

O. AGREEMENTS

1. Specific Agreements with Neighboring Property Owners

No specific or formal agreements are in place with any neighboring property owners at the time of this Site Analysis submittal. No registered neighborhood associations exist within the immediate surrounding area. We have, however, identified two nearby individual homeowner association (HOA's) and their leadership representatives. During the comprehensive plan amendment process and the prior rezoning application on this same property, we interacted with both of the HOA's, as well as with the individual property owners in the area who are not affiliated with the HOA organizations. We will re-engage these same entities with this new rezoning request.

Prior to the full-notice public neighborhood meeting on this rezoning, we will continue our discussions with these nearby HOA leaders and the independent property owners so as to inform them of this proposed rezoning and its revised *Preliminary Development Plan (PDP)*.

Pima County staff will be duly appraised as to the above neighborhood interactions as they proceed.

Bibliography

Pima County Department of Transportation, Traffic Engineering Division website for current traffic counts; <http://dot.pima.gov/trafeng/trafcnt/adt.htm>.

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Institute of Transportation Engineers (ITE). 2008. *Trip Generation, 8th Edition: An ITE Informational Report.*

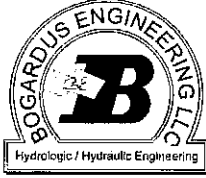
The Smart Growth Network website, *Smart Growth Principles*,
<http://www.smartgrowth.org/engine/index.php/principles>

APPENDICES

Appendix A:

Preliminary Hydrology Report
by
Bogardus Engineering, LLC
September, 2019

**This Report Establishes the 100-year
Flow Quantity for the La Cholla Wash**



Bogardus Engineering LLC

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Preliminary Hydrology Report

La Cholla Wash at La Cholla Boulevard

Township 12 S, Range 13 E, Section 03, 04, 09, 10, 15, 16, 21 and 22

Township 11 S, Range 13 E, Section 15, 16, 21, 22, 27, 28, 33 and 34

September 2019

Prepared For:

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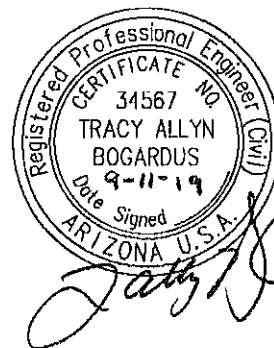


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Introduction

Project Description

This Preliminary Hydrology Report has been prepared to evaluate the La Cholla Wash at La Cholla Blvd. The watershed is approximately 3.95 square miles (2524.9 acres) and spans across 16 sections. The purpose of this preliminary report is to provide an accurate evaluation of the magnitude of runoff impacting La Cholla Blvd crossing exclusive of the breakout flow conditions to the south.

The topography shown on the exhibits and used for the evaluation of this project, was provided using PAG 2015 LIDAR Points. The watersheds were delineated using ArcGIS, the floodplain modeling used GeoHECRAS, Version 2.7.0.23211 and the This program will generate the topography based on the requested contour interval. The LAS points establish a Terrain grid from which contour intervals were established.

Objective

Pima County RFCD has outlined the procedures and methods regarding the acceptable model parametrization for determining the peak discharges within Pima County, through Technical Policy , TECH-018. These methods were used to establish an accurate 100-year peak discharge for the La Cholla Wash were it crosses La Cholla Boulevard. Previous studies were prepared by others that were not accepted by Pima County RFCD and subsequently an independent study has been prepared. This study will be used for the rezoning support of Vista Del Oro. Initially, it was determined that the independent study would be used to verify the magnitude of the discharge. Two prior submittals were prepared to establish a range of discharge, however, the documentation was limited to a cursory review. This study has established a 100-year peak discharge that will be ultimately be used for the design of the development and the basis for the CLOMR that will be required for this project.

The previous two limited reviews established the procedures, methods and formats that comply with the Technical Policy, TECH-018 requirements. There are variables in the modeling that impact the final discharge.

The delineation of the watersheds was prepared using a computer based delineation from ARCGIS. The final result of the size of the watersheds is set and unalterable thus fixing the catchment area. The results are reproducible. The rainfall data is also a fixed data point based on the NOAA, 14 Upper 90% rainfall. This is based on centroidal geometry which is fixed by the watershed delineation using ARCGIS. This too is reproducible.

The variables based on engineering judgment result from the estimation of the LAG time and channel routing. The LAG time was determined by the use of a HEC-RAS model on each of the major water courses for the sub-basins. In particular the choice of the Manning's n-value for each of the cross sections has an impact on the velocity in the channel and the storage available for routing. The previous models used an upper and lower range for the entire cross section. The objective of this report is to define the channels with proper location of the overbanks and assign a different Manning's n-value for each cross section based on the aerial photography.

Hydrologic and Floodplain Analysis

Technical Requirements

The following outline the general procedures and steps used for the preparation of this report.

- Used Technical Policy, TECH-018 as guide for modeling the watershed
- Watershed Delineation
 - Used ArcGIS to process the Pima Association of Governments LIDAR 2015 points to establish the watershed
 - Used 16 sections of land in the analysis
 - Prepared multiple DEM models, the larger the grid size the quicker it processes the points
 - Started with a 10-foot grid
 - Definition was too loose. Streams did not converge properly and established errant flow paths and watersheds
 - Final delineation used a 1-foot grid
 - Streams converged properly
- HEC-1 and HEC-HMS Modeling
 - Rainfall Loss Method
 - Used SCS curve numbers for each watershed weighted relative to the soils
 - Time of Concentration-Lag Time
 - Each sub-basin was analyzed independently with a separate spreadsheet, (discussed below)
 - Sheet flow segments used Technical Release 55, Urban Hydrology for Small Watersheds procedures

- Used for street flow and shallow sheet flow
- Channel flow used HEC-RAS
 - A separate HEC-RAS preliminary model was prepared for each path as far as containment was available
 - The floodplains used varying n-values based on existing conditions from aerial photograph
 - HEC-RAS determined the Travel Time between each cross section which was used to determine the time of concentration
 - The Q_{100} was balanced with the HEC-HMS results resulting in the change in travel time
 - Table was used in spreadsheet to update the time adjusting the cumulative T_c
 - The resulting Lag Time was inserted in the HEC-HMS model changing the Q_{100}
 - HEC-HMS new Q_{100} was used again in the HEC-RAS model until both HEC-HMS and HEC-RAS matched
- Channel Routing
 - Routing used Modified-Puls method
 - The HEC-RAS model had multiple profiles as a percentage of the 100-year event
 - Ratios were - 0.2, 0.4, 0.6, 0.8, 1.0, 1.2 and 1.5
 - Volume and discharge information for each profile from the HEC-RAS models was used to determine the storage-discharge table
 - The number of sub-reaches used for the routing was calculated. The travel time through each

sub-reach should be approximately equal to the simulation time step in the HEC-HMS modeling.

- The average velocity was determined from the HEC-RAS model and updated with each change in data output
 - The average velocity in the channel was multiplied by the HEC-RAS time step of five (5) minutes resulting in the approximate distance traveled in each time step
 - The total travel time was divided by the time step distance to obtain the number of sub-reaches.
- Rainfall Distribution
 - Rainfall used NOAA 14 upper 90% as required
 - Used Aerial Reduction as required
 - Compared model with and without aerial reduction
 - Compared model with and without channel routing
 - Used SCS Type II 3-hour storm distribution over watershed and all sub-basins
 - Comparison of other methods
 - Compared regression analysis
 - USGS Regression Equation 13
 - Eychaner both rural and urban method

Hydrology

An interactive spreadsheet was developed that was used to balance the iterative process of balancing the HEC-HMS model with the HEC-RAS flow in the channels. Each sub-basin watershed had its independent tab in the spreadsheet with the results interconnected with all of the components. Each watershed was evaluated.

- The centroidal coordinates in both northing and easting as well as latitude and longitude were established based on ARCGIS.

- The soils were evaluated and weighted based on contributing area.
 - The weighting was used to establish the SCS curve number
 - B soils used SCS curve number of 82.6
 - C soils used SCS curve number of 88.2
 - D soils used SCS curve number of 91.2
- The impervious area was measured and weighted on the total contributing area to determine the impervious weighting
- The length of the water course and the change in height were fixed numbers
- The HEC-HMS input parameters for each watershed were calculated with the spreadsheet
 - Area- fixed by ARCGIS
 - Loss method used SCS Curve number
 - Transform Method used SCS Unit Hydrograph
 - No Canopy method
 - No Base flow method
 - Loss curve number weighted and determined as shown above
 - Imperviousness as determined above
 - Lag Time was 60% of the time of concentration

The Lag time was based on the first 100 feet of the upstream outside boundary of the sub-basin. Technical Release 55, Urban Hydrology for Small Watersheds procedures base the travel time on the general slope of the watershed and a velocity excerpted from the nomograph. The Manning's n value varied from 0.060 for overland sheet flow, to 0.045 for unpaved roads and 0.011 for paved road sections. The time of concentration was based on the sheet flow equation 3-3 from TR55.

The paved and unpaved roads used the average velocity and the length of the course. The remainder of the travel time was prepared using the HEC-RAS model. The combined time of concentrations were added and multiplied by 0.60 to get the lag time.

The 100-year discharge was used in the HEC-RAS model to generate the lag time as described. The derived lag time was then used as an input parameter in HEC-HMS to determine the 100-year discharge based on that lag time. The revised 100-year discharge was then reinserted into the HEC-RAS model to determine the time of travel and velocity. The HEC-RAS data was inserted into the spreadsheet to generate a new lag time. When the lag times were the same the resulting discharge was finalized.

Floodplain Analysis

Methods, Procedures and Assumptions

The accuracy of this study is based on the current 2015 LIDAR survey which were used to generated one foot contours intervals and the underlying digital terrain model for the HEC-RAS. This statement has prepared an independent study of the floodplain for each of the sub-reaches. This floodplain study is not to be used for setting finished floor elevations or development but only to establish the time of concentration for the reach.

- 11 sub-basins were delineated for the majority of the watershed.
- 1 offsite basin, that was not part of the major watershed was added for the flow at La Cholla Boulevard
- The watersheds to the south and the breakout flow was not evaluated in this study
- The survey used the NAVD 88 datum and had a contour interval generated at 1.0 feet.
- The model used a Manning's n-value as described in the discussion below
- The spacing of the cross sections were typically between 50 ft to 150 ft. The placement varied due to conveyance and at times were spaced outside this range.

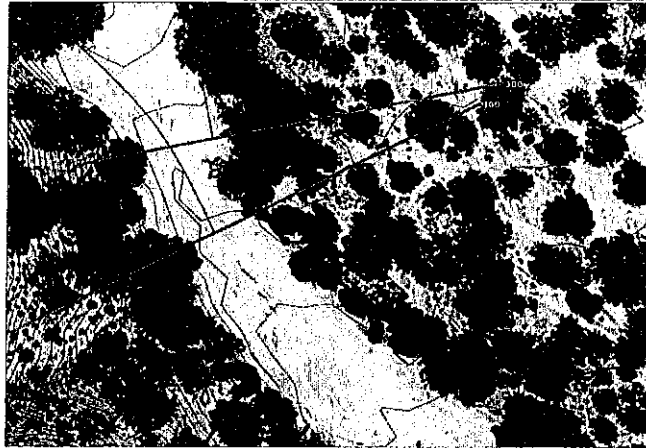
Manning's N-value

The Manning's n-value is an engineering judgement call. A high Manning's n-value generates an overall low discharge rate while a low value will generate a high value.

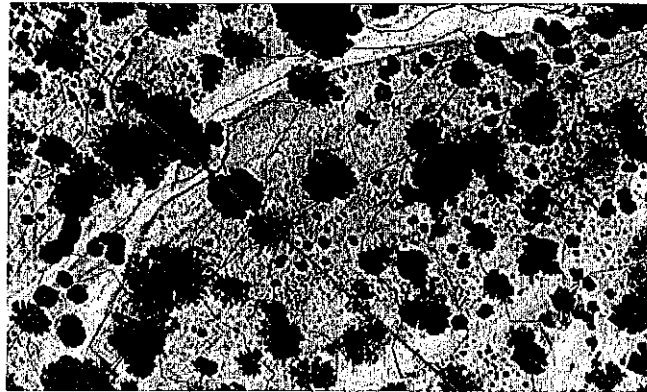
The previous studies used a generic 0.060 value which lowered the overall discharge. It also use a generic 0.045 value which increased the overall discharge. This study evaluated the location of the overbanks, based on the aerial photograph and the underlying topography. Generally, there were four values available for the cross sections, 0.03, 0.035, 0.045 and 0.060. Some road crossings used a value of 0.025. The watershed work sheets in the appendix for each HEC-RAS section has a table of the weighted Manning's n-value for each cross section.

The justification is a follows:

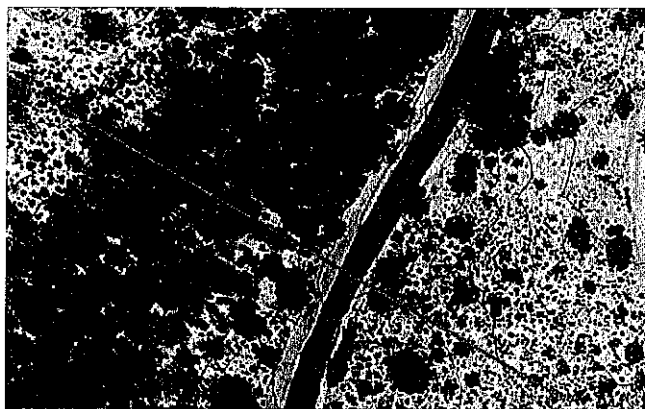
- 0.030- Used for nearly open sandy bottom. The following picture represents a typical section



- 0.035- Used a sandy bottom that had a few trees in sandy bottom braided flow. The trees were assumed to be mostly canopy.



- 0.045- Use for overbank conditions with trees and shrub limited. The pictures above shows a typical overbank for this value
- 0.060- Was used with thick tree canopy which assumed some understory growth, or with shallow flow over heavy vegetation in the overbank. The right overbank in the following picture is an example.



Regression Analysis

The peak discharges were compared with the peak discharges obtained from the USGS Regression Equation 13 and the equations (both the urban and rural) developed by Eychaner (1984). The regressions equations do not work well on small watersheds however the over all watershed was relatively close for both regression equations and the HEC-HMS results. The calculation sheets are located within the appendix of this report. Note that the USGS and the HEC-HMS with this study are nearly identical. The Eychaner equation is closer to the value when the overall watershed used the 0.045 Manning's n-value for the generic HEC-RAS cross section.

Watershed	Area (mi ²)	Length (mi)	Δ Elevation (ft)	Slope %	Q ₁₀₀ (CFS)		
					USGS	Eychaner	HEC-HMS
A	0.0637	0.5422	61.9	2.162%	142	185	76
B	0.3591	2.3019	210.9	1.735%	607	546	284
C	0.2877	1.0561	133.3	2.391%	513	584	364
D	0.0435	0.3396	56.2	3.134%	99	164	68
E	0.3144	1.7625	157.6	1.694%	549	585	442
F	0.3968	2.7275	228.6	1.587%	655	564	306
G	0.6611	1.9610	236	2.279%	948	1018	891
H	0.3884	2.3212	173.1	1.412%	644	593	289
I	0.6367	3.0705	229.5	1.416%	923	836	577
J	0.3856	3.4271	228.3	1.262%	641	557	296
K	0.3339	1.6877	177.5	1.992%	575	1152	488
CP 2	0.0743	0.6045	119.2	3.734%	164	202	82
La Cholla Wash	3.95	7.8176	679.4	1.646%	2934	2748	2904

• Table 1- Regression Analysis Comparison

Conclusion and Limitations

Conclusions

The objective of this report has provided a preliminary 100-year peak discharge for the La Cholla Wash as it crosses the La Cholla Boulevard. Breakout flow to the south was not evaluated, however the discharge evaluated within this report will be. The following are the conclusions:

- The choice of Manning's n-value impacts the final 100-year peak discharge
 - Use of 0.60 for generic n-value resulted in 2275 cfs (This did not include CP 2)
 - Use of 0.045 for generic n-value resulted in 2598 cfs
 - The defined floodplain modeling with varying n-values corresponding to ground conditions resulted in 2904 cfs.
- Regression analysis
 - USGS- 2934 cfs
 - Eychaner equation- 2748
- The final HEC-HMS 100-year discharge value of 2904 cfs provides the best evaluation

Limitations

The design analyzed within this report, consist of opinions and conclusions by the consulting engineer. The only warranty or guarantee made by the Consultant, in connection with the services performed for this project, is that such services are performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions, at the same time, and in the same or a similar locality. No other warranty, expressed or implied, is made or intended by rendering such consulting services or by furnishing written reports of the findings. However, any deviation from the approved recommendations may nullify the conclusions of this report, as may variations in climatic conditions, vegetation changes, or zoning changes.

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Section

7

Appendices

Appendix A – Hydrologic Analysis

Regression Analysis Summary

Regression Analysis Comparison

Project No: 18-002-A-001D

Date: 9/7/2019

Location: La Cholla Wash at Vista Del Oro

Watershed	Area (mi ²)	Length (mi)	Δ Elevation (ft)	Slope %	Q ₁₀₀ (CFS)		
					USGS	Eychaner	HEC-HMS
A	0.0637	0.5422	61.9	2.162%	142	185	76
B	0.3591	2.3019	210.9	1.735%	607	546	284
C	0.2877	1.0561	133.3	2.391%	513	584	364
D	0.0435	0.3396	56.2	3.134%	99	164	68
E	0.3144	1.7625	157.6	1.694%	549	585	442
F	0.3968	2.7275	228.6	1.587%	655	564	306
G	0.6611	1.9610	236	2.279%	948	1018	891
H	0.3884	2.3212	173.1	1.412%	644	593	289
I	0.6367	3.0705	229.5	1.416%	923	836	577
J	0.3856	3.4271	228.3	1.262%	641	557	296
K	0.3339	1.6877	177.5	1.992%	575	1152	488
CP 2	0.0743	0.6045	119.2	3.734%	164	202	82
La Cholla Wash	3.95	7.8176	679.4	1.646%	2934	2748	2904

Note: The Eychaner Q100 is the larger calculated value for Rural or Urban See Eychaner Work Sheet

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BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Eychaner Worksheet

Project No: 18-002-A-001D
 Location: La Cholla Wash at Vista Del Oro

Date: 9/7/2019

Watershed		Area (mi ²)	Length (mi)	Δ Elevation (ft)	Slope (%)	BDF Score	Shape Factor	Q ₁₀₀ (cfs)
							Applied Criteria	
A	Upper					3	1,3,4	
	Middle					0		
	Lower					0		
Rural		0.06374	0.54223	61.9	2.162%	N/A	4.6	185
Urban		0.06374	0.54223	61.9	2.162%	3	N/A	177
B	Upper					0		
	Middle					0		
	Lower					3	1,3,4	
Rural		0.35908	2.30189	210.9	1.735%	N/A	14.8	535
Urban		0.35908	2.30189	210.9	1.735%	3	N/A	546
C	Upper					1	4	
	Middle					1	4	
	Lower					1	4	
Rural		0.28773	1.05606	133.3	2.391%	N/A	3.9	564
Urban		0.28773	1.05606	133.3	2.391%	3	N/A	568
D	Upper					0		
	Middle					0		
	Lower					0		
Rural		0.04346	0.33958	56.2	3.134%	N/A	2.7	164
Urban		0.04346	0.33958	56.2	3.134%	0	N/A	139
E	Upper					3	1,3,4	
	Middle					3	1,3,4	
	Lower					0		
Rural		0.31445	1.7625	157.6	1.694%	N/A	9.9	519
Urban		0.31445	1.7625	157.6	1.694%	6	N/A	585
F	Upper					0		
	Middle					0		
	Lower					2	3,4	
Rural		0.39681	2.72746	228.6	1.587%	N/A	18.7	564
Urban		0.39681	2.72746	228.6	1.587%	2	N/A	561
G	Upper					0		
	Middle					3	1,3,4	
	Lower					2	3,4	
Rural		0.66105	1.96098	236	2.279%	N/A	5.8	938
Urban		0.66105	1.96098	236	2.279%	5	N/A	1018

BOGARDUS ENGINEERING, LLC
 Hydrologic / Hydraulic Engineer

Eychaner Worksheet (2)

