Barrett Solar – Draft Hydraulic Design Report

Revision: 60% Submittal

Prepared for:

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REVISION HISTORY

REVISION	DATE	DESCRIPTION
30% Submittal	8/2/2024	Draft 30% Report for Client Review
60% Submittal	9/13/2024	Draft 60% Submittal

1. INTRODUCTION

PCL Solar Constructors USA, Inc. (“PCL”) has contracted the services of Ulteig Engineers (“Ulteig”) to complete hydraulic design for the Barrett Solar Project. This report summarizes the hydraulic design and associated calculations.

1.1 Project Site Description

The Barrett Solar Project-leased property boundary (“property boundary”) covers approximately 895 acres in Rains County, Texas. The Project site is located south of US Highway 69 West, approximately 0.7 miles northwest of Point, Texas. The Project limits are shown in **Figure A-1: Project Vicinity Map**. The longitude and latitude for the site are approximately 32.953° N, 95.898° W, respectively. These coordinates represent the approximate center of the project area.

Based on the National Land Cover Dataset, the land use for the site is mostly pasture/hay. A small percentage of the area is classified as deciduous forest and woody wetlands.

Soils data was obtained from the USDA SSURGO Soils Database for the project and the surrounding area. The Hydrologic Soil Group (HSG) classifications for this area are primarily composed of HSG type B/D and D soils.

Within the study area, runoff predominantly flows south toward Cedar Creek and contributing tributaries, which continues to convey flow south of the project site. A map of the drainage features, including wetlands, within and surrounding the Project is provided as **Figure A-2: Existing Drainage Map**.

A FEMA Flood Hazard Zone A area borders the southwest edge of the project boundary. The project site is located on FEMA Flood Insurance Rate Map (FIRM) panel numbers 48379C, effective 4/17/2012 and 48231C, effective 1/6/2012. Portions of the project near the Zone A floodplain are subject to flooding by the 100-year flood and are therefore at higher risk of being damaged by floodwaters. Any construction activities within the Special Flood Hazard Area (SFHA) are subject to federal and/or local floodplain management regulations. Preliminary FEMA products are not available within Rains County.

1.2 Project Development Activities

The proposed Barrett Solar project is a ground mounted photovoltaic (PV) solar facility. A map of the proposed site plan for the Project is provided as **Figure A-3: Proposed Site Plan Map.**

Construction activities include:

- Vegetation clearing, grading activities, and re-seeding.
- Construction of access roads, culverts, low water crossings, inverter pads, and installation of PV solar panels, fencing, and pile foundations.
- Construction of temporary development of laydown yards.
- Construction of substation

2. REFERENCES

Table 1: Reference Documentation

Document Name	Regulatory Agency	Date Published
Texas Department of Transportation Hydraulic Design Manual 2019	State of Texas	September 12, 2019
General Construction Permit No. TXR150000	Texas Pollutant Discharge Elimination System	March 6, 2023

3. DRAINAGE DESIGN CRITERIA

3.1 Culvert Design Criteria

Culverts are proposed at access road locations that cross a defined channel to maintain native drainage patterns and mitigate adverse impacts to proposed infrastructure. All culverts within the Barrett Solar project area were designed to convey the 10-year, 24-hour storm event and withstand the 25-year, 24-hour storm event. Culvert locations were confirmed by analyzing the required culvert size for the design storm event against the existing channel. As the site design progresses and a graded surface is created, culvert sizes that exceed the geometry of the existing channel and road profile will be converted to low water crossings. This effort ensures native drainage patterns are maintained while meeting crossing design criteria. Culvert outlet erosion control measures were designed to withstand the outlet velocities created by the 25-year, 24-hour storm event. Culverts were also analyzed in the 100-year, 24-hour storm event to check for overtopping and ensure that protections are in place to prevent adverse impacts along the roadway and downstream of the crossing.

3.2 Low Water Crossing Design Criteria

Low Water Crossings were designed in locations where drainage patterns may adversely impact proposed access roads, but defined channels are not conducive for culvert design due to high design flows, limited cover over the culvert, or other impracticalities. The objective of the low water crossings is to armor access roads and prevent washout during the design storm event. Low water crossing profiles were designed to match the existing grade surface, where possible, to maintain existing drainage patterns. Low water crossings were armored for the 25-year, 24-hour design storm event.

3.3 Stormwater Management Design Criteria

According to the Texas Pollutant Discharge Elimination System (TPDES) General Construction Permit (CGP) No. TXR150000, a sediment basin or impoundment is required where site drainage areas exceed 10 acres where feasible. If a sedimentation basin or impoundment is not feasible, then the permittee shall provide equivalent control measures until final stabilization of the site. The Texas Department of Transportation (TXDOT) Hydraulic Design Manual does not list specific guidelines for the requirement of BMPs. Therefore, no sedimentation basins were proposed on site. There are no local or state requirements for permanent stormwater management structures that apply to the project. Silt fence and fiber rolls will be used to protect the site from erosion and sedimentation. Disturbed areas will also be vegetated as part of the final site stabilization. See the Barrett Solar 60% Erosion and Sediment Control Plan in **Appendix B.**

4. HYDRAULIC ANALYSIS AND DESIGN

4.1 Watershed and Sub-watershed Delineations

Contributing drainage areas were delineated for each of the proposed drainage features. Topography data was sourced from the U.S. Geological Survey's The National Map (1-meter resolution) and survey data received on March 27th, 2024 from Dudek, Inc. Drainage areas were delineated to capture all runoff that drains to the

proposed crossing location. A drainage map of the contributing drainage areas to each drainage feature is provided as **Figure B-1: Drainage Design Map.**

4.2 Peak Flow Calculations

The GeoHECHMS v. 1.0.0.551 computer software was used to calculate the design peak flows for the Barrett Solar drainage design. The SCS Curve Number infiltration (loss) method was utilized to model runoff, as developed by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). This method estimates the excess precipitation that transforms into runoff through estimating losses from infiltration. To perform the calculations, cumulative precipitation depths, hydrologic soils groups, land use coverages, and flow length, and slopes are required as input parameters.

Precipitation estimates were retrieved from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14: Texas (see **Attachment B-5**) and distributed utilizing an SCS Type III distribution within GeoHECHMS. Hydrologic soils group and land use information were downloaded from the USDA SSURGO soils database and the National Land Cover Dataset 2021, respectively. The land cover data was adjusted to reflect proposed conditions by converting all disturbed areas to grassland/herbaceous classification and classifying all impervious areas added by the project development (access roads, inverter pads, and substation pad). Maps of the hydrologic soils group data and land use data are provided as **Figure B-2: Hydrologic Soils Group Map** and **Figure B-3: Proposed Land Use Map**, respectively. A correlation table of the land use and soil types, defining their assigned curve numbers per TR-55, is included as **Table 2: NLCD Land Cover to TR-55 Cover Type Correlation**. A map of the proposed conditions curve numbers, which were utilized in the drainage design process, is provided as **Figure B-4: Proposed Curve Numbers Map.**

Table 2. NLCD Land Cover to TR-55 Cover Type Correlation

NLCD Land Cover Type	Cover Type and Condition	Curve Number for Hydrologic Soil Group			
		A	B	C	D
Barren Land	Bare soil	77	86	91	94
Cultivated Crops	Cultivated Land: With conservation treatment	67	78	85	89
Deciduous Forest	Wood or Forest Land: Good Cover	25	55	70	77
Developed High Intensity	Urban Districts - Commercial and Business	89	92	94	95
Developed Medium Intensity	Residential 1/8 acres or less	77	85	90	92
Developed Low Intensity	Residential 1/4 acre	61	75	83	87
Developed Open Space	Streets and Roads - Paved; Open Ditches (w/ ROW)	83	89	92	93
Emergent Herbaceous Wetlands	Assumed Inundated: Open Water	98	98	98	98
Evergreen Forest	Wood or Forest Land: Good Cover	25	55	70	77
Grassland/Herbaceous	Meadow: Good Condition	30	58	71	78
Mixed Forest	Wood or Forest Land: Good Cover	25	55	70	77
Open Water	Open Water	98	98	98	98
Pasture/Hay	Pasture or Rand Land: Good Condition	39	61	74	80
Shrub/Scrub	Brush - Good Condition	30	48	65	73
Woody Wetlands	Assumed Inundated: Open Water	98	98	98	98

An initial abstraction ratio of r = 0.2 was selected for all drainage areas. The initial extraction ratio was selected to align with Equation 2-2 of TR-55[1].

Longest flow paths for each of the contributing drainage areas were delineated to determine the time of concentration. Time of concentration was calculated by utilizing 300-foot maximum sheet flow lengths and 1,000-foot maximum shallow concentrated flow length, per TR-55 guidance. The remaining length of the longest flow paths were assumed as channelized flow. The time of concentration was then multiplied by 0.6 to calculate the lag time. Longest flow paths for all drainage areas are shown in **Figure B-1: Drainage Design Map.**

A summary table of the drainage areas, lag times, composite curve numbers, 5-year, 24-hour peak flows, and 25-year, 24-hour peak flows is provided below as **Table 3: HEC-HMS Summary Table.**

[1] NRCS, Urban Hydrology for Small Watersheds. Technical Release 55 (TR-55), 2-1.

Table 3. HEC-HMS Summary Table

Subbasin ID	Area (acres)	Composite Curve Number	Lag Time (minutes)	10-year, 24-hour Peak Discharge (cfs)	25-year, 24-hour Peak Discharge (cfs)
LWC-1	80.4	82.5	80.3	99.8	127.9
LWC-2	31.2	78.5	43.1	51.8	67.5
LWC-3	4.7	78.7	41.8	12.8	16.7
LWC-4	7.9	78.2	45.0	8.0	10.4
C-1	0.5	90.5	45.4	1.0	1.3
C-2	6.2	79.6	32.8	12.3	16.0
C-3	3.1	90.5	67.4	5.0	6.2
C-4	1.4	86.4	39.0	2.9	3.7
VF-1	230.8	80.0	91.8	233.5	303.5

4.3 Culverts

The hydraulic design of culverts was completed using the Federal Highway Administration (FHWA) HY-8 version 7.6 software (FHWA, 2019). Proposed culverts across the Barrett Solar site have been designed to convey the 10-year, 24-hour storm event and withstand the 25-year, 24-hour storm event. A minimum culvert diameter of 18 inches was used to mitigate clogging.

Culvert outlet protection was designed based on the 25-year culvert outlet velocities. For culverts with outlet velocities less than 3 feet per second, degradable erosion control products were specified. In locations where velocities exceeded 3 feet per second, non-degradable erosion control products were specified. In locations where the design velocity exceeded 6 feet per second, a rip-rap apron was specified.

All culverts were analyzed for overtopping in the 100-year, 24-hour storm event. Proposed culvert crossing C-2 is the only culvert to overtop for the selected storm event. The overtopping velocity at C-2 during the 100-year, 24-hour storm event is non-erosive since it is less than 2 fps, therefore no additional armoring is required.

Topography data within the roadside ditch upstream and downstream of proposed culvert crossings C-2 and C-4 should be field verified before finalizing the culvert sizes.

Culvert locations are shown on **Figure B-1: Drainage Design Map**. A schedule for the designed culverts and an output report from HY-8 are included in **Appendix B.**

4.4 Low Water Crossings

The hydraulic design of low water crossings was completed utilizing the FHWA Hydraulic Toolbox software version 5.0 software (FHWA, 2020). Proposed low water crossings across the project site have been designed where velocities exceed the erosive threshold velocity for fine gravel of 2 feet per second. Low water crossings were designed to the 25-year, 24-hour storm event. Low water crossing linings were selective using an iterative approach. A light-duty lining (rip-rap D50 of 3 inches) was selected initially and analyzed within Hydraulic Toolbox for its stability. Where a light-duty lining was unstable, the lining was upgraded to a standard-duty lining (D50 of 6 inches). For crossings that are unstable with standard-duty lining, a heavy-duty lining is needed. Hydraulic toolbox considers the profile of the LWC location, the longitudinal slope of the area, the critical shear stress, and the critical velocities of the LWC to determine if the selected lining is stable. The majority of the low water crossings on site require a light- or standard-duty lining. In one location, heavy-duty concrete lining is proposed to ensure additional stability at the crossing location.

A map showing the LWC locations is provided as **Figure B-1: Drainage Design Map.** A schedule for the low water crossings and the output report from Hydraulic Toolbox are provided in **Appendix B.**

4.5 Vented Fords

The hydraulic design of a vented ford was completed utilizing the FHWA HY-8 version 7.6 software (FHWA, 2019) and the FHWA Hydraulic Toolbox software version 5.0 software (FHWA, 2020). The proposed vented ford was requested in this location to maintain access throughout the site during smaller storm events. A culvert size was estimated based on the available space within the upstream and downstream channel geometry. Due to the channel geometry constraints, it was not possible to provide a pipe size capable of conveying the 25-year, 24-hour flow rate at this location. The crossing was also analyzed to determine the lining for the vented ford. Similar to low water crossing linings, the armoring above the vented ford was selected using an iterative approach through Hydraulic Toolbox. Hydraulic Toolbox considers the profile of the crossing location, the longitudinal slope of the area, the critical shear stress, and the critical velocities of the crossing to determine if the selected lining is stable. The 25- and 100-year, 24-hour flow rates in this location cause overtopping of the vented ford. Therefore, it is recommended that a heavy-duty lining is utilized to protect the crossing. Refer to Appendix B for the vented ford schedule, along with output reports from Hydraulic Toolbox and HY-8.

4.6 Pre- vs Post Runoff Analysis

A hydraulic and hydrologic analysis of the project area was completed using a 2D HEC-RAS model. Runoff rates within the model were estimated by creating profiles line downstream of the project site, which is drawn perpendicular to the direction of flow to plot flow quantities crossing each line. The results of the model indicate that runoff rates decrease in the proposed condition. A comparison of the runoff rates in existing and proposed condition are shown in **Table 4. Pre- vs. Post. Runoff Rates** below. The locations of profile lines used to analyze estimated runoff values are shown in **Figure B- 5. Runoff Rates Comparison Map.**

Table 4. Pre- vs. Post. Runoff Rates

Profile Line Number	Pre-Development 100-year, 24-hour Runoff Rate (cfs)	Post-Development 100-year, 24-hour Runoff Rate (cfs)
1	4479.2	4407.6
2	5322.0	5299.1
3	5319.9	5283.6

5. CONCLUSIONS

The proposed drainage infrastructure includes culverts and low water crossings that are designed to convey the 10-year, 24-hour design storm and withstand the 25-year, 24-hour design storm, where feasible. Erosion control measures for culvert outlets, low water crossing linings, and vented ford linings have been designed to the respective design storm events. Drainage features and access roads should be inspected after significant storm events and maintained as necessary to ensure optimal performance. The predicted runoff rates decrease from existing to proposed conditions, which minimizes the risk of downstream impacts.

APPENDIX A. PROJECT LOCATION MAPS

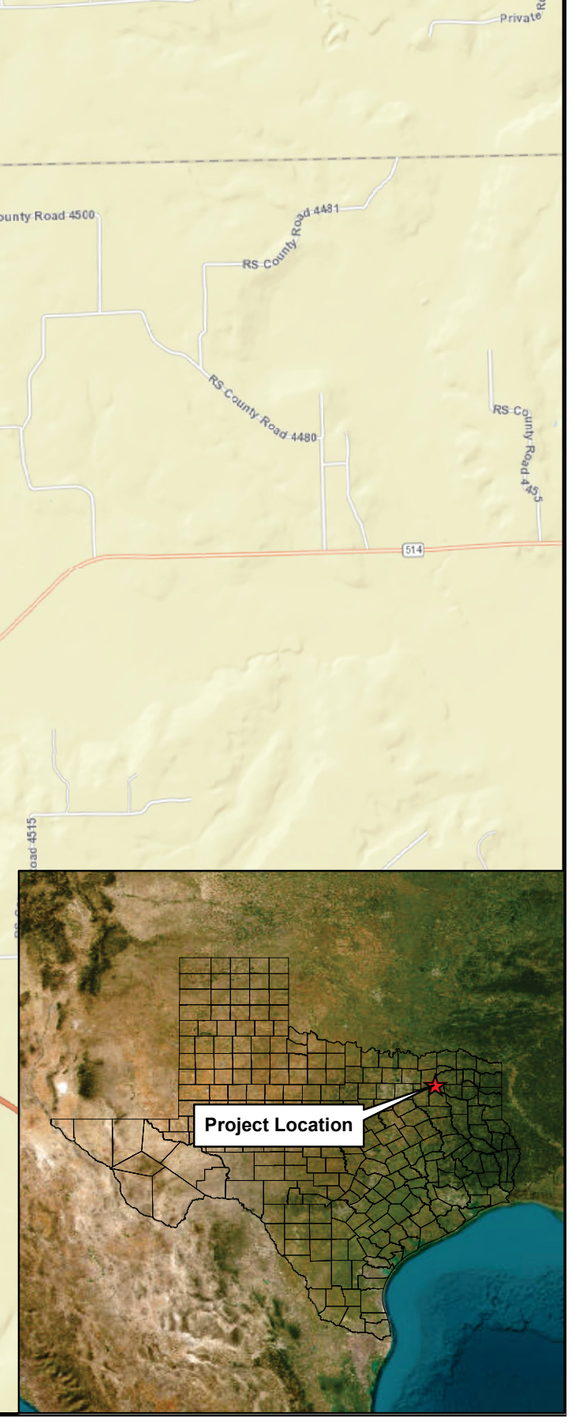
Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	9/13/2024	60% Design Submittal	UEI

Legend

Project Boundary



N

0 1,500 3,000 Feet

NAD 1983 StatePlane Texas North Central FIPS 4202 (US Feet)

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Drawn By:	C. Prest
Approved By:	R. Stapleton
Project Number:	24.01273

Figure A-1

VICINITY MAP

REVISION:
0

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Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

Legend

- Project Boundary
- 2D Project Domain
- HUC-12 Watershed
- NHD Flowlines

N

0 2,000 4,000 Feet

NAD83 Indiana State Plane, East Zone FIPS 1301, US Foot

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Figure A-2

EXISTING
DRAINAGE MAP

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Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

Legend

- Project Boundary
- Proposed Access Roads
- Wetlands
- Proposed Facilities
- Proposed Fence
- Proposed PV Racks
- Proposed Inverters

N

0 1,000 2,000 Feet

NAD83 Indiana State Plane, East Zone FIPS 1301, US Foot

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Figure A-3

PROPOSED SITE PLAN MAP

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APPENDIX B. HYDRAULIC ANALYSIS AND DESIGN

