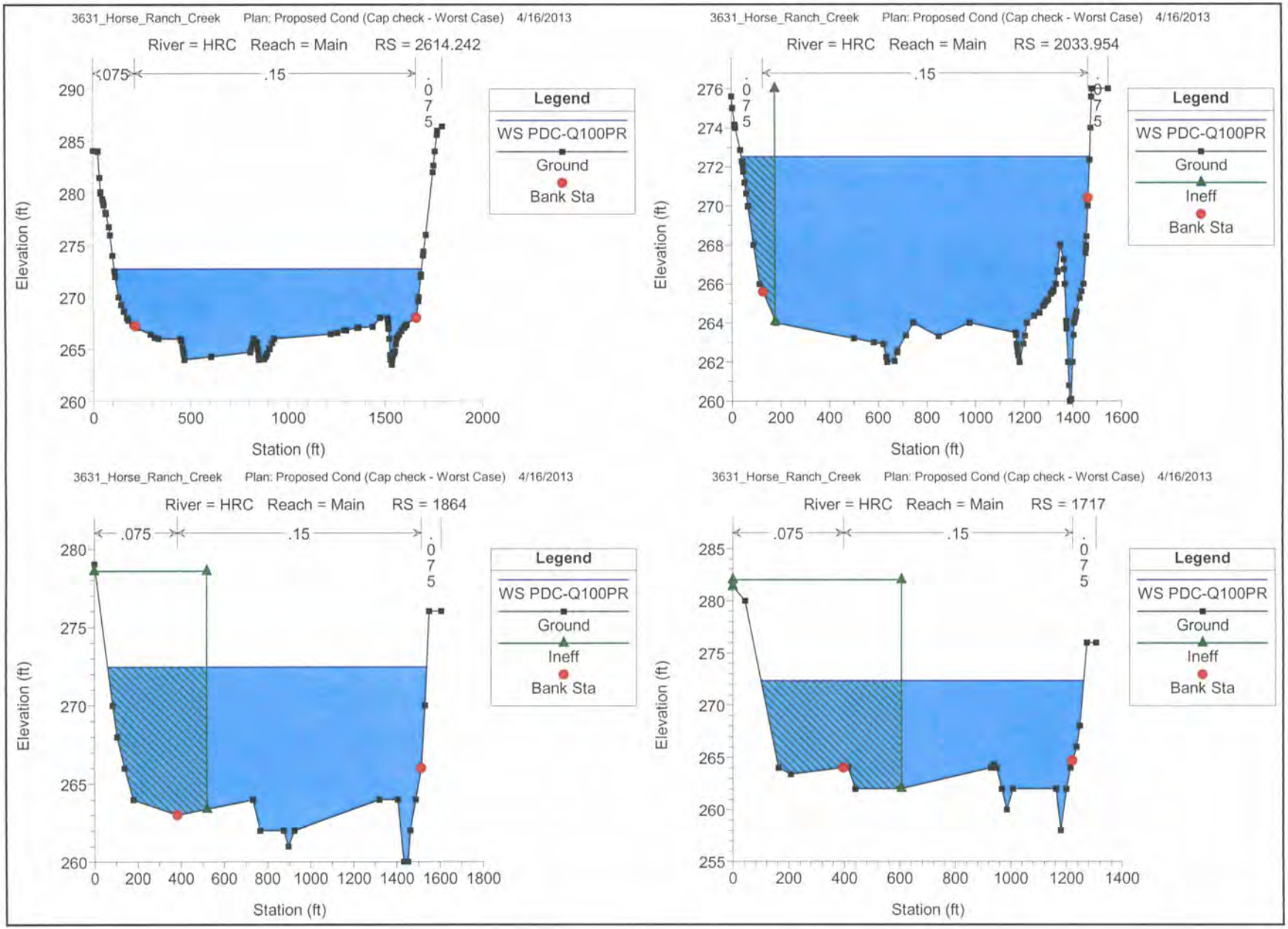

3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
HRC Main
Legend
WS PDC-Q100PR
Ground
Elevation (ft)
300
290
280
270
260
250
240
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

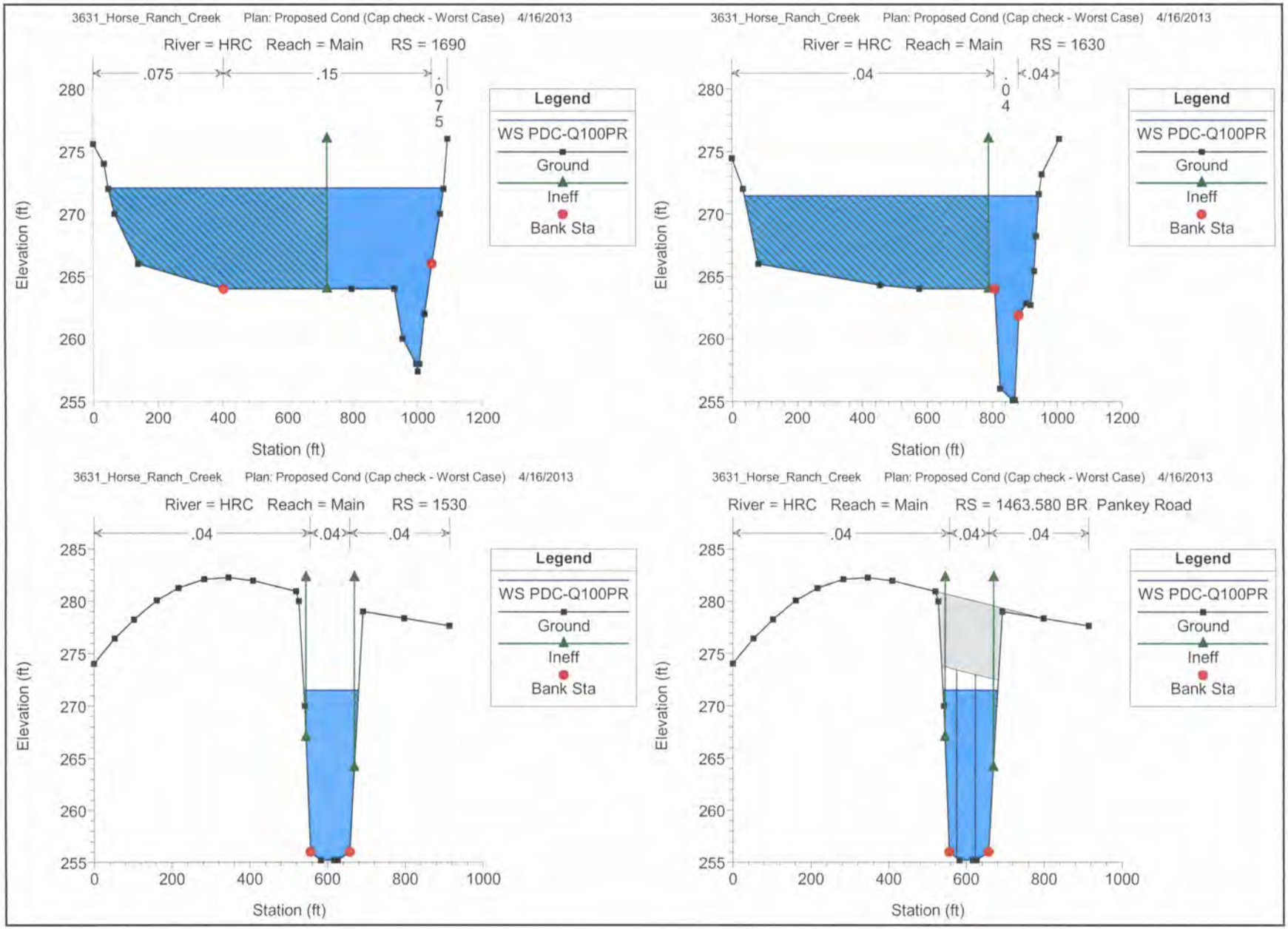
HEC-RAS Plan: PR-WC River: HRC Reach: Main Profile: PDC-Q100PR