Project No: 18-002-A-001D
 Location: La Cholla Wash at Vista Del Oro

Date: 9/7/2019

Watershed		Area (mi ²)	Length (mi)	Δ Elevation (ft)	Slope (%)	BDF Score	Shape Factor	Q ₁₀₀ (cfs)
							Applied Criteria	
H	Upper					0		
	Middle					0		
	Lower					3		
Rural		0.38843	2.32121	173.1	1.412%	N/A	13.9	584
Urban		0.38843	2.32121	173.1	1.412%	3	N/A	593
I	Upper					0		
	Middle					0		
	Lower					3		
Rural		0.63668	3.07045	229.5	1.416%	N/A	14.8	810
Urban		0.63668	3.07045	229.5	1.416%	3	N/A	836
J	Upper					0		
	Middle					0		
	Lower					0		
Rural		0.38556	3.42708	228.3	1.262%	N/A	30.5	557
Urban		0.38556	3.42708	228.3	0.000%	0	N/A	525
K	Upper					4	1,2,3,4	
	Middle					4	1,2,3,4	
	Lower					4	1,2,3,4	
Rural		0.33394	1.68769	177.5	1.992%	N/A	8.5	549
Urban		0.33394	1.68769	177.5	1.992%	12	N/A	1152
2	Upper					1	4	
	Middle					0		
	Lower					0		
Rural		0.07425	0.60455	119.2	3.734%	N/A	4.9	202
Urban		0.07425	0.60455	119.2	3.734%	1	N/A	183
La Cholla	Upper					0		
	Middle					3	1,2,4	
	Lower					0		
Rural		3.95	7.81761	679.4	1.646%	N/A	15.5	2478
Urban		3.94518	7.81761	679.4	1.646%	3	N/A	2748

BOGARDUS ENGINEERING, LLC
 Hydrologic / Hydraulic Engineer

Hydrology Input Parameters

WATERSHED A HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	976,709.37	503,639.13	32.3814	-111.0203

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
40.79	2863	61.9	1431	0.032	20	12.3	44.0	38.9	17.1

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	17.94	36.3
C	88.2	15.88	34.3
D	91.2	6.97	15.6

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	32.25	79.1	0.035	0.0277	5	4.0
< 1 House	0	0.0	0.035	0.0000	10	0.0
3-5 Houses	8.54	20.9	0.022	0.0046	40	8.4

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.063736	SCS Curve Number	SCE Unit Hydrograph	None	None	86.2	12.3	14.2

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED B HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	976,389.92	507,264.13	32.3914	-111.0212

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
229.8	12154	210.9	6077	0.033	20	10.1	39.3	34.2	26.4

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	90.39	32.5
C	88.2	78.64	30.2
D	91.2	60.78	24.1

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	196.2	85.4	0.035	0.0299	5	4.3
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	33.6	14.6	0.022	0.0032	40	5.8

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.359077	SCS Curve Number	SCE Unit Hydrograph	None	None	86.8	10.1	34.8

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED C HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	978,028.81	507,250.24	32.3913	-111.0159

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
184.1	5576	133.3	2788	0.035	20	8.5	45.0	12.8	42.2

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	82.94	37.2
C	88.2	23.49	11.3
D	91.2	77.71	38.5

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nbw	% Basin Factor	Impervious	% Impervious
Natural	57.0	30.9	0.035	0.0108	5	1.5
< 1 House	127.2	69.1	0.035	0.0242	10	6.9
3-5 Houses	0.00	0.0	0.022	0.0000	40	0.0

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.287728	SCS Curve Number	SCE Unit Hydrograph	None	None	86.9	8.5	11.5

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED D HYROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	977,084.37	509,708.57	32.3981	-111.0189

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
27.8	1793	56.2	896	0.035	20	5.0	33.9	10.4	55.7

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	9.44	28.0
C	88.2	2.89	9.2
D	91.2	15.49	50.8

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	27.8	100.0	0.035	0.0350	5	5.0
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	0.0	0.0	0.022	0.0000	40	0.0

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.043457	SCS Curve Number	SCE Unit Hydrograp	None	None	88.0	5.0	4.3

BOGARDUS ENGINEERING
Hydrologic / Hydraulic Engineer

WATERSHED E HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	979,223.26	512,097.46	32.4046	-111.0119

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L _{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
201.2	9306	157.6	4653	0.030	20	23.6	0.0	0.0	100.0

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	0.00	0.0
C	88.2	0.00	0.0
D	91.2	201.25	91.2

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	117.8	58.6	0.035	0.0205	5	2.9
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	83.4	41.4	0.022	0.0091	50	20.7

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.314448	SCS Curve Number	SCE Unit Hydrograph	None	None	91.2	23.6	15.8

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED F HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	977,598.26	515,694.68	32.4145	-111.0171

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
254.0	14401	228.6	7201	0.033	20	11.5	0.0	28.1	71.9

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	0.00	0.0
C	88.2	71.24	24.7
D	91.2	182.72	65.6

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	217.4	85.6	0.035	0.0300	5	4.3
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	36.6	14.4	0.022	0.0032	50	7.2

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.396813	SCS Curve Number	SCE Unit Hydrograph	None	None	90.4	11.5	45.8

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED G HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	979,112.15	516,430.79	32.4165	-111.0122

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
423.1	10354	236	5177	0.031	20	20.6	0.1	38.9	61.0

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	0.56	0.1
C	88.2	164.54	34.3
D	91.2	257.98	55.6

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	276.7	65.4	0.035	0.0229	5	3.3
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	146.4	34.6	0.022	0.0076	50	17.3

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.661054	SCS Curve Number	SCE Unit Hydrograph	None	None	90.0	20.6	15.8

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED H HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	982,751.04	521,361.35	32.4300	-111.0002

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L _{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
248.6	12256	173.1	6128	0.031	20	19.2	55.9	31.5	12.5

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	138.99	46.2
C	88.2	78.43	27.8
D	91.2	31.18	11.4

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	170.4	68.6	0.035	0.0240	5	3.4
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	78.2	31.4	0.022	0.0069	50	15.7

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.388433	SCS Curve Number	SCE Unit Hydrograph	None	None	85.4	19.2	38.4

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED I HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	982,112.14	523,819.68	32.4367	-111.0022

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
407.5	16212	229.5	8106	0.034	20	10.1	7.9	10.4	81.7

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	32.11	6.5
C	88.2	42.36	9.2
D	91.2	333.00	74.5

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	361.5	88.7	0.035	0.0311	5	4.4
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	46.0	11.3	0.022	0.0025	50	5.6

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.636678	SCS Curve Number	SCE Unit Hydrograph	None	None	90.2	10.1	34.9

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED J HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	981,987.15	527,764.13	32.4476	-111.0025

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{ca} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
246.8	18095	228.3	9048	0.032	20	20.8	10.0	18.7	71.3

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	24.63	8.2
C	88.2	46.20	16.5
D	91.2	175.93	65.0

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	200.8	81.4	0.035	0.0285	5	4.1
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
High Dev	46.0	18.6	0.02	0.0037	90	16.8

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.385564	SCS Curve Number	SCE Unit Hydrograph	None	None	89.8	20.8	46.9

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulics Engineer

WATERSHED K HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	980,731.26	512,733.39	32.4476	-111.0066

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
213.7	8911	177.5	4455	0.024	20	43.6	0.0	0.0	100.0

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6		0.0
C	88.2		0.0
D	91.2	213.70	91.2

213.70

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	30.4	14.2	0.035	0.0050	5	0.7
< 1 House	0.0	0.0	0.035	0.0000	10	0.0
3-5 Houses	183.4	85.8	0.022	0.0189	50	42.9

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.3339375	SCS Curve Number	SCE Unit Hydrograph	None	None	91.2	43.6	16.2

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSHED 2 HYDROLOGIC PARAMETERS WORKSHEET

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Centroidal Coordinates	Northing	Easting	Latitude	Longitude
	976,709.37	503,639.13	32.3814	-111.0203

PIMA COUNTY METHOD

Area (ac)	Length of Water Course (ft)	Δ Height (ft)	Length to Centroid, L_{CA} (ft)	Weighted nbw	Vegetation Cover Density	% Impervious Weighted	Soils % B	Soils % C	Soils % D
47.52	3192	119.2	1596	0.035	20	7.6	73.6	13.2	13.2

SOILS	Curve Number	Area of Soils (ac)	% of Curve Number
B	82.6	34.99	60.8
C	88.2	6.27	11.6
D	91.2	6.27	12.0

Land Use / acre	Area of Use (ac)	% of Total Area	Basin Factor nb	% Basin Factor	Impervious	% Impervious
Natural	42.66	89.8	0.035	0.0314	5	4.5
< 1 House		0.0	0.035	0.0000	10	0.0
2 Houses	4.86	10.2	0.032	0.0033	30	3.1

HEC-HMS

Area (mi ²)	Loss Method	Transform Method	Canopy Method	Baseflow Method	Loss Curve Number	Impervious %	Lag Time (min)
0.07425	SCS Curve Number	SCE Unit Hydrograph	None	None	84.5	7.6	13.0

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

HEC-HMS Reach Storage / Discharge Computations

REACH 1 INPUT SUMMARY

Project No: 18-002-A-001D Date: 9/6/2019
 Location: La Cholla Wash at Vista Del Oro

Description:

1. Route Basin J through Basin G to Junction 1
2. Junction 1 combines Basin G, Basin F, and Routed Basin J
3. Starting Q_0 initial trial is USGS Regression computation for routed watershed
4. Subsequent starting Q_{100} HMS output to generate HEC-RAS model
5. Balance Q_{100} used in HEC-RAS to develop Volume with Q_{100} out from HEC-HMS, match within 5%

Upstream Basin or Junction	Upstream Q100 (cfs)	Upstream Reach Storage Cross Section	Down stream Basin	Downstream Q100 (cfs)	Downstream Reach Storage Cross Section	Basin G Number of Routing Sub- Basins
J	296.1	1144	G	891.00	731	4

UPSTREAM CROSS SECTION DATA				DOWNSTREAM CROSS SECTION DATA			
River Station	Profile	Q Total	Volume (ac-ft)	River Station	Profile	Q Total	Volume (ac-ft)
1144	0.2	59	7.22	731	0.2	178	9.09
1144	0.4	118	12.33	731	0.4	356	15.83
1144	0.6	178	16.85	731	0.6	535	21.71
1144	0.8	237	20.93	731	0.8	713	27.51
1144	1.0	296	24.74	731	1.0	891	33.08
1144	1.2	355	28.6	731	1.2	1069	38.99
1144	1.5	444	34.39	731	1.5	1337	46.62

HEC-HMS STORAGE ROUTING TABLE 1	
Storage	Discharge
0	0
1.87	59
3.5	118
4.86	178
6.58	237
8.34	296
10.39	355
12.23	444

BOGARDUS ENGINEERING, LLC
 Hydrologic / Hydraulic Engineer

REACH 2 INPUT SUMMARY

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

Description:

1. Route Basin I through Basin E to Junction 2
2. Junction 1 combines Basin E, Basin F, and Routed Basin I
3. Starting Q, initial trial is USGS Regression computation for routed watershed
4. Subsequent starting Q100 HMS output to generate HEC-RAS model
5. Balance Q100 used in HEC-RAS to develop Volume with Q100 out from HEC-HMS, match within 5%

Upstream Basin	Upstream Q100 (cfs)	Upstream Reach Storage Cross Section	Downstream Basin	Downstream Q100 (cfs)	Downstream Reach Storage Cross Section	Basin E Number of Routing Sub-Basins
I	577.4	944	E	442.3	527	4

UPSTREAM CROSS SECTION DATA				DOWNSTREAM CROSS SECTION DATA			
River Station	Profile	Q Total	Volume (ac-ft)	River Station	Profile	Q Total	Volume (ac-ft)
944	0.2	116	11.26	527	0.2	88.5	4.77
944	0.4	231	19.38	527	0.4	176.9	8.07
944	0.6	346	26.6	527	0.6	265.4	10.95
944	0.8	462	33.37	527	0.8	353.8	13.72
944	1.0	577	39.77	527	1.0	442.3	16.39
944	1.2	693	46.16	527	1.2	530.8	19.03
944	1.5	866	55.14	527	1.5	663.5	22.81

HEC-HMS STORAGE ROUTING	
Storage	Discharge
0	0
6.49	116
11.31	231
15.65	346
19.65	462
23.38	577
27.13	693
32.33	866

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

REACH 3 INPUT SUMMARY

Project No: 18-002-A-001D **Date:** 9/6/2019
Location: La Cholla Wash at Vista Del Oro

Description:

1. Route Basin H through Basin K to Junction 4
2. Junction 4 combines Basin K, and Routed Basin H
3. Starting Q, initial trial is USGS Regression computation for routed watershed
4. Subsequent starting Q100 HMS output to generate HEC-RAS model
5. Balance Q100 used in HEC-RAS to develop Volume with Q100 out from HEC-HMS, match within 5%

Upstream Basin	Upstream Q100 (cfs)	Upstream Reach Storage Cross Section	Downstream Basin	Downstream Q100 (cfs)	Downstream Reach Storage Cross Section	Basin E Number of Routing Sub-Basins
H	288.5	825	K	488.2	1130	4

UPSTREAM CROSS SECTION DATA			
River Station	Profile	Q Total	Volume (ac-ft)
825	0.2	58	3.83
825	0.4	115	6.58
825	0.6	173	8.99
825	0.8	231	11.06
825	1.0	289	13.26
825	1.2	346	15.08
825	1.5	433	18.15

DOWNSTREAM CROSS SECTION DATA			
River Station	Profile	Q Total	Volume (ac-ft)
1130	0.2	98	5.57
1130	0.4	195	9.47
1130	0.6	293	12.99
1130	0.8	391	15.86
1130	1.0	488	18.78
1130	1.2	586	21.54
1130	1.5	732	26.15

HEC-HMS STORAGE ROUTING	
Storage	Discharge
0	0
1.74	58
2.89	115
4.06	173
4.8	231
5.52	289
6.46	346
8	433

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

HEC-HMS Lag Time Analysis

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED A

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow	100	0.01900	0.060	2.20				6.4	3.8
Paved	1076	0.01022	0.011	2.05	8.747967			8.7	5.2
Unpaved	116	0.04310	0.045	2.8	0.690476			0.7	0.4
Channel	1571					0.13	5.42	7.8	4.7

Total 2863 23.6 **14.2**

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1627 ft

Time step= 5

Minimum number of reaches for routing= 2

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
116	75.7	0.13	2503.21	0.88	5.92	84.14	40.10	18.13	1.10
115	75.7	0.13	2501.01	0.84	3.87	113.48	42.99	19.98	0.97
114	75.7	0.12	2498.04	0.79	4.11	95.71	43.39	24.61	0.73
113	75.7	0.11	2495.88	0.74	5.35	63.66	21.66	15.82	0.93
112	75.7	0.11	2493.56	0.72	7.73	129.66	21.52	11.96	1.53
111	75.7	0.10	2490.45	0.67	5.56	93.58	55.63	24.63	1.21
110	75.7	0.09	2487.84	0.62	4.84	61.29	49.02	21.83	1.11
109	75.7	0.09	2485.71	0.58	4.05	19.03	27.51	31.03	0.54
108	75.7	0.09	2485.44	0.57	4.89	50.09	41.99	21.07	0.84
107	75.7	0.08	2483.93	0.55	8.09	61.33	35.19	12.74	1.83
106	75.7	0.08	2481.92	0.53	5.86	59.57	27.86	14.19	1.32
105	75.7	0.08	2480.20	0.51	4.77	97.03	39.04	16.14	1.23
104	75.7	0.07	2477.11	0.44	0.97	117.28	52.50	42.52	0.13

BOGARDUS ENGINEERING, LLC

Hydrologic / Hydraulic Engineer

WATERSED A (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
103	75.7	0.05	2474.21	0.32	0.69	184.08	81.50	46.03	0.12
102	75.7	0.03	2469.22	0.17	4.13	93.52	87.28	26.85	1.25
101	75.7	0.02	2466.25	0.12	3.76	247.20	53.97	22.98	1.30
100	75.7	0.00	2460.49		4.21		34.18	18.09	1.00

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED B

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow	100	0.019000	0.060	2.20				6.4	3.8
Paved								0.0	0.0
Unpaved	1336	0.014521	0.045	1.95	11.4			11.4	6.9
Channel	10718					0.67	7.21	40.2	24.1
Total	12154							58.0	34.8

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 2162 ft

Time step= 5

Minimum number of reaches frouting= 6

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
242	284.1	0.67	2661.71	16.07	5.00	297.70	121.15	75.52	0.86
241	284.1	0.65	2656.84	15.54	7.25	297.70	79.99	79.22	0.98
240	284.1	0.62	2652.24	15.00	6.83	297.70	152.35	80.02	1.32
239	284.1	0.60	2647.19	14.46	5.36	162.61	95.66	76.87	0.84
238	284.1	0.59	2645.00	14.15	8.37	135.09	111.72	89.23	1.18
237	284.1	0.58	2642.75	13.92	7.12	297.70	57.91	60.67	0.95
236	284.1	0.56	2637.94	13.50	8.30	297.70	70.32	60.72	1.11
235	284.1	0.54	2632.94	13.04	7.52	297.70	115.50	75.61	1.05
234	284.1	0.52	2628.18	12.53	8.12	153.84	90.06	71.77	1.00
233	284.1	0.51	2624.44	12.32	9.58	143.85	78.12	48.24	1.47
232	284.1	0.50	2622.66	12.10	5.60	143.91	136.91	85.20	0.90
231	284.1	0.49	2619.93	11.81	5.72	86.27	101.19	88.62	0.80
230	284.1	0.49	2618.00	11.67	5.86	151.71	66.10	59.29	0.94

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSED B (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
229	284.1	0.47	2615.28	11.42	7.07	135.90	117.61	84.61	0.95
228	284.1	0.46	2612.96	11.16	7.23	187.15	121.21	81.18	1.20
227	284.1	0.45	2609.44	10.73	4.74	188.15	146.57	117.09	0.75
226	284.1	0.43	2606.46	10.36	6.32	297.70	57.35	56.33	0.92
225	284.1	0.41	2601.39	9.90	4.44	347.87	85.44	77.56	0.70
224	284.1	0.39	2595.01	9.36	6.00	315.96	66.60	57.98	0.95
223	284.1	0.37	2589.05	8.97	7.21	193.97	53.49	49.27	0.93
222	284.1	0.37	2585.49	8.75	9.79	332.99	60.17	47.52	1.35
221	284.1	0.35	2580.27	8.34	10.28	297.70	52.39	59.69	1.17
220	284.1	0.33	2575.63	7.98	7.33	297.70	38.74	47.77	0.92
219	284.1	0.32	2571.28	7.67	8.33	297.70	31.25	41.68	1.06
218	284.1	0.31	2566.24	7.33	7.05	297.70	56.56	57.73	0.93
217	284.1	0.29	2560.98	6.91	7.90	297.70	61.04	65.16	1.01
216	284.1	0.27	2555.03	6.52	7.53	297.70	63.28	48.02	1.22
215	284.1	0.26	2549.73	6.16	6.50	297.70	61.92	60.05	0.96
214	284.1	0.24	2545.49	5.67	5.96	297.70	95.63	81.53	1.05
213	284.1	0.21	2540.32	5.12	7.17	297.70	108.21	78.52	1.26
212	284.1	0.19	2535.76	4.61	6.42	297.70	94.67	70.75	0.97
211	284.1	0.18	2528.78	4.23	11.60	297.70	59.98	43.09	1.90
210	284.1	0.16	2523.29	3.83	5.58	297.70	93.56	71.80	0.95
209	284.1	0.14	2517.18	3.42	9.97	529.02	46.04	49.01	1.38
208	284.1	0.12	2506.18	2.87	9.71	364.06	59.28	41.21	1.29
207	284.1	0.10	2500.20	2.48	6.97	291.98	48.15	52.46	1.02
206	284.1	0.09	2494.24	2.04	3.99	307.2	130.94	79.04	1.04
205	284.1	0.06	2489.11	1.51	4.55	133.37	124.24	69.98	0.99
204	284.1	0.05	2485.88	1.33	7.02	153.62	111.36	53.71	1.39
203	284.1	0.04	2483.23	1.08	4.71	286.26	185.83	86.15	1.08
202	284.1	0.02	2477.9	0.55	6.5	122.29	162.24	74.58	1.14
201	284.1	0.01	2475.19	0.36	7.04	194.59	116.97	61.42	1.4
200	284.1	0	2471.8		3.47		226.14	99.62	0.74

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P_2 = 2-Year, 24-hour rainfall (in) = 1.82

WATERSHED C

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow									0.0
Paved								0.0	0.0
Unpaved								0.0	0.0
Channel	5576					0.32	6.18	19.2	11.5