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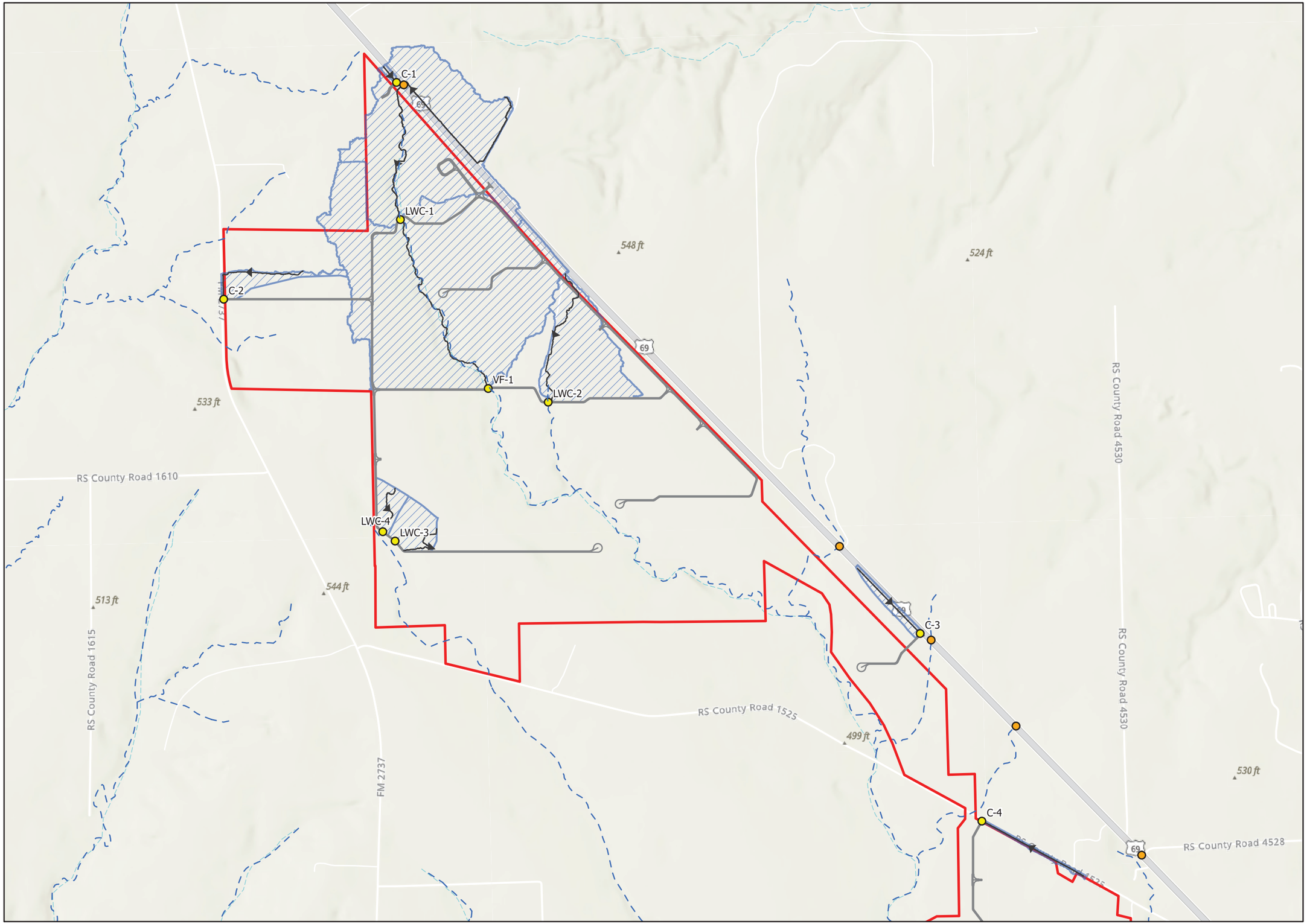
Figure B- 2. Hydrologic Soils Group Map
Figure B- 3. Proposed Land Cover Map
Figure B- 4. Proposed Curve Number Map
Figure B- 5. Runoff Rates Comparison Map

Attachment B- 1: Barrett Crossing Schedules
Attachment B- 2: HY-8 Design Output Report
Attachment B- 3: Hydraulic Toolbox Design Output Report
Attachment B- 4: NOAA Atlas 14 Print Out
Attachment B- 5: Barrett 60% Erosion and Sediment Control Plan



Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

Legend

- Existing Drainage Crossings
- Proposed Site Drainage Crossings
- Flow Paths
- Proposed Access Roads
- Crossing Drainage Areas
- Project Boundary
- NHD Flowlines

N

0 750 1,500 Feet

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Figure B-1

DRAINAGE DESIGN MAP

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Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

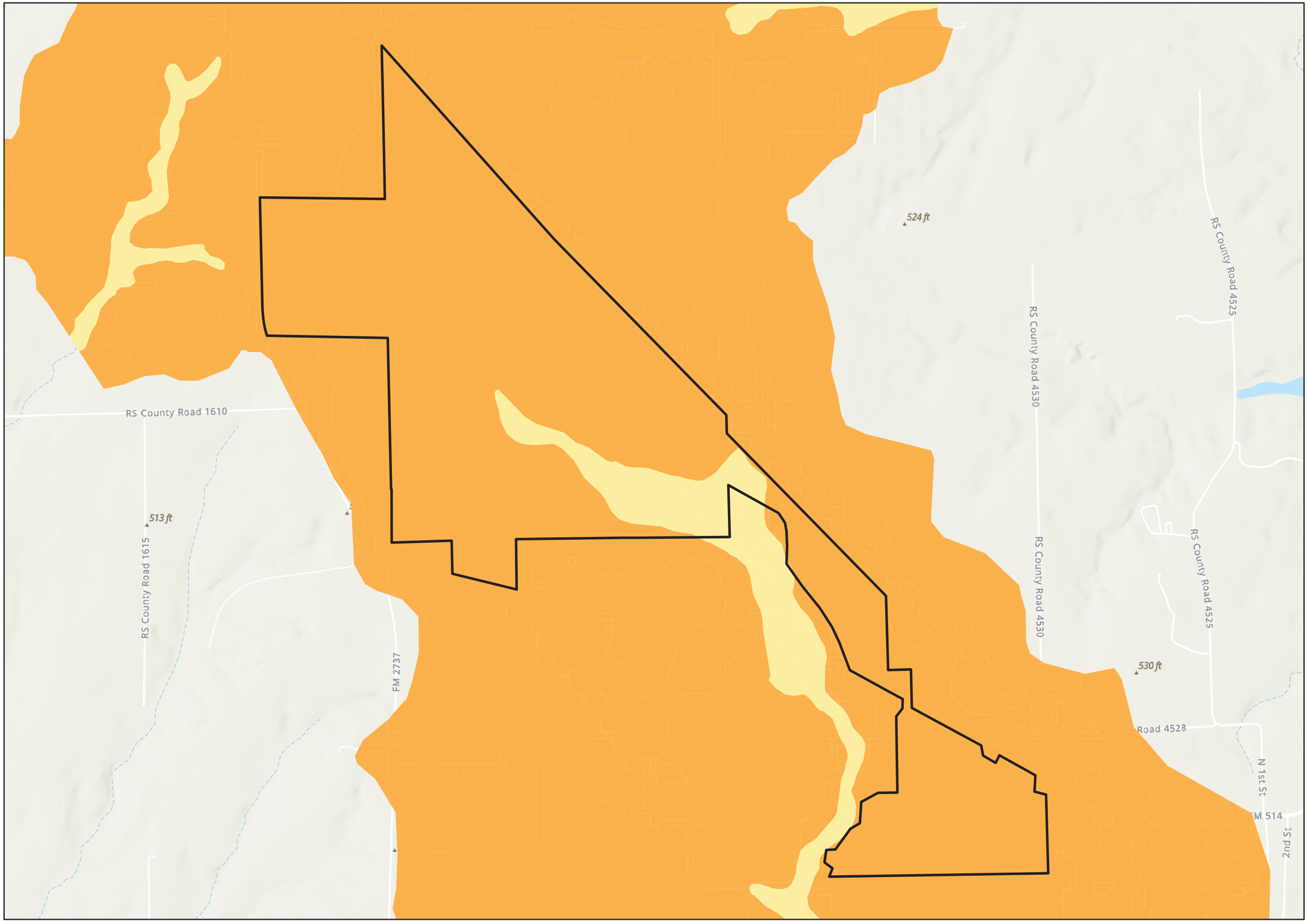
Legend

Project Boundary

Hydrologic Soil Group

B/D

D



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0 1,000 2,000 Feet

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Figure B-2

HYDROLOGIC SOILS GROUP MAP

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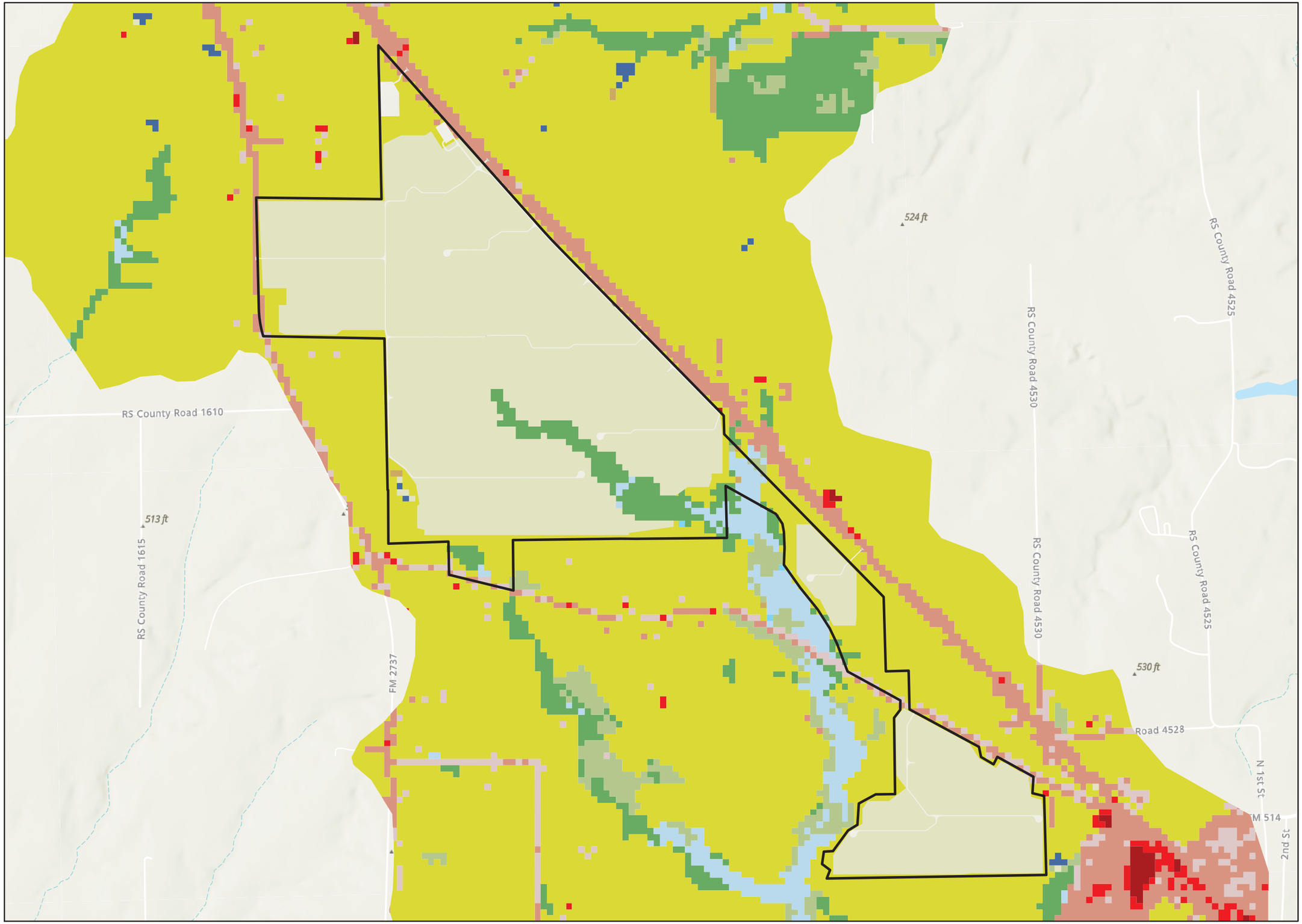

Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

Legend

- Project Boundary

Proposed Land Cover

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Woody Wetlands
- Emergent Herbacerous Wetlands

N

0 1,000 2,000 Feet

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Figure B-3

PROPOSED LAND COVER MAP

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Barrett Solar Project

Rains County, Texas

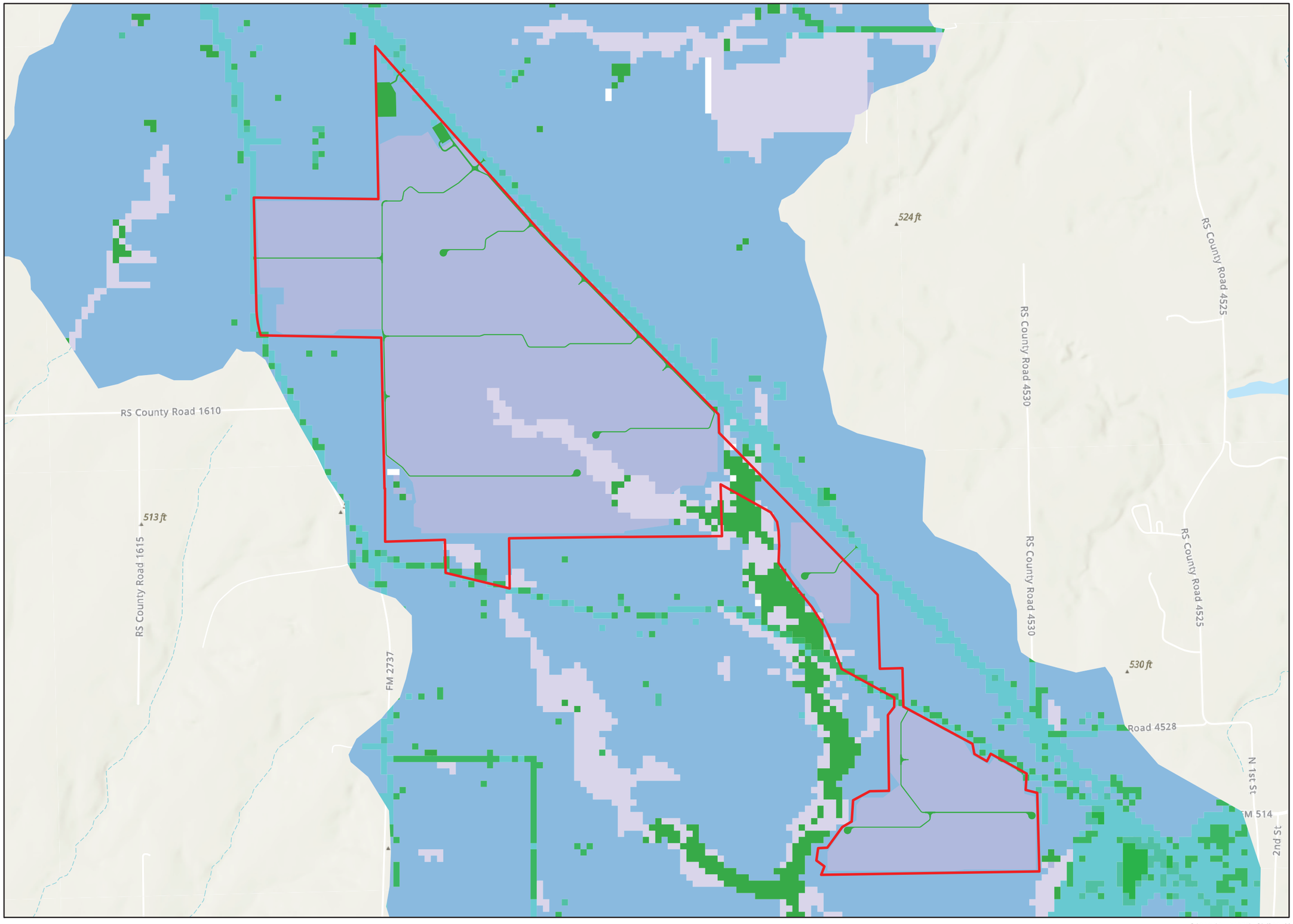
Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

Legend

Project Boundary

Proposed Curve Numbers

- 73
- 77
- 78
- 80
- 87
- 92
- 93
- 95
- 98



N

0 1,000 2,000 Feet

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Figure B-4

PROPOSED CURVE NUMBER MAP

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Barrett Solar Project

Rains County, Texas

Rev.	Date	Description	By
	8/2/2024	30% Design Submittal	UEI
	9/13/2024	60% Design Submittal	UEI

Legend

- Profile Lines
- 2D Project Domain
- Project Boundary

Proposed Inundation Depths (100-year, 24-hour)

- 0 - 0.1
- 0.1 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- < 7

Note: For more information on site inundation depths, see the Barrett Solar Preliminary Hydrology Study

Profile Line 1 Flow Rates
Existing: 4479.2 cfs
Proposed: 4407.6 cfs

Profile Line 2 Flow Rates
Existing: 5322.0 cfs
Proposed: 5299.1 cfs

Profile Line 3 Flow Rates
Existing: 5319.9 cfs
Proposed: 5283.6 cfs

N

0 2,000 4,000 Feet

NAD83 Indiana State Plane, East Zone FIPS 1301, US Foot

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Figure B-5

RUNOFF COMPARISON MAP

100-YEAR, 24-HOUR

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Attachment B- 1: Barrett Crossing Schedules

CULVERT CROSSINGS SCHEDULE
NAD 1983 STATE PLANE TEXAS NORTH CENTRAL 4202 (US FEET)
SIZING AND DESIGN BASED ON 10-YEAR AND 25-YEAR, 24 HOUR STORM EVENTS

ID	ACCESS ROAD #	LATITUDE (FT)	LONGITUDE (FT)	Q 10-YEAR (CFS)	Q 25-YEAR (CFS)	CULVERT SIZE[1]	HW/D[2]	CULVERT LENGTH (FT)	INLET ELEVATION (FT)	OUTLET ELEVATION (FT)	VELOCITY[3] (FPS)	PERMANENT OUTLET PROTECTION	DETAIL #	TEMPORARY CULVERT END TREATMENT DETAIL #	SHEET #
C-1	ACCESS ROAD 1.0	32.9704	-95.9140	1.0	1.3	18" RCP	0.40	34	552.7	552.13	3.12	NON-DEGRADABLE RECP	ECD-518	ECD-516	BAR-CVL-401
C-2[4]	ACCESS ROAD 6.0	32.9624	-95.9219	12.3	16.0	2 - 18" RCP	1.33	43	518.68	518.08	5.73	NON-DEGRADABLE RECP	ECD-518	ECD-516	BAR-CVL-401
C-3	ACCESS ROAD 8.0	32.9493	-95.8914	5.1	6.2	18" RCP	1.16	41	503.57	503.23	5.18	NON-DEGRADABLE RECP	ECD-518	ECD-516	BAR-CVL-405
C-4[4]	ACCESS ROAD 9.0	32.9422	-95.8889	2.9	3.7	18" RCP	0.83	65	493.78	493.23	4.3	NON-DEGRADABLE RECP	ECD-518	ECD-516	BAR-CVL-406

1. CULVERT SIZES ARE BASED OFF OF THE 10-YEAR, 24-HOUR ANALYSIS.
2. HW/D CALCULATIONS ARE BASED OFF OF THE 10-YEAR, 24-HOUR ANALYSIS.
3. VELOCITY CALCULATIONS AREA BASED OFF OF THE 25-YEAR, 24-HOUR ANALYSIS.
4. TOPO DATA WITHIN ROADSIDE DITCHES UPSTREAM AND DOWNSTREAM OF C-2 AND C-4 SHOULD BE FIELD VERIFIED BEFORE FINALIZING CROSSING SIZES.