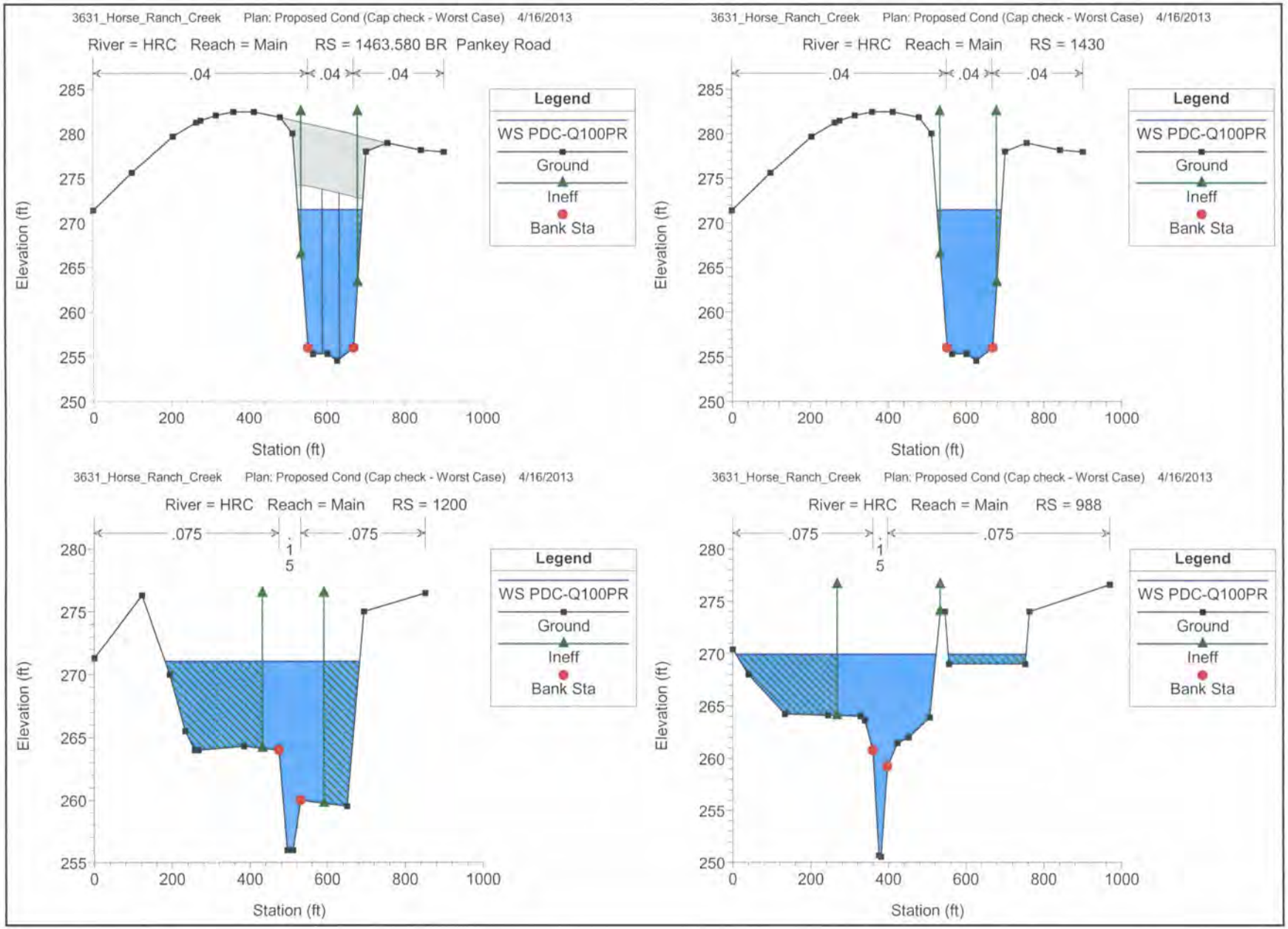
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	5608.249	PDC-Q100PR	8441.00	287.48	291.84	289.41	291.90	0.007071	1.94	4348.77	1596.31	0.18
Main	5000.613	PDC-Q100PR	8441.00	282.91	287.36	285.07	287.42	0.007996	1.94	4241.80	1688.52	0.19
Main	4634.388	PDC-Q100PR	8441.00	279.38	283.79	282.02	283.87	0.012209	2.21	3748.24	1473.70	0.23
Main	4342.055	PDC-Q100PR	8441.00	276.00	281.20		281.25	0.006864	1.85	4583.19	1426.33	0.18
Main	3976.927	PDC-Q100PR	8441.00	274.00	277.89		277.97	0.012291	2.26	3743.74	1345.30	0.23
Main	3642.177	PDC-Q100PR	8441.00	271.44	275.44		275.50	0.004892	1.57	5018.38	1519.41	0.15
Main	3351.951	PDC-Q100PR	8441.00	268.75	274.14	271.00	274.18	0.004193	1.61	5291.07	1490.30	0.14
Main	3038.374	PDC-Q100PR	8441.00	266.96	273.14		273.17	0.002524	1.42	5946.40	1252.66	0.11
Main	2614.242	PDC-Q100PR	8441.00	263.52	272.75		272.76	0.000498	0.80	10420.65	1583.39	0.05
Main	2033.954	PDC-Q100PR	8441.00	260.00	272.52		272.53	0.000316	0.75	11293.65	1432.63	0.04
Main	1864	PDC-Q100PR	8441.00	260.00	272.46	264.27	272.47	0.000403	0.89	9490.33	1478.29	0.05
Main	1717	PDC-Q100PR	8441.00	258.00	272.36	264.30	272.38	0.000866	1.34	6261.90	1161.19	0.08
Main	1690	PDC-Q100PR	8441.00	257.40	272.08		272.19	0.003886	2.72	3107.63	1035.25	0.16
Main	1630	PDC-Q100PR	8441.00	255.09	271.46		271.90	0.000737	5.81	1661.01	907.51	0.27
Main	1530	PDC-Q100PR	8441.00	255.19	271.50	261.33	271.83	0.000392	4.69	1887.96	141.17	0.21
Main	1463.580 Pankey Road		Bridge									
Main	1430	PDC-Q100PR	8441.00	254.57	271.47		271.71	0.000284	4.01	2201.25	167.01	0.18
Main	1200	PDC-Q100PR	8441.00	256.00	271.04		271.52	0.004479	3.56	1688.65	500.76	0.17
Main	988	PDC-Q100PR	8441.00	250.55	269.94		270.21	0.003646	3.40	2075.66	714.23	0.15
Main	632	PDC-Q100PR	8441.00	251.20	268.92		269.25	0.006519	4.31	1868.08	545.61	0.21
Main	627.1	PDC-Q100PR	8441.00	251.76	268.81	260.48	269.10	0.000742	4.73	2464.04	747.22	0.26
Main	561.3247 SR-76		Bridge									
Main	472	PDC-Q100PR	8441.00	252.23	268.21		268.50	0.000886	4.56	2470.44	988.00	0.27
Main	200	PDC-Q100PR	8441.00	251.91	267.14		268.08	0.010570	5.35	1257.29	1134.22	0.27
Main	167	PDC-Q100PR	8441.00	250.00	266.24	260.87	266.56	0.003535	3.11	2040.64	570.73	0.15
Main	120	PDC-Q100PR	8441.00	248.33	265.43		265.74	0.004789	3.80	1957.51	281.95	0.18
Main	114.5	PDC-Q100PR	8441.00	245.58	262.05	255.62	262.94	0.018999	7.31	1133.64	112.79	0.36
Main	114	PDC-Q100PR	8441.00	245.58	262.04	255.62	262.91	0.001448	7.56	1132.34	112.67	0.37
Main	112		Bridge									
Main	110	PDC-Q100PR	8441.00	245.74	261.35	255.86	262.51	0.001975	8.70	983.56	103.69	0.43
Main	109.5	PDC-Q100PR	8441.00	245.74	261.32	255.89	262.48	0.026778	8.53	981.30	103.48	0.42
Main	100	PDC-Q100PR	8441.00	246.00	260.50	253.31	260.74	0.006578	3.89	2244.34	490.21	0.21

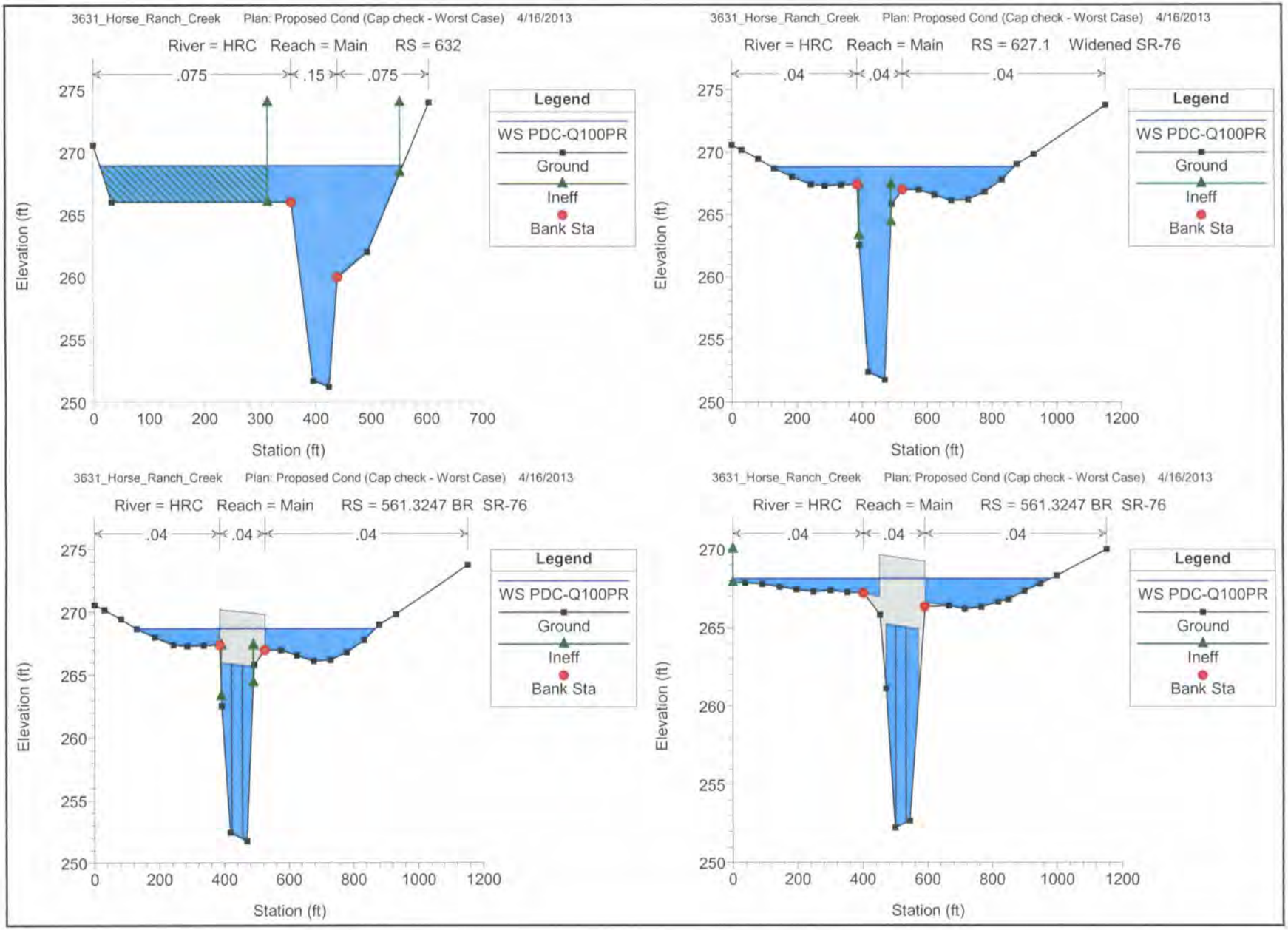

3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 5608.249
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 5000.613
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 4634.388
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 4342.055
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)