Total 5576.48 19.2 **11.5**

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1855 ft

Time step = 5

Minimum number of reaches for routing = 3

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
328	364.4	0.32	2580.20	9.63	6.79	293.50	58.09	55.26	1.16
327	364.4	0.30	2575.90	9.28	8.01	293.50	31.26	50.27	1.03
326	364.4	0.29	2571.46	8.90	6.10	294.24	87.04	59.91	1.29
325	364.4	0.28	2565.99	8.47	5.47	292.76	100.18	68.71	1.15
324	364.4	0.26	2560.57	7.99	4.40	281.70	99.74	75.29	1.09
323	364.4	0.24	2554.60	7.51	5.23	290.84	149.10	72.88	1.20
322	364.4	0.23	2548.64	7.03	6.04	131.40	104.47	71.10	1.15
321	364.4	0.22	2546.13	6.79	7.13	316.08	121.17	83.41	1.24
320	364.4	0.20	2539.67	6.24	5.43	181.71	143.84	69.60	1.47
319	364.4	0.19	2535.17	5.86	5.39	204.26	318.85	113.02	1.29
318	364.4	0.18	2529.55	5.42	7.42	485.68	120.49	74.51	1.36
317	364.4	0.15	2518.58	4.51	7.97	189.95	224.09	87.92	1.28
316	364.4	0.13	2514.39	4.14	6.57	266.37	214.87	83.81	1.34

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Hydrologic / Hydraulic Engineer

WATERSED C (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
315	364.4	0.12	2507.62	3.67	6.76	127.97	98.43	67.66	1.31
314	364.4	0.11	2504.83	3.46	6.11	100.41	121.32	76.32	1.22
313	364.4	0.11	2502.75	3.30	6.04	136.28	80.45	64.47	1.14
312	364.4	0.10	2499.96	3.10	6.17	229.43	85.99	64.59	1.27
311	364.4	0.09	2495.05	2.68	4.32	286.41	188.82	95.10	1.03
310	364.4	0.07	2487.49	2.10	5.56	137.17	175.43	81.54	1.35
309	364.4	0.06	2483.69	1.87	7.47	108.70	70.97	61.13	1.29
308	364.4	0.06	2481.24	1.72	7.28	57.6	71.58	57.6	1.31
307	364.4	0.05	2479.96	1.65	6.92	54.61	85.02	60.16	1.29
306	364.4	0.05	2478.8	1.57	6.98	56.01	92.08	64.49	1.25
305	364.4	0.05	2477.92	1.48	6.19	61.74	128.48	79.69	1.08
304	364.4	0.04	2476.74	1.37	6.42	83.11	113.92	64.87	1.19
303	364.4	0.04	2474.97	1.25	6.38	312.65	118.7	61.68	1.28
302	364.4	0.02	2468.45	0.69	4.87	158.41	213.52	95.4	1.27
301	364.4	0.01	2465.09	0.31	4.68	143.99	256.53	115.46	1.05
300	364.4	0	2461.48		7.38		134.53	69.3	1.42

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED D

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow								0.0	0.0
Paved								0.0	0.0
Unpaved									
Channel	1792.84					0.12	4.54	7.2	4.3

Total 1792.84 7.2 **4.3**

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1362 ft

Time step= 5

Minimum number of reaches for routing= 1

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
407	67.6	0.12	2610.42	0.69	4.58	256.12	23.54	14.86	0.99
406	67.6	0.11	2606.95	0.60	4.18	256.12	22.94	16.29	0.87
405	67.6	0.09	2603.56	0.50	5.02	256.12	25.38	16.45	1.03
404	67.6	0.07	2599.67	0.40	3.67	256.12	30.74	19.78	0.76
403	67.6	0.05	2596.63	0.29	4.08	256.12	32.46	16.58	1.01
402	67.6	0.03	2592.56	0.19	4.58	256.12	32.51	16.87	0.99
401	67.6	0.02	2587.38	0.10	5.67	256.12	33.09	14.48	1.32
400	67.6	0.00	2580.01		3.51		28.81	19.27	0.76

BOGARDUS ENGINEERING

Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P_2 = 2-Year, 24-hour rainfall (in) = 1.82

WATERSHED E

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow									
Paved									
Unpaved									
Channel	9306					0.44	7.56	26.4	15.8
Total	9305.73							26.4	15.8

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 2267 ft

Time step = 5

Minimum number of reaches for routing = 4

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
527	442.3	0.44	2735.31	16.39	9.69	260.84	43.31	66.28	1.10
526	442.3	0.43	2732.64	15.99	8.92	351.36	44.69	68.37	1.00
525	442.3	0.41	2728.80	15.37	6.89	351.36	93.15	84.95	1.08
524	442.3	0.39	2724.18	14.65	7.03	351.36	101.85	93.32	0.91
523	442.3	0.37	2718.48	13.89	5.89	351.36	126.51	96.33	1.13
522	442.3	0.35	2711.58	13.26	8.07	335.14	48.63	58.69	1.11
521	442.3	0.34	2707.85	12.67	5.43	311.14	121.32	93.72	0.93
520	442.3	0.32	2703.70	12.11	8.44	457.92	59.79	64.31	1.04
519	442.3	0.30	2697.58	11.31	7.96	338.08	116.08	88.59	1.20
518	442.3	0.29	2689.31	10.78	10.20	314.53	35.90	47.67	1.36
517	442.3	0.28	2685.73	10.36	6.54	351.36	47.88	68.03	0.94
516	442.3	0.26	2681.82	9.77	6.58	351.36	67.68	77.66	0.90
515	442.3	0.25	2675.31	9.27	9.49	351.36	33.92	47.12	1.36

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Hydrologic / Hydraulic Engineer

WATERSED E (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
514	442.3	0.23	2670.05	8.78	6.32	351.36	94.97	74.42	1.03
513	442.3	0.22	2666.09	8.06	7.73	371.93	151.33	103.15	0.94
512	442.3	0.19	2660.56	7.30	6.46	330.79	100.65	74.75	1.21
511	442.3	0.18	2653.66	6.83	9.22	351.36	28.93	50.35	1.13
510	442.3	0.17	2648.89	6.40	8.94	351.36	62.73	56.48	1.14
509	442.3	0.16	2644.13	5.91	7.87	373.31	57.98	63.81	1.11
508	442.3	0.14	2637.19	5.31	7.53	329.42	115.41	77.86	1.26
507	442.3	0.13	2630.96	4.77	8.08	351.36	53.57	64.21	1.07
506	442.3	0.11	2624.85	4.25	10.17	294.59	74.82	63.56	1.39
505	442.3	0.10	2619.90	3.79	6.47	330.58	69.04	74.16	0.97
504	442.3	0.09	2614.45	3.25	6.92	432.03	64.77	66.88	1.17
503	442.3	0.06	2607.34	2.45	7.00	376.20	127.69	94.62	1.26
502	442.3	0.04	2600.98	1.71	7.12	323.42	88.73	77.10	1.04
501	442.3	0.02	2595.86	0.84	2.86	260.85	269.80	156.08	0.77
500	442.3	0.00	2591.78				183.67	125.94	0.00

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED F

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow	575	0.021043	0.06	2.20				24.8	14.9
Paved	2704	0.016013	0.011	2.80	16.1			16.1	9.7
Unpaved								0.0	0.0
Channel	11122					0.59	6.58	35.4	21.2
Total	14401.22							76.3	45.8

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1974 ft

Time step= 5

Minimum number of reaches for routing= 7

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
631	305.7	0.59	2785.48	15.81	5.96	347.57	124.17	85.8	0.99
630	305.7	0.57	2779.46	15.17	5.57	347.57	119.65	72.8	1.11
629	305.7	0.55	2773.57	14.65	5.2	304.35	81.84	59.04	1.05
628	305.7	0.53	2768.53	14.26	7.45	390.78	64.22	50.91	0.98
627	305.7	0.51	2762.36	13.79	6.89	347.57	66.01	54.93	1.05
626	305.7	0.5	2755.91	13.37	6.95	347.57	51	49.16	1.07
625	305.7	0.48	2750.97	12.91	5.66	347.57	77.15	66.54	0.79
624	305.7	0.46	2747.62	12.39	4.82	347.57	88.77	63.43	1
623	305.7	0.44	2739.77	11.96	6.86	347.57	99.68	45.57	1.72
622	305.7	0.42	2733.21	11.45	5.51	347.57	137.73	82.49	1.11
621	305.7	0.4	2727.72	10.91	6.37	347.57	48.78	51.45	0.98
620	305.7	0.39	2722.07	10.55	8.46	695.14	34.12	40.4	1.13
619	305.7	0.36	2710.27	9.88	7.96	447.43	48.68	42.96	1.13

BOGARDUS ENGINEERING, LLC
 Hydrologic / Hydraulic Engineer

WATERSED F (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
618	305.7	0.35	2704.27	9.45	8.14	247.71	28.42	41.69	1.04
617	305.7	0.34	2701.40	9.21	7.09	223.43	28.07	43.13	1.00
616	305.7	0.33	2698.41	8.98	7.05	471.70	32.93	44.40	1.00
615	305.7	0.31	2690.47	8.55	8.92	347.57	27.24	34.38	1.37
614	305.7	0.29	2685.98	8.04	6.59	347.57	150.41	95.33	0.84
613	305.7	0.28	2679.34	7.52	8.74	347.57	27.64	34.96	1.37
612	305.7	0.26	2675.43	6.85	3.15	347.57	219.65	132.50	0.71
611	305.7	0.23	2669.88	5.99	4.14	347.57	142.74	82.43	0.85
610	305.7	0.20	2665.06	5.36	5.58	347.57	114.56	76.98	0.84
609	305.7	0.19	2659.20	4.89	8.59	347.57	63.45	40.87	1.54
608	305.7	0.17	2654.65	4.43	6.73	347.57	87.24	73.60	1.10
607	305.7	0.15	2650.34	3.85	5.29	347.57	74.56	72.02	0.80
606	305.7	0.12	2645.66	3.20	6.18	347.57	115.14	91.57	1.16
605	305.7	0.09	2641.15	2.37	5.46	347.57	189.20	115.75	0.88
604	305.7	0.07	2635.49	1.69	6.59	354.30	85.46	53.33	1.24
603	305.7	0.05	2628.80	1.20	5.82	340.84	80.96	66.98	0.98
602	305.7	0.03	2624.44	0.73	7.48	347.57	41.07	55.13	0.92
601	305.7	0.01	2619.79	0.33	8.13	347.57	68.10	44.75	1.25
600	305.7	0.00	2610.99		8.15		36.50	37.50	1.41

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P_2 = 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED G

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow								0.0	0.0
Paved								0.0	0.0
Unpaved								0.0	0.0
Channel	10354					0.44	9.58	26.4	15.8
Total	10354							26.4	15.8

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 2874 ft

Time step= 5

Minimum number of reaches for routing= 4

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
731	891.00	0.44	2775.29	33.08	7.85	256.09	86.23	117.09	1.11
730	891.00	0.43	2772.88	32.35	9.29	344.46	68.33	129.63	0.86
729	891.00	0.42	2766.57	31.47	13.58	326.04	62.97	92.25	1.53
728	891.00	0.41	2763.16	30.68	10.95	306.03	58.33	119.73	1.00
727	891.00	0.39	2758.60	29.79	10.68	320.14	108.99	133.53	1.26
726	891.00	0.38	2754.56	28.75	9.05	340.25	88.63	149.60	0.91
725	891.00	0.37	2748.74	27.74	11.44	257.45	96.18	109.02	1.32
724	891.00	0.36	2744.90	27.00	9.42	238.03	108.62	142.56	1.08
723	891.00	0.34	2741.60	26.01	8.25	182.94	178.50	218.86	1.02
722	891.00	0.33	2738.99	25.21	9.19	140.93	106.28	162.65	1.19
721	891.00	0.33	2735.08	24.69	6.59	278.05	77.10	156.87	0.70
720	891.00	0.31	2731.73	23.61	8.36	437.11	117.97	180.93	0.80
719	891.00	0.29	2725.57	22.12	11.99	305.57	122.99	116.99	1.40

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSED G (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chi
718	891	0.28	2721.15	21.02	7.78	387.11	168.99	195.37	1.02
717	891	0.26	2713.50	19.54	7.81	321.03	214.65	137.17	1.35
716	891	0.24	2708.35	18.49	8.22	371.65	107.62	150.13	0.94
715	891	0.22	2703.76	17.06	10.39	440.87	160.06	183.35	1.17
714	891	0.20	2698.57	15.30	9.00	251.82	111.17	165.91	0.91
713	891	0.19	2693.56	14.44	11.76	346.34	205.57	128.75	1.64
712	891	0.17	2689.12	13.15	6.88	201.03	222.74	196.03	1.15
711	891	0.16	2686.47	12.21	7.29	171.23	231.03	212.74	0.97
710	891	0.15	2683.16	11.54	10.53	174.45	157.64	130.10	1.32
709	891	0.14	2680.52	10.97	7.61	343.81	125.70	151.85	1.14
708	891	0.13	2674.59	9.91	11.13	494.86	79.66	118.31	1.07
707	891	0.11	2667.42	8.48	10.37	346.34	132.31	133.31	1.30
706	891	0.09	2661.28	7.19	8.70	336.95	197.62	190.40	1.16
705	891	0.07	2656.37	5.75	8.48	293.33	227.17	181.59	1.10
704	891	0.06	2651.97	4.67	8.73	755.09	146.23	140.11	1.16
703	891	0.04	2635.30	2.86	12.98	346.34	25.98	68.66	1.40
702	891	0.03	2632.27	2.13	9.56	419.24	50.11	114.44	0.87
701	891	0.02	2625.29	1.20	12.36	242.08	41.94	78.85	1.32
700	891	0.01	2618.89	0.77	11.96	377.71	35.89	74.51	1.46

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED H

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow	100	0.400000	0.06					1.9	1.1
Paved	537	0.009311	0.011	2.00	4.5			4.5	2.7
Unpaved	2946	0.013578	0.045	1.95	25.2			25.2	15.1
Channel	8673					0.54	5.96	32.4	19.4

Total 12255.55 63.9 **38.4**

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1789 ft

Time step= 5

Minimum number of reaches for routing= 7

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
825	288.5	0.54	2868.19	13.26	7.00	288.86	77.69	60.88	1.01
824	288.5	0.53	2861.69	12.93	8.42	267.45	37.95	37.84	1.30
823	288.5	0.52	2858.45	12.60	5.30	355.56	94.37	69.14	0.84
822	288.5	0.49	2853.16	12.06	5.60	436.46	85.83	64.57	0.85
821	288.5	0.47	2847.00	11.46	6.90	348.80	51.13	55.96	0.95
820	288.5	0.45	2841.81	11.02	6.79	291.20	83.30	51.88	1.31
819	288.5	0.43	2838.38	10.59	5.49	406.40	108.87	76.97	0.90
818	288.5	0.40	2832.02	9.91	6.14	348.80	127.35	68.92	1.19
817	288.5	0.38	2826.70	9.30	5.31	271.67	124.74	84.47	0.87
816	288.5	0.36	2822.94	8.80	6.02	387.57	102.68	73.65	1.04
815	288.5	0.33	2817.93	8.09	5.37	349.43	123.03	87.55	0.92
814	288.5	0.30	2813.58	7.41	5.19	326.45	137.12	82.62	0.89
813	288.5	0.28	2808.76	6.84	6.13	406.07	86.05	68.59	1.07

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSED H (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
812	288.5	0.24	2803.17	5.97	3.11	371.01	170.82	117.26	0.77
811	288.5	0.21	2797.81	5.21	5.87	329.39	75.97	62.91	0.90
810	288.5	0.19	2793.06	4.73	4.80	340.44	81.95	63.59	0.87
809	288.5	0.17	2788.29	4.21	4.49	357.16	123.87	69.26	0.98
808	288.5	0.15	2782.27	3.72	5.91	373.73	48.98	48.93	1.01
807	288.5	0.13	2777.85	3.25	5.72	281.04	53.61	60.27	0.76
806	288.5	0.12	2774.68	2.88	6.46	445.69	63.05	57.05	0.94
805	288.5	0.09	2769.68	2.13	5.68	278.41	74.00	89.38	0.69
804	288.5	0.07	2766.14	1.69	8.39	365.12	51.38	46.53	1.07
803	288.5	0.05	2760.82	1.22	5.12	348.80	84.15	66.18	1.00
802	288.5	0.03	2756.15	0.76	6.04	348.80	47.55	49.29	0.85
801	288.5	0.02	2751.67	0.37	7.39	348.24	36.73	46.44	0.94
800	288.5	0.00	2746.77		6.39		52.96	47.34	1.11

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED I

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow	100	0.026000	0.06					5.6	3.4
Paved								0.0	0.0
Unpaved	652	0.025414	0.045	2.40	4.5			4.5	2.7
Channel	15460					0.80	7.20	48.0	28.8
Total									58.1 34.9

Note: The travel time through a subreach should be approximately equal to the simulation time step
 Approximate distance traveled in time step 2159 ft
 Time step= 5
 Minimum number of reaches for routing= 8

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
944	577.4	0.80	2954.06	39.77	4.30	322.16	231.00	166.41	0.74
943	577.4	0.77	2949.88	38.42	3.76	256.35	280.89	197.25	0.62
942	577.4	0.75	2946.25	37.46	6.17	380.08	151.65	130.25	0.99
941	577.4	0.73	2941.73	36.35	6.46	327.59	127.85	125.09	0.78
940	577.4	0.72	2936.16	35.61	9.59	209.53	58.05	69.68	1.36
939	577.4	0.71	2933.45	35.11	6.03	214.86	111.53	138.61	0.81
938	577.4	0.69	2931.42	34.41	6.62	352.55	165.63	144.18	0.79
937	577.4	0.68	2924.66	33.57	12.22	352.55	54.41	64.24	1.48
936	577.4	0.66	2920.35	32.79	7.14	352.55	112.44	129.85	0.81
935	577.4	0.65	2914.30	31.97	10.38	352.55	84.32	70.65	1.33
934	577.4	0.63	2910.90	30.88	3.50	325.30	174.18	199.79	0.47
933	577.4	0.61	2905.60	29.74	5.85	379.80	83.64	105.57	0.79
932	577.4	0.59	2898.89	28.94	8.39	352.55	49.50	78.76	0.89

BOGARDUS ENGINEERING, LLC
 Hydrologic / Hydraulic Engineer

WATERSED I (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
931	577.4	0.58	2894.97	28.08	6.83	352.55	149.93	132.78	0.96
930	577.4	0.56	2889.53	27.21	7.81	352.55	72.95	83.48	0.96
929	577.4	0.54	2884.38	26.50	7.95	395.70	94.53	91.72	1.04
928	577.4	0.52	2878.90	25.57	8.88	309.41	85.92	113.29	0.95
927	577.4	0.50	2875.49	24.55	5.39	352.55	170.63	172.33	0.77
926	577.4	0.48	2870.18	23.35	7.46	413.74	140.19	125.19	1.23
925	577.4	0.45	2863.45	22.11	7.39	291.36	126.79	135.01	0.88
924	577.4	0.44	2858.64	21.37	7.74	293.96	99.75	87.13	1.20
923	577.4	0.43	2854.37	20.75	6.98	392.59	65.18	94.98	0.78
922	577.4	0.41	2850.07	19.89	7.77	371.11	85.41	97.59	1.02
921	577.4	0.39	2845.33	18.92	6.93	352.55	157.02	128.51	0.88
920	577.4	0.37	2840.19	18.06	8.26	352.55	67.80	84.67	1.03
919	577.4	0.35	2836.15	17.10	4.41	350.52	120.33	152.33	0.60
918	577.4	0.33	2831.00	16.12	8.70	354.59	79.95	92.41	1.13
917	577.4	0.32	2825.81	15.39	8.06	359.17	67.33	86.89	1.04
916	577.4	0.30	2820.88	14.50	6.89	345.93	95.74	127.16	0.80
915	577.4	0.28	2817.31	13.61	7.74	295.03	66.65	98.62	0.88
914	577.4	0.27	2812.78	13.00	9.53	387.15	68.34	81.47	1.16
913	577.4	0.25	2808.42	12.19	7.76	291.21	84.55	100.11	0.93
912	577.4	0.24	2805.23	11.48	7.31	461.37	95.77	113.92	0.87
911	577.4	0.21	2798.14	10.35	9.93	318.44	102.59	98.08	1.39
910	577.4	0.20	2794.79	9.58	6.89	362.12	98.22	113.68	0.81
909	577.4	0.18	2788.42	8.80	8.77	379.78	71.27	73.44	1.46
908	577.4	0.17	2782.49	8.02	7.42	677.87	82.27	105.16	0.91
907	577.4	0.14	2769.09	6.60	10.21	352.55	107.41	77.96	1.48
906	577.4	0.12	2764.86	5.81	6.58	352.55	103.52	116.85	0.92
905	577.4	0.10	2760.53	4.94	7.14	352.55	92.61	98.83	0.85
904	577.4	0.08	2756.49	4.06	6.46	352.55	82.13	117.85	0.68
903	577.4	0.06	2752.89	3.05	6.41	352.55	132.50	131.12	0.86
902	577.4	0.04	2748.38	1.91	5.10	352.55	146.12	150.33	0.77
901	577.4	0.02	2743.67	0.88	6.00	352.55	103.41	105.38	1.00
900	577.4	0.00	2738.51		7.42		83.22	111.70	0.92