LOW WATER CROSSINGS SCHEDULE
NAD 1983 STATE PLANE TEXAS NORTH CENTRAL 4202 (US FEET)
SIZING AND DESIGN BASED ON THE 25-YEAR, 24 HOUR STORM EVENT

ID	ACCESS ROAD #	LATITUDE (FT)	LONGITUDE (FT)	Q 10-YEAR (CFS)	Q 25-YEAR (CFS)	LWC LINING DESIGN	DETAIL #	FLOW DEPTH[1] (FT)	LWC LENGTH[1] (FT)	VELOCITY[1] (FPS)	MAXIMUM SHEAR STRESS[1] (PSF)	SHEET #
LWC-1	ACCESS ROAD 4.0	32.9652	-95.9140	99.8	127.9	CONCRETE PAVEMENT	ACR-111	1.63	40	5.73	1.72	BAR-CVL-401
LWC-2	ACCESS ROAD 7.0	32.9583	-95.9076	51.8	67.5	6" RIPRAP	ACR-111	0.56	49	4.64	0.91	BAR-CVL-404
LWC-3	ACCESS ROAD 4.0	32.9532	-95.9146	12.8	16.7	6" RIPRAP	ACR-111	0.19	23	3.48	0.52	BAR-CVL-403
LWC-4	ACCESS ROAD 4.0	32.9536	-95.9151	8.0	10.4	3" CLEAN AGGREGATE	ACR-111	0.31	26	2.60	0.61	BAR-CVL-403

1. RESULTS OF THE 25-YEAR ANALYSIS.

VENTED FORDS SCHEDULE
NAD 1983 STATE PLANE TEXAS NORTH CENTRAL 4202 (US FEET)
SIZING AND DESIGN BASED ON THE 25-YEAR, 24 HOUR STORM EVENT

ID	ACCESS ROAD #	LATITUDE (FT)	LONGITUDE (FT)	Q 25-YEAR (CFS)	CULVERT SIZE	CULVERT OUTLET VELOCITY (FPS)	CULVERT OUTLET DETAIL #	LWC LINING DESIGN	DETAIL #	FLOW DEPTH[1] (FT)	LWC LENGTH[1] (FT)	VELOCITY[1] (FPS)	MAXIMUM SHEAR STRESS[1] (PSF)	SHEET #
VF-1	ACCESS ROAD 7.0	32.9588	-95.9103	303.5	36"	10.6	ECD-517A	CONCRETE PAVEMENT	ACR-112	0.23	240	4.70	0.56	BAR-CVL-403

Attachment B- 2: HY-8 Design Output Report

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

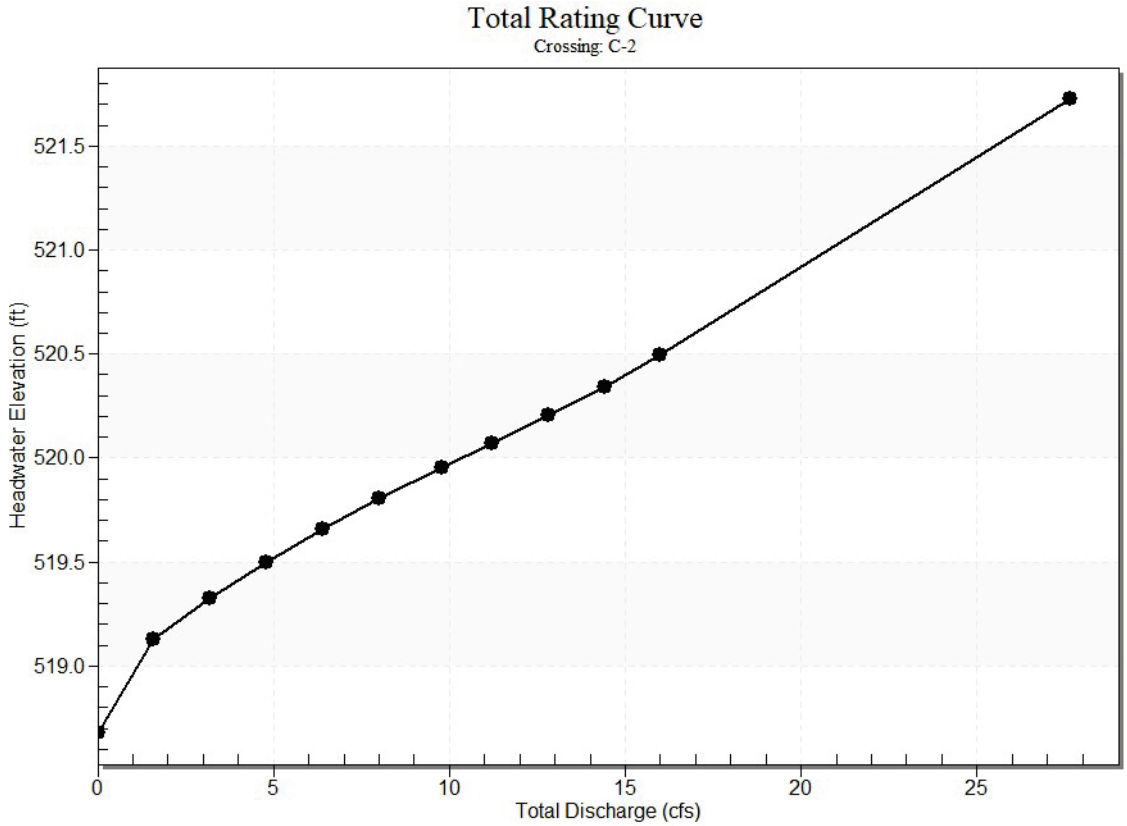
Design Flow: 9.80 cfs

Maximum Flow: 16.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: C-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
518.68	0.00	0.00	0.00	1
519.13	1.60	1.60	0.00	1
519.33	3.20	3.20	0.00	1
519.50	4.80	4.80	0.00	1
519.66	6.40	6.40	0.00	1
519.80	8.00	8.00	0.00	1
519.95	9.80	9.80	0.00	1
520.07	11.20	11.20	0.00	1
520.20	12.80	12.80	0.00	1
520.34	14.40	14.40	0.00	1
520.50	16.00	16.00	0.00	1
521.68	25.20	25.20	0.00	Overtopping

Rating Curve Plot for Crossing: C-2



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	518.68	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.60 cfs	1.60 cfs	519.13	0.45	0.0*	1-S2n	0.25	0.33	0.25	0.14	4.19	1.13
3.20 cfs	3.20 cfs	519.33	0.65	0.0*	1-S2n	0.35	0.47	0.35	0.20	5.13	1.43
4.80 cfs	4.80 cfs	519.50	0.82	0.048	1-S2n	0.43	0.59	0.44	0.25	5.64	1.63
6.40	6.40	519.66	0.98	0.19	1-	0.50	0.68	0.5	0.30	6.08	1.79

cfs	cfs			1	S2 n			1			
8.00 cfs	8.00 cfs	519.80	1.12	0.337	1-S2 n	0.56	0.77	0.57	0.34	6.42	1.92
9.80 cfs	9.80 cfs	519.95	1.27	0.510	1-S2 n	0.63	0.85	0.64	0.38	6.74	2.04
11.20 cfs	11.20 cfs	520.07	1.39	0.650	1-S2 n	0.67	0.91	0.70	0.40	6.96	2.12
12.80 cfs	12.80 cfs	520.20	1.52	0.819	5-S2 n	0.73	0.98	0.75	0.43	7.19	2.21
14.40 cfs	14.40 cfs	520.34	1.66	0.997	5-S2 n	0.78	1.04	0.81	0.46	7.40	2.29
16.00 cfs	16.00 cfs	520.50	1.82	1.184	5-S2 n	0.83	1.10	0.86	0.49	7.59	2.36

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

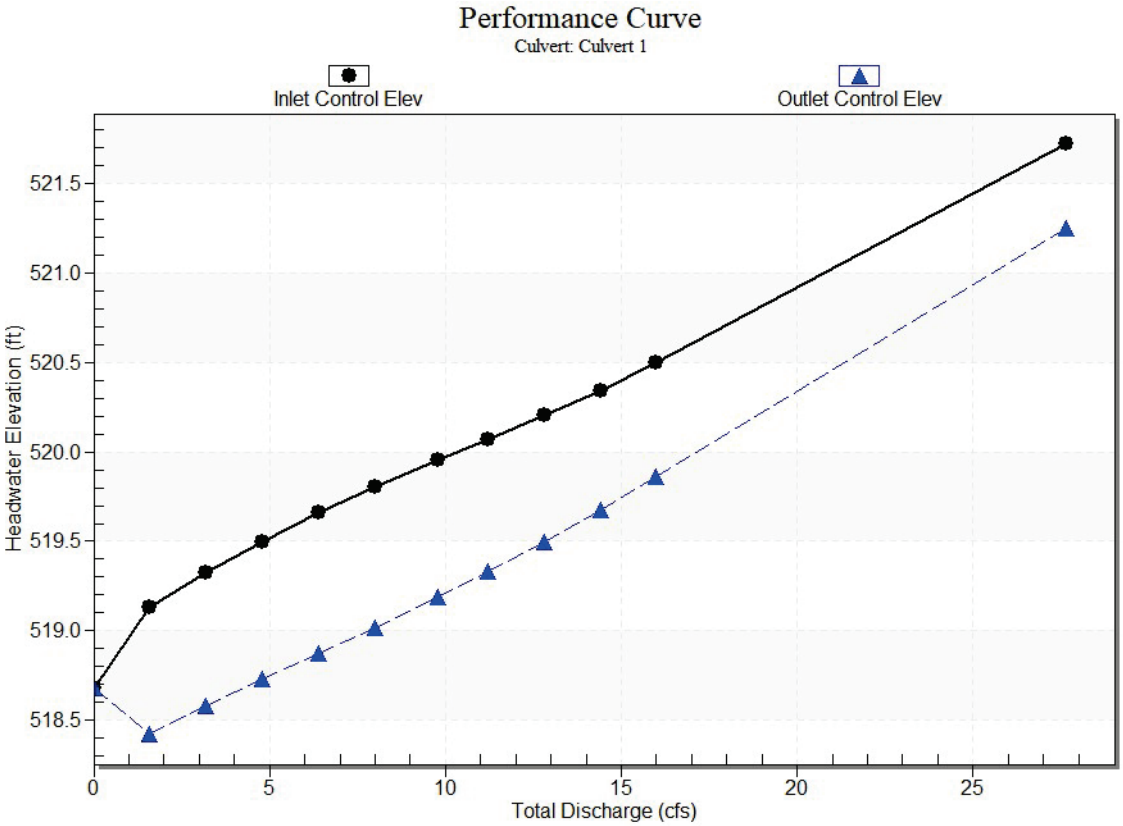
Inlet Elevation (invert): 518.68 ft,

Outlet Elevation (invert): 518.08 ft

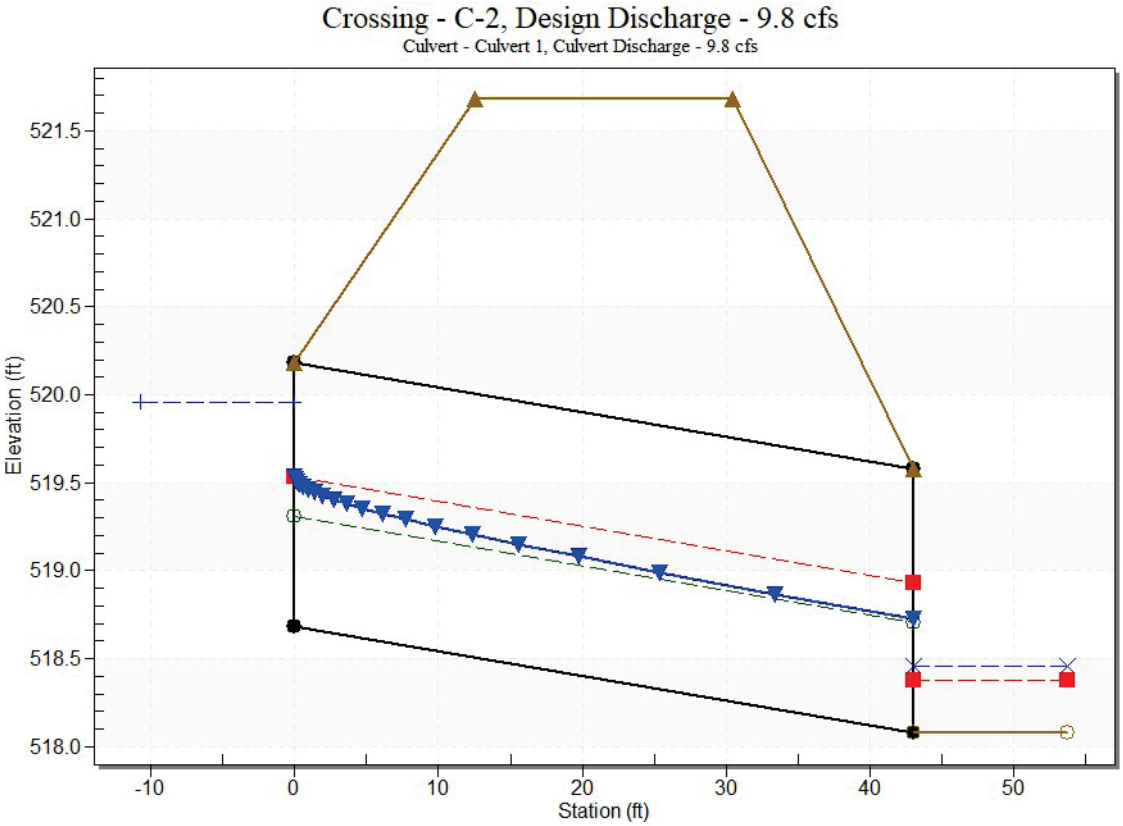
Culvert Length: 43.00 ft,

Culvert Slope: 0.0140

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 518.68 ft

Outlet Station: 43.00 ft

Outlet Elevation: 518.08 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: C-2

Table 3 - Downstream Channel Rating Curve (Crossing: C-2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	518.08	0.00	0.00	0.00	0.00
1.60	518.22	0.14	1.13	0.10	0.58
3.20	518.28	0.20	1.43	0.15	0.61
4.80	518.33	0.25	1.63	0.19	0.63
6.40	518.38	0.30	1.79	0.22	0.64
8.00	518.42	0.34	1.92	0.25	0.66
9.80	518.46	0.38	2.04	0.28	0.67
11.20	518.48	0.40	2.12	0.30	0.67
12.80	518.51	0.43	2.21	0.33	0.68
14.40	518.54	0.46	2.29	0.35	0.69
16.00	518.57	0.49	2.36	0.37	0.69

Tailwater Channel Data - C-2

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 9.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0120

Channel Manning's n: 0.0350

Channel Invert Elevation: 518.08 ft

Roadway Data for Crossing: C-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 88.00 ft

Crest Elevation: 521.68 ft

Roadway Surface: Gravel

Roadway Top Width: 18.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

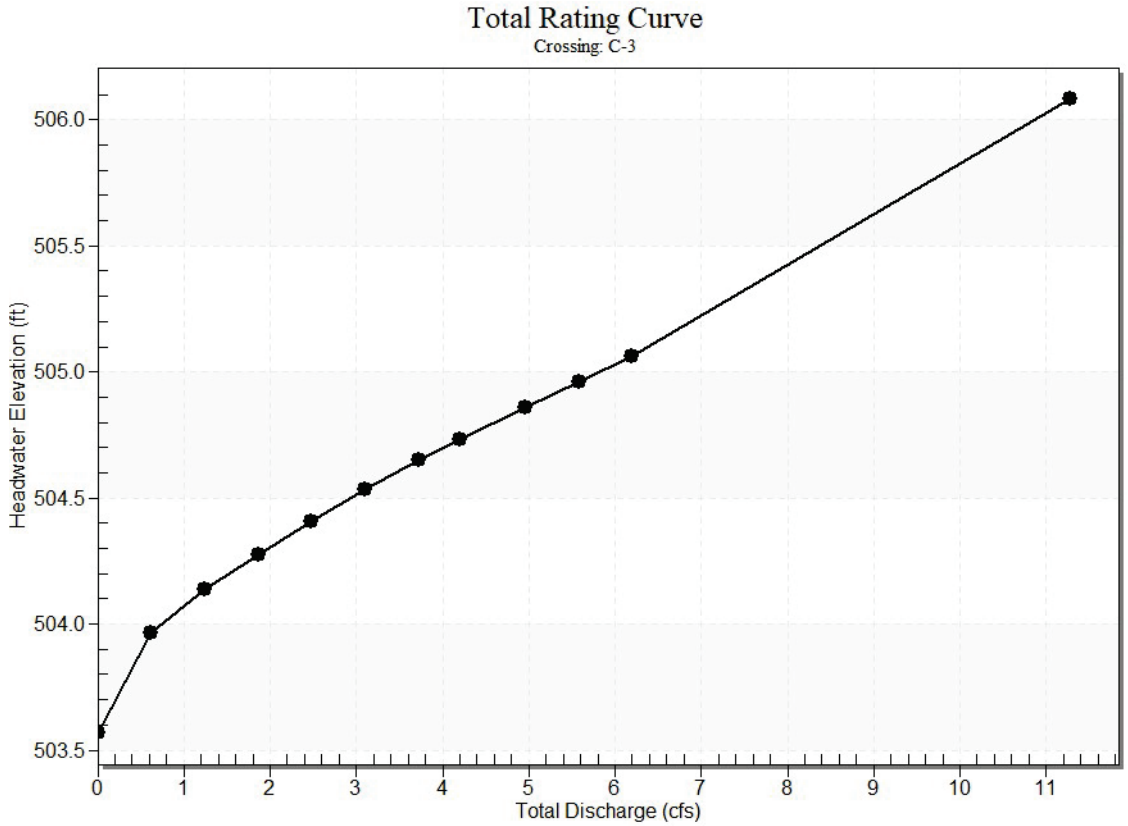
Design Flow: 4.20 cfs

Maximum Flow: 6.20 cfs

Table 4 - Summary of Culvert Flows at Crossing: C-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
503.57	0.00	0.00	0.00	1
503.97	0.62	0.62	0.00	1
504.14	1.24	1.24	0.00	1
504.27	1.86	1.86	0.00	1
504.41	2.48	2.48	0.00	1
504.53	3.10	3.10	0.00	1
504.65	3.72	3.72	0.00	1
504.73	4.20	4.20	0.00	1
504.86	4.96	4.96	0.00	1
504.96	5.58	5.58	0.00	1
505.06	6.20	6.20	0.00	1
506.07	10.91	10.91	0.00	Overtopping

Rating Curve Plot for Crossing: C-3



Culvert Data: Culvert 1

Table 5 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	503.57	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.62 cfs	0.62 cfs	503.97	0.40	0.0*	1-S2n	0.25	0.29	0.25	0.20	3.24	0.81
1.24 cfs	1.24 cfs	504.14	0.57	0.093	1-S2n	0.35	0.42	0.35	0.25	3.96	0.96
1.86 cfs	1.86 cfs	504.27	0.70	0.210	1-S2n	0.43	0.51	0.43	0.30	4.42	1.06
2.48	2.48	504.41	0.84	0.32	1-	0.50	0.60	0.5	0.33	4.78	1.14

cfs	cfs			1	S2 n			0			
3.10 cfs	3.10 cfs	504.53	0.96	0.43 2	1- S2 n	0.56	0.67	0.5 7	0.36	5.07	1.21
3.72 cfs	3.72 cfs	504.65	1.08	0.54 4	1- S2 n	0.62	0.74	0.6 3	0.38	5.32	1.26
4.20 cfs	4.20 cfs	504.73	1.16	0.63 2	1- S2 n	0.66	0.79	0.6 7	0.40	5.49	1.30
4.96 cfs	4.96 cfs	504.86	1.29	0.77 8	1- S2 n	0.73	0.86	0.7 4	0.43	5.73	1.36
5.58 cfs	5.58 cfs	504.96	1.39	0.90 1	1- S2 n	0.78	0.91	0.7 9	0.45	5.90	1.40
6.20 cfs	6.20 cfs	505.06	1.49	1.03 0	1- S2 n	0.83	0.96	0.8 4	0.46	6.05	1.43