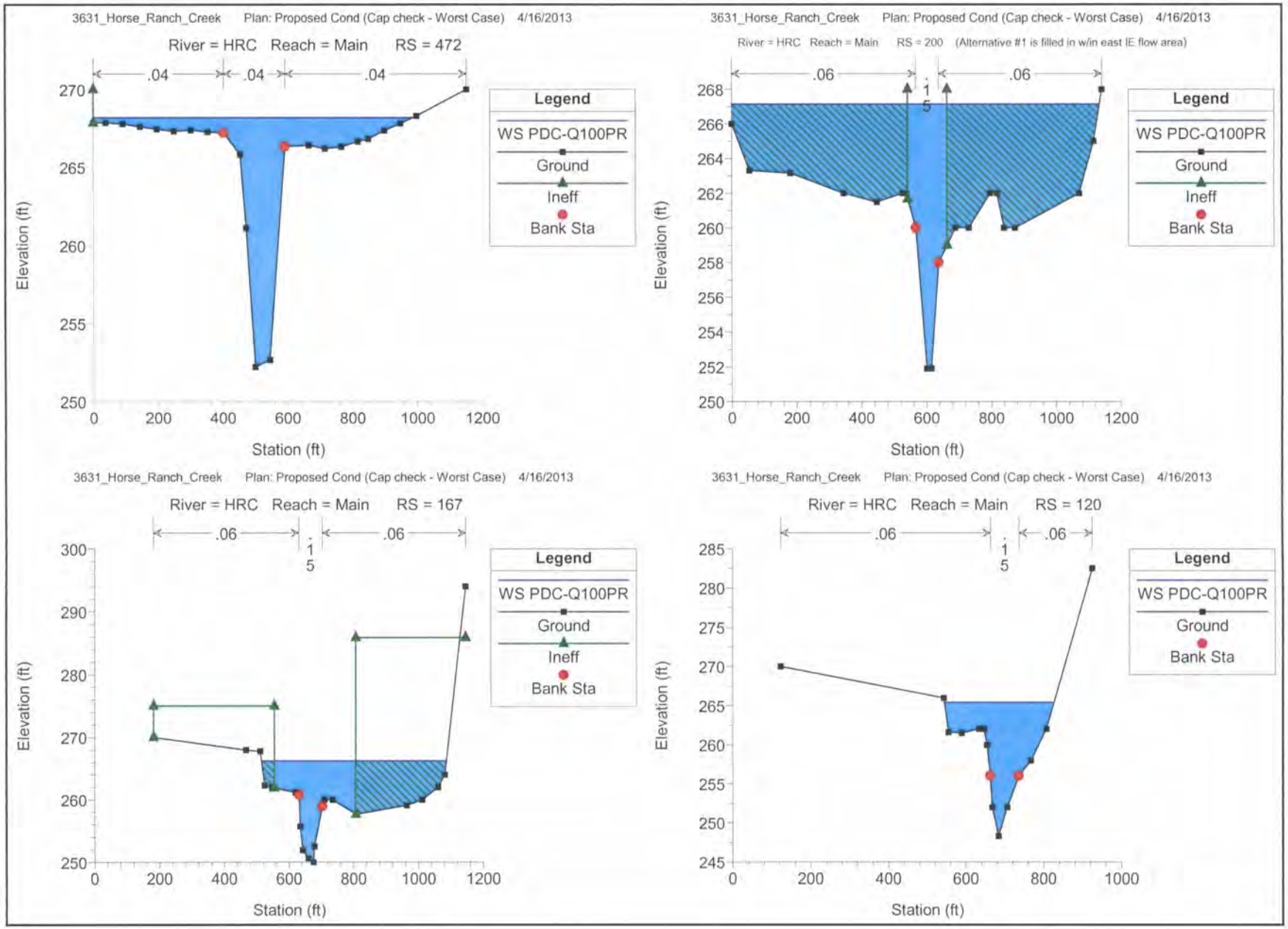

3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 3976.927
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 3642.177
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 3351.951
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 3038.374
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)

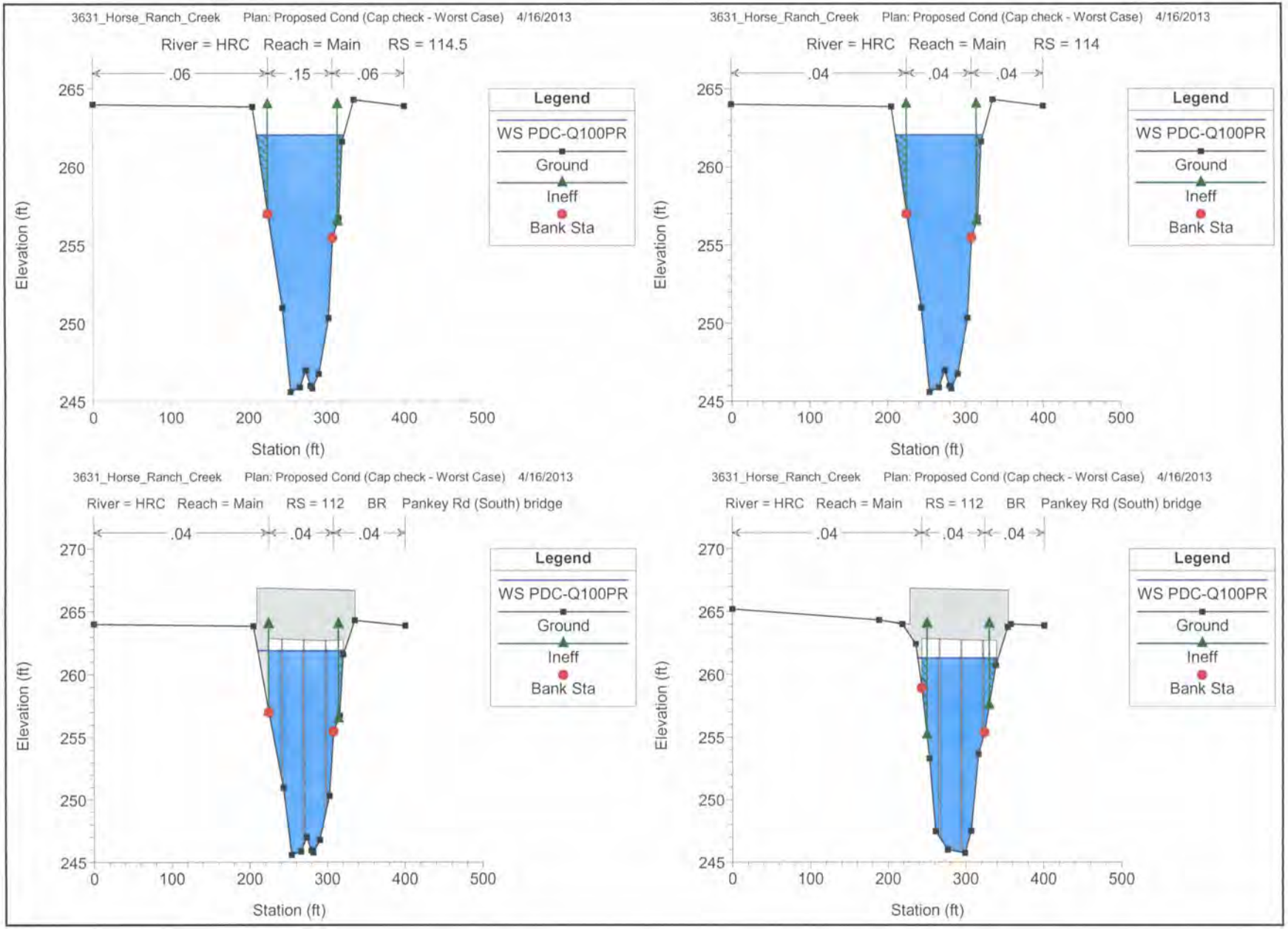

3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 2614.242
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 2033.954
.15
.075
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1864
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1717
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

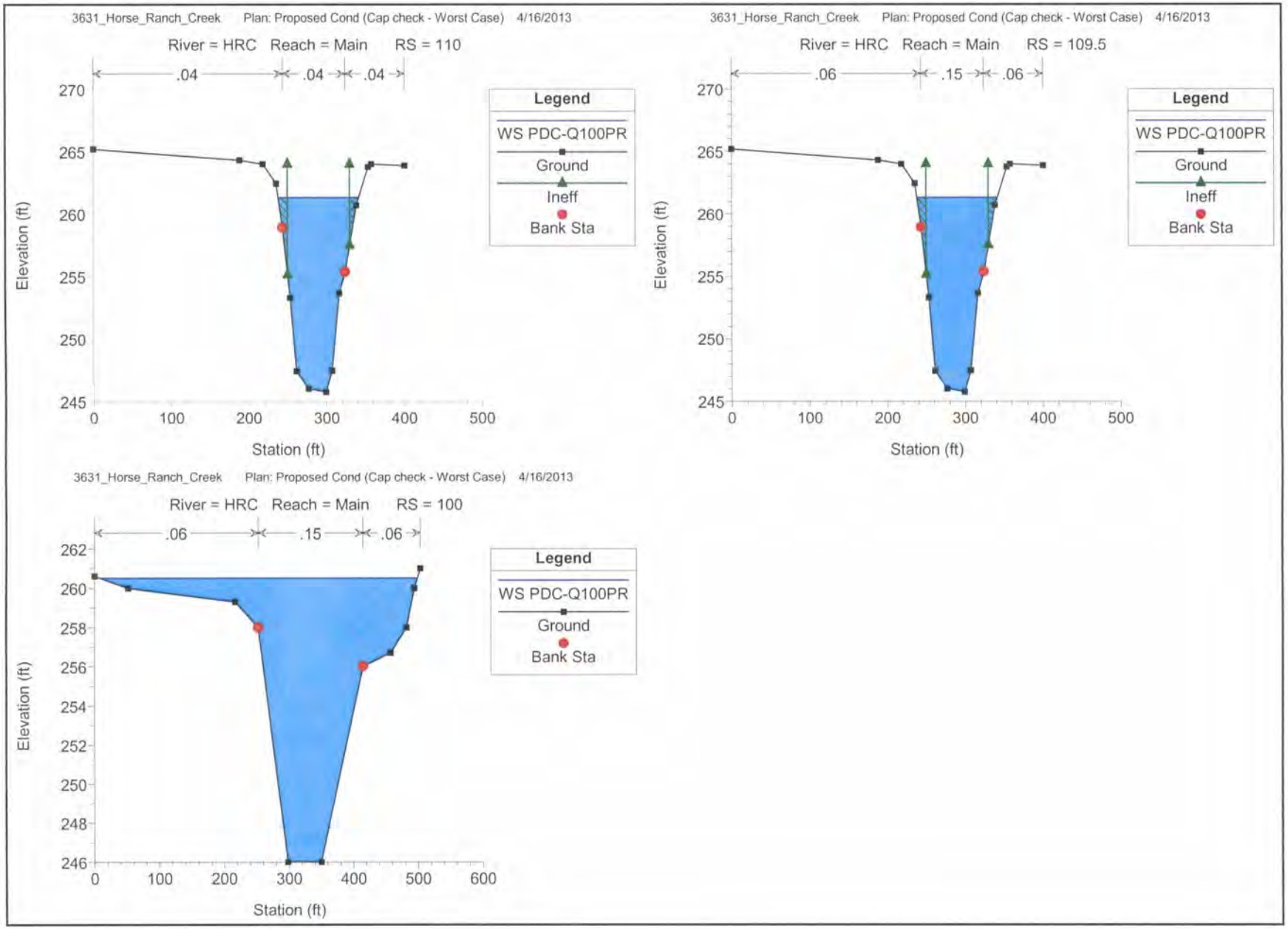

3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1690
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1630
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1530
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1463.580 BR Pankey Road
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1463.580 BR Pankey Road
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1430
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 1200
.075
.1
5
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 988
.075
.1
5
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 632
.075
.15
.075
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 627.1 Widened SR-76
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 561.3247 BR SR-76
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 561.3247 BR SR-76
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 472
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 200 (Alternative #1 is filled in w/in east IE flow area)
.06
.1
5
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 167
.06
.1
5
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 120
.06
.1
5
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 114.5
.06
.15
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 114
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 112 BR Pankey Rd (South) bridge
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 112 BR Pankey Rd (South) bridge
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 110
.04
.04
.04
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 109.5
.06
.15
.06
Legend
WS PDC-Q100PR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3631_Horse_Ranch_Creek Plan: Proposed Cond (Cap check - Worst Case) 4/16/2013
River = HRC Reach = Main RS = 100
.06
.15
.06
Legend
WS PDC-Q100PR
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX 9