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P_2 = 2-Year, 24-hour rainfall (in) = 1.82

WATERSHED J

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow								0.0	0.0
Paved								0.0	0.0
Unpaved	2256	0.022606	0.035	2.00	18.8			18.8	11.3
Channel	15839					0.99	5.60	59.4	35.6
Total	18095.03					0.99		78.2	46.9

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1679 ft

Time step= 5

Minimum number of reaches for routing= 11

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
1144	296.1	0.99	3003.61	24.74	5.51	352.33	101.92	67.73	1.01
1143	296.1	0.97	2995.92	24.18	5.35	352.33	149.7	71.76	1.13
1142	296.1	0.94	2989.02	23.62	6.46	352.33	111.52	66.24	0.96
1141	296.1	0.92	2983.61	23.03	5.69	352.33	153.5	80.37	1.11
1140	296.1	0.89	2977.47	22.4	6.02	352.33	163.59	74.77	0.99
1139	296.1	0.87	2972.51	21.77	4.69	352.33	98.46	82.57	0.75
1138	296.1	0.84	2968.45	21.15	6.34	352.33	86.13	69.02	0.91
1137	296.1	0.82	2963.68	20.56	5.85	352.33	112.15	76.55	0.93
1136	296.1	0.79	2959.22	19.88	4.79	352.33	183.3	93.26	0.81
1135	296.1	0.76	2954.51	19.19	6.03	352.33	122.23	76.62	0.94
1134	296.1	0.73	2951.29	18.47	3.71	352.33	160.54	100.98	0.59
1133	296.1	0.71	2947.86	17.77	4.99	352.33	127.92	71.44	0.97
1132	296.1	0.68	2942.97	17.21	5.57	352.33	77.87	67.92	0.8

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

WATERSED J (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
1131	296.1	0.66	2939.38	16.65	4.88	352.33	95.45	71.48	0.79
1130	296.1	0.64	2935.55	16.08	5.64	352.33	87.96	68.07	0.82
1129	296.1	0.62	2930.02	15.58	6.69	352.33	94.92	56.25	1.17
1128	296.1	0.6	2922.75	15.13	6.11	352.33	74.12	54.43	1.01
1127	296.1	0.58	2916.7	14.69	7.3	352.33	92.26	54.75	1.02
1126	296.1	0.56	2911.35	14.25	6.73	352.33	80.63	55.12	0.96
1125	296.1	0.54	2907.23	13.65	3.17	352.33	276.42	93.39	0.96
1124	296.1	0.51	2902.8	13.02	5.48	352.33	79.56	60.9	0.84
1123	296.1	0.49	2898.74	12.51	5.9	352.33	90.67	65.6	0.85
1122	296.1	0.48	2893.06	12.07	7.05	704.65	40.31	43.04	1.11
1121	296.1	0.44	2885.84	11.08	5.09	352.33	90.28	79.98	0.84
1120	296.1	0.41	2881.45	10.42	4.84	352.33	139.93	83.14	0.84
1119	296.1	0.39	2875.6	9.91	7.2	352.33	52.7	42.7	1.06
1118	296.1	0.38	2870.25	9.47	6.03	352.33	92.26	66.41	0.92
1117	296.1	0.36	2864.65	9.03	7.29	352.33	29.63	40.6	1.1
1116	296.1	0.34	2860.04	8.61	5.79	352.33	78.38	65.02	0.92
1115	296.1	0.32	2854.27	8.1	6.09	352.33	83.64	59.33	1.02
1114	296.1	0.3	2849.25	7.62	6.13	352.33	73.87	60.23	0.9
1113	296.1	0.28	2844.1	7.1	5.85	352.33	135.11	68.67	0.99
1112	296.1	0.26	2838.37	6.62	6.47	352.33	55.63	49.08	0.95
1111	296.1	0.25	2833.74	6.2	6.66	352.33	106.86	54.99	0.89
1110	296.1	0.22	2829.97	5.67	5.21	352.33	113.89	77.34	0.9
1109	296.1	0.2	2825.07	5.11	6.48	352.33	67.11	61.04	0.89
1108	296.1	0.18	2819.95	4.57	4.6	352.33	108.25	72.45	0.8
1107	296.1	0.16	2813.77	4.08	6.51	352.33	42.38	48.79	0.95
1106	296.1	0.14	2808.99	3.58	5.62	352.33	112.2	74.19	0.89
1105	296.1	0.12	2804.2	2.95	4.14	352.33	112.16	81.48	0.82
1104	296.1	0.09	2800.78	2.21	3.25	352.33	157.54	101.98	0.64
1103	296.1	0.06	2796.32	1.51	5.04	352.33	111.13	71.62	1.04
1102	296.1	0.04	2789.43	1.03	6.91	352.33	45.34	45.83	1.01
1101	296.1	0.02	2784.02	0.52	3.77	336.52	136.06	80.28	0.84
1100	296.1	0	2779.76		5.43		60.35	54.5	1.01

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED K

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow									0.0
Paved								0.0	0.0
Unpaved								0.0	0.0
Channel	8910.61					0.45	7.62	27.0	16.2
Total	8910.61					0.45		27.0	16.2

Note: The travel time through a subreach should be approximately equal to the simulation time step
 Approximate distance traveled in time step 2285 ft
 Time step= 5
 Minimum number of reaches routing= 4

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
1130	488.2	0.45	2746.73	18.78	7.75	266.15	59.12	77.98	0.92
1129	488.2	0.44	2743.06	18.24	8.20	299.09	86.63	98.82	0.88
1128	488.2	0.42	2737.07	17.66	8.38	299.09	95.30	70.09	1.70
1127	488.2	0.41	2732.78	17.04	7.30	299.09	97.49	110.54	1.03
1126	488.2	0.39	2728.42	16.27	5.52	304.80	142.67	113.22	1.03
1125	488.2	0.37	2722.51	15.51	5.61	293.38	100.84	104.34	1.04
1124	488.2	0.35	2717.69	14.76	5.88	299.09	143.01	118.21	0.89
1123	488.2	0.33	2712.79	13.98	6.33	299.09	121.50	111.26	0.96
1122	488.2	0.31	2708.00	13.18	6.56	393.12	124.41	119.75	1.03
1121	488.2	0.29	2700.28	12.10	7.32	244.11	137.29	120.80	1.15
1120	488.2	0.27	2694.74	11.57	9.44	260.03	43.63	67.70	1.15
1119	488.2	0.26	2690.03	11.19	9.53	299.09	28.38	58.62	1.07
1118	488.2	0.25	2684.37	10.80	10.66	299.09	35.90	55.85	1.23

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WATERSED K (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
1117	488.2	0.24	2680.52	10.32	8.69	299.09	48.14	82.90	0.94
1116	488.2	0.23	2676.40	9.80	8.81	299.09	71.45	70.29	1.18
1115	488.2	0.22	2672.90	9.16	6.76	299.09	80.32	115.77	0.77
1114	488.2	0.20	2669.40	8.46	6.16	276.66	84.33	87.98	1.03
1113	488.2	0.18	2665.34	7.87	5.72	321.51	131.47	95.98	0.98
1112	488.2	0.17	2655.60	7.33	9.82	299.09	56.19	50.40	1.79
1111	488.2	0.16	2651.92	6.95	10.41	299.09	24.77	60.24	0.94
1110	488.2	0.15	2646.85	6.58	11.61	299.09	25.35	47.62	1.27
1109	488.2	0.14	2642.92	6.10	8.53	299.09	76.40	92.24	1.09
1108	488.2	0.13	2638.29	5.49	6.72	311.67	92.71	86.13	1.10
1107	488.2	0.11	2634.08	4.90	6.86	286.51	94.23	79.81	0.91
1106	488.2	0.10	2627.62	4.48	10.15	299.09	35.01	48.08	1.53
1105	488.2	0.09	2623.89	3.86	6.48	279.21	173.66	131.24	0.72
1104	488.2	0.08	2618.17	3.22	8.65	318.97	100.17	70.14	1.39
1103	488.2	0.06	2612.56	2.62	7.21	225.02	105.85	92.11	1.38
1102	488.2	0.05	2607.67	1.97	4.67	336.34	256.68	158.26	0.86
1101	488.2	0.02	2603.04	0.80	6.30	306.78	235.57	145.41	1.03
1100	488.2	0.00	2598.41		6.36		89.62	82.44	0.96

BOGARDUS ENGINEERING, LLC
Hydrologic / Hydraulic Engineer

Lag Time Analysis

Project No: 18-002-A-001D
Location: La Cholla Wash at Vista Del Oro

Date: 9/6/2019

P₂= 2-Year, 24-hour rainfall (in)= 1.82

WATERSHED 2

Reach	Length (ft)	Slope (ft/ft)	n-value	Average Velocity (fps)	Travel Time (min)	HEC-RAS Travel Time Avg (hr)	HEC-RAS Channel AVG Velocity (fps)	Tc (min)	Time to Lag (min)
Sheet Flow									
Paved	260	0.01962	0.011	2.05	2.1			2.1	1.3
Unpaved	560	0.07518	0.045	2.80	3.3			3.3	2.0
Channel	2372					0.27	4.50	16.2	9.7

Total 3192 21.6 **13.0**

Note: The travel time through a subreach should be approximately equal to the simulation time step

Approximate distance traveled in time step 1351 ft

Time step= 5

Minimum number of reaches for routing= 2

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
2016	82.4	0.27	2500.37	1.86	3.01	113.05	69.25	28.67	0.76
2015	82.4	0.26	2498.72	1.79	4.09	48.22	71.94	27.91	0.85
2014	82.4	0.25	2497.88	1.76	4.01	28.85	52.55	22.87	0.95
2013	82.4	0.25	2495.32	1.75	10.03	178.15	12.49	8.22	2.18
2012	82.4	0.24	2490.97	1.68	3.56	285.24	42.11	23.88	0.81
2011	82.4	0.22	2484.79	1.5	2.64	137.32	89.61	32.92	0.72
2010	82.4	0.21	2482.07	1.41	3.85	149.81	49.46	21.54	1
2009	82.4	0.2	2478.73	1.34	5.14	107.15	50.8	18.26	1.28
2008	82.4	0.19	2476.1	1.29	4.2	123.66	77.01	22.52	1.16
2007	82.4	0.18	2473.31	1.22	3.08	301.61	80.51	26.28	1.1
2006	82.4	0.15	2464.42	1.02	3.03	272.27	122.3	31.59	0.98

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WATERSED 2 (Page 2)

River Sta	Q Channel (cfs)	Trvl Time AVG (hrs)	W.S. Elev (ft)	Volume (acre-ft)	Vel Chnl (ft/s)	Length Chnl (ft)	Top Width (ft)	Area (sq ft)	Froude # Chl
2005	82.4	0.12	2456.73	0.82	2.51	206.50	179.85	33.87	1.00
2004	82.4	0.10	2451.62	0.67	2.84	143.74	63.63	29.06	0.73
2003	82.4	0.08	2449.05	0.58	3.42	208.80	68.30	24.11	1.01
2002	82.4	0.07	2442.96	0.46	3.61	223.85	106.73	25.80	1.12
2001	82.4	0.05	2437.68	0.31	2.66	417.90	74.08	30.92	0.73
2000	82.4	0.00	2428.18		2.38		112.28	34.65	0.75

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Appendix B – Floodplain Analysis

WATERHSED A

HEC-RAS OUTPUT

Plan: Default Scenario Reach A Reach A RS: 116 Profile: 1

E.G. Elev (ft)	2503.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.43	Wt. n-Val.	0.060	0.035	0.045
W.S. Elev (ft)	2503.21	Reach Len. (ft)	84.14	84.14	84.14
Crit W.S. (ft)	2503.15	Flow Area (sq ft)	0.46	9.77	7.90
E.G. Slope (ft/ft)	0.022623	Area (sq ft)	0.46	9.77	7.90
Q Total (cfs)	75.70	Flow (cfs)	0.59	57.86	17.25
Top Width (ft)	40.10	Top Width (ft)	2.24	10.87	26.99
Vel Total (ft/s)	4.18	Avg. Vel. (ft/s)	1.28	5.92	2.18
Max Chl Dpth (ft)	1.09	Hydr. Depth (ft)	0.20	0.90	0.29
Conv. Total (cfs)	503.3	Conv. (cfs)	3.9	384.7	114.7
Length Wtd. (ft)	84.14	Wetted Per. (ft)	2.28	10.95	27.06
Min Ch El (ft)	2502.12	Shear (lb/sq ft)	0.28	1.26	0.41
Alpha	1.60	Stream Power (lb/ft s)	161.19	0.00	0.00
Frcn Loss (ft)	2.35	Cum Volume (acre-ft)	0.30	0.47	0.11
C & E Loss (ft)	0.06	Cum SA (acres)	0.76	0.74	0.27

Plan: Default Scenario Reach A Reach A RS: 115 Profile: 1

E.G. Elev (ft)	2501.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	2501.01	Reach Len. (ft)	113.48	113.48	113.48
Crit W.S. (ft)	2501.01	Flow Area (sq ft)	0.12	19.21	0.66
E.G. Slope (ft/ft)	0.035331	Area (sq ft)	0.12	19.21	0.66
Q Total (cfs)	75.70	Flow (cfs)	0.09	74.41	1.20
Top Width (ft)	42.99	Top Width (ft)	1.86	38.49	2.64
Vel Total (ft/s)	3.79	Avg. Vel. (ft/s)	0.75	3.87	1.82
Max Chl Dpth (ft)	1.09	Hydr. Depth (ft)	0.06	0.50	0.25
Conv. Total (cfs)	402.7	Conv. (cfs)	0.5	395.9	6.4
Length Wtd. (ft)	113.48	Wetted Per. (ft)	1.86	38.94	2.69
Min Ch El (ft)	2499.92	Shear (lb/sq ft)	0.14	1.09	0.54
Alpha	1.03	Stream Power (lb/ft s)	133.24	0.00	0.00
Frcn Loss (ft)	2.62	Cum Volume (acre-ft)	0.29	0.44	0.11
C & E Loss (ft)	0.00	Cum SA (acres)	0.76	0.69	0.24

Plan: Default Scenario Reach A Reach A RS: 114 Profile: 1

E.G. Elev (ft)	2498.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	2498.04	Reach Len. (ft)	95.71	95.71	95.71
Crit W.S. (ft)	2497.97	Flow Area (sq ft)	2.23	14.47	7.92
E.G. Slope (ft/ft)	0.016285	Area (sq ft)	2.23	14.47	7.92
Q Total (cfs)	75.70	Flow (cfs)	4.38	59.40	11.92
Top Width (ft)	43.39	Top Width (ft)	4.42	14.90	24.07
Vel Total (ft/s)	3.08	Avg. Vel. (ft/s)	1.97	4.11	1.50
Max Chl Dpth (ft)	1.34	Hydr. Depth (ft)	0.50	0.97	0.33
Conv. Total (cfs)	593.2	Conv. (cfs)	34.3	465.5	93.4
Length Wtd. (ft)	95.71	Wetted Per. (ft)	4.54	15.04	24.10
Min Ch El (ft)	2496.70	Shear (lb/sq ft)	0.50	0.98	0.33
Alpha	1.46	Stream Power (lb/ft s)	96.85	0.00	0.00
Frcn Loss (ft)	1.93	Cum Volume (acre-ft)	0.29	0.40	0.09
C & E Loss (ft)	0.02	Cum SA (acres)	0.75	0.62	0.20

Plan: Default Scenario Reach A Reach A RS: 113 Profile: 1

E.G. Elev (ft)	2496.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	2495.88	Reach Len. (ft)	63.66	63.66	63.66
Crit W.S. (ft)	2495.88	Flow Area (sq ft)	0.72	13.25	1.85
E.G. Slope (ft/ft)	0.025575	Area (sq ft)	0.72	13.25	1.85
Q Total (cfs)	75.70	Flow (cfs)	0.88	70.85	3.97
Top Width (ft)	21.66	Top Width (ft)	4.21	12.88	4.57
Vel Total (ft/s)	4.79	Avg. Vel. (ft/s)	1.22	5.35	2.14
Max Chl Dpth (ft)	1.34	Hydr. Depth (ft)	0.17	1.03	0.40
Conv. Total (cfs)	473.4	Conv. (cfs)	5.5	443.0	24.8
Length Wtd. (ft)	63.66	Wetted Per. (ft)	4.23	12.99	4.64
Min Ch El (ft)	2494.54	Shear (lb/sq ft)	0.27	1.63	0.64
Alpha	1.18	Stream Power (lb/ft s)	105.24	0.00	0.00
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)	0.29	0.37	0.08
C & E Loss (ft)	0.02	Cum SA (acres)	0.74	0.59	0.17

Plan: Default Scenario Reach A Reach A RS: 112 Profile: 1

E.G. Elev (ft)	2494.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.	0.045	0.030	0.060
W.S. Elev (ft)	2493.56	Reach Len. (ft)	129.66	129.66	129.66
Crit W.S. (ft)	2493.87	Flow Area (sq ft)	1.17	8.88	1.91
E.G. Slope (ft/ft)	0.033251	Area (sq ft)	1.17	8.88	1.91
Q Total (cfs)	75.70	Flow (cfs)	2.56	68.63	4.51
Top Width (ft)	21.52	Top Width (ft)	5.35	11.19	4.98
Vel Total (ft/s)	6.33	Avg. Vel. (ft/s)	2.19	7.73	2.36
Max Chl Dpth (ft)	1.03	Hydr. Depth (ft)	0.22	0.79	0.38
Conv. Total (cfs)	415.1	Conv. (cfs)	14.1	376.4	24.7
Length Wtd. (ft)	129.66	Wetted Per. (ft)	5.36	11.22	5.04
Min Ch El (ft)	2492.53	Shear (lb/sq ft)	0.45	1.64	0.79
Alpha	1.36	Stream Power (lb/ft s)	111.74	0.00	0.00
Frctn Loss (ft)	1.85	Cum Volume (acre-ft)	0.29	0.35	0.08
C & E Loss (ft)	0.04	Cum SA (acres)	0.73	0.57	0.17

Plan: Default Scenario Reach A Reach A RS: 111 Profile: 1

E.G. Elev (ft)	2490.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2490.45	Reach Len. (ft)	93.58	93.58	93.58
Crit W.S. (ft)	2490.50	Flow Area (sq ft)	12.38	7.28	4.98
E.G. Slope (ft/ft)	0.022293	Area (sq ft)	12.38	7.28	4.98
Q Total (cfs)	75.70	Flow (cfs)	22.42	40.45	12.83
Top Width (ft)	55.63	Top Width (ft)	35.99	11.15	8.49
Vel Total (ft/s)	3.07	Avg. Vel. (ft/s)	1.81	5.56	2.58
Max Chl Dpth (ft)	0.90	Hydr. Depth (ft)	0.34	0.65	0.59
Conv. Total (cfs)	507.0	Conv. (cfs)	150.1	270.9	86.0
Length Wtd. (ft)	93.58	Wetted Per. (ft)	36.11	11.16	8.56
Min Ch El (ft)	2489.60	Shear (lb/sq ft)	0.48	0.91	0.81
Alpha	1.97	Stream Power (lb/ft s)	111.32	0.00	0.00
Frctn Loss (ft)	3.50	Cum Volume (acre-ft)	0.27	0.33	0.07
C & E Loss (ft)	0.17	Cum SA (acres)	0.67	0.54	0.15

Plan: Default Scenario Reach A Reach A RS: 110 Profile: 1

E.G. Elev (ft)	2488.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	2487.84	Reach Len. (ft)	61.29	61.29	61.29
Crit W.S. (ft)	2487.84	Flow Area (sq ft)	11.60	6.44	3.79
E.G. Slope (ft/ft)	0.043860	Area (sq ft)	11.60	6.44	3.79
Q Total (cfs)	75.70	Flow (cfs)	35.75	31.18	8.77
Top Width (ft)	49.02	Top Width (ft)	25.27	11.00	12.75
Vel Total (ft/s)	3.47	Avg. Vel. (ft/s)	3.08	4.84	2.31
Max Chl Dpth (ft)	0.73	Hydr. Depth (ft)	0.46	0.59	0.30
Conv. Total (cfs)	361.5	Conv. (cfs)	170.7	148.9	41.9
Length Wtd. (ft)	61.29	Wetted Per. (ft)	25.30	11.00	12.76
Min Ch El (ft)	2487.18	Shear (lb/sq ft)	1.25	1.60	0.81
Alpha	1.23	Stream Power (lb/ft s)	135.64	0.00	0.00
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	0.24	0.31	0.06
C & E Loss (ft)	0.01	Cum SA (acres)	0.61	0.51	0.12