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

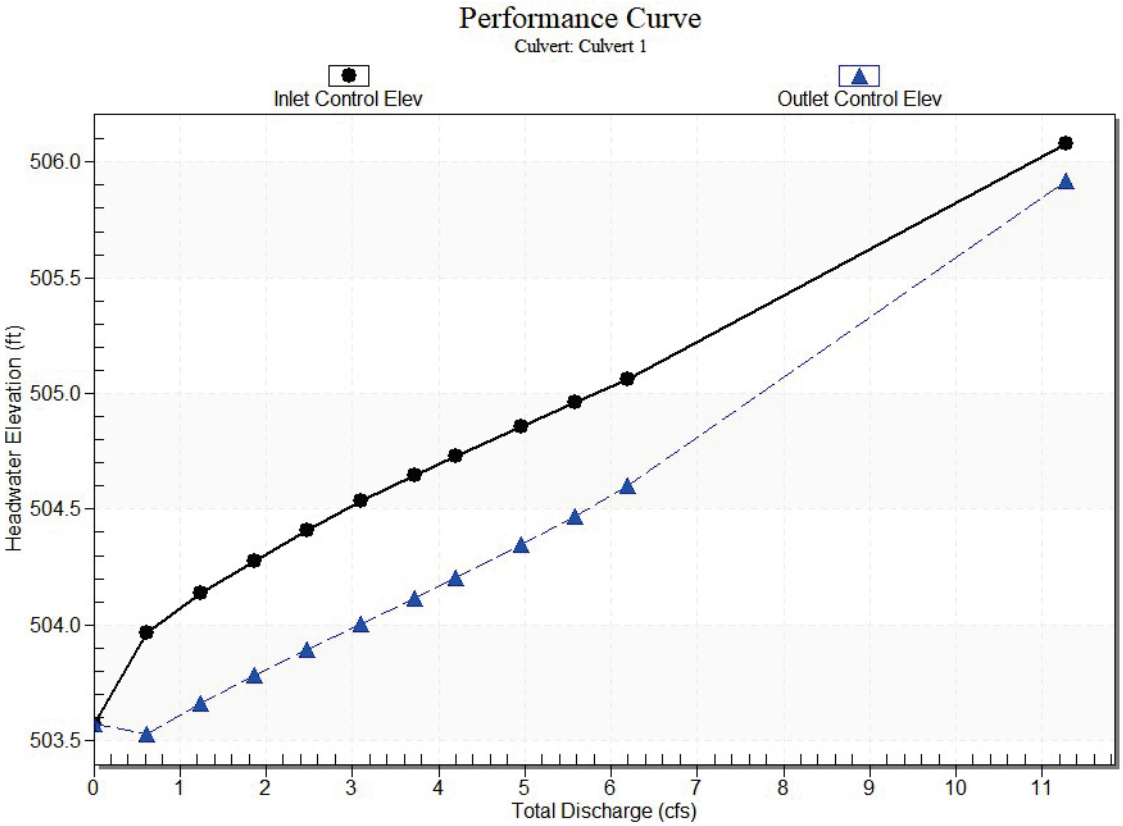
Inlet Elevation (invert): 503.57 ft,

Outlet Elevation (invert): 503.23 ft

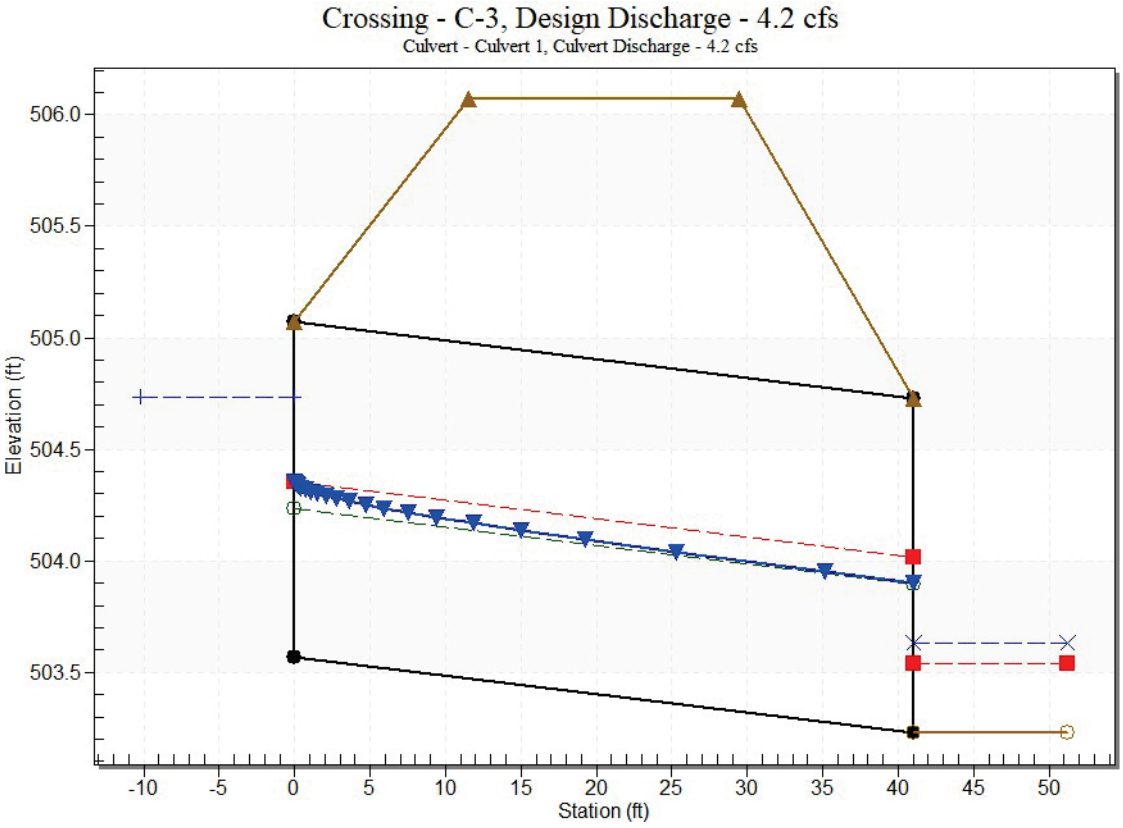
Culvert Length: 41.00 ft,

Culvert Slope: 0.0083

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 503.57 ft

Outlet Station: 41.00 ft

Outlet Elevation: 503.23 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: C-3

Table 6 - Downstream Channel Rating Curve (Crossing: C-3)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	503.23	0.00	0.00	0.00	0.00
0.62	503.43	0.20	0.81	0.10	0.45
1.24	503.48	0.25	0.96	0.13	0.47
1.86	503.53	0.30	1.06	0.15	0.49
2.48	503.56	0.33	1.14	0.16	0.50
3.10	503.59	0.36	1.21	0.18	0.50
3.72	503.61	0.38	1.26	0.19	0.51
4.20	503.63	0.40	1.30	0.20	0.51
4.96	503.66	0.43	1.36	0.21	0.52
5.58	503.68	0.45	1.40	0.22	0.52
6.20	503.69	0.46	1.43	0.23	0.52

Tailwater Channel Data - C-3

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 20.00 (_:1)

Channel Slope: 0.0080

Channel Manning's n: 0.0350

Channel Invert Elevation: 503.23 ft

Roadway Data for Crossing: C-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 88.00 ft

Crest Elevation: 506.07 ft

Roadway Surface: Gravel

Roadway Top Width: 18.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

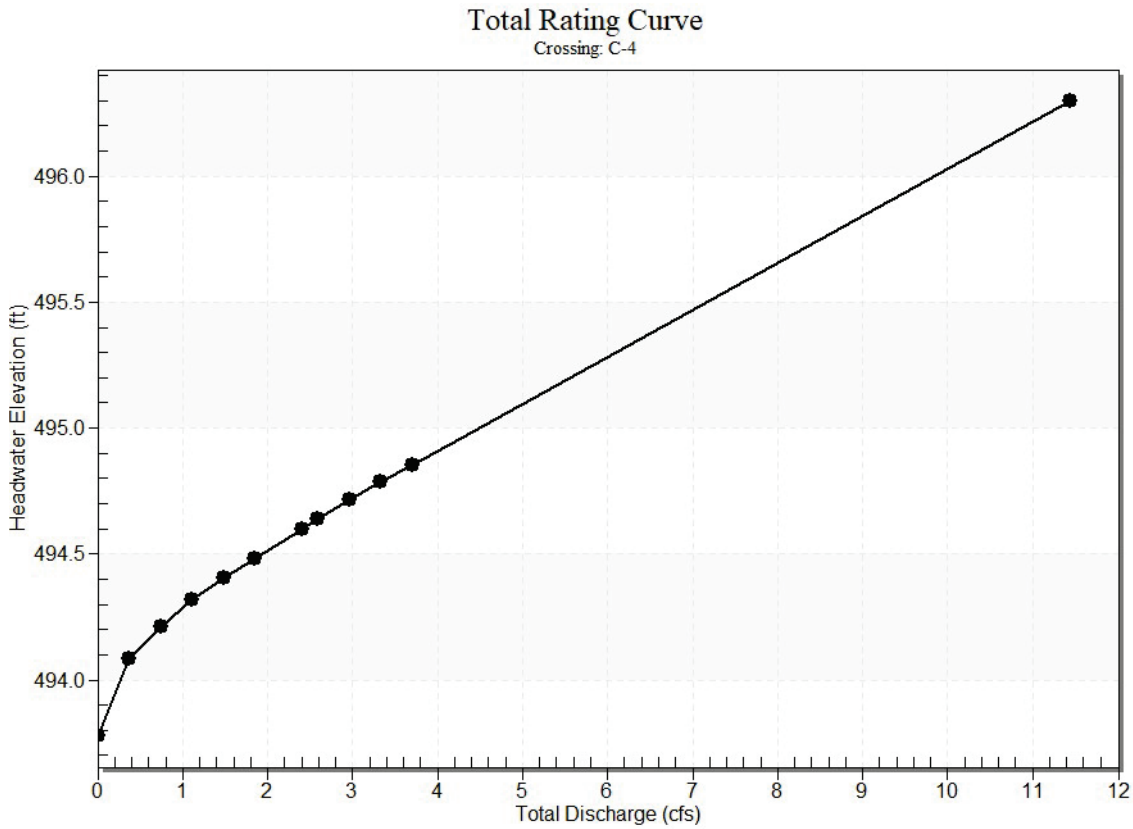
Design Flow: 2.40 cfs

Maximum Flow: 3.70 cfs

Table 7 - Summary of Culvert Flows at Crossing: C-4

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
493.78	0.00	0.00	0.00	1
494.08	0.37	0.37	0.00	1
494.21	0.74	0.74	0.00	1
494.32	1.11	1.11	0.00	1
494.40	1.48	1.48	0.00	1
494.48	1.85	1.85	0.00	1
494.60	2.40	2.40	0.00	1
494.64	2.59	2.59	0.00	1
494.72	2.96	2.96	0.00	1
494.79	3.33	3.33	0.00	1
494.85	3.70	3.70	0.00	1
496.28	10.91	10.91	0.00	Overtopping

Rating Curve Plot for Crossing: C-4



Culvert Data: Culvert 1

Table 8 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	493.78	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.37 cfs	0.37 cfs	494.08	0.30	0.0*	1-S2n	0.19	0.22	0.19	0.19	2.79	0.80
0.74 cfs	0.74 cfs	494.21	0.43	0.0*	1-S2n	0.27	0.32	0.27	0.25	3.43	0.95
1.11 cfs	1.11 cfs	494.32	0.54	0.0*	1-S2n	0.33	0.39	0.33	0.29	3.86	1.05
1.48 cfs	1.48 cfs	494.40	0.62	0.0*	1-S2n	0.38	0.46	0.38	0.32	4.20	1.13
1.85 cfs	1.85 cfs	494.48	0.70	0.005	1-S2n	0.43	0.51	0.43	0.35	4.44	1.19
2.40 cfs	2.40 cfs	494.60	0.82	0.108	1-S2n	0.49	0.59	0.49	0.39	4.82	1.27
2.59 cfs	2.59 cfs	494.64	0.86	0.143	1-S2n	0.51	0.61	0.51	0.40	4.92	1.30
2.96 cfs	2.96 cfs	494.72	0.94	0.213	1-S2n	0.55	0.65	0.55	0.42	5.10	1.34
3.33 cfs	3.33 cfs	494.79	1.01	0.283	1-S2n	0.58	0.70	0.58	0.44	5.27	1.38
3.70 cfs	3.70 cfs	494.85	1.07	0.355	1-S2n	0.62	0.73	0.62	0.46	5.42	1.42

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

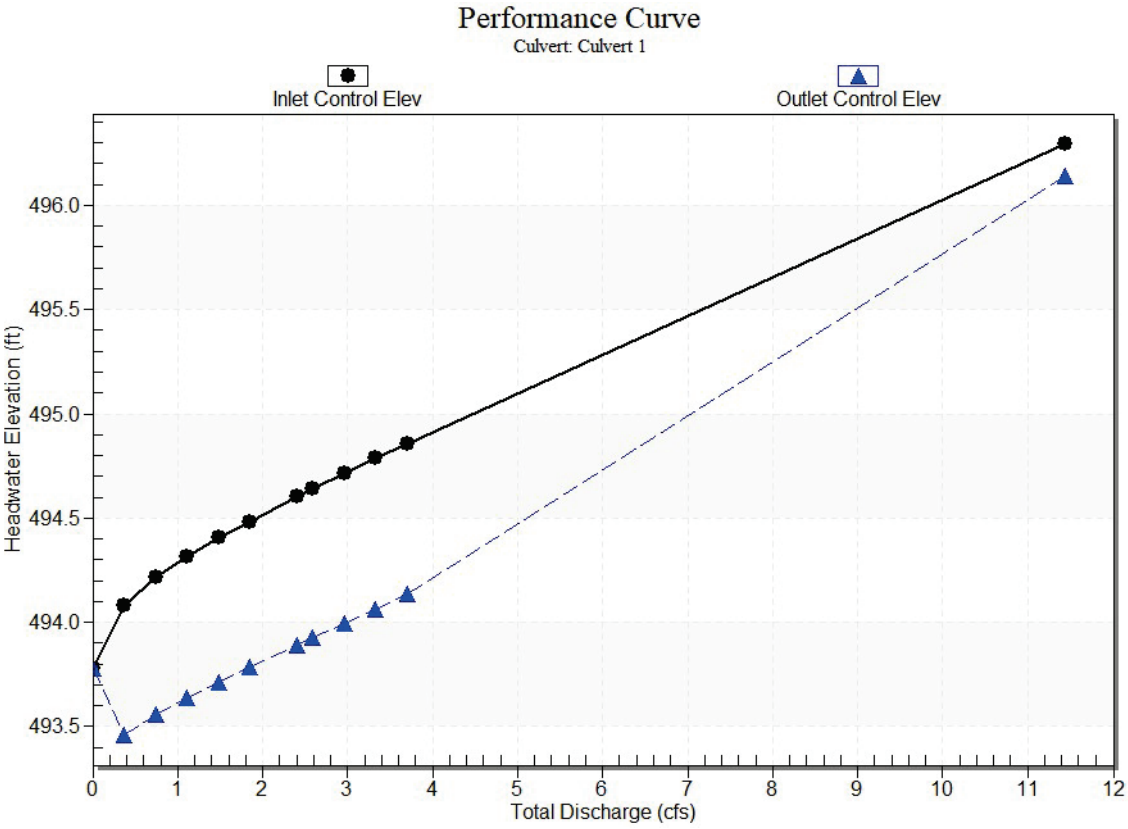
Inlet Elevation (invert): 493.78 ft,

Outlet Elevation (invert): 493.23 ft

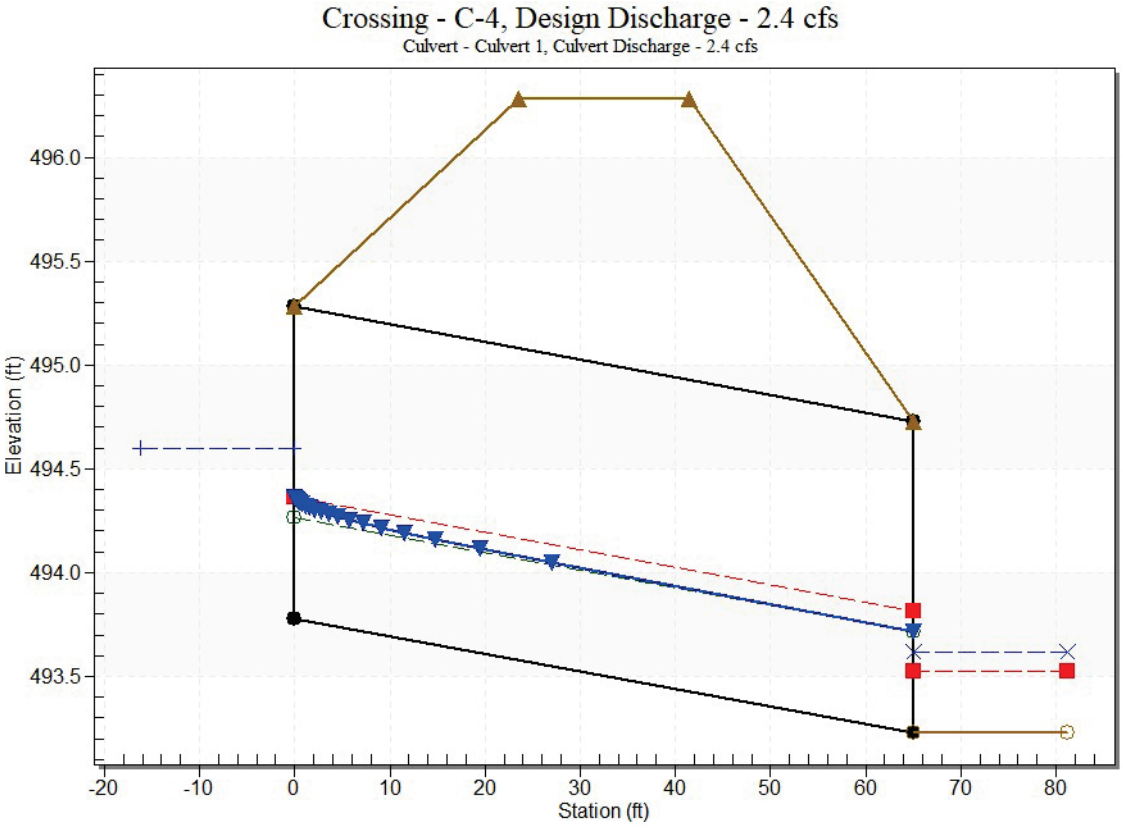
Culvert Length: 65.00 ft,

Culvert Slope: 0.0085

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 493.78 ft

Outlet Station: 65.00 ft

Outlet Elevation: 493.23 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: C-4

Table 9 - Downstream Channel Rating Curve (Crossing: C-4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	493.23	0.00	0.00	0.00	0.00
0.37	493.42	0.19	0.80	0.10	0.45
0.74	493.48	0.25	0.95	0.12	0.47
1.11	493.52	0.29	1.05	0.15	0.48
1.48	493.55	0.32	1.13	0.16	0.49
1.85	493.58	0.35	1.19	0.18	0.50
2.40	493.62	0.39	1.27	0.19	0.51
2.59	493.63	0.40	1.30	0.20	0.51
2.96	493.65	0.42	1.34	0.21	0.51
3.33	493.67	0.44	1.38	0.22	0.52
3.70	493.69	0.46	1.42	0.23	0.52

Tailwater Channel Data - C-4

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 12.50 (_:1)

Channel Slope: 0.0080

Channel Manning's n: 0.0350

Channel Invert Elevation: 493.23 ft

Roadway Data for Crossing: C-4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 80.00 ft