HEC-RAS Comparative Summary

HEC-RAS River: HRC Reach: Main Profile: PDC-Q100EX

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	5608.249	PDC-Q100EX	EX	8441.00	287.48	290.66	289.41	290.79	0.007043	2.95	2874.45	1474.85	0.34
Main	5608.249	PDC-Q100PR	PR	8441.00	287.48	290.66	289.41	290.79	0.007034	2.95	2875.55	1474.89	0.34
Main	5608.249	PDC-Q100PR	PR-WC	8441.00	287.48	291.84	289.41	291.90	0.007071	1.94	4348.77	1596.31	0.18
Main	5000.613	PDC-Q100EX	EX	8441.00	282.91	286.44	285.07	286.57	0.006938	2.90	2963.29	1651.43	0.33
Main	5000.613	PDC-Q100PR	PR	8441.00	282.91	286.44	285.07	286.57	0.006954	2.90	2961.26	1651.38	0.34
Main	5000.613	PDC-Q100PR	PR-WC	8441.00	282.91	287.36	285.07	287.42	0.007996	1.94	4241.80	1688.52	0.19
Main	4634.388	PDC-Q100EX	EX	8441.00	279.38	282.74	282.04	282.94	0.015277	3.64	2389.48	1621.94	0.48
Main	4634.388	PDC-Q100PR	PR	8441.00	279.38	282.78	282.02	282.98	0.014750	3.63	2357.99	1454.07	0.47
Main	4634.388	PDC-Q100PR	PR-WC	8441.00	279.38	283.79	282.02	283.87	0.012209	2.21	3748.24	1473.70	0.23
Main	4342.055	PDC-Q100EX	EX	8441.00	276.00	280.15		280.26	0.006029	2.71	3126.10	1370.69	0.31
Main	4342.055	PDC-Q100PR	PR	8441.00	276.00	280.10		280.22	0.006443	2.76	3063.38	1369.54	0.32
Main	4342.055	PDC-Q100PR	PR-WC	8441.00	276.00	281.20		281.25	0.006864	1.85	4583.19	1426.33	0.18
Main	3976.927	PDC-Q100EX	EX	8441.00	274.00	276.82		277.03	0.014276	3.61	2345.50	1276.44	0.46
Main	3976.927	PDC-Q100PR	PR	8441.00	274.00	276.95		277.12	0.011561	3.39	2501.68	1284.39	0.42
Main	3976.927	PDC-Q100PR	PR-WC	8441.00	274.00	277.89		277.97	0.012291	2.26	3743.74	1345.30	0.23
Main	3642.177	PDC-Q100EX	EX	8441.00	271.44	274.15	273.01	274.25	0.005306	2.37	3437.97	1975.12	0.29
Main	3642.177	PDC-Q100PR	PR	8441.00	271.44	274.24		274.35	0.006147	2.62	3196.53	1498.99	0.31
Main	3642.177	PDC-Q100PR	PR-WC	8441.00	271.44	275.44		275.50	0.004892	1.57	5018.38	1519.41	0.15
Main	3351.951	PDC-Q100EX	EX	8441.00	268.75	272.58	271.00	272.70	0.005400	2.70	3126.27	1257.05	0.30
Main	3351.951	PDC-Q100PR	PR	8441.00	268.75	272.64	271.00	272.75	0.005003	2.64	3200.79	1266.85	0.29
Main	3351.951	PDC-Q100PR	PR-WC	8441.00	268.75	274.14	271.00	274.18	0.004193	1.61	5291.07	1490.30	0.14
Main	3038.374	PDC-Q100EX	EX	8441.00	266.96	270.50		270.65	0.008003	3.10	2723.79	1179.20	0.36
Main	3038.374	PDC-Q100PR	PR	8441.00	266.96	271.76		271.82	0.001911	2.00	4232.92	1219.71	0.19
Main	3038.374	PDC-Q100PR	PR-WC	8441.00	266.96	273.14		273.17	0.002524	1.42	5946.40	1252.66	0.11
Main	2614.242	PDC-Q100EX	EX	8441.00	263.52	269.64		269.67	0.001020	1.53	5565.35	1536.64	0.14
Main	2614.242	PDC-Q100PR	PR	8441.00	263.52	271.56		271.57	0.000249	1.00	8550.83	1567.32	0.07
Main	2614.242	PDC-Q100PR	PR-WC	8441.00	263.52	272.75		272.76	0.000498	0.80	10420.65	1583.39	0.05
Main	2033.954	PDC-Q100EX	EX	8441.00	260.00	269.33		269.35	0.000337	1.14	7410.74	1387.59	0.09
Main	2033.954	PDC-Q100PR	PR	8441.00	260.00	271.46		271.48	0.000121	0.85	9928.50	1417.77	0.05
Main	2033.954	PDC-Q100PR	PR-WC	8441.00	260.00	272.52		272.53	0.000316	0.75	11293.65	1432.63	0.04
Main	1864	PDC-Q100EX	EX	8441.00	260.00	269.27	264.21	269.30	0.000335	1.23	6870.03	1437.36	0.09
Main	1864	PDC-Q100PR	PR	8441.00	260.00	271.44	264.27	271.45	0.000149	1.00	8453.94	1465.72	0.06
Main	1864	PDC-Q100PR	PR-WC	8441.00	260.00	272.46	264.27	272.47	0.000403	0.89	9490.33	1478.29	0.05
Main	1717	PDC-Q100EX	EX	8441.00	258.00	269.22	263.91	269.24	0.000324	1.28	6565.70	1127.19	0.09
Main	1717	PDC-Q100PR	PR	8441.00	258.00	271.38	264.30	271.42	0.000317	1.51	5626.72	1150.86	0.09

HEC-RAS River: HRC Reach: Main Profile: PDC-Q100EX (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	1717	PDC-Q100PR	PR-WC	8441.00	258.00	272.36	264.30	272.38	0.000866	1.34	6261.90	1161.19	0.08
Main	1690	PDC-Q100PR	PR	8441.00	257.40	271.20		271.34	0.001406	3.06	2793.75	1022.52	0.19
Main	1690	PDC-Q100PR	PR-WC	8441.00	257.40	272.08		272.19	0.003886	2.72	3107.63	1035.25	0.16
Main	1630	PDC-Q100PR	PR	8441.00	255.09	270.54		271.07	0.000960	6.34	1520.03	897.92	0.30
Main	1630	PDC-Q100PR	PR-WC	8441.00	255.09	271.46		271.90	0.000737	5.81	1661.01	907.51	0.27
Main	1535	PDC-Q100EX	EX	8441.00	255.09	268.78	266.94	268.99	0.001991	3.57	2347.17	731.24	0.21
Main	1530	PDC-Q100PR	PR	8441.00	255.19	270.60	261.33	270.97	0.000479	4.99	1775.48	138.49	0.23
Main	1530	PDC-Q100PR	PR-WC	8441.00	255.19	271.50	261.33	271.83	0.000392	4.69	1887.96	141.17	0.21
Main	1463.580 Pankey Road			Bridge									
Main	1434	PDC-Q100EX	EX	8441.00	255.26	268.48	267.00	268.77	0.003389	4.65	2007.63	683.38	0.28
Main	1430	PDC-Q100PR	PR	8441.00	254.57	269.35		269.67	0.000464	4.67	1893.83	158.72	0.22
Main	1430	PDC-Q100PR	PR-WC	8441.00	254.57	271.47		271.71	0.000284	4.01	2201.25	167.01	0.18
Main	1200	PDC-Q100EX	EX	8441.00	256.00	268.22		268.40	0.000940	2.76	2631.65	832.77	0.15
Main	1200	PDC-Q100PR	PR	8441.00	256.00	268.60		269.38	0.002928	5.00	1300.90	469.75	0.27
Main	1200	PDC-Q100PR	PR-WC	8441.00	256.00	271.04		271.52	0.004479	3.56	1688.65	500.76	0.17
Main	988	PDC-Q100EX	EX	8441.00	250.55	267.93		268.13	0.001223	3.59	2367.50	893.80	0.17
Main	988	PDC-Q100PR	PR	8441.00	250.55	268.01		268.46	0.002402	5.05	1590.59	476.23	0.24
Main	988	PDC-Q100PR	PR-WC	8441.00	250.55	269.94		270.21	0.003646	3.40	2075.66	714.23	0.15
Main	632	PDC-Q100EX	EX	8441.00	251.20	267.19		267.70	0.003470	5.73	1511.99	528.24	0.30
Main	632	PDC-Q100PR	PR	8441.00	251.20	267.39		267.89	0.003279	5.63	1508.70	520.37	0.29
Main	632	PDC-Q100PR	PR-WC	8441.00	251.20	268.92		269.25	0.006519	4.31	1868.08	545.61	0.21
Main	627.1	PDC-Q100PR	PR	8441.00	251.76	266.86	260.48	267.64	0.001435	7.10	1188.91	329.85	0.36
Main	627.1	PDC-Q100PR	PR-WC	8441.00	251.76	268.81	260.48	269.10	0.000742	4.73	2464.04	747.22	0.26
Main	627	PDC-Q100EX	EX	8441.00	251.57	266.70	260.30	267.43	0.001398	6.85	1231.56	242.09	0.36
Main	561.3247 SR-76			Bridge									
Main	472	PDC-Q100EX	EX	8441.00	252.23	265.62	260.77	266.53	0.001852	7.64	1105.03	136.18	0.41
Main	472	PDC-Q100PR	PR	8441.00	252.23	265.62	260.77	266.52	0.001853	7.64	1104.76	136.16	0.41
Main	472	PDC-Q100PR	PR-WC	8441.00	252.23	268.21		268.50	0.000886	4.56	2470.44	988.00	0.27
Main	200	PDC-Q100EX	EX	8441.00	251.91	264.85		266.08	0.007872	8.06	978.82	1090.78	0.45
Main	200	PDC-Q100PR	PR	8441.00	251.91	264.85		266.08	0.007885	8.06	978.35	1090.64	0.45
Main	200	PDC-Q100PR	PR-WC	8441.00	251.91	267.14		268.08	0.010570	5.35	1257.29	1134.22	0.27