Plan: Default Scenario Reach A Reach A RS: 109 Profile: 1

E.G. Elev (ft)	2485.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2485.71	Reach Len. (ft)	19.03	19.03	19.03
Crit W.S. (ft)	2485.10	Flow Area (sq ft)	5.74	12.73	12.56
E.G. Slope (ft/ft)	0.003216	Area (sq ft)	5.74	12.73	12.56
Q Total (cfs)	75.70	Flow (cfs)	6.38	51.50	17.82
Top Width (ft)	27.51	Top Width (ft)	8.01	7.34	12.16
Vel Total (ft/s)	2.44	Avg. Vel. (ft/s)	1.11	4.05	1.42
Max Chl Dpth (ft)	2.04	Hydr. Depth (ft)	0.72	1.73	1.03
Conv. Total (cfs)	1334.9	Conv. (cfs)	112.5	908.2	314.2
Length Wtd. (ft)	19.03	Wetted Per. (ft)	8.14	7.36	12.38
Min Ch El (ft)	2483.72	Shear (lb/sq ft)	0.14	0.35	0.20
Alpha	1.97	Stream Power (lb/ft s)	134.36	0.00	0.00
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.23	0.30	0.05
C & E Loss (ft)	0.02	Cum SA (acres)	0.58	0.50	0.11

Plan: Default Scenario Reach A Reach A RS: 108 Profile: 1

E.G. Elev (ft)	2485.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.34	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2485.44	Reach Len. (ft)	50.09	50.09	50.09
Crit W.S. (ft)	2485.44	Flow Area (sq ft)	3.21	14.16	3.70
E.G. Slope (ft/ft)	0.009357	Area (sq ft)	3.21	14.16	3.70
Q Total (cfs)	75.70	Flow (cfs)	2.73	69.20	3.77
Top Width (ft)	41.99	Top Width (ft)	15.09	13.57	13.33
Vel Total (ft/s)	3.59	Avg. Vel. (ft/s)	0.85	4.89	1.02
Max Chl Dpth (ft)	1.58	Hydr. Depth (ft)	0.21	1.04	0.28
Conv. Total (cfs)	782.6	Conv. (cfs)	28.2	715.3	39.0
Length Wtd. (ft)	50.09	Wetted Per. (ft)	15.14	13.75	13.35
Min Ch El (ft)	2483.86	Shear (lb/sq ft)	0.12	0.60	0.16
Alpha	1.70	Stream Power (lb/ft s)	137.50	0.00	0.00
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	0.23	0.29	0.05
C & E Loss (ft)	0.03	Cum SA (acres)	0.58	0.50	0.10

Plan: Default Scenario Reach A Reach A RS: 107 Profile: 1

E.G. Elev (ft)	2484.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.87	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2483.93	Reach Len. (ft)	61.33	61.33	61.33
Crit W.S. (ft)	2484.20	Flow Area (sq ft)	4.46	7.89	0.38
E.G. Slope (ft/ft)	0.053363	Area (sq ft)	4.46	7.89	0.38
Q Total (cfs)	75.70	Flow (cfs)	11.57	63.78	0.34
Top Width (ft)	35.19	Top Width (ft)	15.96	13.07	6.16
Vel Total (ft/s)	5.94	Avg. Vel. (ft/s)	2.59	8.09	0.90
Max Chl Dpth (ft)	1.17	Hydr. Depth (ft)	0.28	0.60	0.06
Conv. Total (cfs)	327.7	Conv. (cfs)	50.1	276.1	1.5
Length Wtd. (ft)	61.33	Wetted Per. (ft)	16.08	13.28	6.17
Min Ch El (ft)	2482.76	Shear (lb/sq ft)	0.92	1.98	0.21
Alpha	1.59	Stream Power (lb/ft s)	121.39	0.00	0.00
Frctn Loss (ft)	0.93	Cum Volume (acre-ft)	0.22	0.28	0.04
C & E Loss (ft)	0.05	Cum SA (acres)	0.56	0.48	0.09

Plan: Default Scenario Reach A Reach A RS: 106 Profile: 1

E.G. Elev (ft)	2482.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.	0.045	0.030	0.045
W.S. Elev (ft)	2481.92	Reach Len. (ft)	59.57	59.57	59.57
Crit W.S. (ft)	2482.05	Flow Area (sq ft)	0.99	12.18	1.03
E.G. Slope (ft/ft)	0.027149	Area (sq ft)	0.99	12.18	1.03
Q Total (cfs)	75.70	Flow (cfs)	2.31	71.34	2.05
Top Width (ft)	27.86	Top Width (ft)	3.48	19.76	4.62
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	2.33	5.86	1.99
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)	0.28	0.62	0.22
Conv. Total (cfs)	459.4	Conv. (cfs)	14.0	433.0	12.4
Length Wtd. (ft)	59.57	Wetted Per. (ft)	3.52	20.02	4.64
Min Ch El (ft)	2480.84	Shear (lb/sq ft)	0.48	1.03	0.38
Alpha	1.15	Stream Power (lb/ft s)	88.48	0.00	0.00
Frctn Loss (ft)	2.27	Cum Volume (acre-ft)	0.22	0.27	0.04
C & E Loss (ft)	0.11	Cum SA (acres)	0.55	0.46	0.08

Plan: Default Scenario Reach A Reach A RS: 105 Profile: 1

E.G. Elev (ft)	2480.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2480.20	Reach Len. (ft)	97.03	97.03	97.03
Crit W.S. (ft)	2480.29	Flow Area (sq ft)	0.16	15.78	0.21
E.G. Slope (ft/ft)	0.035033	Area (sq ft)	0.16	15.78	0.21
Q Total (cfs)	75.70	Flow (cfs)	0.19	75.32	0.19
Top Width (ft)	39.04	Top Width (ft)	1.90	33.64	3.50
Vel Total (ft/s)	4.69	Avg. Vel. (ft/s)	1.19	4.77	0.93
Max Chl Dpth (ft)	1.16	Hydr. Depth (ft)	0.09	0.47	0.06
Conv. Total (cfs)	404.4	Conv. (cfs)	1.0	402.4	1.0
Length Wtd. (ft)	97.03	Wetted Per. (ft)	1.91	33.87	3.50
Min Ch El (ft)	2479.04	Shear (lb/sq ft)	0.19	1.02	0.13
Alpha	1.03	Stream Power (lb/ft s)	140.14	0.00	0.00
Frctn Loss (ft)	1.83	Cum Volume (acre-ft)	0.22	0.25	0.04
C & E Loss (ft)	0.05	Cum SA (acres)	0.54	0.42	0.08

Plan: Default Scenario Reach A Reach A RS: 104 Profile: 1

E.G. Elev (ft)	2477.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.060	0.350	0.060
W.S. Elev (ft)	2477.11	Reach Len. (ft)	117.28	117.28	117.28
Crit W.S. (ft)	2476.59	Flow Area (sq ft)	7.66	24.41	10.45
E.G. Slope (ft/ft)	0.026360	Area (sq ft)	7.66	24.41	10.45
Q Total (cfs)	75.70	Flow (cfs)	13.57	23.64	38.49
Top Width (ft)	52.50	Top Width (ft)	26.14	14.54	11.82
Vel Total (ft/s)	1.78	Avg. Vel. (ft/s)	1.77	0.97	3.68
Max Chl Dpth (ft)	1.96	Hydr. Depth (ft)	0.29	1.68	0.88
Conv. Total (cfs)	466.3	Conv. (cfs)	83.6	145.6	237.1
Length Wtd. (ft)	117.28	Wetted Per. (ft)	26.17	14.65	11.93
Min Ch El (ft)	2475.15	Shear (lb/sq ft)	0.48	2.74	1.44
Alpha	2.44	Stream Power (lb/ft s)	250.00	0.00	0.00
Frcn Loss (ft)	2.94	Cum Volume (acre-ft)	0.21	0.20	0.03
C & E Loss (ft)	0.02	Cum SA (acres)	0.51	0.37	0.06

Plan: Default Scenario Reach A Reach A RS: 103 Profile: 1

E.G. Elev (ft)	2474.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.060	0.350	0.060
W.S. Elev (ft)	2474.21	Reach Len. (ft)	184.08	184.08	184.08
Crit W.S. (ft)		Flow Area (sq ft)	25.02	17.17	3.84
E.G. Slope (ft/ft)	0.023859	Area (sq ft)	25.02	17.17	3.84
Q Total (cfs)	75.70	Flow (cfs)	54.59	11.90	9.21
Top Width (ft)	81.50	Top Width (ft)	58.06	15.75	7.69
Vel Total (ft/s)	1.64	Avg. Vel. (ft/s)	2.18	0.69	2.40
Max Chl Dpth (ft)	1.31	Hydr. Depth (ft)	0.43	1.09	0.50
Conv. Total (cfs)	490.1	Conv. (cfs)	353.4	77.1	59.6
Length Wtd. (ft)	184.08	Wetted Per. (ft)	58.08	15.79	7.75
Min Ch El (ft)	2472.90	Shear (lb/sq ft)	0.64	1.62	0.74
Alpha	1.56	Stream Power (lb/ft s)	158.23	0.00	0.00
Frcn Loss (ft)	4.86	Cum Volume (acre-ft)	0.17	0.15	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.40	0.33	0.03

Plan: Default Scenario Reach A Reach A RS: 102 Profile: 1

E.G. Elev (ft)	2469.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2469.22	Reach Len. (ft)	93.52	93.52	93.52
Crit W.S. (ft)	2469.18	Flow Area (sq ft)	14.60	11.43	0.82
E.G. Slope (ft/ft)	0.029322	Area (sq ft)	14.60	11.43	0.82
Q Total (cfs)	75.70	Flow (cfs)	27.33	47.15	1.22
Top Width (ft)	87.28	Top Width (ft)	49.75	33.67	3.86
Vel Total (ft/s)	2.82	Avg. Vel. (ft/s)	1.87	4.13	1.50
Max Chl Dpth (ft)	0.69	Hydr. Depth (ft)	0.29	0.34	0.21
Conv. Total (cfs)	442.1	Conv. (cfs)	159.6	275.3	7.1
Length Wtd. (ft)	93.52	Wetted Per. (ft)	49.80	33.70	3.88
Min Ch El (ft)	2468.73	Shear (lb/sq ft)	0.54	0.62	0.38
Alpha	1.50	Stream Power (lb/ft s)	158.82	0.00	0.00
Frcn Loss (ft)	2.98	Cum Volume (acre-ft)	0.08	0.09	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.17	0.22	0.01

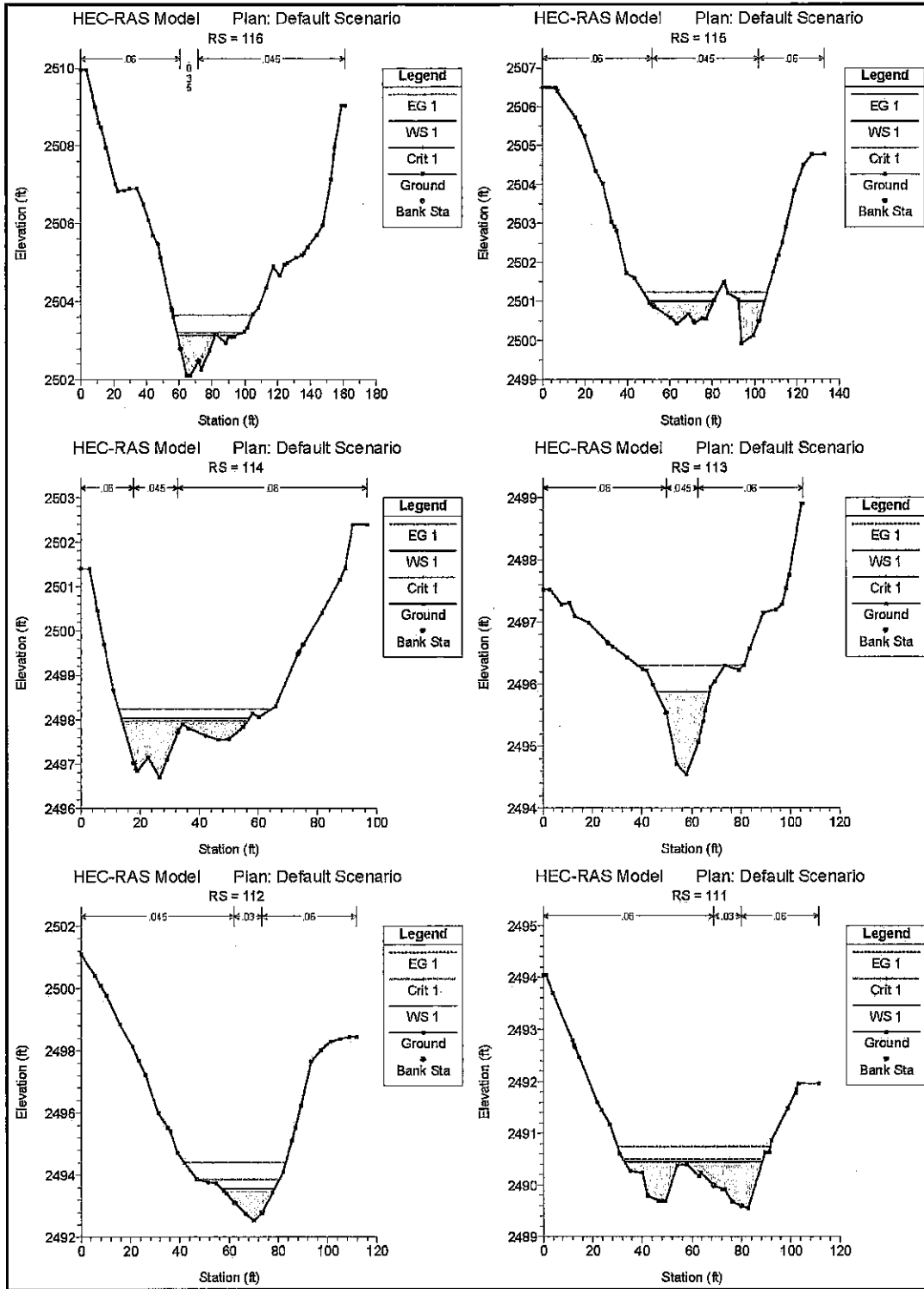
Plan: Default Scenario Reach A Reach A RS: 101 Profile: 1

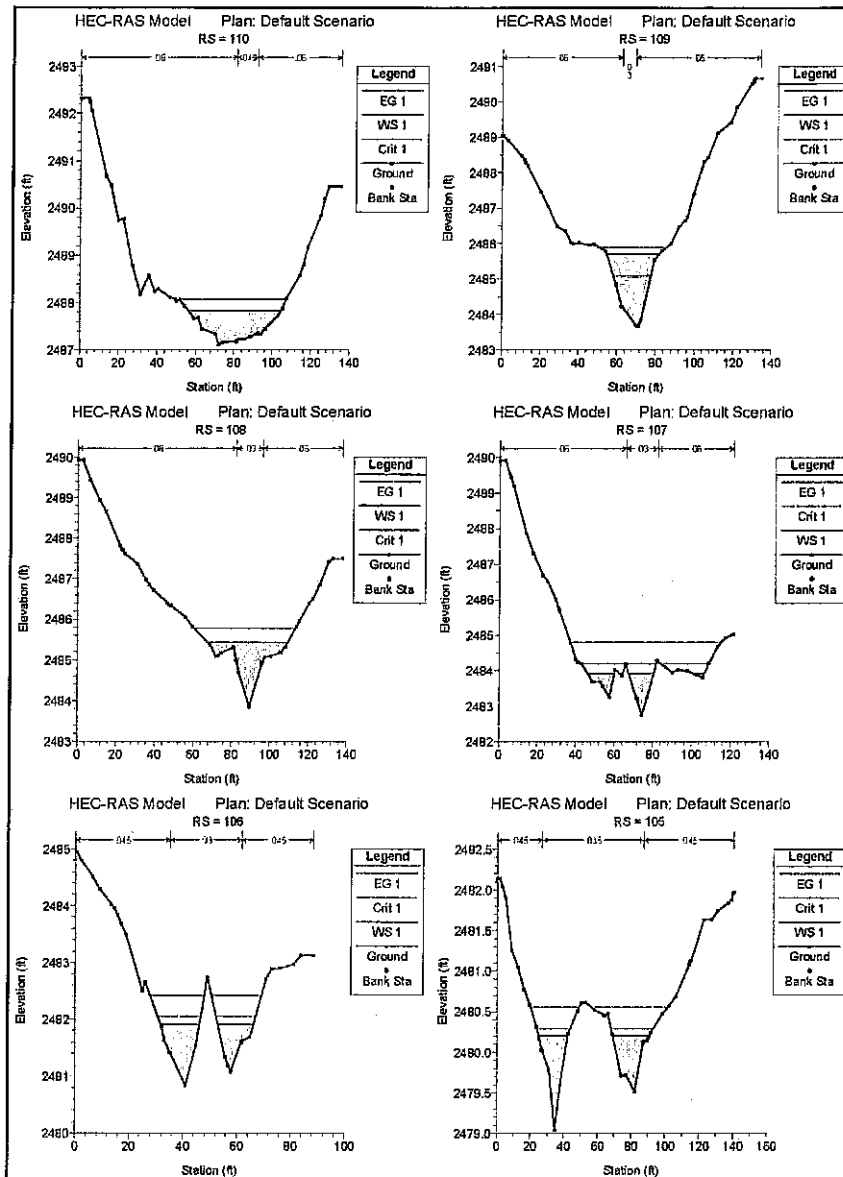
E.G. Elev (ft)	2466.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.060	0.030	
W.S. Elev (ft)	2466.25	Reach Len. (ft)	247.20	247.20	247.20
Crit W.S. (ft)	2466.20	Flow Area (sq ft)	16.79	6.19	
E.G. Slope (ft/ft)	0.034845	Area (sq ft)	16.79	6.19	
Q Total (cfs)	75.70	Flow (cfs)	52.44	23.26	
Top Width (ft)	53.97	Top Width (ft)	30.13	23.85	
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)	3.12	3.76	
Max Chl Dpth (ft)	1.17	Hydr. Depth (ft)	0.56	0.26	
Conv. Total (cfs)	405.5	Conv. (cfs)	280.9	124.6	
Length Wtd. (ft)	247.20	Wetted Per. (ft)	30.23	23.88	
Min Ch El (ft)	2465.83	Shear (lb/sq ft)	1.21	0.56	
Alpha	1.02	Stream Power (lb/ft s)	153.06	0.00	0.00
Frctn Loss (ft)	5.66	Cum Volume (acre-ft)	0.05	0.07	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.09	0.16	0.00

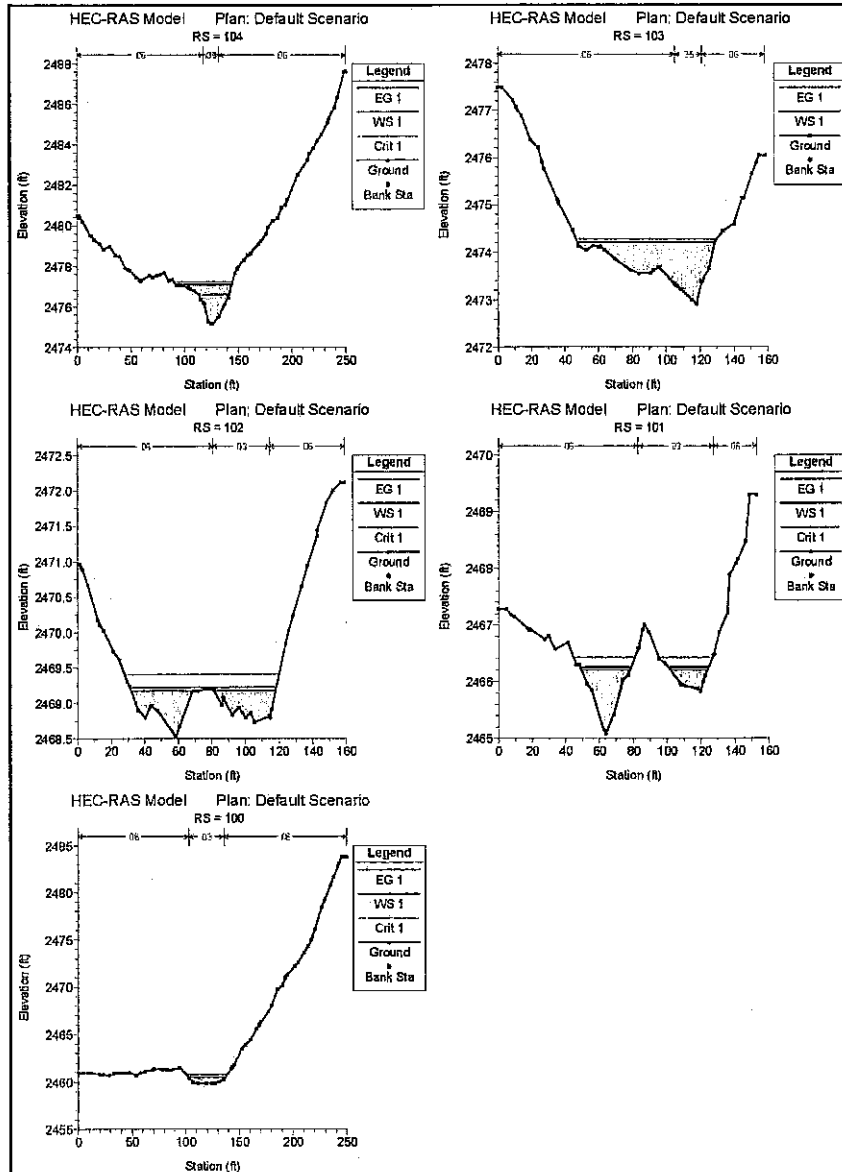
Plan: Default Scenario Reach A Reach A RS: 100 Profile: 1