Crest Elevation: 496.28 ft

Roadway Surface: Gravel

Roadway Top Width: 18.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

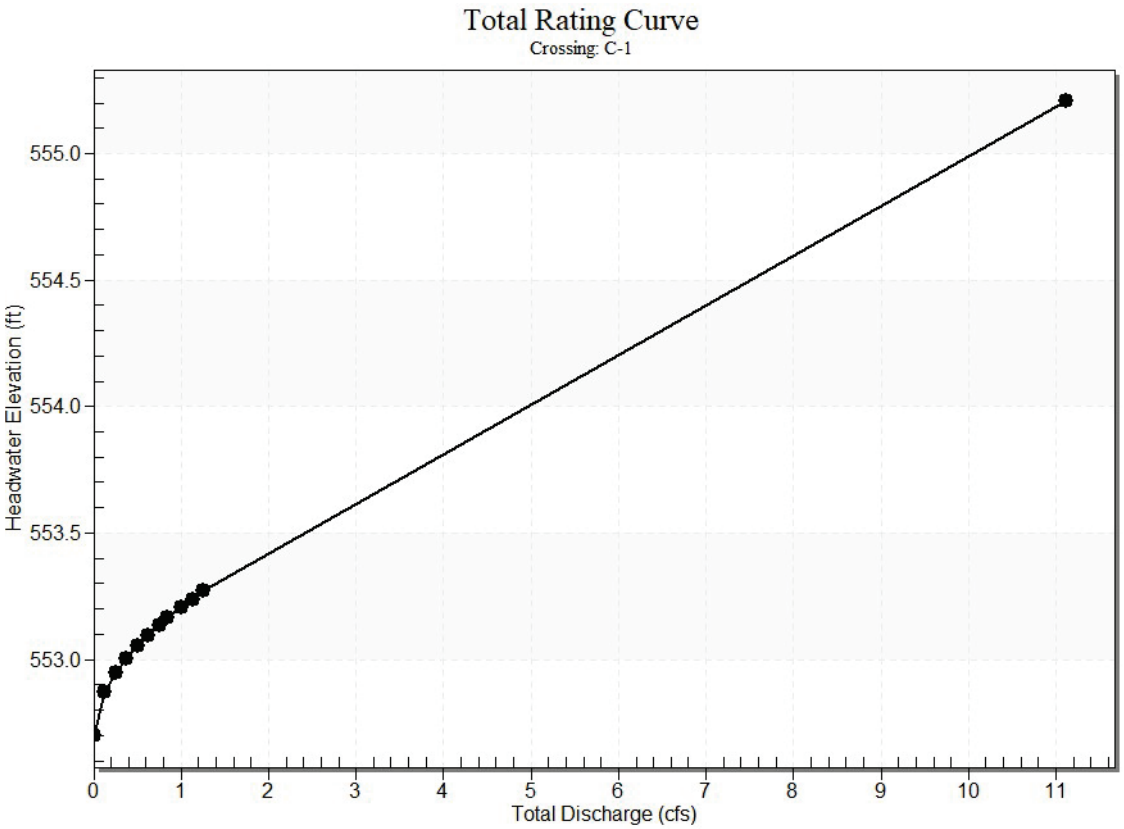
Design Flow: 0.85 cfs

Maximum Flow: 1.26 cfs

Table 10 - Summary of Culvert Flows at Crossing: C-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
552.70	0.00	0.00	0.00	1
552.87	0.13	0.13	0.00	1
552.95	0.25	0.25	0.00	1
553.00	0.38	0.38	0.00	1
553.05	0.50	0.50	0.00	1
553.10	0.63	0.63	0.00	1
553.14	0.76	0.76	0.00	1
553.16	0.85	0.85	0.00	1
553.21	1.01	1.01	0.00	1
553.24	1.13	1.13	0.00	1
553.27	1.26	1.26	0.00	1
555.20	10.93	10.93	0.00	Overtopping

Rating Curve Plot for Crossing: C-1



Culvert Data: Culvert 1

Table 11 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	552.70	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.13 cfs	0.13 cfs	552.87	0.17	0.0*	1-S2n	0.10	0.13	0.10	0.03	2.60	0.45
0.25 cfs	0.25 cfs	552.95	0.25	0.0*	1-S2n	0.13	0.18	0.13	0.04	3.18	0.57
0.38 cfs	0.38 cfs	553.00	0.30	0.0*	1-S2n	0.16	0.23	0.16	0.05	3.58	0.66
0.50 cfs	0.50 cfs	553.05	0.35	0.0*	1-S2n	0.19	0.26	0.19	0.06	3.89	0.73
0.63 cfs	0.63 cfs	553.10	0.40	0.0*	1-S2n	0.21	0.29	0.21	0.07	4.11	0.79
0.76 cfs	0.76 cfs	553.14	0.44	0.0*	1-S2n	0.23	0.32	0.23	0.07	4.39	0.84
0.85 cfs	0.85 cfs	553.16	0.46	0.0*	1-S2n	0.24	0.34	0.24	0.08	4.55	0.87
1.01 cfs	1.01 cfs	553.21	0.51	0.0*	1-S2n	0.27	0.37	0.27	0.09	4.78	0.92
1.13 cfs	1.13 cfs	553.24	0.54	0.0*	1-S2n	0.28	0.40	0.28	0.09	4.95	0.95
1.26 cfs	1.26 cfs	553.27	0.57	0.0*	1-S2n	0.30	0.42	0.30	0.10	5.02	0.99

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

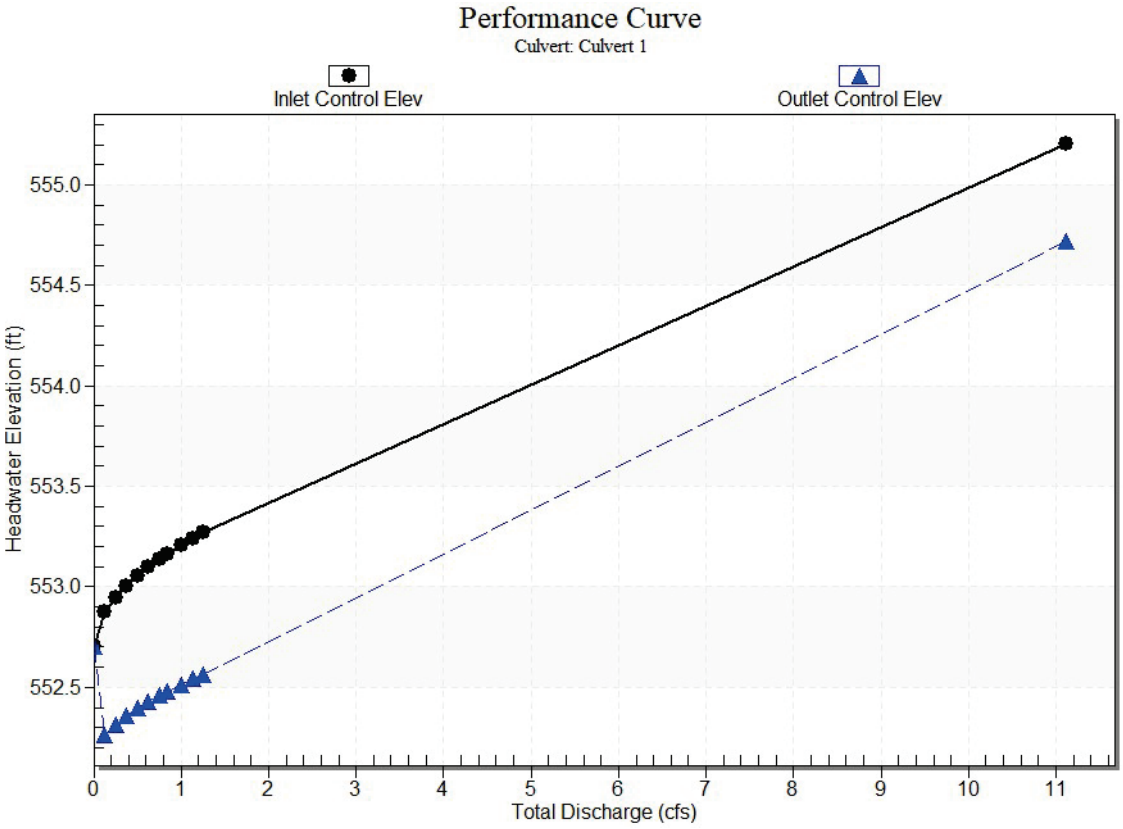
Inlet Elevation (invert): 552.70 ft,

Outlet Elevation (invert): 552.13 ft

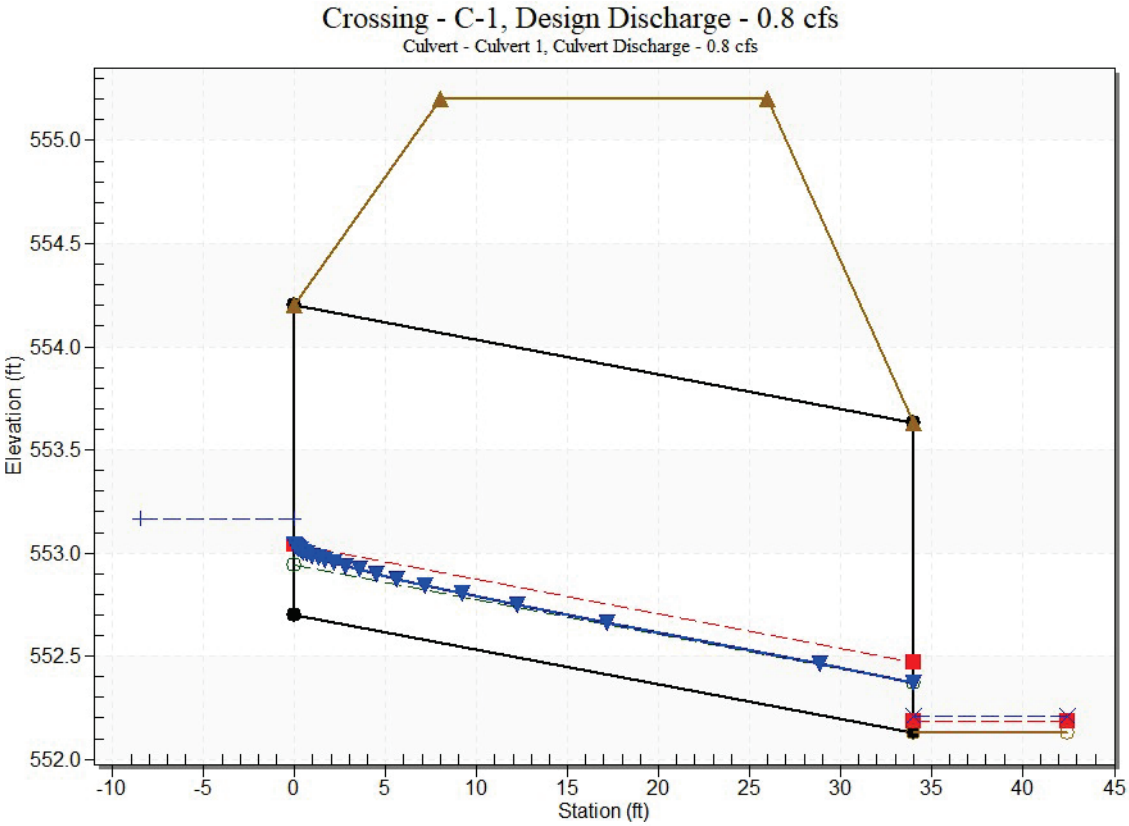
Culvert Length: 34.00 ft,

Culvert Slope: 0.0168

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 552.70 ft

Outlet Station: 34.00 ft

Outlet Elevation: 552.13 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: C-1

Table 12 - Downstream Channel Rating Curve (Crossing: C-1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	552.13	0.00	0.00	0.00	0.00
0.13	552.16	0.03	0.45	0.03	0.51
0.25	552.17	0.04	0.57	0.04	0.54
0.38	552.18	0.05	0.66	0.05	0.56
0.50	552.19	0.06	0.73	0.06	0.58
0.63	552.20	0.07	0.79	0.07	0.59
0.76	552.20	0.07	0.84	0.07	0.60
0.85	552.21	0.08	0.87	0.08	0.60
1.01	552.22	0.09	0.92	0.09	0.61
1.13	552.22	0.09	0.95	0.09	0.61
1.26	552.23	0.10	0.99	0.10	0.62

Tailwater Channel Data - C-1

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 32.20 (_:1)

Channel Slope: 0.0160

Channel Manning's n: 0.0350

Channel Invert Elevation: 552.13 ft

Roadway Data for Crossing: C-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 91.00 ft

Crest Elevation: 555.20 ft

Roadway Surface: Gravel

Roadway Top Width: 18.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

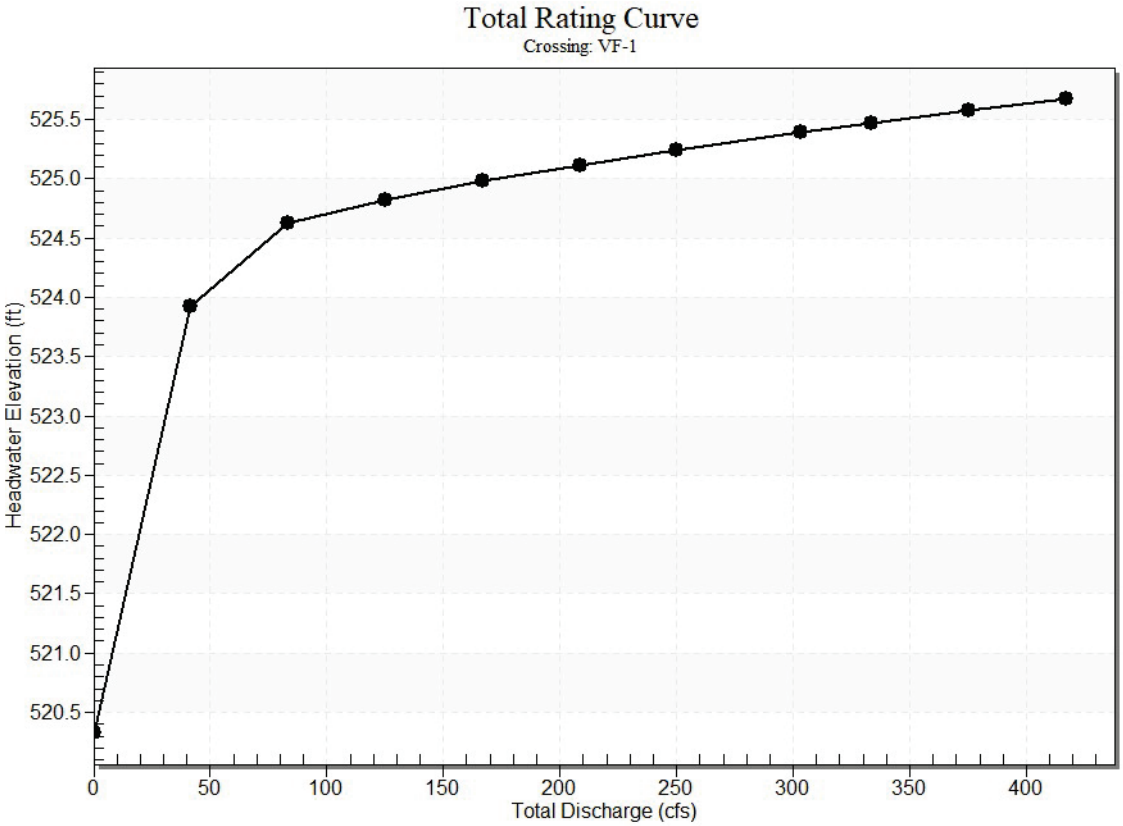
Design Flow: 303.50 cfs

Maximum Flow: 416.86 cfs

Table 13 - Summary of Culvert Flows at Crossing: VF-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
520.33	0.00	0.00	0.00	1
523.93	41.69	41.69	0.00	1
524.63	83.37	49.21	33.99	6
524.82	125.06	51.09	73.64	5
524.98	166.74	52.58	114.00	5
525.12	208.43	53.84	154.31	4
525.24	250.12	54.96	195.02	4
525.39	303.50	56.27	247.17	4
525.47	333.49	56.94	276.35	3
525.57	375.17	57.82	317.23	3
525.67	416.86	58.65	358.18	3
524.33	46.18	46.18	0.00	Overtopping

Rating Curve Plot for Crossing: VF-1



Culvert Data: Culvert 1

Table 14 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	520.33	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
41.69 cfs	41.69 cfs	523.93	3.60	2.757	5-S2n	1.59	2.10	1.76	1.11	9.64	6.40
83.37 cfs	49.21 cfs	524.63	4.30	3.703	5-S2n	1.77	2.28	1.95	1.51	10.12	7.71
125.06 cfs	51.09 cfs	524.82	4.49	3.835	5-S2n	1.81	2.32	2.00	1.81	10.23	8.45
166.7	52.58	524.98	4.65	3.94	5-	1.84	2.36	2.0	2.14	10.3	8.25

4 cfs	cfs			3	S2 n			3		3	
208.43 cfs	53.84 cfs	525.12	4.79	3.752	5-S2 n	1.87	2.38	2.06	2.44	10.41	6.78
250.12 cfs	54.96 cfs	525.24	4.91	3.931	5-S2 n	1.90	2.41	2.09	2.54	10.47	7.06
303.50 cfs	56.27 cfs	525.39	5.06	4.243	5-S2 n	1.93	2.43	2.12	2.77	10.56	6.19
333.49 cfs	56.94 cfs	525.47	5.14	4.337	5-S2 n	1.95	2.44	2.13	2.82	10.60	6.29
375.17 cfs	57.82 cfs	525.57	5.24	4.454	5-S2 n	1.97	2.46	2.15	2.87	10.65	6.49
416.86 cfs	58.65 cfs	525.67	5.34	4.565	5-JS1 t	1.99	2.48	2.90	2.93	8.39	6.67