HEC-RAS River: HRC Reach: Main Profile: PDC-Q100EX (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	167	PDC-Q100EX	EX	8441.00	250.00	264.24	261.06	264.73	0.003244	5.33	1537.01	1098.98	0.28
Main	167	PDC-Q100PR	PR	8441.00	250.00	264.23	261.06	264.72	0.003257	5.34	1535.16	561.37	0.28
Main	167	PDC-Q100PR	PR-WC	8441.00	250.00	266.24	260.87	266.56	0.003535	3.11	2040.64	570.73	0.15
Main	120	PDC-Q100EX	EX	8441.00	248.33	263.33		263.96	0.004469	6.55	1375.69	483.80	0.34
Main	120	PDC-Q100PR	PR	8441.00	248.33	263.33		263.95	0.004438	6.53	1384.33	263.97	0.34
Main	120	PDC-Q100PR	PR-WC	8441.00	248.33	265.43		265.74	0.004789	3.80	1957.51	281.95	0.18
Main	114.5	PDC-Q100EX	EX	8441.00	245.58	261.27	255.62	262.25	0.006049	7.91	1063.28	107.76	0.40
Main	114.5	PDC-Q100PR	PR	8441.00	245.58	261.27	255.62	262.25	0.006049	7.91	1063.28	107.76	0.40
Main	114.5	PDC-Q100PR	PR-WC	8441.00	245.58	262.05	255.62	262.94	0.018999	7.31	1133.64	112.79	0.36
Main	114	PDC-Q100EX	EX	8441.00	245.58	261.22	255.62	262.22	0.001804	8.08	1059.07	107.58	0.41
Main	114	PDC-Q100PR	PR	8441.00	245.58	261.22	255.62	262.22	0.001804	8.08	1059.07	107.58	0.41
Main	114	PDC-Q100PR	PR-WC	8441.00	245.58	262.04	255.62	262.91	0.001448	7.56	1132.34	112.67	0.37
Main	112			Bridge									
Main	110	PDC-Q100EX	EX	8441.00	245.74	260.34	255.86	261.72	0.002613	9.47	902.67	97.28	0.49
Main	110	PDC-Q100PR	PR	8441.00	245.74	260.34	255.86	261.72	0.002613	9.47	902.67	97.28	0.49
Main	110	PDC-Q100PR	PR-WC	8441.00	245.74	261.35	255.86	262.51	0.001975	8.70	983.56	103.69	0.43
Main	109.5	PDC-Q100EX	EX	8441.00	245.74	260.32	255.88	261.68	0.009051	9.39	901.13	97.19	0.48
Main	109.5	PDC-Q100PR	PR	8441.00	245.74	260.32	255.88	261.68	0.009051	9.39	901.13	97.19	0.48
Main	109.5	PDC-Q100PR	PR-WC	8441.00	245.74	261.32	255.89	262.48	0.026778	8.53	981.30	103.48	0.42
Main	100	PDC-Q100EX	EX	8441.00	246.00	260.50	253.31	260.74	0.001814	4.09	2244.34	490.21	0.22
Main	100	PDC-Q100PR	PR	8441.00	246.00	260.50	253.31	260.74	0.001814	4.09	2244.34	490.21	0.22
Main	100	PDC-Q100PR	PR-WC	8441.00	246.00	260.50	253.31	260.74	0.006578	3.89	2244.34	490.21	0.21

APPENDIX 10

Bridge Plans and As-builts

Existing North Pankey Road Bridge

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	15	R45.9/R48.1	166	208

R C Cassano 9013
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER

DATE APPROVED February 5, 1979

PROFILE GRADE
NO SCALE

ELEVATION
1" = 20'

PILE DATA

Class 45-1 Piles Specified Tip 220.0
Precast prestressed Alt YY

TYPICAL SECTION
1/8" = 1'-0"

PLAN
1" = 20'

Note
① = Paint "Horse Ranch Creek Bridge"
② = Paint "57C-324" & Year Constructed
③ = Metal Beam Guard Railing see "Road Plans".

Standard Plan Sheet No.
Detail No.

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	DECK CONTOURS
3	FOUNDATION PLAN
4	ABUTMENT AND PIER DETAILS
5	PIER PILE DETAILS - CLASS 45-1
6	SLAB SECTION AND REINFORCEMENT DETAILS
7	SLAB REINFORCEMENT DETAILS
8	LOG OF TEST BORINGS

STANDARD PLANS DATED MARCH, 1977

A62-B8	EXCAVATION AND BACKFILL - LIMITS OF PAYMENT (BRIDGE)
B0-1	BRIDGE DETAILS
B11-51	TUBULAR HAND RAILING
B11-53	CONCRETE BARRIER TYPE 25

APPROXIMATE QUANTITIES

FURNISH PILING (CLASS 45-1)	1,136 LF
DRIVE PILE (CLASS 45)	28 EA
TUBULAR HANDRAILING	253 LF
CONCRETE BARRIER (TYPE 25)	253 LF

FINAL PAY QUANTITIES

STRUCTURE EXCAVATION (BRIDGE)	118 CY
STRUCTURE BACKFILL (BRIDGE)	63 CY
STRUCTURAL CONCRETE, BRIDGE	277 CY
BAR REINFORCING STEEL (BRIDGE)	54,500 LB

AS BUILT
CORRECTED BY John T. Day RE 12-7-81
CONTRACT NO. 11-095094
DATE 6-15-81

(360 Ac)

FOR GENERAL NOTES SEE "Deck Contours" sheet

LIVE LOADING HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOADING

BRIDGE DEPARTMENT
··· DESIGN SECTION ··· 8
Section Supervisor F.R.Al... 10/78 8909
Project Engineer A.M. McGilvray 9604

DESIGN	By ...phy 2-73	Checked Taylor 9/78
DETAILS	By Vern Gr8th 3-73	Checked Taylor 9/78
LAYOUT	By ... 3-73	Checked Taylor 9/78
QUANTITIES	By F.N. Eskel 9/78	Checked ...phy 9/78
SPECIFICATIONS	By N.D. Jensen ...	Plans and Specs Compared ... 1/79

Approval Recommended by ... Design Engineer — Assistant Civil Eng. Liaison Ex. 8/78

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HORSE RANCH CREEK BRIDGE
PANKEY(SOUTH)

GENERAL PLAN

BRIDGE NO. 57C-324 | POST MILE CO. RD. | DRAWING NO. | SHEET 1 OF 8

WO 095091
CU 11203

Disregard prints bearing earlier revision dates → REVISION DATES 3/4/73 (PRELIMINARY STAGE ONLY)

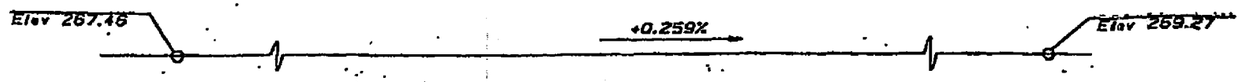
166

AS BUILT PLANS
Contract No. 11-095094
Date Completed
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 1-19-82 SIGNATURE Donald Blackford TITLE SUPERVISOR OF MICROFILM SERVICES

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM
SCALE 1" = 50' — SCALE 1" = 10' or 1" = 100' — SCALE 1" = 20' — SCALE 1" = 40'

Existing SR 76 Road Bridge



PROFILE GRADE

No Scale

Location	Design Loading (Service Load)	Specified Tip Elev.	Probable Tip Elev.
Abutment 1	45 ton	218.0	212.0
Bent 2	70 ton	194.0	188.0
Bent 3	70 ton	192.0	186.0
Abutment 4	45 ton	197.0	191.0

Precised Prestressed option used

QUANTITIES

BRIDGE REMOVAL	LUMP	SUM
STRUCTURE EXCAVATION (BRIDGE)	242	CY
STRUCTURE BACKFILL (BRIDGE)	116	CY
FURNISH PILING (CLASS 70)	1,030	LF
DRIVE PILE (CLASS 70)	16	EA
FURNISH PILING (CLASS 45)	684	LF
DRIVE PILE (CLASS 45)	16	EA
STRUCTURAL CONCRETE, BRIDGE	404	CY
BAR REINFORCING STEEL (BRIDGE)	67,600	LB
CONCRETE BARRIER (TYPE 25)	280	LF

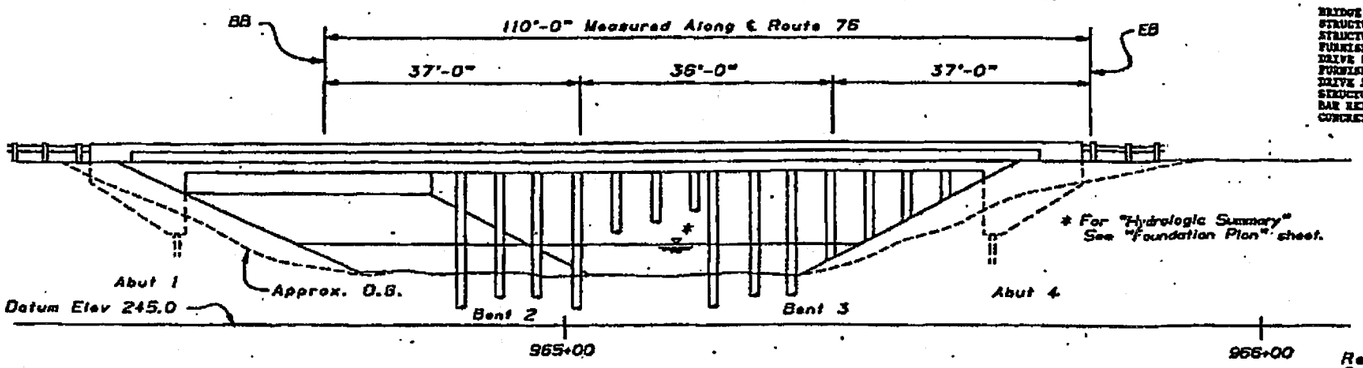
REGISTERED ENGINEER - CIVIL

Norbert Gee No. 47308 Exp. 12-31-95 CIVIL STATE OF CALIFORNIA

7-10-95

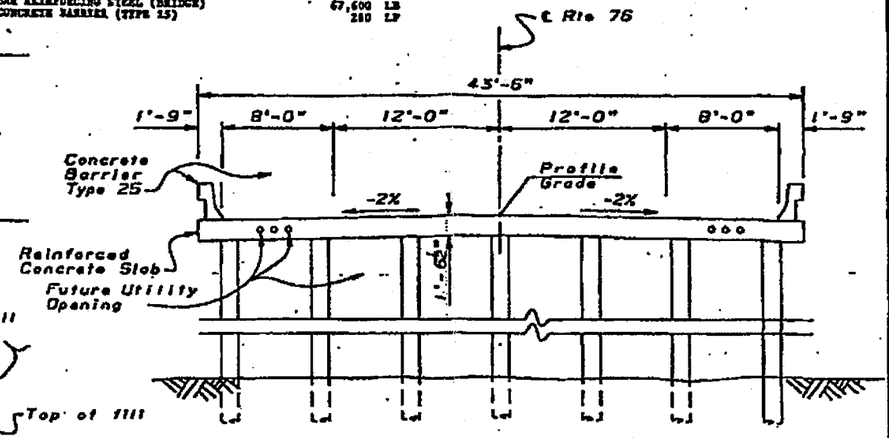
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