E.G. Elev (ft)	2460.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.27	Wt. n-Val.	0.000	0.030	0.060
W.S. Elev (ft)	2460.49	Reach Len. (ft)			
Crit W.S. (ft)	2460.49	Flow Area (sq ft)	0.00	17.98	0.11
E.G. Slope (ft/ft)	0.016172	Area (sq ft)	0.00	17.98	0.11
Q Total (cfs)	75.70	Flow (cfs)	0.00	75.63	0.07
Top Width (ft)	34.18	Top Width (ft)	0.13	32.89	1.16
Vel Total (ft/s)	4.18	Avg. Vel. (ft/s)	0.13	4.21	0.64
Max Chl Dpth (ft)	0.68	Hydr. Depth (ft)	0.01	0.55	0.09
Conv. Total (cfs)	595.3	Conv. (cfs)	0.0	594.7	0.5
Length Wtd. (ft)		Wetted Per. (ft)	0.13	32.94	1.18
Min Ch El (ft)	2459.81	Shear (lb/sq ft)		0.55	0.09
Alpha	1.01	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

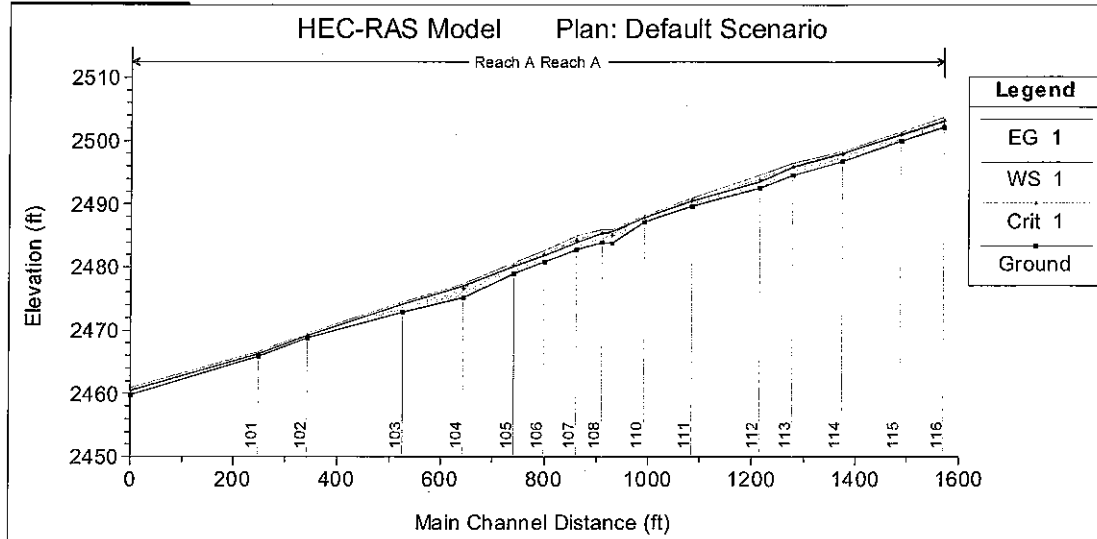
CROSS SECTION PLOTS







PROFILE PLOT



STANDARD TABLE 1

HEC-RAS Plan: Default Scenario River: Reach A Reach: Reach A Profile: 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
Reach A	116	1	75.70	2502.12	2503.21	2503.15	2503.84	0.022623	5.92	18.13	40.10	1.10
Reach A	115	1	75.70	2499.92	2501.01	2501.01	2501.24	0.035391	3.87	19.99	42.99	0.97
Reach A	114	1	75.70	2498.70	2499.04	2497.97	2498.25	0.016285	4.11	24.61	43.38	0.73
Reach A	113	1	75.70	2494.54	2495.98	2495.98	2496.30	0.026575	5.35	15.82	21.66	0.93
Reach A	112	1	75.70	2492.53	2493.56	2493.87	2494.40	0.033251	7.73	11.96	21.52	1.53
Reach A	111	1	75.70	2489.80	2490.45	2490.50	2490.74	0.022283	5.56	24.83	55.83	1.21
Reach A	110	1	75.70	2487.18	2487.84	2487.84	2488.07	0.043680	4.84	21.83	49.02	1.11
Reach A	109	1	75.70	2483.72	2485.71	2485.10	2485.89	0.003216	4.05	31.03	27.51	0.54
Reach A	108	1	75.70	2483.66	2485.44	2485.44	2485.78	0.009357	4.69	21.07	41.99	0.84
Reach A	107	1	75.70	2482.78	2483.93	2484.20	2484.80	0.053383	8.09	12.74	35.19	1.83
Reach A	106	1	75.70	2480.84	2481.92	2482.05	2482.42	0.027149	5.86	14.19	27.88	1.32
Reach A	105	1	75.70	2479.04	2480.20	2480.28	2480.56	0.035033	4.77	16.14	38.04	1.23
Reach A	104	1	75.70	2475.15	2477.11	2476.55	2477.23	0.026360	0.97	42.52	52.50	0.13
Reach A	103	1	75.70	2472.80	2474.21		2474.28	0.023958	0.59	46.03	81.50	0.12
Reach A	102	1	75.70	2469.73	2469.22	2469.18	2469.41	0.029322	4.13	28.85	87.28	1.25
Reach A	101	1	75.70	2465.83	2466.25	2466.20	2466.43	0.034845	3.76	22.98	53.87	1.30
Reach A	100	1	75.70	2459.81	2460.48	2460.49	2460.76	0.018172	4.21	18.08	34.19	1.00

STANDARD TABLE 2

HEC-RAS Plan: Default Scenario River: Reach A Reach: Reach A Profile: 1

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frcn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Reach A	116	1	2503.84	2503.21	0.43	2.35	0.06	0.59	57.88	17.25	40.10
Reach A	115	1	2501.24	2501.01	0.23	2.62	0.00	0.09	74.41	1.20	42.99
Reach A	114	1	2498.25	2498.04	0.21	1.93	0.02	4.38	58.40	11.92	43.38
Reach A	113	1	2496.30	2495.98	0.42	0.94	0.02	0.88	70.85	3.97	21.66
Reach A	112	1	2494.40	2493.56	0.85	1.85	0.04	2.56	66.83	4.51	21.52
Reach A	111	1	2490.74	2490.45	0.29	3.50	0.17	22.42	40.45	12.83	55.83
Reach A	110	1	2488.07	2487.84	0.23	0.49	0.01	35.75	31.18	8.77	49.02
Reach A	109	1	2485.89	2485.71	0.18	0.10	0.02	6.38	51.50	17.82	27.51
Reach A	108	1	2485.78	2485.44	0.34	0.54	0.03	2.73	69.20	3.77	41.99
Reach A	107	1	2484.80	2483.93	0.87	0.93	0.05	11.57	63.78	0.34	35.19
Reach A	106	1	2482.42	2481.92	0.51	2.27	0.11	2.31	71.34	2.05	27.86
Reach A	105	1	2480.56	2480.20	0.35	1.83	0.05	0.19	75.32	0.19	38.04
Reach A	104	1	2477.23	2477.11	0.12	2.94	0.02	13.57	23.64	38.49	52.50
Reach A	103	1	2474.28	2474.21	0.07	4.86	0.01	54.59	11.90	9.21	81.50
Reach A	102	1	2469.41	2469.22	0.18	2.98	0.00	27.33	47.15	1.22	87.28
Reach A	101	1	2466.43	2466.25	0.17	5.66	0.01	52.44	23.26		53.87
Reach A	100	1	2460.76	2460.49	0.27			0.00	75.53	0.07	34.18

HYDRAULIC DEPTH TABLE

HEC-RAS Plan: Default Scenario River: Reach A Reach: Reach A Profile: 1

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Hydr Depth L (ft)	Hydr Depth C (ft)	Hydr Depth R (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)
Reach A	116	1	75.70	2503.21	0.20	0.90	0.29	0.59	57.86	17.25
Reach A	115	1	75.70	2501.01	0.06	0.50	0.25	0.09	74.41	1.20
Reach A	114	1	75.70	2498.04	0.50	0.97	0.33	4.38	59.40	11.92
Reach A	113	1	75.70	2495.88	0.17	1.03	0.40	0.88	70.85	3.97
Reach A	112	1	75.70	2493.58	0.22	0.79	0.38	2.58	68.63	4.51
Reach A	111	1	75.70	2490.45	0.34	0.65	0.59	22.42	40.45	12.83
Reach A	110	1	75.70	2487.84	0.46	0.59	0.30	35.75	31.18	8.77
Reach A	109	1	75.70	2485.71	0.72	1.73	1.03	6.38	51.50	17.82
Reach A	108	1	75.70	2485.44	0.21	1.04	0.28	2.73	69.20	3.77
Reach A	107	1	75.70	2483.93	0.28	0.80	0.06	11.57	65.78	0.34
Reach A	106	1	75.70	2481.92	0.28	0.82	0.22	2.31	71.34	2.05
Reach A	105	1	75.70	2480.20	0.09	0.47	0.06	0.19	75.32	0.19
Reach A	104	1	75.70	2477.11	0.29	1.68	0.88	13.57	23.84	38.49
Reach A	103	1	75.70	2474.21	0.43	1.09	0.50	54.59	11.90	9.21
Reach A	102	1	75.70	2469.22	0.29	0.34	0.21	27.33	47.15	1.22
Reach A	101	1	75.70	2468.25	0.56	0.26		52.44	23.28	
Reach A	100	1	75.70	2460.49	0.01	0.55	0.09	0.00	75.63	0.07

MANNING'S N-VALUE TABLE

HEC-RAS Plan: Default Scenario River: Reach A Reach: Reach A Profile: 1

Reach	River Sta	Profile	Q Total (cfs)	Mann Wtd Left	Mann Wtd Chnl	Mann Wtd Right	Mann Wtd Total
Reach A	116	1	75.70	0.060	0.035	0.045	0.031
Reach A	115	1	75.70	0.060	0.045	0.060	0.044
Reach A	114	1	75.70	0.060	0.045	0.080	0.042
Reach A	113	1	75.70	0.060	0.045	0.060	0.040
Reach A	112	1	75.70	0.045	0.030	0.060	0.029
Reach A	111	1	75.70	0.060	0.030	0.060	0.042
Reach A	110	1	75.70	0.060	0.045	0.060	0.052
Reach A	109	1	75.70	0.060	0.030	0.060	0.037
Reach A	108	1	75.70	0.060	0.030	0.060	0.025
Reach A	107	1	75.70	0.060	0.030	0.080	0.029
Reach A	106	1	75.70	0.045	0.030	0.045	0.029
Reach A	105	1	75.70	0.045	0.035	0.045	0.033
Reach A	104	1	75.70	0.060	0.350	0.080	0.117
Reach A	103	1	75.70	0.060	0.350	0.080	0.095
Reach A	102	1	75.70	0.060	0.030	0.080	0.041
Reach A	101	1	75.70	0.060	0.030		0.048
Reach A	100	1	75.70	0.000	0.030	0.060	0.030

WATERHSED B

HEC-RAS OUTPUT

Plan: Default Scenario Reach B Reach B RS: 242 Profile: 1

E.G. Elev (ft)	2662.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.045	0.045	0.060
W.S. Elev (ft)	2661.71	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2661.71	Flow Area (sq ft)	10.90	41.58	23.04
E.G. Slope (ft/ft)	0.021667	Area (sq ft)	10.90	41.58	23.04
Q Total (cfs)	284.10	Flow (cfs)	25.95	207.74	50.40
Top Width (ft)	121.15	Top Width (ft)	31.76	39.88	49.51
Vel Total (ft/s)	3.76	Avg. Vel. (ft/s)	2.38	5.00	2.19
Max Chl Dpth (ft)	1.34	Hydr. Depth (ft)	0.34	1.04	0.47
Conv. Total (cfs)	1930.1	Conv. (cfs)	176.3	1411.3	342.4
Length Wtd. (ft)	297.70	Wetted Per. (ft)	31.80	39.90	49.55
Min Ch El (ft)	2660.37	Shear (lb/sq ft)	0.46	1.41	0.63
Alpha	1.39	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.39	Cum Volume (acre-ft)	6.09	5.58	4.39
C & E Loss (ft)	0.02	Cum SA (acres)	9.53	4.62	7.07

Plan: Default Scenario Reach B Reach B RS: 241 Profile: 1

E.G. Elev (ft)	2657.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.045	0.030	0.045
W.S. Elev (ft)	2656.84	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2656.51	Flow Area (sq ft)	52.99	3.32	22.91
E.G. Slope (ft/ft)	0.010688	Area (sq ft)	52.99	3.32	22.91
Q Total (cfs)	284.10	Flow (cfs)	196.71	24.09	63.30
Top Width (ft)	79.99	Top Width (ft)	46.62	1.97	31.40
Vel Total (ft/s)	3.59	Avg. Vel. (ft/s)	3.71	7.25	2.76
Max Chl Dpth (ft)	1.97	Hydr. Depth (ft)	1.14	1.69	0.73
Conv. Total (cfs)	2748.0	Conv. (cfs)	1902.7	233.0	612.2
Length Wtd. (ft)	297.70	Wetted Per. (ft)	46.72	1.97	31.46
Min Ch El (ft)	2655.12	Shear (lb/sq ft)	0.76	1.12	0.49
Alpha	1.22	Stream Power (lb/ft s)	197.75	0.00	0.00
Frctn Loss (ft)	4.60	Cum Volume (acre-ft)	5.88	5.43	4.24
C & E Loss (ft)	0.00	Cum SA (acres)	9.27	4.48	6.79

Plan: Default Scenario Reach B Reach B RS: 240 Profile: 1

E.G. Elev (ft)	2652.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.045	0.030	0.045
W.S. Elev (ft)	2652.24	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2652.24	Flow Area (sq ft)	66.11	5.64	8.27
E.G. Slope (ft/ft)	0.024346	Area (sq ft)	66.11	5.64	8.27
Q Total (cfs)	284.10	Flow (cfs)	221.81	38.53	23.76
Top Width (ft)	152.35	Top Width (ft)	125.73	6.80	19.82
Vel Total (ft/s)	3.55	Avg. Vel. (ft/s)	3.36	6.83	2.87
Max Chl Dpth (ft)	0.85	Hydr. Depth (ft)	0.53	0.83	0.42
Conv. Total (cfs)	1820.8	Conv. (cfs)	1421.5	246.9	152.3
Length Wtd. (ft)	297.70	Wetted Per. (ft)	125.79	6.80	19.84
Min Ch El (ft)	2651.39	Shear (lb/sq ft)	0.80	1.26	0.63
Alpha	1.25	Stream Power (lb/ft s)	219.24	0.00	0.00
Frctn Loss (ft)	4.90	Cum Volume (acre-ft)	5.47	5.40	4.13
C & E Loss (ft)	0.00	Cum SA (acres)	8.68	4.45	6.62

Plan: Default Scenario Reach B Reach B RS: 239 Profile: 1

E.G. Elev (ft)	2647.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2647.19	Reach Len. (ft)	162.61	162.61	162.61
Crit W.S. (ft)	2647.10	Flow Area (sq ft)	46.86	26.59	3.42
E.G. Slope (ft/ft)	0.011869	Area (sq ft)	46.86	26.59	3.42
Q Total (cfs)	284.10	Flow (cfs)	135.25	142.57	6.28
Top Width (ft)	95.66	Top Width (ft)	65.13	21.18	9.35
Vel Total (ft/s)	3.70	Avg. Vel. (ft/s)	2.89	5.36	1.84
Max Chl Dpth (ft)	1.67	Hydr. Depth (ft)	0.72	1.26	0.37
Conv. Total (cfs)	2607.7	Conv. (cfs)	1241.4	1308.6	57.7
Length Wtd. (ft)	162.61	Wetted Per. (ft)	65.20	21.31	9.39
Min Ch El (ft)	2645.52	Shear (lb/sq ft)	0.53	0.92	0.27
Alpha	1.35	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	2.21	Cum Volume (acre-ft)	5.08	5.29	4.09
C & E Loss (ft)	0.01	Cum SA (acres)	8.02	4.35	6.52

Plan: Default Scenario Reach B Reach B RS: 238 Profile: 1

E.G. Elev (ft)	2645.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.060	0.030	0.045
W.S. Elev (ft)	2645.00	Reach Len. (ft)	135.09	135.09	135.09
Crit W.S. (ft)	2644.90	Flow Area (sq ft)	54.26	3.86	31.11
E.G. Slope (ft/ft)	0.015781	Area (sq ft)	54.26	3.86	31.11
Q Total (cfs)	284.10	Flow (cfs)	145.20	32.34	106.56
Top Width (ft)	111.72	Top Width (ft)	67.84	2.47	41.41
Vel Total (ft/s)	3.18	Avg. Vel. (ft/s)	2.68	8.37	3.42
Max Chl Dpth (ft)	1.67	Hydr. Depth (ft)	0.80	1.56	0.75
Conv. Total (cfs)	2261.5	Conv. (cfs)	1155.8	257.4	848.2
Length Wtd. (ft)	135.09	Wetted Per. (ft)	68.00	2.48	41.47
Min Ch El (ft)	2643.35	Shear (lb/sq ft)	0.79	1.54	0.74
Alpha	1.58	Stream Power (lb/ft s)	191.70	0.00	0.00
Frctn Loss (ft)	1.96	Cum Volume (acre-ft)	4.89	5.23	4.03
C & E Loss (ft)	0.03	Cum SA (acres)	7.78	4.31	6.42

Plan: Default Scenario Reach B Reach B RS: 237 Profile: 1

E.G. Elev (ft)	2643.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.	0.045	0.035	0.060
W.S. Elev (ft)	2642.75	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2642.75	Flow Area (sq ft)	29.51	22.92	8.24
E.G. Slope (ft/ft)	0.013334	Area (sq ft)	29.51	22.92	8.24
Q Total (cfs)	284.10	Flow (cfs)	99.79	163.27	21.03
Top Width (ft)	57.91	Top Width (ft)	35.27	13.02	9.62
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)	3.38	7.12	2.55
Max Chl Dpth (ft)	2.12	Hydr. Depth (ft)	0.84	1.76	0.86
Conv. Total (cfs)	2460.3	Conv. (cfs)	864.2	1413.9	182.2
Length Wtd. (ft)	297.70	Wetted Per. (ft)	35.33	13.09	9.77
Min Ch El (ft)	2640.63	Shear (lb/sq ft)	0.70	1.46	0.70
Alpha	1.53	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	3.68	Cum Volume (acre-ft)	4.76	5.19	3.96
C & E Loss (ft)	0.02	Cum SA (acres)	7.62	4.29	6.35

Plan: Default Scenario Reach B Reach B RS: 236 Profile: 1

E.G. Elev (ft)	2638.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	Wt. n-Val.	0.045	0.035	0.060
W.S. Elev (ft)	2637.94	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2638.12	Flow Area (sq ft)	10.36	20.62	29.74
E.G. Slope (ft/ft)	0.018328	Area (sq ft)	10.36	20.62	29.74
Q Total (cfs)	284.10	Flow (cfs)	34.15	171.08	78.87
Top Width (ft)	70.32	Top Width (ft)	16.25	11.83	42.24
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)	3.30	8.30	2.65
Max Chl Dpth (ft)	2.00	Hydr. Depth (ft)	0.64	1.74	0.70
Conv. Total (cfs)	2098.5	Conv. (cfs)	252.3	1263.7	582.6
Length Wtd. (ft)	297.70	Wetted Per. (ft)	16.35	11.89	42.30
Min Ch El (ft)	2635.94	Shear (lb/sq ft)	0.72	1.98	0.80
Alpha	2.04	Stream Power (lb/ft s)	201.64	0.00	0.00
Frctn Loss (ft)	4.62	Cum Volume (acre-ft)	4.63	5.04	3.83
C & E Loss (ft)	0.02	Cum SA (acres)	7.44	4.20	6.17