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

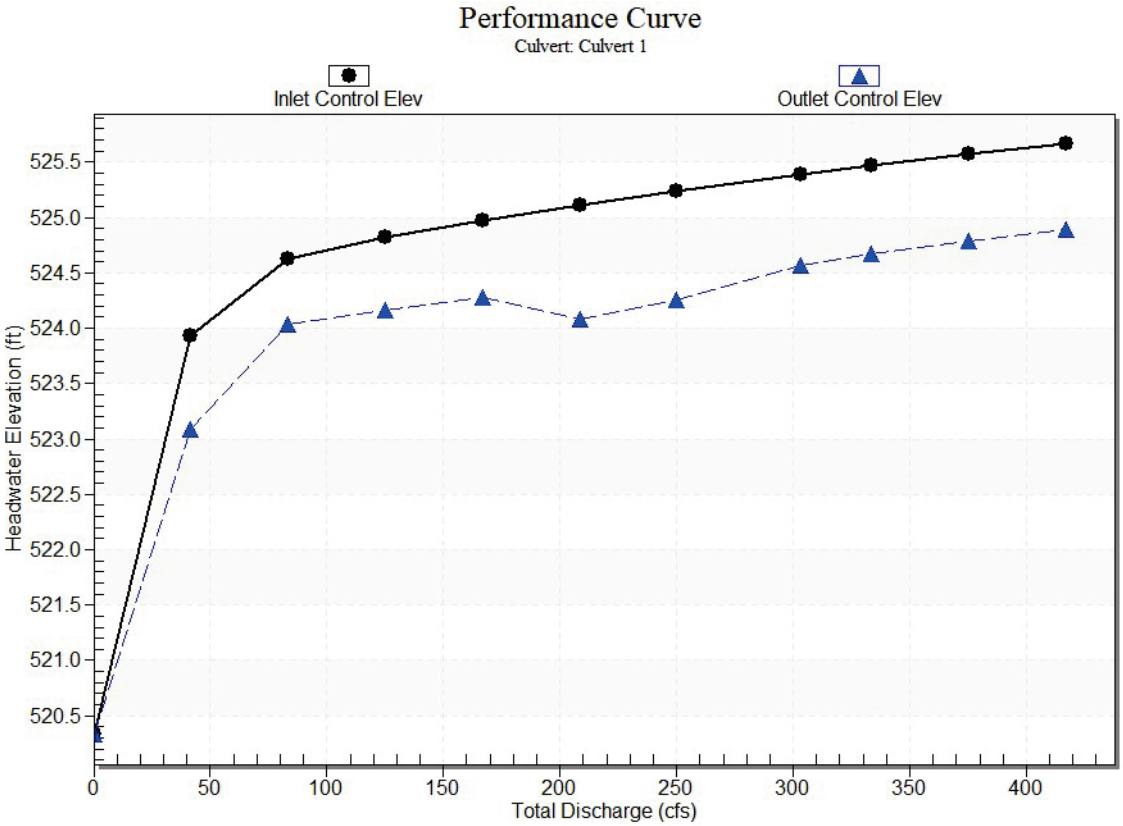
Inlet Elevation (invert): 520.33 ft,

Outlet Elevation (invert): 519.95 ft

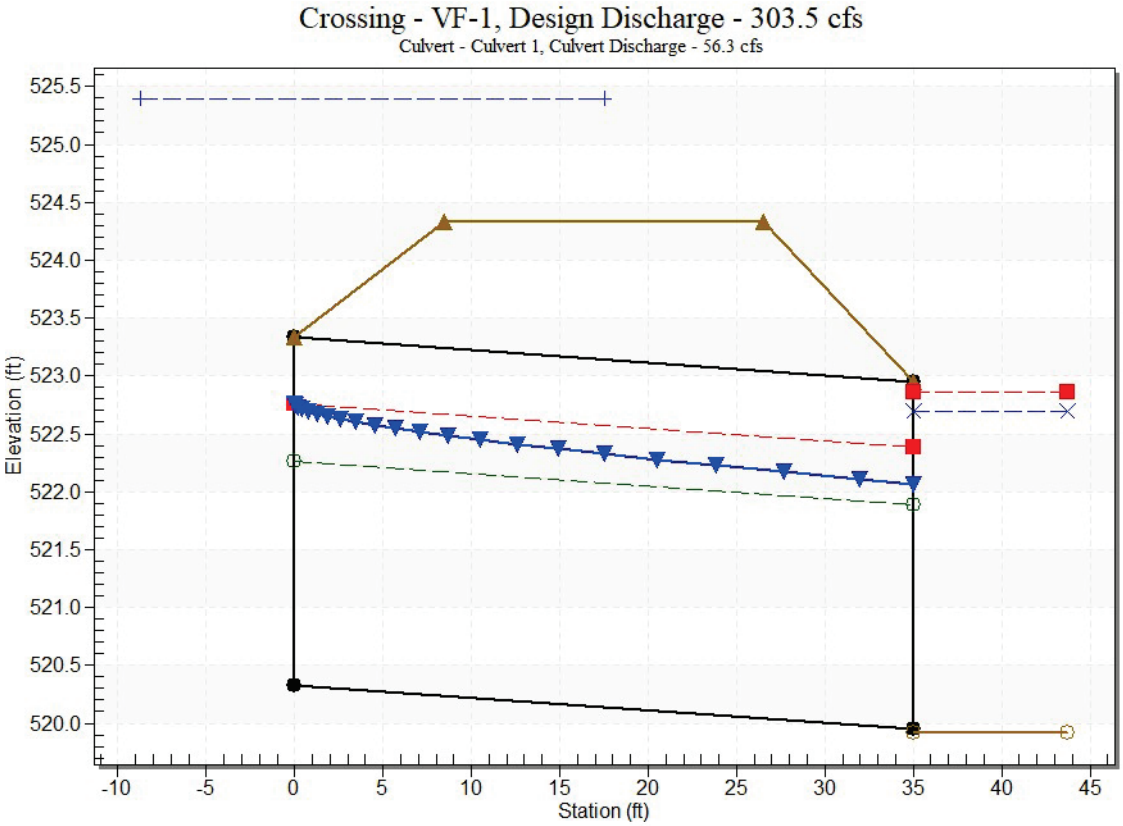
Culvert Length: 35.00 ft,

Culvert Slope: 0.0109

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 520.33 ft

Outlet Station: 35.00 ft

Outlet Elevation: 519.95 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material:

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope (Ke=0.7)

Inlet Depression: None

Tailwater Data for Crossing: VF-1

Table 15 - Downstream Channel Rating Curve (Crossing: VF-1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	519.92	0.00	0.00	0.00	0.00
41.69	521.03	1.11	6.40	2.78	1.37
83.37	521.43	1.51	7.71	3.77	1.43
125.06	521.73	1.81	8.45	4.53	1.47
166.74	522.06	2.14	8.25	5.34	1.46
208.43	522.36	2.44	6.78	6.08	1.40
250.12	522.46	2.54	7.06	6.35	1.42
303.50	522.69	2.77	6.19	6.91	1.38
333.49	522.74	2.82	6.29	7.03	1.38
375.17	522.79	2.87	6.49	7.18	1.39
416.86	522.85	2.93	6.67	7.31	1.40

Tailwater Channel Data - VF-1

Tailwater Channel Option: Irregular Channel

Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	526.13	0.0350
2	0.62	526.12	0.0350
3	1.50	526.11	0.0350
4	2.87	526.06	0.0350
5	3.93	526.04	0.0350
6	5.30	526.00	0.0350
7	5.80	526.01	0.0350
8	7.24	525.97	0.0350
9	8.73	525.94	0.0350
10	9.10	525.91	0.0350
11	10.54	525.88	0.0350
12	11.66	525.87	0.0350
13	12.90	525.87	0.0350
14	13.85	525.86	0.0350
15	14.59	525.86	0.0350
16	16.69	525.87	0.0350
17	17.16	525.86	0.0350
18	17.52	525.86	0.0350

19	20.32	525.88	0.0350
20	20.47	525.88	0.0350
21	20.49	525.88	0.0350
22	23.38	525.83	0.0350
23	23.77	525.82	0.0350
24	24.29	525.81	0.0350
25	26.31	525.76	0.0350
26	27.08	525.75	0.0350
27	28.08	525.74	0.0350
28	29.24	525.73	0.0350
29	30.39	525.72	0.0350
30	31.88	525.67	0.0350
31	32.17	525.68	0.0350
32	33.70	525.62	0.0350
33	35.10	525.55	0.0350
34	35.68	525.54	0.0350
35	37.01	525.48	0.0350
36	38.03	525.47	0.0350
37	39.47	525.46	0.0350
38	40.31	525.45	0.0350
39	40.96	525.45	0.0350
40	43.27	525.45	0.0350
41	43.62	525.45	0.0350
42	43.89	525.45	0.0350
43	46.01	525.44	0.0350
44	46.93	525.44	0.0350
45	47.07	525.43	0.0350
46	49.76	525.36	0.0350
47	50.24	525.35	0.0350
48	50.86	525.34	0.0350
49	52.69	525.31	0.0350
50	53.55	525.30	0.0350
51	54.66	525.31	0.0350
52	55.62	525.29	0.0350
53	56.85	525.31	0.0350
54	58.46	525.25	0.0350
55	58.55	525.31	0.0350
56	60.16	525.25	0.0350
57	61.48	525.24	0.0350
58	62.25	525.24	0.0350
59	63.47	525.24	0.0350
60	64.41	525.25	0.0350
61	66.05	525.27	0.0350
62	66.78	525.28	0.0350
63	67.34	525.28	0.0350
64	69.85	525.37	0.0350
65	70.08	525.37	0.0350
66	70.27	525.38	0.0350
67	71.70	525.38	0.0350
68	73.20	525.36	0.0350

69	73.39	525.35	0.0350
70	73.64	525.34	0.0350
71	76.13	525.29	0.0350
72	76.70	525.26	0.0350
73	77.44	525.23	0.0350
74	79.06	525.12	0.0350
75	80.01	525.08	0.0350
76	81.24	525.04	0.0350
77	81.99	525.03	0.0350
78	83.32	524.99	0.0350
79	84.92	524.97	0.0350
80	85.03	524.95	0.0350
81	86.62	524.93	0.0350
82	87.85	524.93	0.0350
83	88.83	524.93	0.0350
84	89.93	524.93	0.0350
85	90.78	524.91	0.0350
86	92.63	524.94	0.0350
87	93.24	524.93	0.0350
88	93.71	524.92	0.0350
89	96.42	524.91	0.0350
90	96.55	524.90	0.0350
91	96.64	524.90	0.0350
92	97.39	524.90	0.0350
93	99.57	524.84	0.0350
94	99.86	524.83	0.0350
95	100.22	524.83	0.0350
96	102.51	524.71	0.0350
97	103.16	524.70	0.0350
98	104.02	524.66	0.0350
99	105.44	524.58	0.0350
100	106.47	524.53	0.0350
101	107.81	524.51	0.0350
102	108.37	524.43	0.0350
103	109.78	524.41	0.0350
104	109.83	524.40	0.0350
105	111.11	524.23	0.0350
106	112.42	524.19	0.0350
107	113.27	524.09	0.0350
108	113.67	524.03	0.0350
109	114.75	524.00	0.0350
110	116.22	523.89	0.0350
111	116.77	523.86	0.0350
112	117.93	523.76	0.0350
113	118.78	523.67	0.0350
114	120.26	523.56	0.0350
115	121.34	523.39	0.0350
116	123.45	523.44	0.0350
117	123.75	523.41	0.0350
118	123.90	523.39	0.0350

119	124.28	523.41	0.0350
120	126.45	523.36	0.0350
121	127.25	523.34	0.0350
122	128.96	523.30	0.0350
123	129.01	523.11	0.0350
124	130.74	523.14	0.0350
125	131.57	523.05	0.0350
126	133.82	523.12	0.0350
127	134.24	523.11	0.0350
128	134.48	523.11	0.0350
129	136.68	522.81	0.0350
130	137.73	522.85	0.0350
131	139.24	522.71	0.0350
132	139.99	522.79	0.0350
133	141.22	522.71	0.0350
134	141.80	522.66	0.0350
135	143.36	522.39	0.0350
136	144.72	522.10	0.0350
137	145.51	521.80	0.0350
138	146.91	521.38	0.0350
139	148.21	520.87	0.0350
140	149.47	520.35	0.0350
141	151.02	520.18	0.0350
142	151.71	519.95	0.0350
143	152.02	519.92	0.0350
144	152.89	519.99	0.0350
145	155.20	520.33	0.0350
146	156.54	520.73	0.0350
147	157.14	520.95	0.0350
148	158.69	521.40	0.0350
149	159.70	521.69	0.0350
150	162.05	521.94	0.0350
151	162.19	521.97	0.0350
152	162.25	521.98	0.0350
153	162.43	521.98	0.0350
154	164.81	522.02	0.0350
155	165.68	522.08	0.0350
156	167.37	522.10	0.0350
157	167.57	522.09	0.0350
158	169.18	522.10	0.0350
159	169.92	522.11	0.0350
160	171.96	522.13	0.0350
161	172.67	522.12	0.0350
162	173.08	522.14	0.0350
163	175.04	522.06	0.0350
164	175.05	522.06	0.0350
165	176.10	522.12	0.0350
166	177.38	522.13	0.0350
167	178.06	522.13	0.0350
168	179.40	522.15	0.0350

169	181.00	522.20	0.0350
170	181.08	522.19	0.0350
171	182.69	522.25	0.0350
172	184.10	522.30	0.0350
173	184.63	522.32	0.0350
174	185.98	522.36	0.0350
175	187.12	522.41	0.0350
176	188.25	522.43	0.0350
177	189.28	522.48	0.0350
178	190.13	522.49	0.0350
179	191.87	522.53	0.0350
180	192.57	522.54	0.0350
181	193.15	522.54	0.0350
182	195.50	522.54	0.0350
183	195.87	522.54	0.0350
184	196.17	522.54	0.0350
185	199.12	522.55	0.0350
186	199.16	522.55	0.0350
187	199.19	522.55	0.0350
188	199.56	522.55	0.0350
189	200.87	522.56	0.0350
190	202.32	522.57	0.0350
191	202.45	522.57	0.0350
192	202.58	522.57	0.0350
193	205.59	522.58	0.0350
194	205.73	522.58	0.0350
195	205.87	522.58	0.0350
196	208.85	522.61	0.0350
197	209.01	522.61	0.0350
198	209.17	522.61	0.0350
199	212.12	522.63	0.0350
200	212.29	522.64	0.0350
201	212.47	522.64	0.0350
202	215.38	522.67	0.0350
203	215.57	522.67	0.0350
204	215.76	522.67	0.0350
205	218.65	522.68	0.0350
206	218.85	522.68	0.0350
207	219.06	522.68	0.0350
208	221.92	522.72	0.0350
209	222.13	522.72	0.0350
210	222.36	522.73	0.0350
211	225.18	522.84	0.0350
212	225.42	522.85	0.0350
213	225.65	522.86	0.0350
214	228.45	522.94	0.0350
215	228.70	522.95	0.0350
216	228.95	522.95	0.0350
217	231.71	522.99	0.0350
218	231.98	522.99	0.0350

219	232.25	523.00	0.0350
220	234.98	523.03	0.0350
221	235.26	523.04	0.0350
222	235.54	523.05	0.0350
223	238.24	523.14	0.0350
224	238.54	523.16	0.0350
225	238.84	523.17	0.0350
226	241.51	523.27	0.0350
227	241.82	523.28	0.0350
228	242.13	523.30	0.0350
229	244.77	523.47	0.0350
230	245.10	523.49	0.0350
231	245.43	523.51	0.0350
232	248.04	523.74	0.0350
233	248.38	523.76	0.0350
234	248.73	523.78	0.0350
235	251.30	523.93	0.0350
236	251.66	523.95	0.0350
237	252.02	523.96	0.0350
238	254.57	524.05	0.0350
239	254.94	524.06	0.0350
240	255.32	524.07	0.0350
241	257.83	524.14	0.0350
242	258.22	524.15	0.0350
243	258.62	524.15	0.0350
244	261.10	524.18	0.0350
245	261.50	524.18	0.0350
246	261.91	524.18	0.0350
247	264.36	524.19	0.0350
248	264.79	524.19	0.0350
249	265.21	524.20	0.0350
250	267.63	524.21	0.0350
251	268.07	524.22	0.0350
252	268.51	524.23	0.0350
253	270.89	524.30	0.0350
254	271.35	524.31	0.0350
255	271.80	524.33	0.0350
256	274.16	524.42	0.0350
257	274.63	524.44	0.0350
258	275.10	524.46	0.0350
259	277.43	524.57	0.0350
260	277.91	524.60	0.0350
261	278.40	524.62	0.0350
262	280.69	524.72	0.0350
263	281.19	524.74	0.0350
264	281.69	524.76	0.0350
265	283.96	524.83	0.0350
266	284.47	524.85	0.0350
267	284.99	524.88	0.0350
268	287.22	524.93	0.0350

269	287.75	524.96	0.0350
270	288.29	524.97	0.0350
271	290.49	525.01	0.0350
272	291.03	525.02	0.0350
273	291.58	525.02	0.0350
274	293.75	525.03	0.0350
275	294.31	525.03	0.0350
276	294.88	525.03	0.0350
277	297.02	525.01	0.0350
278	297.59	525.00	0.0350
279	298.18	525.02	0.0350
280	299.05	525.02	0.0000

Roadway Data for Crossing: VF-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 80.00 ft

Crest Elevation: 524.33 ft

Roadway Surface: Gravel

Roadway Top Width: 18.00 ft

Attachment B- 3: Hydraulic Toolbox Design Output Report

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Tuesday, July 30, 2024

Project Units: U.S. Customary Units

Notes:

Channel Analysis: LWC-3

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	531.85	0.1247
0.31	531.85	0.1247
1.79	531.85	0.1247
3.10	531.85	0.1247
3.95	531.85	0.1247
4.25	531.84	0.1247
4.87	531.83	0.1247
6.71	531.80	0.1247
7.59	531.79	0.1247
9.16	531.78	0.1247
10.12	531.76	0.1247
11.23	531.75	0.1247
11.62	531.75	0.1247
12.42	531.75	0.1247
14.07	531.74	0.1247
14.87	531.73	0.1247
16.53	531.71	0.1247
17.14	531.70	0.1247
18.51	531.69	0.1247
18.99	531.68	0.1247
19.98	531.67	0.1247
21.44	531.65	0.1247
22.15	531.65	0.1247
23.90	531.68	0.1247
24.16	531.67	0.1247
25.78	531.69	0.1247
26.35	531.69	0.1247
27.53	531.68	0.1247
28.81	531.68	0.1247
29.42	531.68	0.1247
31.18	531.69	0.1247
31.27	531.71	0.1247
33.06	531.71	0.1247
33.72	531.71	0.1247
35.09	531.73	0.1247
36.18	531.74	0.1247
36.70	531.75	0.1247
38.20	531.74	0.1247
38.63	531.73	0.1247
40.34	531.73	0.1247
41.09	531.73	0.1247
42.64	531.72	0.1247
43.55	531.72	0.1247
43.98	531.72	0.1247
45.22	531.71	0.1247
46.00	531.73	0.1247
47.62	531.71	0.1247
48.46	531.70	0.1247
50.20	531.72	0.1247
50.91	531.72	0.1247
51.26	531.71	0.1247

52.24	531.70	0.1247
53.37	531.67	0.1247
54.90	531.66	0.1247
55.82	531.61	0.1247
57.75	531.56	0.1247
58.28	531.54	0.1247
58.54	531.55	0.1247
59.26	531.51	0.1247
60.74	531.49	0.1247
62.17	531.40	0.1247
63.19	531.39	0.1247
65.31	531.30	0.1247
65.65	531.29	0.1247
65.81	531.28	0.1247
66.28	531.28	0.1247
68.10	531.27	0.1247
69.45	531.26	0.1247
70.56	531.26	0.1247
72.86	531.23	0.1247
73.02	531.23	0.1247
73.09	531.23	0.1247
73.30	531.23	0.1247
75.47	531.24	0.1247
76.73	531.22	0.1247
77.93	531.22	0.1247
80.32	531.19	0.1247
80.37	531.19	0.1247
80.38	531.19	0.1247
80.42	531.19	0.1247
82.84	531.15	0.1247
84.01	531.13	0.1247
85.30	531.09	0.1247
87.34	531.05	0.1247
87.65	531.04	0.1247
87.75	531.04	0.1247
87.97	531.03	0.1247
90.21	531.02	0.1247
91.29	530.96	0.1247
92.66	530.96	0.1247
94.37	530.90	0.1247
94.92	530.90	0.1247
95.12	530.90	0.1247
95.53	530.90	0.1247
97.58	530.90	0.1247
98.56	530.93	0.1247
100.03	530.93	0.1247
101.39	530.92	0.1247
102.20	530.92	0.1247
102.49	530.91	0.1247
103.08	530.89	0.1247
104.94	530.84	0.1247
105.84	530.83	0.1247
107.40	530.83	0.1247
108.41	530.80	0.1247
108.83	530.80	0.1247
109.25	530.80	0.1247
109.70	530.80	0.1247

109.86	530.80	0.1247
110.19	530.80	0.1247
112.32	530.78	0.1247
113.33	530.78	0.1247
114.78	530.81	0.1247
116.18	530.80	0.1247
116.96	530.81	0.1247
117.24	530.81	0.1247
117.82	530.80	0.1247
119.70	530.79	0.1247
120.59	530.80	0.1247
122.16	530.80	0.1247
123.11	530.80	0.1247
124.22	530.80	0.1247
124.62	530.80	0.1247
125.45	530.80	0.1247
127.08	530.78	0.1247
127.85	530.78	0.1247
129.54	530.72	0.1247
130.04	530.74	0.1247
131.48	530.71	0.1247
132.00	530.69	0.1247
133.07	530.67	0.1247
134.46	530.62	0.1247
135.12	530.59	0.1247
136.92	530.49	0.1247
136.97	530.49	0.1247
138.75	530.39	0.1247
139.38	530.36	0.1247
140.70	530.31	0.1247
141.84	530.27	0.1247
142.38	530.25	0.1247
143.91	530.20	0.1247
144.30	530.20	0.1247
144.65	530.18	0.1247
145.88	530.14	0.1247
147.46	530.08	0.1247
147.58	530.05	0.1247
149.16	529.99	0.1247
150.73	529.93	0.1247
150.85	529.91	0.1247
152.43	529.84	0.1247
154.01	529.78	0.1247
154.13	529.77	0.1247
155.71	529.70	0.1247
157.29	529.61	0.1247
157.41	529.61	0.1247
158.99	529.51	0.1247
160.57	529.37	0.1247
160.69	529.38	0.1247
162.27	529.24	0.1247
163.85	529.11	0.1247
163.97	529.11	0.1247
165.55	528.98	0.1247
167.13	528.85	0.1247
167.25	528.86	0.1247
168.83	528.73	0.1247