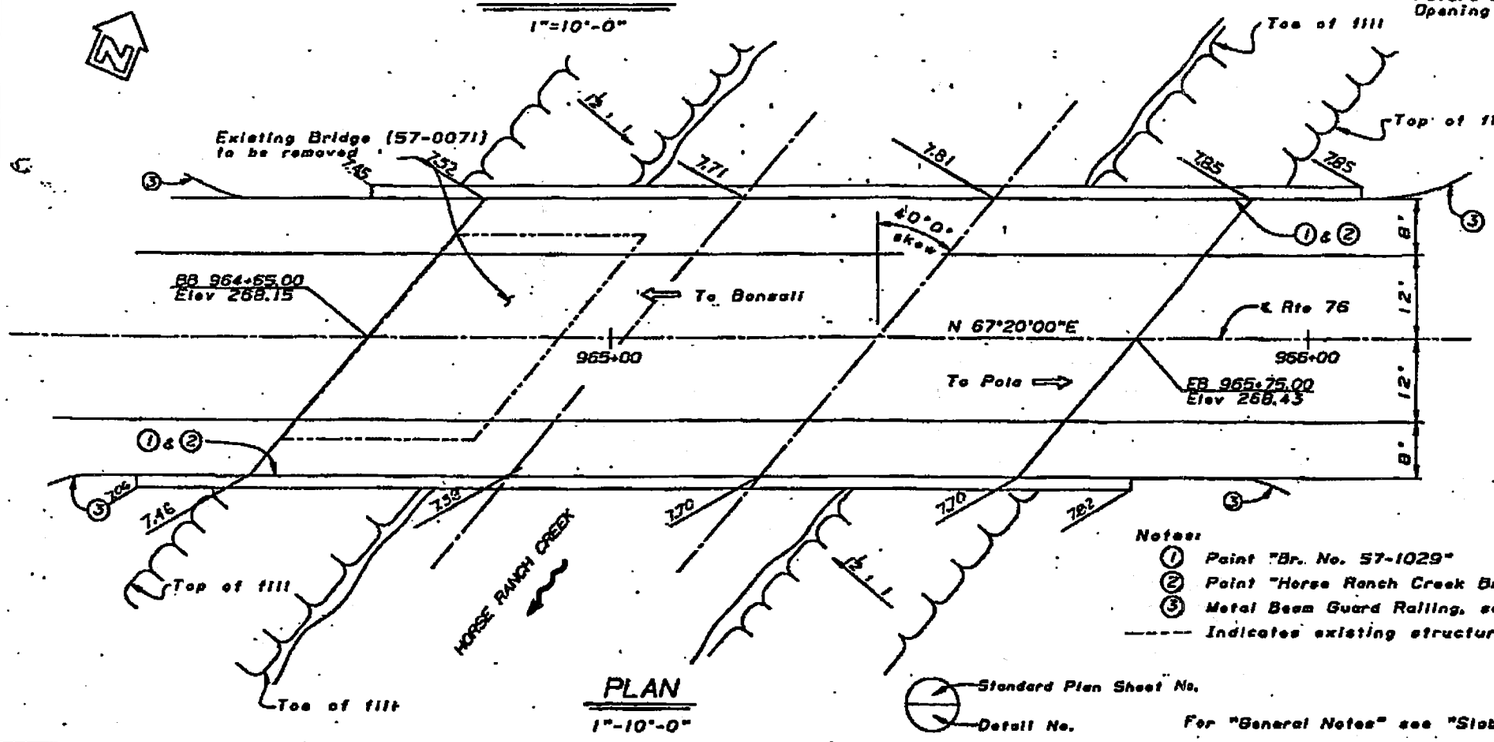
ELEVATION

1"=10'-0"



TYPICAL SECTION

1"=5'-0"



PLAN

1"-10'-0"

Notes:

① Paint "Br. No. 57-1029"

② Paint "Horse Ranch Creek Bridge"

③ Metal Beam Guard Railing, see "Road Plans"

----- Indicates existing structure

Standard Plan Sheet No.

Detail No.

For "General Notes" see "Slab Reinforcement Details" sheet.

NO AS BUILT CHANGES

AS BUILT

CORRECTIONS BY Mohamed Fouad

CONTRACT NO. 11-055304

DATE 6-17-96

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	DECK CONTOURS
3	FOUNDATION PLAN
4	ABUTMENT DETAILS
5	BENT DETAILS & TYPICAL SECTION
6	TOP & BOTTOM SLAB REINFORCEMENT
7	SLAB BRIDGE PILE DETAILS
8	SLAB REINFORCEMENT DETAILS
9	LOG OF TEST BORINGS 1 OF 2
10	LOG OF TEST BORINGS 2 OF 2

STANDARD PLANS DATED JULY 1992

A10A	ABBREVIATIONS
A62C	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL - BRIDGE
B0-1	BRIDGE DETAILS
B0-3	BRIDGE DETAILS
B2-5	PILE DETAILS CLASS 45 AND CLASS 70
B11-53	CONCRETE BARRIER TYPE 25

DESIGN	BY Ed Warren	CHECKED N. Gee	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD	
DETAILS	BY Bruno Janke 10-93	CHECKED N. Gee	LAYOUT	BY Ed Warren	CHECKED N. Gee
QUANTITIES	BY M.K. Brady	CHECKED Ed Warren	SPECIFICATIONS	BY	PLANS AND SPECS COMPARED

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN 7

BRIDGE NO. 57-1029

POST MILE 17.75

CU 11 EA 055301

HORSE RANCH CREEK BRIDGE

GENERAL PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 1 OF 10

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
11	SD	76	R28.0-R30.1	135	151

Caltrans Metric

Eli Arai 2/13/08
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER — ELIE M. ARAMOUNI — No. CE41712 — EXP. 3-31-08 — CIVIL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

GRANITE CONSTRUCTION COMPANY
38000 MONROE STREET
INDIO, CALIFORNIA 92203

IMBSEN & ASSOCIATES INC.
9471 Ridgehaven, Suite E
San Diego, California 92123

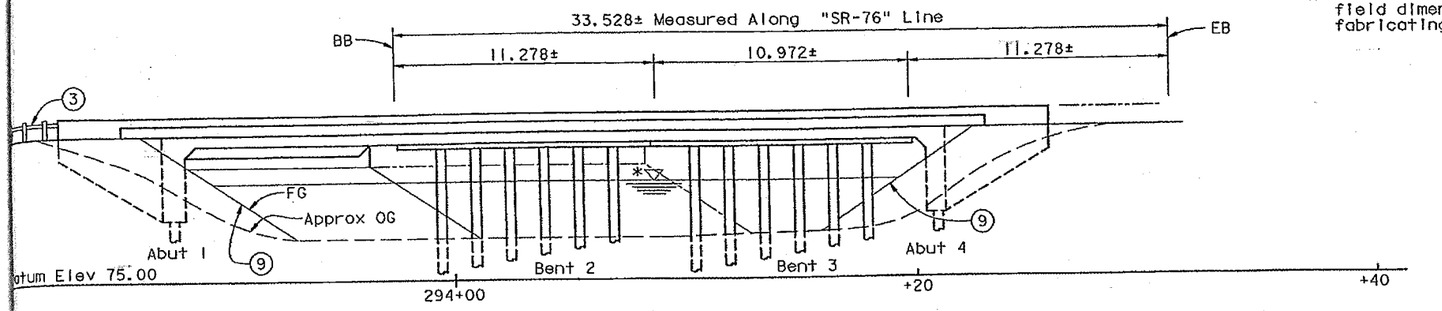
+0.266%

293+45.000 EVC
Elev 82.139

"SR-76" Line

295+00.000
Elev 82.552

PROFILE GRADE
NO SCALE

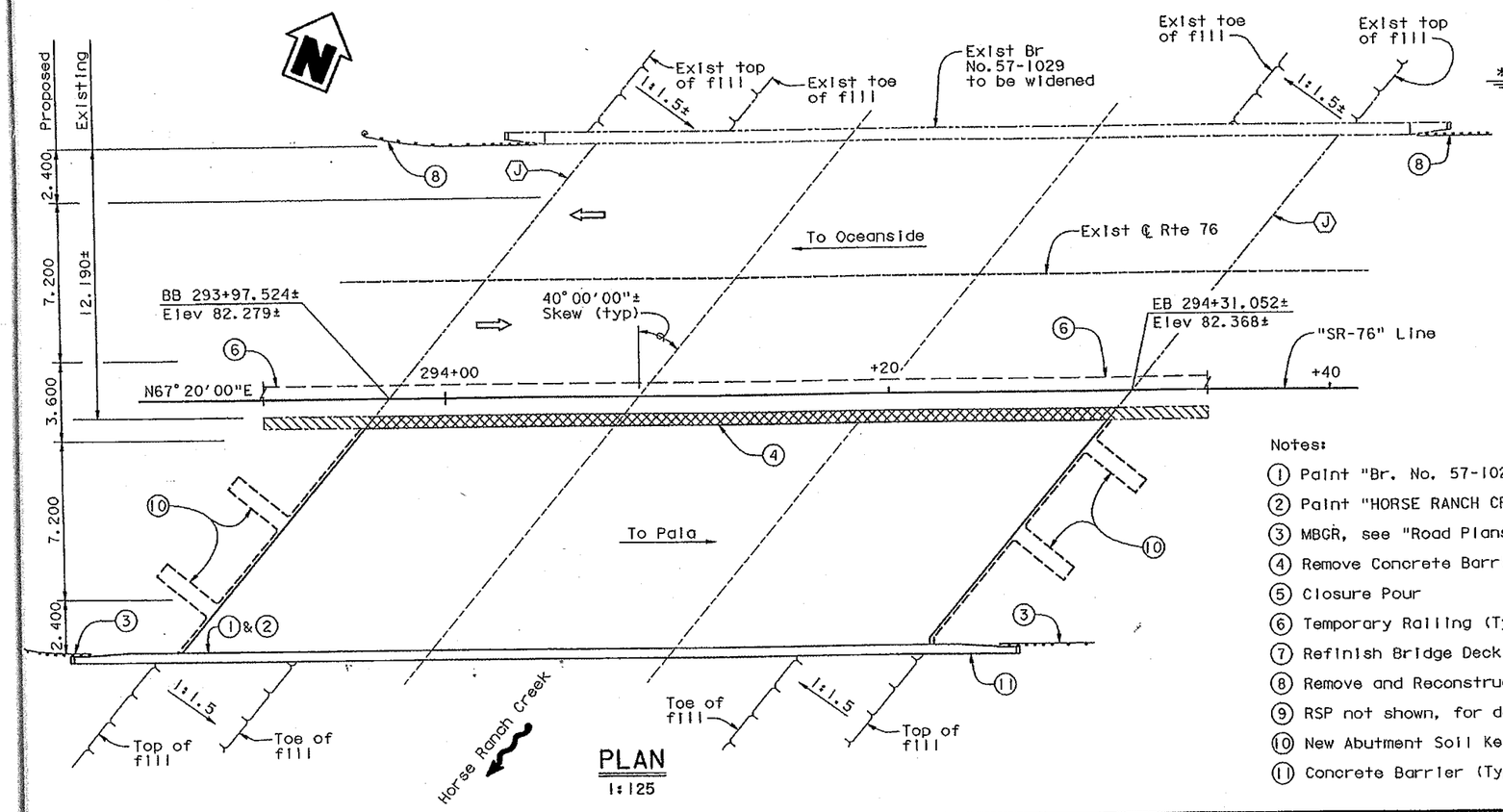


ELEVATION
1:125

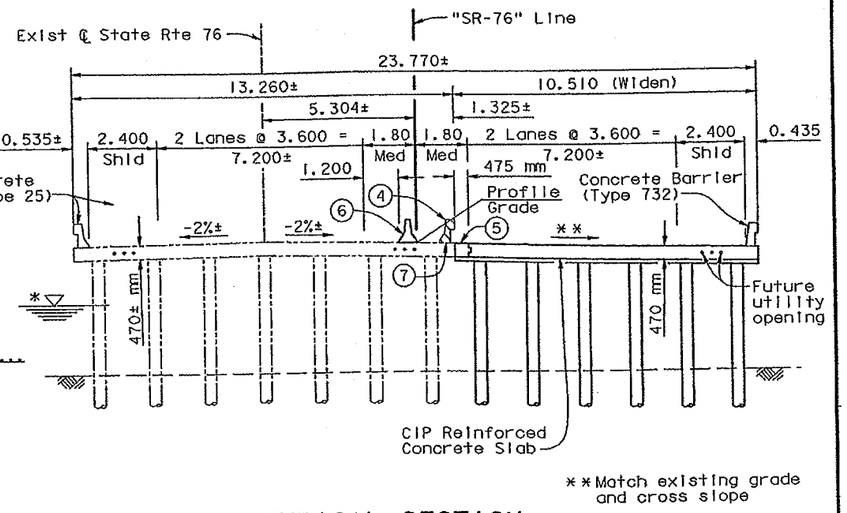
* Note: For "Hydrologic Summary," see "Foundation Plan" sheet