Plan: Default Scenario Reach B Reach B RS: 235 Profile: 1

E.G. Elev (ft)	2633.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2632.94	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2633.01	Flow Area (sq ft)	47.02	12.73	15.87
E.G. Slope (ft/ft)	0.016743	Area (sq ft)	47.02	12.73	15.87
Q Total (cfs)	284.10	Flow (cfs)	145.27	95.73	43.10
Top Width (ft)	115.50	Top Width (ft)	76.35	7.92	31.22
Vel Total (ft/s)	3.76	Avg. Vel. (ft/s)	3.09	7.52	2.72
Max Chl Dpth (ft)	1.76	Hydr. Depth (ft)	0.62	1.61	0.51
Conv. Total (cfs)	2195.6	Conv. (cfs)	1122.7	739.8	333.1
Length Wtd. (ft)	297.70	Wetted Per. (ft)	76.46	7.95	31.30
Min Ch El (ft)	2631.18	Shear (lb/sq ft)	0.64	1.67	0.53
Alpha	1.77	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	5.21	Cum Volume (acre-ft)	4.43	4.93	3.68
C & E Loss (ft)	0.09	Cum SA (acres)	7.12	4.13	5.92

Plan: Default Scenario Reach B Reach B RS: 234 Profile: 1

E.G. Elev (ft)	2628.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.56	Wt. n-Val.	0.060	0.035	0.045
W.S. Elev (ft)	2628.18	Reach Len. (ft)	153.84	153.84	153.84
Crit W.S. (ft)	2628.29	Flow Area (sq ft)	26.83	17.20	27.74
E.G. Slope (ft/ft)	0.014124	Area (sq ft)	26.83	17.20	27.74
Q Total (cfs)	284.10	Flow (cfs)	57.95	139.77	86.39
Top Width (ft)	90.06	Top Width (ft)	42.57	8.35	39.14
Vel Total (ft/s)	3.96	Avg. Vel. (ft/s)	2.16	8.12	3.11
Max Chl Dpth (ft)	2.35	Hydr. Depth (ft)	0.63	2.06	0.71
Conv. Total (cfs)	2390.5	Conv. (cfs)	487.6	1176.0	726.9
Length Wtd. (ft)	153.84	Wetted Per. (ft)	42.67	8.42	39.23
Min Ch El (ft)	2625.83	Shear (lb/sq ft)	0.55	1.80	0.62
Alpha	2.32	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.57	Cum Volume (acre-ft)	4.18	4.82	3.53
C & E Loss (ft)	0.02	Cum SA (acres)	6.72	4.08	5.68

Plan: Default Scenario Reach B Reach B RS: 233 Profile: 1

E.G. Elev (ft)	2625.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.060	0.035	0.045
W.S. Elev (ft)	2624.44	Reach Len. (ft)	143.85	143.85	143.85
Crit W.S. (ft)	2624.78	Flow Area (sq ft)	12.14	19.31	16.80
E.G. Slope (ft/ft)	0.035271	Area (sq ft)	12.14	19.31	16.80
Q Total (cfs)	284.10	Flow (cfs)	28.82	184.97	70.31
Top Width (ft)	78.12	Top Width (ft)	33.24	14.60	30.28
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	2.37	9.58	4.19
Max Chl Dpth (ft)	1.56	Hydr. Depth (ft)	0.37	1.32	0.55
Conv. Total (cfs)	1512.7	Conv. (cfs)	153.4	984.9	374.4
Length Wtd. (ft)	143.85	Wetted Per. (ft)	33.27	14.66	30.30
Min Ch El (ft)	2622.88	Shear (lb/sq ft)	0.80	2.90	1.22
Alpha	1.86	Stream Power (lb/ft s)	271.00	0.00	0.00
Frcn Loss (ft)	3.26	Cum Volume (acre-ft)	4.11	4.76	3.45
C & E Loss (ft)	0.04	Cum SA (acres)	6.58	4.04	5.55

Plan: Default Scenario Reach B Reach B RS: 232 Profile: 1

E.G. Elev (ft)	2622.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	2622.66	Reach Len. (ft)	143.91	143.91	143.91
Crit W.S. (ft)	2622.57	Flow Area (sq ft)	21.35	15.04	48.82
E.G. Slope (ft/ft)	0.022620	Area (sq ft)	21.35	15.04	48.82
Q Total (cfs)	284.10	Flow (cfs)	37.15	84.14	162.81
Top Width (ft)	136.91	Top Width (ft)	66.78	12.56	57.57
Vel Total (ft/s)	3.33	Avg. Vel. (ft/s)	1.74	5.60	3.33
Max Chl Dpth (ft)	1.35	Hydr. Depth (ft)	0.32	1.20	0.85
Conv. Total (cfs)	1889.0	Conv. (cfs)	247.0	559.4	1082.5
Length Wtd. (ft)	143.91	Wetted Per. (ft)	66.84	12.57	57.63
Min Ch El (ft)	2621.34	Shear (lb/sq ft)	0.45	1.69	1.20
Alpha	1.44	Stream Power (lb/ft s)	250.00	0.00	0.00
Frcn Loss (ft)	2.75	Cum Volume (acre-ft)	4.05	4.70	3.34
C & E Loss (ft)	0.01	Cum SA (acres)	6.42	3.99	5.41

Plan: Default Scenario Reach B Reach B RS: 231 Profile: 1

E.G. Elev (ft)	2620.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	2619.93	Reach Len. (ft)	86.27	86.27	86.27
Crit W.S. (ft)		Flow Area (sq ft)	12.21	13.42	62.98
E.G. Slope (ft/ft)	0.016379	Area (sq ft)	12.21	13.42	62.98
Q Total (cfs)	284.10	Flow (cfs)	31.55	76.80	175.75
Top Width (ft)	101.19	Top Width (ft)	16.54	8.49	76.16
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)	2.58	5.72	2.79
Max Chl Dpth (ft)	1.74	Hydr. Depth (ft)	0.74	1.58	0.83
Conv. Total (cfs)	2219.9	Conv. (cfs)	246.5	600.1	1373.3
Length Wtd. (ft)	86.27	Wetted Per. (ft)	16.60	8.51	76.24
Min Ch El (ft)	2618.19	Shear (lb/sq ft)	0.75	1.61	0.84
Alpha	1.40	Stream Power (lb/ft s)	159.79	0.00	0.00
Frcn Loss (ft)	1.71	Cum Volume (acre-ft)	4.00	4.66	3.16
C & E Loss (ft)	0.02	Cum SA (acres)	6.28	3.96	5.19

Plan: Default Scenario Reach B Reach B RS: 230 Profile: 1

E.G. Elev (ft)	2618.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.045	0.045	0.060
W.S. Elev (ft)	2618.00	Reach Len. (ft)	151.71	151.71	151.71
Crit W.S. (ft)	2617.98	Flow Area (sq ft)	11.08	33.18	15.03
E.G. Slope (ft/ft)	0.024615	Area (sq ft)	11.08	33.18	15.03
Q Total (cfs)	284.10	Flow (cfs)	37.70	194.52	51.88
Top Width (ft)	66.10	Top Width (ft)	20.75	27.49	17.86
Vel Total (ft/s)	4.79	Avg. Vel. (ft/s)	3.40	5.86	3.45
Max Chl Dpth (ft)	1.70	Hydr. Depth (ft)	0.53	1.21	0.84
Conv. Total (cfs)	1810.8	Conv. (cfs)	240.3	1239.8	330.7
Length Wtd. (ft)	151.71	Wetted Per. (ft)	20.80	27.57	17.95
Min Ch El (ft)	2616.30	Shear (lb/sq ft)	0.82	1.85	1.29
Alpha	1.19	Stream Power (lb/ft s)	117.13	0.00	0.00
Frctn Loss (ft)	2.69	Cum Volume (acre-ft)	3.98	4.61	3.08
C & E Loss (ft)	0.00	Cum SA (acres)	6.24	3.92	5.10

Plan: Default Scenario Reach B Reach B RS: 229 Profile: 1

E.G. Elev (ft)	2615.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.060	0.035	0.060
W.S. Elev (ft)	2615.28	Reach Len. (ft)	135.90	135.90	135.90
Crit W.S. (ft)	2615.05	Flow Area (sq ft)	22.12	21.95	40.54
E.G. Slope (ft/ft)	0.013339	Area (sq ft)	22.12	21.95	40.54
Q Total (cfs)	284.10	Flow (cfs)	39.04	155.25	89.81
Top Width (ft)	117.61	Top Width (ft)	45.58	12.64	59.39
Vel Total (ft/s)	3.36	Avg. Vel. (ft/s)	1.77	7.07	2.22
Max Chl Dpth (ft)	1.81	Hydr. Depth (ft)	0.49	1.74	0.68
Conv. Total (cfs)	2459.8	Conv. (cfs)	338.0	1344.2	777.6
Length Wtd. (ft)	135.90	Wetted Per. (ft)	45.63	12.67	59.48
Min Ch El (ft)	2613.47	Shear (lb/sq ft)	0.40	1.44	0.57
Alpha	2.60	Stream Power (lb/ft s)	148.44	0.00	0.00
Frctn Loss (ft)	2.42	Cum Volume (acre-ft)	3.92	4.51	2.98
C & E Loss (ft)	0.04	Cum SA (acres)	6.13	3.85	4.96

Plan: Default Scenario Reach B Reach B RS: 228 Profile: 1

E.G. Elev (ft)	2613.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.	0.045	0.035	0.060
W.S. Elev (ft)	2612.96	Reach Len. (ft)	187.15	187.15	187.15
Crit W.S. (ft)	2612.96	Flow Area (sq ft)	7.22	9.82	64.13
E.G. Slope (ft/ft)	0.024874	Area (sq ft)	7.22	9.82	64.13
Q Total (cfs)	284.10	Flow (cfs)	21.54	70.95	191.61
Top Width (ft)	121.21	Top Width (ft)	16.64	8.75	95.83
Vel Total (ft/s)	3.50	Avg. Vel. (ft/s)	2.98	7.23	2.99
Max Chl Dpth (ft)	1.21	Hydr. Depth (ft)	0.43	1.12	0.67
Conv. Total (cfs)	1801.4	Conv. (cfs)	136.6	449.9	1214.9
Length Wtd. (ft)	187.15	Wetted Per. (ft)	16.67	8.76	95.86
Min Ch El (ft)	2611.75	Shear (lb/sq ft)	0.67	1.74	1.04
Alpha	1.61	Stream Power (lb/ft s)	159.69	0.00	0.00
Frctn Loss (ft)	2.71	Cum Volume (acre-ft)	3.87	4.46	2.82
C & E Loss (ft)	0.05	Cum SA (acres)	6.03	3.82	4.72

Plan: Default Scenario Reach B Reach B RS: 227 Profile: 1

E.G. Elev (ft)	2609.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.	0.060	0.035	0.060
W.S. Elev (ft)	2609.44	Reach Len. (ft)	188.15	188.15	188.15
Crit W.S. (ft)	2609.21	Flow Area (sq ft)	91.32	16.55	9.23
E.G. Slope (ft/ft)	0.009474	Area (sq ft)	91.32	16.55	9.23
Q Total (cfs)	284.10	Flow (cfs)	193.40	78.39	12.31
Top Width (ft)	146.57	Top Width (ft)	110.79	13.41	22.37
Vel Total (ft/s)	2.43	Avg. Vel. (ft/s)	2.12	4.74	1.33
Max Chl Dpth (ft)	1.69	Hydr. Depth (ft)	0.82	1.23	0.41
Conv. Total (cfs)	2918.8	Conv. (cfs)	1987.0	805.3	126.5
Length Wtd. (ft)	188.15	Wetted Per. (ft)	110.88	13.48	22.39
Min Ch El (ft)	2608.00	Shear (lb/sq ft)	0.49	0.73	0.24
Alpha	1.58	Stream Power (lb/ft s)	288.06	0.00	0.00
Frctn Loss (ft)	2.59	Cum Volume (acre-ft)	3.66	4.41	2.66
C & E Loss (ft)	0.04	Cum SA (acres)	5.76	3.77	4.46

Plan: Default Scenario Reach B Reach B RS: 226 Profile: 1

E.G. Elev (ft)	2606.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.	0.045	0.045	0.060
W.S. Elev (ft)	2606.46	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2606.46	Flow Area (sq ft)	11.31	33.15	11.87
E.G. Slope (ft/ft)	0.021811	Area (sq ft)	11.31	33.15	11.87
Q Total (cfs)	284.10	Flow (cfs)	40.83	209.55	33.72
Top Width (ft)	57.35	Top Width (ft)	17.70	22.37	17.28
Vel Total (ft/s)	5.04	Avg. Vel. (ft/s)	3.61	6.32	2.84
Max Chl Dpth (ft)	1.96	Hydr. Depth (ft)	0.64	1.48	0.69
Conv. Total (cfs)	1923.7	Conv. (cfs)	276.5	1418.9	228.4
Length Wtd. (ft)	297.70	Wetted Per. (ft)	17.76	22.46	17.32
Min Ch El (ft)	2604.50	Shear (lb/sq ft)	0.87	2.01	0.93
Alpha	1.27	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	5.00	Cum Volume (acre-ft)	3.44	4.30	2.62
C & E Loss (ft)	0.08	Cum SA (acres)	5.48	3.69	4.38

Plan: Default Scenario Reach B Reach B RS: 225 Profile: 1

E.G. Elev (ft)	2601.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.045	0.045	0.045
W.S. Elev (ft)	2601.39	Reach Len. (ft)	347.87	347.87	347.87
Crit W.S. (ft)	2601.14	Flow Area (sq ft)	6.71	25.32	45.53
E.G. Slope (ft/ft)	0.013308	Area (sq ft)	6.71	25.32	45.53
Q Total (cfs)	284.10	Flow (cfs)	19.32	112.34	152.43
Top Width (ft)	85.44	Top Width (ft)	10.14	20.11	55.19
Vel Total (ft/s)	3.86	Avg. Vel. (ft/s)	2.88	4.44	3.35
Max Chl Dpth (ft)	1.50	Hydr. Depth (ft)	0.66	1.26	0.82
Conv. Total (cfs)	2462.7	Conv. (cfs)	167.5	973.8	1321.4
Length Wtd. (ft)	347.87	Wetted Per. (ft)	10.22	20.14	55.24
Min Ch El (ft)	2599.89	Shear (lb/sq ft)	0.55	1.04	0.68
Alpha	1.07	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	6.15	Cum Volume (acre-ft)	3.38	4.10	2.42
C & E Loss (ft)	0.02	Cum SA (acres)	5.38	3.55	4.13

Plan: Default Scenario Reach B Reach B RS: 224 Profile: 1

E.G. Elev (ft)	2595.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.045	0.045	0.060
W.S. Elev (ft)	2595.01	Reach Len. (ft)	315.96	315.96	315.96
Crit W.S. (ft)	2595.01	Flow Area (sq ft)	30.45	24.43	3.11
E.G. Slope (ft/ft)	0.024658	Area (sq ft)	30.45	24.43	3.11
Q Total (cfs)	284.10	Flow (cfs)	130.04	146.62	7.45
Top Width (ft)	66.60	Top Width (ft)	40.69	19.56	6.34
Vel Total (ft/s)	4.90	Avg. Vel. (ft/s)	4.27	6.00	2.40
Max Chl Dpth (ft)	1.53	Hydr. Depth (ft)	0.75	1.25	0.49
Conv. Total (cfs)	1809.2	Conv. (cfs)	828.1	933.7	47.4
Length Wtd. (ft)	315.96	Wetted Per. (ft)	40.75	19.61	6.41
Min Ch El (ft)	2593.48	Shear (lb/sq ft)	1.15	1.92	0.75
Alpha	1.13	Stream Power (lb/ft s)	211.09	0.00	0.00
Frctn Loss (ft)	4.65	Cum Volume (acre-ft)	3.23	3.90	2.23
C & E Loss (ft)	0.01	Cum SA (acres)	5.18	3.39	3.89

Plan: Default Scenario Reach B Reach B RS: 223 Profile: 1

E.G. Elev (ft)	2589.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.72	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2589.05	Reach Len. (ft)	193.97	193.97	193.97
Crit W.S. (ft)	2589.18	Flow Area (sq ft)	6.51	34.45	8.30
E.G. Slope (ft/ft)	0.013223	Area (sq ft)	6.51	34.45	8.30
Q Total (cfs)	284.10	Flow (cfs)	18.51	248.49	17.10
Top Width (ft)	53.49	Top Width (ft)	9.99	18.31	25.20
Vel Total (ft/s)	5.77	Avg. Vel. (ft/s)	2.84	7.21	2.06
Max Chl Dpth (ft)	2.67	Hydr. Depth (ft)	0.65	1.88	0.33
Conv. Total (cfs)	2470.7	Conv. (cfs)	160.9	2161.0	148.7
Length Wtd. (ft)	193.97	Wetted Per. (ft)	10.07	19.19	25.27
Min Ch El (ft)	2586.38	Shear (lb/sq ft)	0.53	1.48	0.27
Alpha	1.39	Stream Power (lb/ft s)	190.91	0.00	0.00
Frctn Loss (ft)	5.64	Cum Volume (acre-ft)	3.10	3.69	2.19
C & E Loss (ft)	0.03	Cum SA (acres)	5.00	3.25	3.77

Plan: Default Scenario Reach B Reach B RS: 222 Profile: 1

E.G. Elev (ft)	2586.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.045	0.030	0.060
W.S. Elev (ft)	2585.49	Reach Len. (ft)	332.99	332.99	332.99
Crit W.S. (ft)	2585.85	Flow Area (sq ft)	22.23	20.59	4.70
E.G. Slope (ft/ft)	0.020305	Area (sq ft)	22.23	20.59	4.70
Q Total (cfs)	284.10	Flow (cfs)	68.80	201.51	13.79
Top Width (ft)	60.17	Top Width (ft)	41.57	12.58	6.01
Vel Total (ft/s)	5.98	Avg. Vel. (ft/s)	3.10	9.79	2.93
Max Chl Dpth (ft)	1.83	Hydr. Depth (ft)	0.53	1.64	0.78
Conv. Total (cfs)	1993.7	Conv. (cfs)	482.8	1414.1	96.8
Length Wtd. (ft)	332.99	Wetted Per. (ft)	41.65	12.61	6.21
Min Ch El (ft)	2583.66	Shear (lb/sq ft)	0.68	2.07	0.96
Alpha	1.98	Stream Power (lb/ft s)	142.65	0.00	0.00
Frctn Loss (ft)	3.14	Cum Volume (acre-ft)	3.03	3.57	2.16
C & E Loss (ft)	0.04	Cum SA (acres)	4.88	3.18	3.70

Plan: Default Scenario Reach B Reach B RS: 221 Profile: 1

E.G. Elev (ft)	2580.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.	0.060	0.035	0.045
W.S. Elev (ft)	2580.27	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2580.26	Flow Area (sq ft)	19.96	4.67	35.07
E.G. Slope (ft/ft)	0.018428	Area (sq ft)	19.96	4.67	35.07
Q Total (cfs)	284.10	Flow (cfs)	73.93	48.03	162.13
Top Width (ft)	52.39	Top Width (ft)	17.07	1.94	33.38
Vel Total (ft/s)	4.76	Avg. Vel. (ft/s)	3.70	10.28	4.62
Max Chl Dpth (ft)	2.47	Hydr. Depth (ft)	1.17	2.41	1.05
Conv. Total (cfs)	2092.8	Conv. (cfs)	544.6	353.8	1194.3
Length Wtd. (ft)	297.70	Wetted Per. (ft)	17.25	1.96	33.47
Min Ch El (ft)	2577.79	Shear (lb/sq ft)	1.33	2.74	1.21
Alpha	1.49	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.39	Cum Volume (acre-ft)	2.87	3.47	2.01
C & E Loss (ft)	0.02	Cum SA (acres)	4.66	3.13	3.55

Plan: Default Scenario Reach B Reach B RS: 220 Profile: 1

E.G. Elev (ft)	2576.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.75	Wt. n-Val.	0.045	0.035	0.060
W.S. Elev (ft)	2575.63	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2575.63	Flow Area (sq ft)	9.97	34.23	3.56
E.G. Slope (ft/ft)	0.012051	Area (sq ft)	9.97	34.23	3.56
Q Total (cfs)	284.10	Flow (cfs)	24.85	250.84	8.41
Top Width (ft)	38.74	Top Width (ft)	17.42	17.28	4.03
Vel Total (ft/s)	5.95	Avg. Vel. (ft/s)	2.49	7.33	2.36
Max Chl Dpth (ft)	2.34	Hydr. Depth (ft)	0.57	1.98	0.88
Conv. Total (cfs)	2588.0	Conv. (cfs)	226.4	2285.0	76.6
Length Wtd. (ft)	297.70	Wetted Per. (ft)	17.51	17.36	4.40
Min Ch El (ft)	2573.29	Shear (lb/sq ft)	0.43	1.48	0.61
Alpha	1.36	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	3.70	Cum Volume (acre-ft)	2.77	3.34	1.87
C & E Loss (ft)	0.00	Cum SA (acres)	4.54	3.06	3.42