170.41	528.55	0.1247
170.53	528.57	0.1247
172.10	528.39	0.1247
173.68	528.22	0.1247
173.80	528.23	0.1247
175.38	528.06	0.1247
176.96	527.98	0.1247
177.08	527.97	0.1247
178.66	527.88	0.1247
180.24	527.85	0.1247
180.36	527.82	0.1247
181.94	527.79	0.1247
183.52	527.80	0.1247
183.64	527.76	0.1247
185.22	527.77	0.1247
186.80	527.82	0.1247
186.92	527.82	0.1247
188.50	527.87	0.1247
190.08	527.92	0.1247
190.20	527.91	0.1247
191.78	527.96	0.1247
193.35	527.97	0.1247
193.47	527.96	0.1247
195.05	527.97	0.1247
196.63	527.97	0.1247
196.75	527.97	0.1247
198.33	527.97	0.1247
199.91	527.98	0.1247
200.03	528.00	0.1247
201.61	528.01	0.1247
203.19	527.99	0.1247
203.31	528.03	0.1247
204.89	528.02	0.1247
206.47	527.99	0.1247
206.59	528.05	0.1247
208.17	528.02	0.1247
209.75	528.05	0.1247
209.87	528.10	0.1247
211.45	528.13	0.1247
213.03	528.21	0.1247
213.14	528.21	0.1247
214.72	528.29	0.1247
216.30	528.40	0.1247
216.42	528.30	0.1247
218.00	528.41	0.1247
219.58	528.41	0.1247
219.70	528.35	0.1247
221.28	528.35	0.1247
221.65	528.34	0.1247
222.87	528.30	0.1247
222.97	528.31	0.1247
224.56	528.26	0.1247
226.17	528.26	0.1247
226.22	528.30	0.1247
227.84	528.30	0.1247
229.48	528.36	0.1247
229.48	528.38	0.1247

231.12	528.44	0.1247
232.73	528.48	0.1247
232.78	528.50	0.1247
234.40	528.54	0.1247
235.99	528.56	0.1247
236.08	528.58	0.1247
237.67	528.60	0.1247
239.24	528.64	0.1247
239.38	528.64	0.1247
240.95	528.67	0.1247
242.50	528.69	0.1247
242.69	528.70	0.1247
244.23	528.72	0.1247
245.75	528.73	0.1247
245.99	528.74	0.1247
247.51	528.74	0.1247
249.01	528.76	0.1247
249.29	528.78	0.1247
250.79	528.79	0.1247
252.26	528.83	0.1247
252.60	528.84	0.1247
254.07	528.88	0.1247
255.51	528.94	0.1247
255.90	528.94	0.1247
257.35	529.01	0.1247
258.77	529.08	0.1247
259.20	529.08	0.1247
260.62	529.15	0.1247
262.02	529.23	0.1247
262.51	529.20	0.1247
263.90	529.27	0.1247
265.28	529.35	0.1247
265.81	529.32	0.1247
267.18	529.40	0.1247
268.53	529.47	0.1247
269.11	529.46	0.1247
270.46	529.53	0.1247
271.79	529.58	0.1247
272.42	529.56	0.1247
273.74	529.62	0.1247
275.04	529.65	0.1247
275.72	529.63	0.1247
277.02	529.66	0.1247
278.29	529.67	0.1247
279.02	529.67	0.1247
280.29	529.69	0.1247
281.55	529.70	0.1247
282.32	529.69	0.1247
283.57	529.69	0.1247
284.80	529.65	0.1247
285.63	529.65	0.1247
286.85	529.60	0.1247
288.06	529.54	0.1247
288.93	529.55	0.1247
290.13	529.48	0.1247
291.31	529.46	0.1247
292.23	529.49	0.1247

293.41	529.47	0.1247
294.57	529.48	0.1247
295.54	529.52	0.1247
296.69	529.53	0.1247
297.82	529.55	0.1247
298.84	529.57	0.1247
299.97	529.58	0.1247
301.08	529.61	0.1247
302.14	529.65	0.1247
303.24	529.68	0.1247
304.33	529.71	0.1247
305.45	529.76	0.1247
306.52	529.78	0.1247
307.58	529.80	0.1247
308.75	529.83	0.1247
309.80	529.85	0.1247
310.84	529.87	0.1247
312.05	529.90	0.1247
313.08	529.91	0.1247
314.09	529.93	0.1247
315.36	529.94	0.1247
316.36	529.96	0.1247
317.35	529.97	0.1247
318.66	529.96	0.1247
319.64	529.97	0.1247
320.60	529.97	0.1247
321.96	529.98	0.1247
322.92	529.98	0.1247
323.86	529.99	0.1247
325.26	530.02	0.1247
326.19	530.02	0.1247
327.11	530.03	0.1247
328.57	530.04	0.1247
329.47	530.04	0.1247
330.36	530.04	0.1247
331.87	530.04	0.1247
332.75	530.04	0.1247
333.62	530.05	0.1247
335.17	530.08	0.1247
336.03	530.09	0.1247
336.87	530.10	0.1247
338.48	530.14	0.1247
339.31	530.16	0.1247
340.13	530.17	0.1247
341.78	530.20	0.1247
342.59	530.21	0.1247
343.38	530.22	0.1247
345.08	530.24	0.1247
345.87	530.25	0.1247
346.64	530.26	0.1247
348.39	530.32	0.1247
349.14	530.33	0.1247
349.89	530.35	0.1247
351.69	530.40	0.1247
352.42	530.42	0.1247
353.15	530.44	0.1247
354.99	530.48	0.1247

355.70	530.50	0.1247
356.40	530.51	0.1247
358.30	530.52	0.1247
358.98	530.53	0.1247
359.65	530.53	0.1247
361.60	530.54	0.1247
362.26	530.55	0.1247
362.91	530.56	0.1247
364.90	530.59	0.1247
365.54	530.60	0.1247
366.16	530.61	0.1247
368.20	530.61	0.1247
368.82	530.62	0.1247
369.42	530.62	0.1247
371.51	530.61	0.1247
372.09	530.61	0.1247
372.67	530.62	0.1247
374.81	530.65	0.1247
375.37	530.66	0.1247
375.93	530.66	0.1247
378.11	530.71	0.1247
378.65	530.72	0.1247
379.18	530.72	0.1247
381.42	530.77	0.1247
381.93	530.77	0.1247
382.43	530.77	0.1247
384.72	530.81	0.1247
385.21	530.80	0.1247
385.69	530.81	0.1247
388.02	530.86	0.1247
388.49	530.86	0.1247
388.94	530.87	0.1247
391.33	530.90	0.1247
391.76	530.91	0.1247
392.20	530.92	0.1247
394.63	530.94	0.1247
395.04	530.95	0.1247
395.45	530.96	0.1247
397.93	530.99	0.1247
398.32	530.99	0.1247
398.71	531.00	0.1247
401.23	531.01	0.1247
401.60	531.02	0.1247
401.96	531.02	0.1247
404.54	531.05	0.1247
404.88	531.05	0.1247
405.22	531.06	0.1247
407.84	531.08	0.1247
408.16	531.08	0.1247
408.47	531.09	0.1247
411.14	531.10	0.1247
411.44	531.11	0.1247
411.72	531.11	0.1247
414.45	531.16	0.1247
414.71	531.16	0.1247
414.98	531.16	0.1247
417.75	531.22	0.1247

417.99	531.23	0.1247
418.23	531.23	0.1247
421.05	531.28	0.1247
421.27	531.28	0.1247
421.49	531.29	0.1247
424.36	531.31	0.1247
424.55	531.31	0.1247
424.74	531.31	0.1247
427.66	531.33	0.1247
427.83	531.33	0.1247
428.00	531.33	0.1247
429.04	531.35	-----

Longitudinal Slope: 0.0260 ft/ft

Lining Type: User Defined

Flow: 67.5000 cfs

Result Parameters

Depth: 0.5596 ft

Area of Flow: 14.5423 ft^2

Wetted Perimeter: 48.8984 ft

Hydraulic Radius: 0.2974 ft

Average Velocity: 4.6416 ft/s

Top Width: 48.8011 ft

Froude Number: 1.4984

Critical Depth: 0.6654 ft

Critical Velocity: 3.3288 ft/s

Critical Slope: 0.0111 ft/ft

Critical Top Width: 58.93 ft

Calculated Max Shear Stress: 0.9079 lb/ft^2

Calculated Avg Shear Stress: 0.4825 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0230

Channel Analysis: LWC-4

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	535.73	0.5235
0.38	535.73	0.5235
2.71	535.62	0.5235
3.16	535.60	0.5235
3.59	535.58	0.5235
6.06	535.49	0.5235
6.44	535.48	0.5235
6.80	535.46	0.5235
9.41	535.34	0.5235
9.72	535.33	0.5235
10.01	535.32	0.5235
12.77	535.21	0.5235
13.00	535.20	0.5235
13.22	535.19	0.5235
16.12	535.12	0.5235
16.28	535.11	0.5235
16.43	535.11	0.5235
19.47	535.04	0.5235
19.56	535.04	0.5235
19.64	535.04	0.5235
22.82	534.99	0.5235
22.83	534.99	0.5235
22.85	534.99	0.5235
23.73	534.97	0.5235
26.06	534.93	0.5235
26.11	534.93	0.5235
26.17	534.93	0.5235
29.28	534.84	0.5235
29.39	534.83	0.5235
29.52	534.83	0.5235
32.49	534.78	0.5235
32.67	534.77	0.5235
32.87	534.77	0.5235
35.70	534.72	0.5235
35.95	534.71	0.5235
36.22	534.71	0.5235
38.91	534.64	0.5235
39.23	534.63	0.5235
39.57	534.63	0.5235
42.12	534.57	0.5235
42.51	534.56	0.5235
42.92	534.55	0.5235
45.33	534.50	0.5235
45.79	534.50	0.5235
46.27	534.48	0.5235
48.54	534.44	0.5235
49.07	534.42	0.5235
49.62	534.41	0.5235
51.75	534.39	0.5235
52.35	534.38	0.5235
52.97	534.38	0.5235

54.97	534.39	0.5235
55.63	534.39	0.5235
56.32	534.40	0.5235
58.18	534.40	0.5235
58.91	534.40	0.5235
59.67	534.39	0.5235
61.39	534.36	0.5235
62.19	534.34	0.5235
63.02	534.32	0.5235
64.60	534.27	0.5235
65.46	534.25	0.5235
66.37	534.23	0.5235
67.81	534.20	0.5235
68.74	534.18	0.5235
69.72	534.17	0.5235
71.02	534.14	0.5235
72.02	534.12	0.5235
73.07	534.10	0.5235
74.23	534.07	0.5235
75.30	534.04	0.5235
76.42	534.00	0.5235
77.44	533.95	0.5235
78.58	533.91	0.5235
79.77	533.86	0.5235
80.65	533.78	0.5235
81.86	533.73	0.5235
83.12	533.68	0.5235
83.87	533.63	0.5235
85.14	533.58	0.5235
86.47	533.53	0.5235
87.08	533.51	0.5235
88.42	533.46	0.5235
89.82	533.41	0.5235
90.29	533.39	0.5235
91.70	533.34	0.5235
93.17	533.30	0.5235
93.50	533.28	0.5235
94.98	533.24	0.5235
96.52	533.22	0.5235
96.71	533.23	0.5235
98.26	533.21	0.5235
99.87	533.19	0.5235
99.92	533.21	0.5235
101.54	533.19	0.5235
103.13	533.20	0.5235
103.22	533.20	0.5235
104.81	533.21	0.5235
106.34	533.24	0.5235
106.57	533.24	0.5235
108.09	533.26	0.5235
109.55	533.27	0.5235
109.92	533.27	0.5235
111.37	533.27	0.5235
112.77	533.29	0.5235
113.27	533.27	0.5235
114.65	533.28	0.5235
115.98	533.29	0.5235

116.62	533.28	0.5235
117.93	533.28	0.5235
119.19	533.29	0.5235
119.97	533.27	0.5235
121.21	533.28	0.5235
122.40	533.25	0.5235
123.32	533.20	0.5235
124.49	533.17	0.5235
125.61	533.10	0.5235
126.67	533.01	0.5235
127.77	532.94	0.5235
128.82	532.91	0.5235
130.02	532.88	0.5235
131.05	532.86	0.5235
132.03	532.86	0.5235
133.37	532.91	0.5235
134.33	532.92	0.5235
135.24	532.90	0.5235
136.72	532.92	0.5235
137.61	532.91	0.5235
138.45	532.90	0.5235
140.07	532.88	0.5235
140.89	532.87	0.5235
141.67	532.89	0.5235
143.42	532.90	0.5235
144.16	532.91	0.5235
144.88	532.92	0.5235
146.77	532.93	0.5235
147.44	532.93	0.5235
148.09	532.93	0.5235
150.12	532.89	0.5235
150.72	532.88	0.5235
151.30	532.86	0.5235
153.47	532.82	0.5235
154.00	532.80	0.5235
154.51	532.77	0.5235
156.82	532.67	0.5235
157.28	532.64	0.5235
157.72	532.60	0.5235
160.17	532.38	0.5235
160.56	532.35	0.5235
160.93	532.31	0.5235
163.52	532.04	0.5235
163.84	532.01	0.5235
164.14	531.98	0.5235
166.87	531.78	0.5235
167.12	531.76	0.5235
167.36	531.75	0.5235
170.22	531.63	0.5235
170.40	531.62	0.5235
170.57	531.61	0.5235
173.57	531.47	0.5235
173.68	531.46	0.5235
173.78	531.46	0.5235
176.92	531.38	0.5235
176.96	531.38	0.5235
176.99	531.38	0.5235

178.51	531.39	0.5235
180.20	531.40	0.5235
180.24	531.40	0.5235
180.27	531.40	0.5235
183.41	531.47	0.5235
183.51	531.47	0.5235
183.62	531.47	0.5235
186.62	531.56	0.5235
186.79	531.56	0.5235
186.97	531.57	0.5235
189.83	531.69	0.5235
190.07	531.69	0.5235
190.32	531.71	0.5235
193.04	531.84	0.5235
193.35	531.86	0.5235
193.67	531.88	0.5235
196.26	531.99	0.5235
196.63	532.01	0.5235
197.02	532.02	0.5235
199.47	532.11	0.5235
199.91	532.12	0.5235
200.37	532.12	0.5235
202.68	532.17	0.5235
203.19	532.17	0.5235
203.72	532.16	0.5235
205.89	532.19	0.5235
206.47	532.18	0.5235
207.07	532.17	0.5235
209.10	532.17	0.5235
209.75	532.16	0.5235
210.42	532.15	0.5235
212.31	532.08	0.5235
213.03	532.07	0.5235
213.77	532.05	0.5235
215.52	531.96	0.5235
216.31	531.93	0.5235
217.12	531.88	0.5235
218.73	531.77	0.5235
219.59	531.72	0.5235
220.47	531.66	0.5235
221.94	531.54	0.5235
222.86	531.48	0.5235
223.82	531.43	0.5235
225.16	531.31	0.5235
226.14	531.26	0.5235
227.18	531.23	0.5235
228.37	531.14	0.5235
229.42	531.11	0.5235
230.53	531.08	0.5235
231.58	531.05	0.5235
232.70	531.02	0.5235
233.88	530.98	0.5235
234.79	530.97	0.5235
235.98	530.93	0.5235
237.23	530.94	0.5235
238.00	530.92	0.5235
239.26	530.93	0.5235

240.58	530.97	0.5235
241.21	530.96	0.5235
242.54	531.00	0.5235
243.93	531.01	0.5235
244.42	531.03	0.5235
245.82	531.03	0.5235
247.28	531.00	0.5235
247.63	531.00	0.5235
249.10	530.97	0.5235
250.63	530.92	0.5235
250.84	530.94	0.5235
252.38	530.89	0.5235
253.98	530.85	0.5235
254.06	530.88	0.5235
255.66	530.83	0.5235
257.27	530.78	0.5235
257.33	530.78	0.5235
258.94	530.73	0.5235
260.48	530.67	0.5235
260.68	530.63	0.5235
262.22	530.57	0.5235
263.69	530.50	0.5235
264.03	530.44	0.5235
265.49	530.38	0.5235
266.90	530.30	0.5235
267.38	530.28	0.5235
268.77	530.20	0.5235
270.11	530.16	0.5235
270.73	530.14	0.5235
272.05	530.09	0.5235
273.32	530.07	0.5235
274.08	530.00	0.5235
275.33	529.98	0.5235
276.53	530.03	0.5235
277.43	530.11	0.5235
278.61	530.16	0.5235
279.75	530.29	0.5235
280.78	530.52	0.5235
281.89	530.65	0.5235
282.96	530.71	0.5235
284.13	530.83	0.5235
285.17	530.89	0.5235
286.17	530.91	0.5235
287.48	530.93	0.5235
288.45	530.95	0.5235
289.38	530.98	0.5235
290.83	531.00	0.5235
291.73	531.03	0.5235
292.59	531.03	0.5235
294.18	530.95	0.5235
295.01	530.95	0.5235
295.80	530.93	0.5235
297.53	530.82	0.5235
298.29	530.80	0.5235
299.01	530.79	0.5235
300.88	530.73	0.5235
301.57	530.72	0.5235

302.22	530.70	0.5235
304.23	530.64	0.5235
304.84	530.62	0.5235
305.43	530.60	0.5235
307.58	530.58	0.5235
308.12	530.56	0.5235
308.65	530.54	0.5235
310.93	530.49	0.5235
311.40	530.47	0.5235
311.86	530.44	0.5235
314.28	530.28	0.5235
314.68	530.26	0.5235
315.07	530.23	0.5235
317.63	530.05	0.5235
317.96	530.03	0.5235
318.28	530.01	0.5235
320.98	529.83	0.5235
321.24	529.82	0.5235
321.49	529.81	0.5235
324.33	529.66	0.5235
324.52	529.65	0.5235
324.70	529.65	0.5235
327.68	529.53	0.5235
327.80	529.52	0.5235
327.91	529.52	0.5235
331.03	529.38	0.5235
331.08	529.38	0.5235
331.12	529.38	0.5235
333.29	529.29	0.5235
334.33	529.25	0.5235
334.36	529.25	0.5235
334.38	529.25	0.5235
336.42	529.16	0.5235
337.30	529.13	0.5235
337.74	529.11	0.5235
338.86	529.06	0.5235
339.79	529.05	0.5235
341.31	528.98	0.5235
342.29	528.94	0.5235
344.58	528.86	0.5235
344.79	528.86	0.5235
344.88	528.85	0.5235
345.10	528.85	0.5235
347.28	528.82	0.5235
348.44	528.79	0.5235
349.78	528.76	0.5235
351.34	528.70	0.5235
352.01	528.68	0.5235
352.28	528.67	0.5235
352.90	528.64	0.5235
354.77	528.59	0.5235
355.58	528.58	0.5235
357.27	528.58	0.5235
357.59	528.58	0.5235
359.14	528.59	0.5235
359.77	528.58	0.5235
361.22	528.56	0.5235