Notes:

1. For General Notes and "Pile Data Table," see "Index to Plans" sheet.
2. The Contractor shall verify all controlling field dimensions before ordering or fabricating any material.



PLAN
1:125



**Match existing grade and cross slope

TYPICAL SECTION
1:100

Notes:

1. Paint "Br. No. 57-1029"
2. Paint "HORSE RANCH CREEK BRIDGE"
3. MBGR, see "Road Plans"
4. Remove Concrete Barrier (Type 25)
5. Closure Pour
6. Temporary Railing (Type K), see "Road Plans"
7. Refinish Bridge Deck
8. Remove and Reconstruct MBGR, see "Road Plans"
9. RSP not shown, for details, see "Road Plans"
10. New Abutment Soil Key
11. Concrete Barrier (Type 732A)

SEISMIC RETROFIT LEGEND:

Ⓙ Abutment Joint Retrofit Bracket

LEGEND:

- Indicates Existing Structure
- Indicates Concrete Barrier (Type 25) Removal
- Indicates Limits of Refinsh Bridge Deck
- Indicates direction of existing traffic
- Indicates direction of traffic

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DESIGN	BY S. SOLTANI/J. GUTIERREZ	CHECKED P. PRESTON	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	ELIE M. ARAMOUNI PROJECT MANAGER	BRIDGE NO. 57-1029	HORSE RANCH CREEK BRIDGE (WIDEN)
DETAILS	BY R. CARTER	CHECKED P. PRESTON	LAYOUT	BY R. CARTER	CHECKED P. PRESTON			KP (PM) 28.0	GENERAL PLAN
QUANTITIES	BY M. PHILIPPS	CHECKED K. NELSON	SPECIFICATIONS	BY E. TYK	PLANS AND SPECS COMPARED E. TYK		CU 225 EA 231501	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (PRELIMINARY STAGE ONLY) 05-27-01 02-13-08 05-06-04 01-18-01 01-15-01 01-26-05 05-26-05 03-26-05 03-21-01

SHEET 1 OF 17

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

ELIE M. ARAMOUNI

DIVISION OVERSIGHT

DIVISION OFF DATE

DIVISION GENERAL PLAN SHEET (METRIC) (REV. 3/1/99)

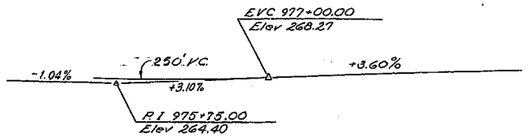
FEB 2008 5:21:56 h:\1311\57-1029-a-gp.dgn

Existing South Pankey Road Bridge

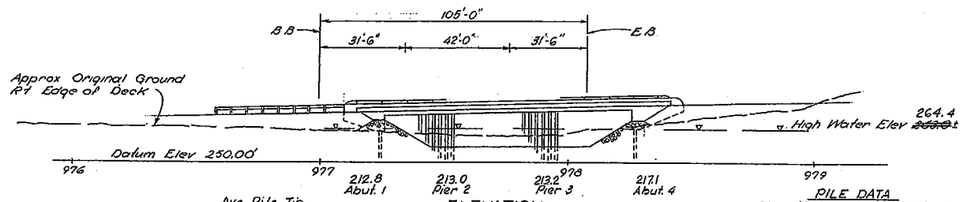
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	15	R45.9/R48.1	158	208

R.C. Grassano 9017
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER

DATE APPROVED February 5, 1979

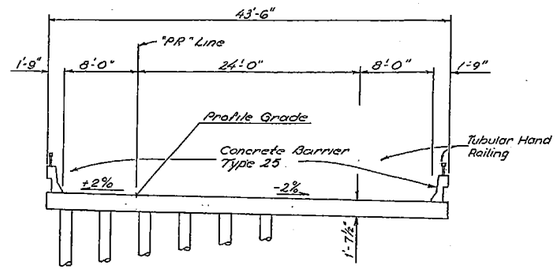


PROFILE GRADE
NO SCALE

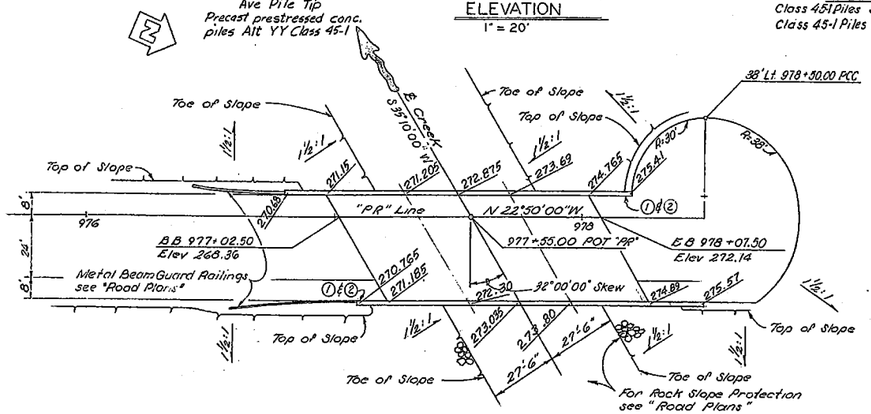


ELEVATION
1" = 20'

PILE DATA
Class 45-1 Piles Specified Tip 213.0 - Abut 1, Pier 2 & Pier 3
Class 45-1 Piles Specified Tip 220.0 - Abut 5



TYPICAL SECTION
3/16" = 1'-0"



ELEVATION
1" = 20'

Note
① = Point "Horse Ranch Creek Bridge."
② = Point "57C-323" & Year Constructed.

Standard Plan Sheet No.
Detail No.

FOR GENERAL NOTES SEE "Deck Contour" sheet

LIVE LOADING HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOADING

APPROXIMATE QUANTITIES

FURNISH PILING (CLASS 45-1)	1,703 LF
DRIVE PILE (CLASS 45)	32 EA
TUBULAR HANDRAILING	275 LF
CONCRETE BARRIER (TYPE 25)	275 LF

FINAL PAY QUANTITIES

STRUCTURE EXCAVATION (BRIDGE)	102 CY
STRUCTURE BACKFILL (BRIDGE)	64 CY
STRUCTURAL CONCRETE, BRIDGE	348 CY
BAR REINFORCING STEEL (BRIDGE)	61,000 LB

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	DECK CONTOURS
3	FOUNDATION PLAN
4	ABUTMENT & PIER DETAILS
5	PIER PILE DETAILS - CLASS 45-1
6	SLAB SECTION & REINFORCEMENT DETAILS
7	SLAB REINFORCEMENT DETAILS
8	LOG OF TEST BORINGS

STANDARD PLANS DATED MARCH, 1977

A62-DB	EXCAVATION AND BACKFILL - LIMITS OF PAYMENT (BRIDGE)
B0-1	BRIDGE DETAILS
B11-51	TUBULAR HAND RAILING.
B11-53	CONCRETE BARRIER TYPE 25.

DATUM: NGVD 29

AS BUILT
CORRECTED BY John T. Day RE 12781
CONTRACT NO. 11-095094
DATE 6-15-81

BRIDGE DEPARTMENT
''' DESIGN SECTION '''
Section Supervisor Fred Jaya 10/78 8905
Project Engineer A.M. Shivaraj 9604
8

DESIGN	M. Gonzalez 2-79	Checked	Taylor 3/79
DETAILS	M. Vern Groth 2-79	Checked	Taylor 3/79
LAYOUT	M. Gonzalez 2-79	Checked	Taylor 3/79
QUANTITIES	M. Shivaraj 4-79	Checked	C.F. Eckert 3-79
SPECIFICATIONS	M. Wyant 3-79	Was Signed Checked	M.E.J. 1/79
Quantity Recommended by	Supervising Engineer	Bid Item List Checked by	8/79

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HORSE RANCH CREEK BRIDGE
PANKEY (NORTH)
GENERAL PLAN

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
57C-323	CO. RD.		1	8

WO 095091
CU 11203

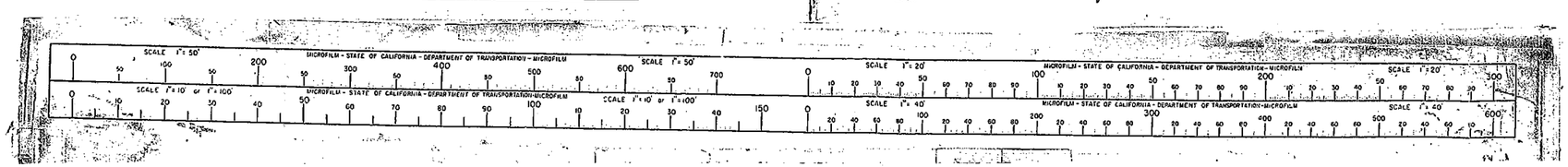
Standard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)										
7/23										

158

AS BUILT PLANS
Contract No. 11-095094
Date Completed
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 1-19-82 SIGNATURE Donald Blandford TITLE SUPERVISOR OF MICROFILM SERVICES



APPENDIX 11

Bridge and Creek Photos

Existing North Pankey Road Bridge (Looking Upstream)

Existing (Recently Widened) SR 76 Bridge (Looking Upstream)

Existing South Pankey Road Bridge (Looking Upstream)

Existing Dense Vegetation in Horse Ranch Creek

APPENDIX 12

Drainage Exhibits

WATERSHED CENTROID

HORSE RANCH CREEK

SAN LUIS REY RIVER

MODERATE

LEGEND:

DRAINAGE SUBAREA

DRAINAGE FLOWPATH

NOTE: TOPOGRAPHY SHOWN IS USGS QUAD MAP.