Plan: Default Scenario Reach B Reach B RS: 219 Profile: 1

E.G. Elev (ft)	2572.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2571.28	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2571.41	Flow Area (sq ft)	8.88	28.22	4.58
E.G. Slope (ft/ft)	0.016306	Area (sq ft)	8.88	28.22	4.58
Q Total (cfs)	284.10	Flow (cfs)	33.11	235.10	15.89
Top Width (ft)	31.25	Top Width (ft)	10.54	14.77	5.93
Vel Total (ft/s)	6.82	Avg. Vel. (ft/s)	3.73	8.33	3.47
Max Chl Dpth (ft)	2.10	Hydr. Depth (ft)	0.84	1.91	0.77
Conv. Total (cfs)	2224.8	Conv. (cfs)	259.3	1841.1	124.5
Length Wtd. (ft)	297.70	Wetted Per. (ft)	10.67	14.82	6.14
Min Ch El (ft)	2569.18	Shear (lb/sq ft)	0.85	1.94	0.76
Alpha	1.29	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.15	Cum Volume (acre-ft)	2.70	3.12	1.85
C & E Loss (ft)	0.02	Cum SA (acres)	4.45	2.95	3.39

Plan: Default Scenario Reach B Reach B RS: 218 Profile: 1

E.G. Elev (ft)	2566.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.	0.045	0.045	0.060
W.S. Elev (ft)	2566.24	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2566.12	Flow Area (sq ft)	20.60	20.88	16.26
E.G. Slope (ft/ft)	0.020881	Area (sq ft)	20.60	20.88	16.26
Q Total (cfs)	284.10	Flow (cfs)	77.57	147.10	59.43
Top Width (ft)	56.56	Top Width (ft)	29.34	11.60	15.63
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	3.77	7.05	3.66
Max Chl Dpth (ft)	2.03	Hydr. Depth (ft)	0.70	1.80	1.04
Conv. Total (cfs)	1966.0	Conv. (cfs)	536.8	1017.9	411.3
Length Wtd. (ft)	297.70	Wetted Per. (ft)	29.38	11.63	15.75
Min Ch El (ft)	2564.21	Shear (lb/sq ft)	0.91	2.34	1.35
Alpha	1.34	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	5.22	Cum Volume (acre-ft)	2.80	2.95	1.77
C & E Loss (ft)	0.00	Cum SA (acres)	4.31	2.86	3.32

Plan: Default Scenario Reach B Reach B RS: 217 Profile: 1

E.G. Elev (ft)	2561.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.	0.045	0.035	0.060
W.S. Elev (ft)	2560.98	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2560.98	Flow Area (sq ft)	9.26	17.21	38.69
E.G. Slope (ft/ft)	0.014911	Area (sq ft)	9.26	17.21	38.69
Q Total (cfs)	284.10	Flow (cfs)	26.23	136.00	121.88
Top Width (ft)	61.04	Top Width (ft)	15.64	9.07	36.33
Vel Total (ft/s)	4.36	Avg. Vel. (ft/s)	2.83	7.90	3.15
Max Chl Dpth (ft)	2.23	Hydr. Depth (ft)	0.59	1.90	1.07
Conv. Total (cfs)	2326.6	Conv. (cfs)	214.8	1113.7	998.1
Length Wtd. (ft)	297.70	Wetted Per. (ft)	15.72	9.15	36.40
Min Ch El (ft)	2558.75	Shear (lb/sq ft)	0.55	1.75	0.99
Alpha	1.84	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.12	Cum Volume (acre-ft)	2.50	2.82	1.59
C & E Loss (ft)	0.02	Cum SA (acres)	4.16	2.79	3.14

Plan: Default Scenario Reach B Reach B RS: 216 Profile: 1

E.G. Elev (ft)	2555.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.	0.060	0.035	0.060
W.S. Elev (ft)	2555.03	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2555.26	Flow Area (sq ft)	6.15	33.40	8.47
E.G. Slope (ft/ft)	0.025347	Area (sq ft)	6.15	33.40	8.47
Q Total (cfs)	284.10	Flow (cfs)	15.50	251.50	17.09
Top Width (ft)	63.28	Top Width (ft)	11.93	28.29	23.06
Vel Total (ft/s)	5.92	Avg. Vel. (ft/s)	2.52	7.53	2.02
Max Chl Dpth (ft)	1.86	Hydr. Depth (ft)	0.52	1.18	0.37
Conv. Total (cfs)	1784.5	Conv. (cfs)	97.4	1579.7	107.4
Length Wtd. (ft)	297.70	Wetted Per. (ft)	12.02	28.41	23.11
Min Ch El (ft)	2553.17	Shear (lb/sq ft)	0.81	1.86	0.58
Alpha	1.45	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	5.69	Cum Volume (acre-ft)	2.45	2.65	1.43
C & E Loss (ft)	0.02	Cum SA (acres)	4.06	2.66	2.94

Plan: Default Scenario Reach B Reach B RS: 215 Profile: 1

E.G. Elev (ft)	2550.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2549.73	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2549.71	Flow Area (sq ft)	12.64	25.36	22.05
E.G. Slope (ft/ft)	0.014811	Area (sq ft)	12.64	25.36	22.05
Q Total (cfs)	284.10	Flow (cfs)	46.78	164.80	72.52
Top Width (ft)	61.92	Top Width (ft)	14.22	17.97	29.73
Vel Total (ft/s)	4.73	Avg. Vel. (ft/s)	3.70	6.50	3.29
Max Chl Dpth (ft)	1.49	Hydr. Depth (ft)	0.89	1.41	0.74
Conv. Total (cfs)	2334.5	Conv. (cfs)	384.4	1354.2	595.9
Length Wtd. (ft)	297.70	Wetted Per. (ft)	14.31	17.98	29.76
Min Ch El (ft)	2548.24	Shear (lb/sq ft)	0.82	1.30	0.68
Alpha	1.32	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.35	Cum Volume (acre-ft)	2.38	2.45	1.32
C & E Loss (ft)	0.05	Cum SA (acres)	3.97	2.51	2.75

Plan: Default Scenario Reach B Reach B RS: 214 Profile: 1

E.G. Elev (ft)	2545.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2545.49	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2545.35	Flow Area (sq ft)	58.61	21.21	1.71
E.G. Slope (ft/ft)	0.014409	Area (sq ft)	58.61	21.21	1.71
Q Total (cfs)	284.10	Flow (cfs)	155.42	126.30	2.38
Top Width (ft)	95.63	Top Width (ft)	69.20	21.13	5.30
Vel Total (ft/s)	3.48	Avg. Vel. (ft/s)	2.65	5.96	1.39
Max Chl Dpth (ft)	1.39	Hydr. Depth (ft)	0.85	1.00	0.32
Conv. Total (cfs)	2366.7	Conv. (cfs)	1294.7	1052.1	19.9
Length Wtd. (ft)	297.70	Wetted Per. (ft)	69.58	21.15	5.34
Min Ch El (ft)	2544.27	Shear (lb/sq ft)	0.76	0.90	0.29
Alpha	1.62	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	5.11	Cum Volume (acre-ft)	2.14	2.29	1.24
C & E Loss (ft)	0.01	Cum SA (acres)	3.69	2.37	2.63

Plan: Default Scenario Reach B Reach B RS: 213 Profile: 1

E.G. Elev (ft)	2540.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2540.32	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2540.32	Flow Area (sq ft)	29.44	12.53	36.55
E.G. Slope (ft/ft)	0.020769	Area (sq ft)	29.44	12.53	36.55
Q Total (cfs)	284.10	Flow (cfs)	107.80	89.89	86.42
Top Width (ft)	108.21	Top Width (ft)	28.19	12.44	67.58
Vel Total (ft/s)	3.62	Avg. Vel. (ft/s)	3.66	7.17	2.36
Max Chl Dpth (ft)	1.65	Hydr. Depth (ft)	1.04	1.01	0.54
Conv. Total (cfs)	1971.3	Conv. (cfs)	748.0	623.7	599.6
Length Wtd. (ft)	297.70	Wetted Per. (ft)	28.32	12.45	67.77
Min Ch El (ft)	2539.28	Shear (lb/sq ft)	1.35	1.31	0.70
Alpha	1.76	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.06	Cum Volume (acre-ft)	1.84	2.18	1.11
C & E Loss (ft)	0.01	Cum SA (acres)	3.35	2.26	2.39

Plan: Default Scenario Reach B Reach B RS: 212 Profile: 1

E.G. Elev (ft)	2536.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.045	0.030	0.060
W.S. Elev (ft)	2535.76	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2535.81	Flow Area (sq ft)	16.63	30.07	24.05
E.G. Slope (ft/ft)	0.011181	Area (sq ft)	16.63	30.07	24.05
Q Total (cfs)	284.10	Flow (cfs)	54.65	192.94	36.50
Top Width (ft)	94.67	Top Width (ft)	18.12	22.17	54.38
Vel Total (ft/s)	4.02	Avg. Vel. (ft/s)	3.29	6.42	1.52
Max Chl Dpth (ft)	1.53	Hydr. Depth (ft)	0.92	1.36	0.44
Conv. Total (cfs)	2686.7	Conv. (cfs)	516.9	1824.7	345.2
Length Wtd. (ft)	297.70	Wetted Per. (ft)	18.22	22.18	54.49
Min Ch El (ft)	2534.23	Shear (lb/sq ft)	0.64	0.95	0.31
Alpha	1.88	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	4.43	Cum Volume (acre-ft)	1.68	2.03	0.90
C & E Loss (ft)	0.01	Cum SA (acres)	3.20	2.14	1.97

Plan: Default Scenario Reach B Reach B RS: 211 Profile: 1

E.G. Elev (ft)	2530.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.42	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2528.78	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2529.23	Flow Area (sq ft)	13.45	15.73	13.91
E.G. Slope (ft/ft)	0.045065	Area (sq ft)	13.45	15.73	13.91
Q Total (cfs)	284.10	Flow (cfs)	54.00	182.36	47.75
Top Width (ft)	59.98	Top Width (ft)	20.11	13.54	26.34
Vel Total (ft/s)	6.59	Avg. Vel. (ft/s)	4.01	11.60	3.43
Max Chl Dpth (ft)	1.48	Hydr. Depth (ft)	0.67	1.16	0.53
Conv. Total (cfs)	1338.3	Conv. (cfs)	254.4	859.0	224.9
Length Wtd. (ft)	297.70	Wetted Per. (ft)	20.17	13.58	26.37
Min Ch El (ft)	2527.30	Shear (lb/sq ft)	1.88	3.26	1.48
Alpha	2.10	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	5.93	Cum Volume (acre-ft)	1.58	1.87	0.77
C & E Loss (ft)	0.09	Cum SA (acres)	3.07	2.02	1.69

Plan: Default Scenario Reach B Reach B RS: 210 Profile: 1

E.G. Elev (ft)	2523.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.	0.060	0.035	0.060
W.S. Elev (ft)	2523.29	Reach Len. (ft)	297.70	297.70	297.70
Crit W.S. (ft)	2523.29	Flow Area (sq ft)	8.36	37.72	25.72
E.G. Slope (ft/ft)	0.015655	Area (sq ft)	8.36	37.72	25.72
Q Total (cfs)	284.10	Flow (cfs)	19.04	210.53	54.53
Top Width (ft)	93.56	Top Width (ft)	13.21	35.02	45.33
Vel Total (ft/s)	3.96	Avg. Vel. (ft/s)	2.28	5.58	2.12
Max Chl Dpth (ft)	1.34	Hydr. Depth (ft)	0.63	1.08	0.57
Conv. Total (cfs)	2270.6	Conv. (cfs)	152.2	1682.6	435.8
Length Wtd. (ft)	297.70	Wetted Per. (ft)	13.26	35.03	45.44
Min Ch El (ft)	2521.95	Shear (lb/sq ft)	0.62	1.05	0.55
Alpha	1.55	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	3.92	Cum Volume (acre-ft)	1.50	1.69	0.64
C & E Loss (ft)	0.03	Cum SA (acres)	2.95	1.85	1.45

Plan: Default Scenario Reach B Reach B RS: 209 Profile: 1

E.G. Elev (ft)	2518.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-Val.	0.060	0.030	0.060
W.S. Elev (ft)	2517.18	Reach Len. (ft)	529.02	529.02	529.02
Crit W.S. (ft)	2517.46	Flow Area (sq ft)	27.05	17.45	4.51
E.G. Slope (ft/ft)	0.021297	Area (sq ft)	27.05	17.45	4.51
Q Total (cfs)	284.10	Flow (cfs)	100.10	174.01	9.99
Top Width (ft)	46.04	Top Width (ft)	25.96	10.70	9.38
Vel Total (ft/s)	5.80	Avg. Vel. (ft/s)	3.70	9.97	2.21
Max Chl Dpth (ft)	2.12	Hydr. Depth (ft)	1.04	1.63	0.48
Conv. Total (cfs)	1946.8	Conv. (cfs)	685.9	1192.4	68.4
Length Wtd. (ft)	529.02	Wetted Per. (ft)	26.10	10.76	9.43
Min Ch El (ft)	2515.06	Shear (lb/sq ft)	1.38	2.16	0.64
Alpha	1.96	Stream Power (lb/ft s)	200.29	0.00	0.00
Frctn Loss (ft)	5.40	Cum Volume (acre-ft)	1.38	1.50	0.53
C & E Loss (ft)	0.06	Cum SA (acres)	2.82	1.70	1.26

Plan: Default Scenario Reach B Reach B RS: 208 Profile: 1

E.G. Elev (ft)	2507.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.29	Wt. n-Val.	0.045	0.030	0.045
W.S. Elev (ft)	2506.18	Reach Len. (ft)	364.06	364.06	364.06
Crit W.S. (ft)	2506.64	Flow Area (sq ft)	4.92	25.44	10.85
E.G. Slope (ft/ft)	0.019277	Area (sq ft)	4.92	25.44	10.85
Q Total (cfs)	284.10	Flow (cfs)	9.14	247.06	27.90
Top Width (ft)	59.28	Top Width (ft)	19.02	14.46	25.80
Vel Total (ft/s)	6.89	Avg. Vel. (ft/s)	1.86	9.71	2.57
Max Chl Dpth (ft)	2.82	Hydr. Depth (ft)	0.26	1.76	0.42
Conv. Total (cfs)	2046.2	Conv. (cfs)	65.8	1779.4	201.0
Length Wtd. (ft)	364.06	Wetted Per. (ft)	19.07	15.16	25.84
Min Ch El (ft)	2503.35	Shear (lb/sq ft)	0.31	2.02	0.51
Alpha	1.74	Stream Power (lb/ft s)	379.37	0.00	0.00
Frctn Loss (ft)	10.71	Cum Volume (acre-ft)	1.19	1.24	0.44
C & E Loss (ft)	0.03	Cum SA (acres)	2.54	1.54	1.05

Plan: Default Scenario Reach B Reach B RS: 207 Profile: 1

E.G. Elev (ft)	2500.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.	0.045	0.035	0.060
W.S. Elev (ft)	2500.20	Reach Len. (ft)	291.98	291.98	291.98
Crit W.S. (ft)	2500.22	Flow Area (sq ft)	13.52	30.38	8.56
E.G. Slope (ft/ft)	0.016343	Area (sq ft)	13.52	30.38	8.56
Q Total (cfs)	284.10	Flow (cfs)	44.38	211.65	28.08
Top Width (ft)	48.15	Top Width (ft)	19.56	20.78	7.81
Vel Total (ft/s)	5.42	Avg. Vel. (ft/s)	3.28	6.97	3.28
Max Chl Dpth (ft)	2.40	Hydr. Depth (ft)	0.69	1.46	1.10
Conv. Total (cfs)	2222.3	Conv. (cfs)	347.1	1655.6	219.6
Length Wtd. (ft)	291.98	Wetted Per. (ft)	19.73	20.89	8.11
Min Ch El (ft)	2497.80	Shear (lb/sq ft)	0.70	1.48	1.08
Alpha	1.33	Stream Power (lb/ft s)	250.00	0.00	0.00
Frctn Loss (ft)	6.45	Cum Volume (acre-ft)	1.11	1.01	0.36
C & E Loss (ft)	0.20	Cum SA (acres)	2.38	1.40	0.91

Plan: Default Scenario Reach B Reach B RS: 206 Profile: 1

E.G. Elev (ft)	2494.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.045	0.030	0.060
W.S. Elev (ft)	2494.24	Reach Len. (ft)	307.20	307.20	307.20
Crit W.S. (ft)	2494.14	Flow Area (sq ft)	69.14	9.89	0.02
E.G. Slope (ft/ft)	0.018350	Area (sq ft)	69.14	9.89	0.02
Q Total (cfs)	284.10	Flow (cfs)	244.60	39.50	0.00
Top Width (ft)	130.94	Top Width (ft)	107.85	21.51	1.58
Vel Total (ft/s)	3.59	Avg. Vel. (ft/s)	3.54	3.99	0.15
Max Chl Dpth (ft)	1.38	Hydr. Depth (ft)	0.64	0.46	0.01
Conv. Total (cfs)	2097.3	Conv. (cfs)	1805.6	291.6	0.0
Length Wtd. (ft)	307.20	Wetted Per. (ft)	107.96	21.53	1.59
Min Ch El (ft)	2493.55	Shear (lb/sq ft)	0.73	0.53	0.01
Alpha	1.01	Stream Power (lb/ft s)	272.28	0.00	0.00
Frctn Loss (ft)	5.02	Cum Volume (acre-ft)	0.84	0.87	0.33
C & E Loss (ft)	0.01	Cum SA (acres)	1.96	1.25	0.88

Plan: Default Scenario Reach B Reach B RS: 205 Profile: 1

E.G. Elev (ft)	2489.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.	0.045	0.030	0.060
W.S. Elev (ft)	2489.11	Reach Len. (ft)	133.37	133.37	133.37
Crit W.S. (ft)	2489.11	Flow Area (sq ft)	0.90	58.98	10.10
E.G. Slope (ft/ft)	0.014623	Area (sq ft)	0.90	58.98	10.10
Q Total (cfs)	284.10	Flow (cfs)	1.57	268.60	13.92
Top Width (ft)	124.24	Top Width (ft)	3.04	88.87	32.33
Vel Total (ft/s)	4.06	Avg. Vel. (ft/s)	1.75	4.55	1.38
Max Chl Dpth (ft)	1.12	Hydr. Depth (ft)	0.30	0.66	0.31
Conv. Total (cfs)	2349.4	Conv. (cfs)	13.0	2221.2	115.1
Length Wtd. (ft)	133.37	Wetted Per. (ft)	3.10	88.96	32.34
Min Ch El (ft)	2487.99	Shear (lb/sq ft)	0.26	0.61	0.29
Alpha	1.20	Stream Power (lb/ft s)	169.28	0.00	0.00
Frctn Loss (ft)	2.05	Cum Volume (acre-ft)	0.59	0.63	0.29
C & E Loss (ft)	0.00	Cum SA (acres)	1.57	0.86	0.76

Plan: Default Scenario Reach B Reach B RS: 204 Profile: 1

E.G. Elev (ft)	2486.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	2485.88	Reach Len. (ft)	153.62	153.62	153.62
Crit W.S. (ft)	2486.06	Flow Area (sq ft)	5.94	29.14	18.63
E.G. Slope (ft/ft)	0.037205	Area (sq ft)	5.94	29.14	18.63
Q Total (cfs)	284.10	Flow (cfs)	23.43	204.59	56.08
Top Width (ft)	111.36	Top Width (ft)	12.18	36.68	62.50
Vel Total (ft/s)	5.29	Avg. Vel. (ft/s)	3.94	7.02	3.01
Max Chl Dpth (ft)	1.01	Hydr. Depth (ft)	0.49	0.79	0.30
Conv. Total (cfs)	1472.9	Conv. (cfs)	121.5	1060.7	290.7
Length Wtd. (ft)		Wetted Per. (ft)	12.21	36.70	62.56
Min Ch El (ft)	2484.87	Shear (lb/sq ft)	1.13	1.84	0.69
Alpha	1.38	Stream Power (lb/ft s)	335.59	0.00	0.00
Frctn Loss (ft)	2.91	Cum Volume (acre-ft)	0.58	0.50	0.25
C & E Loss (ft)	0.03	Cum SA (acres)	1.54	0.67	0.61