SCALE: 1"=1000'

JOB #: 3631.10

CREATED: 09/16/09

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

COUNTY OF SAN DIEGO

CAMPUS PARK WEST

REGIONAL DRAINAGE MAP
HORSE RANCH CREEK WATERSHED
EXHIBIT E

EXISTING N. PANKEY BRIDGE

PANKEY RD

RANCH CREEK

EXISTING SR 76 BRIDGE

EXISTING 72" CULVERT

EXISTING S. PANKEY BRIDGE

Obscured by Dense Trees

LEGEND:

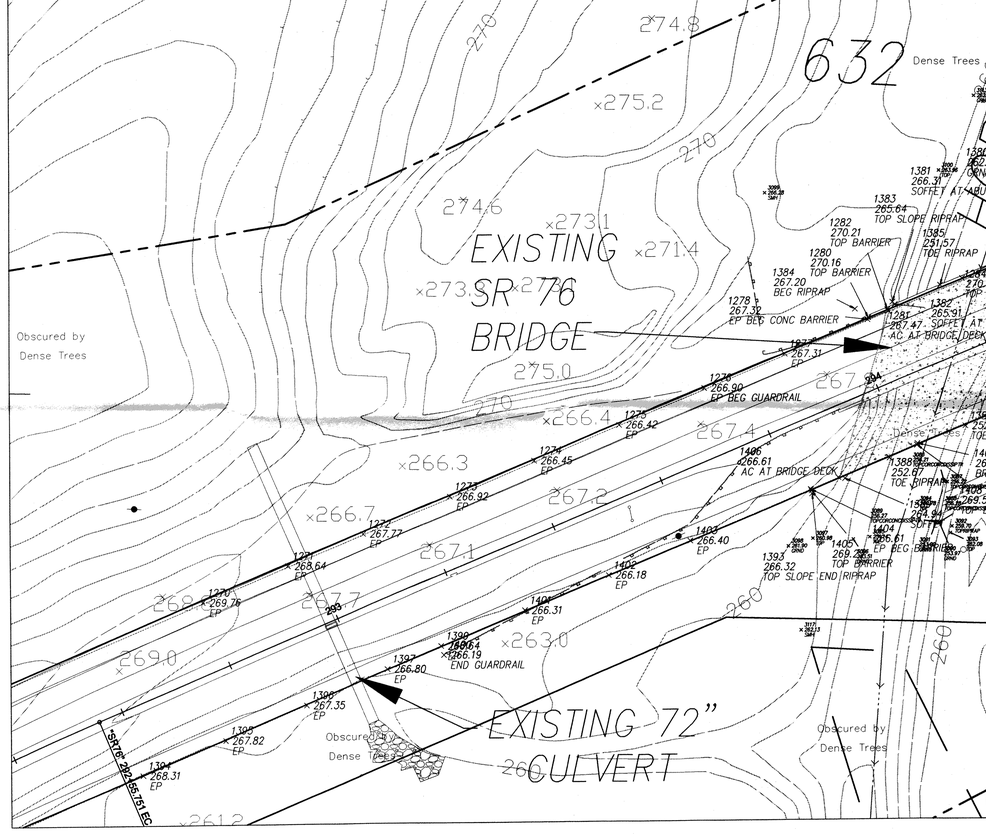
HEC-RAS CROSS SECTIONS — XXX

STREAM FLOWLINE

SURVEY SHOT ELEVATION & DESCRIPTION — POINT # / ELEVATION / DESCRIPTION

NOTE: SURVEY DATA FROM PDC FIELD SURVEY CREW (9/21&22/2009, AND 5/31/2012)

SR 76 AND N. PANKEY ROAD BRIDGE SURVEYED CROSS SECTIONS



S. PANKEY ROAD BRIDGE SURVEYED CROSS SECTIONS

SCALE: 1"=40'	PREPARED BY: PROJECT DESIGN CONSULTANTS, Planning | Landscape Architecture | Engineering | Survey	701 B Street, Suite 800 San Diego, CA 92101 619.235.6471 Tel 619.234.0349 Fax	COUNTY OF SAN DIEGO
JOB #: 3631.10			CAMPUS PARK WEST
CREATED: 9/30/09			FIELD SURVEY SPOT ELEVATIONS OF CREEK AND EXISTING BRIDGES EXHIBIT F

P:\3631\ENGR\REPORTS\DRAIN\EXH\F&G_3631HECRAS-EX.dwg 10/16/2012 4:05:39 PM

N

LEGEND:

HEC-RAS CROSS SECTIONS	XXX
STREAM FLOWLINE	
100-YEAR FLOODPLAIN/INUNDATION LIMITS	
INEFFECTIVE FLOW AREA MARKER ALONG CROSS SECTION	

NOTE: SUPPLEMENTAL TOPO SHOWN IS AERIAL TOPOGRAPHY FROM LANDMARK ENGINEERING (CAMPUS PARK)

5608.2495
5000.6133
4634.3882
4342.0557
3976.9275
3642.1777
3351.9519
3038.374
2614.2427
2033.9547
1864
1717
1200
1535
1438
988
632
627
472
200
167
120
114.5
110
100
HORSE RANCH CREEK
EXISTING N. PANKEY BRIDGE
PANKEY RD
CALTRANS SR 76 REALIGNMENT & WIDENING
INTERSTATE 15
SUMP AREA
EXISTING SR 76 BRIDGE
HORSE RANCH CREEK
100-YEAR FLOODPLAIN LIMITS PER THIS STUDY
EXISTING 72" CULVERT
STATE ROUTE 76
EXISTING S. PANKEY BRIDGE
EXISTING SAN LUIS REY FLOODPLAIN LIMITS PER CHANG'S STUDY
SAN LUIS REY RIVER

FEMA EFFECTIVE 100 YEAR FLOODPLAIN LIMITS PER URS STUDY "FEMA LETTER OF MAP REVISION (LOMR) FOLLOW-UP TO CLOMR CASE #12-09-0511P STATE ROUTE 76 WIDENING AND REALIGNMENT FROM INTERSTATE 15 TO 0.9 KM EAST SAN DIEGO COUNTY" DATED AUGUST 26, 2011. LOMR EFFECTIVE DATE DECEMBER 5, 2012.

SCALE:	1"=150'
JOB #:	3631.10
CREATED:	9/30/09

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

COUNTY OF SAN DIEGO
CAMPUS PARK WEST
HORSE RANCH CREEK HEC-RAS WORK MAP
EXISTING CONDITIONS
EXHIBIT G

P:\3631\ENGR\REPORTS\DRAIN\EXH\FAG_3631HECRAS-EX.dwg 4/16/2013 11:40:36 AM

N

LEGEND:

- HEC-RAS CROSS SECTIONS — XXX
- STREAM FLOWLINE
- 100-YEAR FLOODPLAIN/INUNDATION LIMITS
- INEFFECTIVE FLOW AREA MARKER ALONG CROSS SECTION

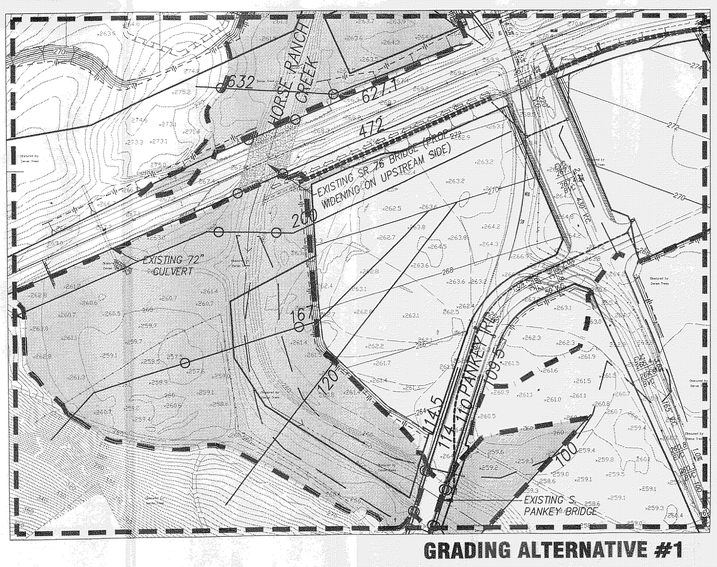
NOTE: SUPPLEMENTAL TOPO SHOWN IS AERIAL TOPOGRAPHY FROM LANDMARK ENGINEERING (CAMPUS PARK)

5608.2495
5000.6133
4634.3882
4342.0557
3976.9275
3642.1777
3351.9519
3038.374
2614.2427
2033.9547
1864
1717
1690
1630
1530
1430
1200
988
632
621.1
472
200
167
120
114.5
100

HORSE RANCH CREEK
INTERSTATE 15
SUMP AREA
100-YEAR FLOODPLAIN LIMITS PER THIS STUDY
EXISTING 72" CULVERT
EXISTING SR 76 BRIDGE (PROP. WIDENING ON UPSTREAM SIDE)
EXISTING N. PANKEY BRIDGE
PROPOSED N. PANKEY BRIDGE
PANKEY RD
114.5 TIO PANKEY RD
EXISTING S. PANKEY BRIDGE
CALTRANS SR 76 REALIGNMENT & WIDENING
PROP. EP 274.20
PROP. EP 274.45
PROPOSED SAN LUIS REY FLOODPLAIN LIMITS PER CHANG'S STUDY
SAN LUIS REY RIVER

FEMA EFFECTIVE 100 YEAR FLOODPLAIN LIMITS PER URS STUDY "FEMA LETTER OF MAP REVISION (LOMR) FOLLOW UP TO CLOMR CASE #12-09-0511P "STATE ROUTE 76 WIDENING AND REALIGNMENT FROM INTERSTATE 15 TO 3.9 KM EAST SAN DIEGO "COUNTY" DATED AUGUST 26, 2011. LOMR EFFECTIVE DATE DECEMBER 3, 2012.

SEE INSET AT BOTTOM LEFT FOR "GRADING ALTERNATIVE #1"



GRADING ALTERNATIVE #1

SCALE:	1"=150'
JOB #:	3631.10
CREATED:	09/30/09

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

COUNTY OF SAN DIEGO

CAMPUS PARK WEST

HORSE RANCH CREEK HEC-RAS WORK MAP
PROPOSED CONDITIONS (WIDEN SR 76)
EXHIBIT H

P:\3631\ENGR\REPORTS\DRAW\EXH\H_3631HECRAS-PR-widen 76.dwg 4/16/2013 11:59:31 AM

PROJECT DESIGN CONSULTANTS

PLANNING | LANDSCAPE ARCHITECTURE
ENVIRONMENTAL | ENGINEERING | SURVEY

WWW.PROJECTDESIGN.COM

SAN DIEGO • PHOENIX • TEMECULA • BAKERSFIELD