362.26	528.55	0.5235
362.71	528.55	0.5235
363.83	528.54	0.5235
364.76	528.53	0.5235
366.28	528.52	0.5235
367.26	528.52	0.5235
368.98	528.53	0.5235
369.26	528.53	0.5235
369.71	528.55	0.5235
370.33	528.57	0.5235
372.05	528.64	0.5235
373.31	528.70	0.5235
374.40	528.76	0.5235
375.90	528.86	0.5235
376.75	528.91	0.5235
377.36	528.95	0.5235
379.10	529.07	0.5235
381.26	529.17	0.5235
381.42	529.18	0.5235
381.44	529.18	0.5235
381.48	529.19	0.5235
383.79	529.33	0.5235
385.47	529.40	0.5235
386.14	529.43	0.5235
387.05	529.50	0.5235
388.48	529.62	0.5235
389.53	529.68	0.5235
390.83	529.75	0.5235
392.62	529.86	0.5235
393.18	529.88	0.5235
393.58	529.91	0.5235
395.52	529.98	0.5235
396.12	530.04	0.5235
397.63	530.12	0.5235
397.87	530.13	0.5235
398.20	530.16	0.5235
400.22	530.26	0.5235
401.69	530.34	0.5235
402.56	530.34	0.5235
403.77	530.36	0.5235
404.91	530.35	0.5235
405.74	530.38	0.5235
407.26	530.40	0.5235
409.35	530.49	0.5235
409.61	530.50	0.5235
409.79	530.51	0.5235
410.99	530.53	0.5235
411.95	530.49	0.5235
413.85	530.58	0.5235
414.30	530.57	0.5235
414.92	530.56	0.5235
416.65	530.46	0.5235
417.90	530.41	0.5235
418.99	530.34	0.5235
420.49	530.25	0.5235
421.34	530.18	0.5235
421.96	530.16	0.5235

423.69	530.03	0.5235
425.85	529.92	0.5235
426.01	529.91	0.5235
426.03	529.91	0.5235
426.07	529.91	0.5235
428.38	529.75	0.5235
430.06	529.66	0.5235
430.73	529.61	0.5235
431.64	529.55	0.5235
433.07	529.44	0.5235
434.12	529.40	0.5235
435.42	529.34	0.5235
437.22	529.26	0.5235
437.77	529.23	0.5235
438.17	529.22	0.5235
440.12	529.13	0.5235
440.72	529.12	0.5235
442.22	529.06	0.5235
442.46	529.06	0.5235
442.79	529.05	0.5235
444.81	529.03	0.5235
446.28	529.04	0.5235
447.16	529.07	0.5235
448.36	529.09	0.5235
449.50	529.12	0.5235
450.33	529.15	0.5235
451.85	529.25	0.5235
453.94	529.37	0.5235
454.20	529.39	0.5235
454.39	529.41	0.5235
455.58	529.51	0.5235
456.54	529.58	0.5235
458.44	529.74	0.5235
458.89	529.79	0.5235
459.51	529.84	0.5235
461.24	529.98	0.5235
462.49	530.11	0.5235
463.58	530.22	0.5235
465.09	530.38	0.5235
465.93	530.46	0.5235
466.55	530.51	0.5235
468.28	530.64	0.5235
470.44	530.82	0.5235
470.60	530.83	0.5235
470.63	530.83	0.5235
470.66	530.83	0.5235
472.97	530.95	0.5235
474.65	531.03	0.5235
475.32	531.07	0.5235
476.23	531.11	0.5235
477.67	531.20	0.5235
478.71	531.21	0.5235
480.01	531.26	0.5235
481.81	531.29	0.5235
482.36	531.32	0.5235
482.76	531.33	0.5235
484.71	531.47	0.5235

485.31	531.41	0.5235
486.82	531.48	0.5235
487.05	531.48	0.5235
487.38	531.48	0.5235
489.40	531.51	0.5235
490.87	531.54	0.5235
491.75	531.55	0.5235
492.96	531.53	0.5235
494.10	531.52	0.5235
494.92	531.52	0.5235
496.44	531.54	0.5235
498.53	531.46	0.5235
498.79	531.45	0.5235
498.98	531.45	0.5235
500.17	531.44	0.5235
501.14	531.42	0.5235
503.03	531.42	0.5235
503.48	531.42	0.5235
504.10	531.41	0.5235
505.83	531.37	0.5235
507.09	531.32	0.5235
508.18	531.28	0.5235
509.68	531.27	0.5235
510.52	531.27	0.5235
511.14	531.25	0.5235
512.87	531.21	0.5235
515.04	531.18	0.5235
515.19	531.18	0.5235
515.22	531.18	0.5235
515.25	531.18	0.5235
517.56	531.12	0.5235
519.25	531.09	0.5235
519.91	531.08	0.5235
520.83	531.08	0.5235
522.26	531.08	0.5235
523.30	531.08	0.5235
524.61	531.08	0.5235
526.40	531.08	0.5235
526.95	531.08	0.5235
527.35	531.07	0.5235
529.30	531.04	0.5235
529.90	531.08	0.5235
531.41	531.08	0.5235
531.65	531.08	0.5235
531.97	531.08	0.5235
533.99	531.08	0.5235
535.46	531.06	0.5235
536.34	531.06	0.5235
537.55	531.06	0.5235
538.69	531.05	0.5235
539.52	531.05	0.5235
541.03	531.04	0.5235
543.12	531.02	0.5235
543.38	531.02	0.5235
543.45	531.02	-----

Longitudinal Slope: 0.0430 ft/ft

Lining Type: User Defined

Flow: 10.4000 cfs

Result Parameters

Depth: 0.8253 ft

Area of Flow: 30.7230 ft^2

Wetted Perimeter: 70.4556 ft

Hydraulic Radius: 0.4361 ft

Average Velocity: 0.3385 ft/s

Top Width: 70.4027 ft

Froude Number: 0.0903

Critical Depth: 0.2534 ft

Critical Velocity: 2.3618 ft/s

Critical Slope: 7.1712 ft/ft

Critical Top Width: 25.42 ft

Calculated Max Shear Stress: 2.2144 lb/ft^2

Calculated Avg Shear Stress: 1.1700 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.5235

Channel Analysis: LWC-5

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	530.93	0.0971
1.08	530.93	0.0971
1.76	530.93	0.0971
2.30	530.93	0.0971
4.10	530.92	0.0971
6.39	530.87	0.0971
6.43	530.87	0.0971
6.47	530.87	0.0971
6.72	530.87	0.0971
8.77	530.87	0.0971
10.63	530.83	0.0971
11.10	530.83	0.0971
11.71	530.82	0.0971
13.44	530.83	0.0971
14.79	530.82	0.0971
15.78	530.82	0.0971
17.03	530.80	0.0971
18.11	530.80	0.0971
18.96	530.80	0.0971
20.45	530.82	0.0971
22.34	530.81	0.0971
22.78	530.82	0.0971
23.12	530.82	0.0971
25.12	530.85	0.0971
25.94	530.85	0.0971
27.29	530.86	0.0971
27.45	530.86	0.0971
27.66	530.86	0.0971
29.79	530.89	0.0971
31.45	530.87	0.0971
32.12	530.87	0.0971
32.98	530.87	0.0971
34.46	530.88	0.0971
35.62	530.90	0.0971
36.79	530.90	0.0971
38.29	530.89	0.0971
39.13	530.88	0.0971
39.78	530.88	0.0971
41.46	530.87	0.0971
43.61	530.85	0.0971
43.80	530.85	0.0971
43.95	530.85	0.0971
45.16	530.81	0.0971
46.13	530.80	0.0971
48.11	530.72	0.0971
48.47	530.72	0.0971
48.93	530.71	0.0971
50.80	530.68	0.0971
52.28	530.63	0.0971
53.14	530.61	0.0971
54.24	530.57	0.0971

55.47	530.52	0.0971
56.44	530.47	0.0971
57.81	530.38	0.0971
59.56	530.31	0.0971
60.15	530.29	0.0971
60.60	530.25	0.0971
62.48	530.14	0.0971
64.39	529.91	0.0971
64.77	529.88	0.0971
64.82	529.87	0.0971
64.88	529.87	0.0971
67.15	529.70	0.0971
68.93	529.53	0.0971
69.49	529.49	0.0971
70.19	529.42	0.0971
71.82	529.29	0.0971
73.10	529.18	0.0971
74.16	529.10	0.0971
75.51	529.00	0.0971
76.49	528.92	0.0971
77.26	528.86	0.0971
78.83	528.73	0.0971
80.82	528.60	0.0971
81.16	528.58	0.0971
81.43	528.56	0.0971
83.50	528.47	0.0971
83.61	528.46	0.0971
85.59	528.36	0.0971
85.83	528.35	0.0971
86.14	528.35	0.0971
88.17	528.33	0.0971
89.76	528.27	0.0971
90.50	528.25	0.0971
91.46	528.22	0.0971
92.84	528.18	0.0971
93.92	528.13	0.0971
95.17	528.09	0.0971
96.77	528.03	0.0971
97.51	528.00	0.0971
98.09	527.99	0.0971
99.84	527.97	0.0971
102.09	527.97	0.0971
102.18	527.97	0.0971
102.25	527.97	0.0971
102.83	527.98	0.0971
104.52	527.99	0.0971
106.41	528.04	0.0971
106.85	528.05	0.0971
107.41	528.07	0.0971
108.62	528.11	0.0971
109.18	528.13	0.0971
111.05	528.20	0.0971
111.51	528.21	0.0971
111.89	528.22	0.0971
113.84	528.25	0.0971
115.74	528.30	0.0971
116.13	528.31	0.0971

116.17	528.31	0.0971
116.22	528.31	0.0971
118.50	528.40	0.0971
120.37	528.51	0.0971
120.83	528.54	0.0971
121.39	528.57	0.0971
123.16	528.69	0.0971
124.61	528.78	0.0971
125.49	528.85	0.0971
126.56	528.91	0.0971
127.82	528.97	0.0971
128.85	529.05	0.0971
130.15	529.15	0.0971
131.73	529.23	0.0971
132.48	529.26	0.0971
133.09	529.29	0.0971
134.81	529.36	0.0971
136.90	529.45	0.0971
137.14	529.46	0.0971
137.33	529.47	0.0971
139.32	529.61	0.0971
139.47	529.62	0.0971
141.57	529.76	0.0971
141.80	529.78	0.0971
142.07	529.79	0.0971
144.13	529.93	0.0971
145.82	530.02	0.0971
146.46	530.05	0.0971
147.24	530.08	0.0971
148.79	530.14	0.0971
150.06	530.18	0.0971
151.12	530.21	0.0971
152.41	530.27	0.0971
153.44	530.30	0.0971
154.30	530.30	0.0971
155.77	530.30	0.0971
157.58	530.30	0.0971
158.10	530.31	0.0971
158.54	530.31	0.0971
160.43	530.31	0.0971
162.75	530.28	0.0971
162.76	530.28	0.0971
162.78	530.28	0.0971
162.91	530.28	0.0971
165.09	530.26	0.0971
167.02	530.28	0.0971
167.42	530.28	0.0971
167.92	530.29	0.0971
169.75	530.29	0.0971
171.26	530.30	0.0971
172.08	530.30	0.0971
173.09	530.31	0.0971
174.41	530.32	0.0971
175.50	530.33	0.0971
176.74	530.34	0.0971
178.26	530.36	0.0971
179.07	530.38	0.0971

179.74	530.38	0.0971
181.40	530.40	0.0971
183.42	530.41	0.0971
183.73	530.41	0.0971
183.98	530.41	0.0971
186.06	530.41	0.0971
186.50	530.43	0.0971
188.22	530.44	0.0971
188.39	530.44	0.0971
188.59	530.45	0.0971
190.72	530.48	0.0971
192.46	530.51	0.0971
193.05	530.52	0.0971
193.76	530.52	0.0971
195.38	530.53	0.0971
196.70	530.53	0.0971
197.70	530.52	0.0971
198.93	530.54	0.0971
200.03	530.55	0.0971
200.94	530.55	0.0971
202.36	530.55	0.0971
204.10	530.56	0.0971
204.69	530.57	0.0971
205.18	530.57	0.0971
207.02	530.56	0.0971
209.27	530.53	0.0971
209.35	530.53	0.0971
209.42	530.53	0.0971
210.08	530.52	0.0971
211.68	530.51	0.0971
213.66	530.51	0.0971
214.01	530.51	0.0971
214.44	530.52	0.0971
216.34	530.53	0.0971
217.90	530.50	0.0971
218.67	530.48	0.0971
219.61	530.46	0.0971
221.00	530.45	0.0971
222.14	530.44	0.0971
223.33	530.45	0.0971
224.78	530.44	0.0971
225.66	530.44	0.0971
226.38	530.45	0.0971
227.99	530.49	0.0971
229.95	530.53	0.0971
230.32	530.53	0.0971
230.62	530.53	0.0971
232.65	530.54	0.0971
233.67	530.56	0.0971
234.86	530.57	0.0971
234.98	530.57	0.0971
235.12	530.57	0.0971
237.31	530.59	0.0971
239.10	530.59	0.0971
239.64	530.59	0.0971
240.29	530.58	0.0971
241.97	530.56	0.0971

243.34	530.54	0.0971
244.29	530.53	0.0971
245.46	530.52	0.0971
246.62	530.51	0.0971
247.58	530.49	0.0971
248.95	530.48	0.0971
250.63	530.46	0.0971
251.28	530.45	0.0971
251.82	530.45	0.0971
253.61	530.42	0.0971
255.80	530.39	0.0971
255.94	530.39	0.0971
256.06	530.39	0.0971
257.25	530.37	0.0971
258.27	530.36	0.0971
260.30	530.33	0.0971
260.60	530.33	0.0971
260.97	530.33	0.0971
262.93	530.35	0.0971
264.54	530.36	0.0971
265.26	530.37	0.0971
266.14	530.38	0.0971
267.59	530.40	0.0971
268.78	530.42	0.0971
269.92	530.43	0.0971
271.31	530.43	0.0971
272.25	530.43	0.0971
272.68	530.43	0.0971
273.13	530.42	0.0971
274.59	530.44	0.0971
275.67	530.45	0.0971
276.94	530.47	0.0971
278.67	530.52	0.0971
279.28	530.55	0.0971
279.73	530.57	0.0971
281.63	530.66	0.0971
282.65	530.69	0.0971
283.80	530.74	0.0971
283.97	530.75	0.0971
284.21	530.76	0.0971
286.32	530.79	0.0971
287.86	530.84	0.0971
288.66	530.86	0.0971
289.76	530.90	0.0971
291.01	530.93	0.0971
291.93	530.94	0.0971
293.36	530.96	0.0971
295.30	531.02	0.0971
295.70	531.03	0.0971
295.99	531.04	0.0971
297.89	531.05	0.0971
298.05	531.09	0.0971
299.19	531.08	0.0971
299.89	531.08	0.0971
300.91	531.10	0.0971
302.12	531.12	0.0971
303.17	531.14	0.0971

304.26	531.14	0.0971
305.33	531.13	0.0971
306.45	531.14	0.0971
307.61	531.16	0.0971
308.54	531.19	0.0971
309.73	531.21	0.0971
310.96	531.22	0.0971
311.75	531.24	0.0971
313.01	531.24	0.0971
314.31	531.28	0.0971
314.96	531.29	0.0971
316.29	531.33	0.0971
317.66	531.34	0.0971
318.17	531.32	0.0971
319.56	531.33	0.0971
321.02	531.30	0.0971
321.38	531.36	0.0971
322.84	531.33	0.0971
324.37	531.36	0.0971
324.59	531.37	0.0971
326.12	531.40	0.0971
327.72	531.43	0.0971
327.81	531.42	0.0971
329.40	531.45	0.0971
331.02	531.46	0.0971
331.07	531.47	0.0971
332.68	531.47	0.0971
334.23	531.53	0.0971
334.42	531.55	0.0971
335.96	531.61	0.0971
337.44	531.58	0.0971
337.77	531.57	0.0971
339.24	531.54	0.0971
340.65	531.55	0.0971
341.12	531.57	0.0971
342.52	531.58	0.0971
343.86	531.60	0.0971
344.47	531.60	0.0971
345.80	531.61	0.0971
347.07	531.62	0.0971
347.83	531.64	0.0971
349.08	531.64	0.0971
350.28	531.64	0.0971
351.18	531.63	0.0971
352.36	531.63	0.0971
353.49	531.63	0.0971
354.53	531.63	0.0971
355.64	531.64	0.0971
356.70	531.63	0.0971
357.88	531.63	0.0971
358.92	531.62	0.0971
359.91	531.62	0.0971
361.23	531.61	0.0971
362.19	531.61	0.0971
363.12	531.62	0.0971
364.58	531.61	0.0971
365.47	531.62	0.0971

366.33	531.61	0.0971
367.93	531.63	0.0971
368.75	531.63	0.0971
369.54	531.63	0.0971
371.28	531.64	0.0971
372.03	531.64	0.0971
372.75	531.64	0.0971
374.64	531.66	0.0971
375.31	531.67	0.0971
375.96	531.67	0.0971
377.99	531.70	0.0971
378.59	531.70	0.0971
379.17	531.71	0.0971
381.34	531.75	0.0971
381.87	531.76	0.0971
382.38	531.76	0.0971
384.69	531.74	0.0971
385.15	531.74	0.0971
385.59	531.74	0.0971
388.04	531.76	0.0971
388.43	531.77	0.0971
388.80	531.77	0.0971
391.39	531.80	0.0971
391.71	531.81	0.0971
392.01	531.81	0.0971
394.74	531.85	0.0971
394.99	531.85	0.0971
395.22	531.85	0.0971
398.10	531.87	0.0971
398.27	531.87	0.0971
398.43	531.87	0.0971
401.45	531.92	0.0971
401.54	531.92	0.0971
401.64	531.92	0.0971
404.80	531.99	0.0971
404.82	531.99	0.0971
404.85	531.99	0.0971
406.02	532.08	0.0971
408.06	532.23	0.0971
408.10	532.23	0.0971
408.15	532.23	0.0971
411.27	531.98	0.0971
411.38	531.98	0.0971
411.50	531.98	0.0971
414.48	532.00	0.0971
414.66	532.00	0.0971
414.85	532.01	0.0971
417.69	532.13	0.0971
417.94	532.13	0.0971
418.20	532.14	0.0971
420.90	532.17	0.0971
421.22	532.17	0.0971
421.55	532.18	0.0971
424.11	532.23	0.0971
424.50	532.25	0.0971
424.91	532.25	0.0971
427.32	532.25	0.0971

427.78	532.25	0.0971
428.26	532.25	0.0971
430.53	532.33	0.0971
431.06	532.34	0.0971
431.61	532.35	0.0971
431.76	532.35	-----

Longitudinal Slope: 0.0320 ft/ft

Lining Type: User Defined

Flow: 16.7000 cfs

Result Parameters

Depth: 0.5564 ft

Area of Flow: 12.7353 ft^2

Wetted Perimeter: 38.4380 ft

Hydraulic Radius: 0.3313 ft

Average Velocity: 1.3113 ft/s

Top Width: 38.4170 ft

Froude Number: 0.4014

Critical Depth: 0.3756 ft

Critical Velocity: 2.6018 ft/s

Critical Slope: 0.2312 ft/ft

Critical Top Width: 30.53 ft

Calculated Max Shear Stress: 1.1109 lb/ft^2

Calculated Avg Shear Stress: 0.6616 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0971

Channel Lining Analysis: LWC-3

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 0.5 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.00016

Lining Results

Angle of Repose: 41.15 degrees

Relative Flow Depth: 0.995824

Manning's n method: Bathurst

Manning's n: 0.124693

Channel Bottom Shear Results

V*: 0.867462

Reynold's Number: 35639.3

Shield's Parameter: 0.047

shear stress on channel bottom: 1.45824 lb/ft^2

Permissible shear stress for channel bottom: 2.4111 lb/ft^2

channel bottom is stable

Stable D50: 0.302449 ft

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: LWC-3

Channel Lining Analysis: LWC-4

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 0.5 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.01232

Lining Results

Angle of Repose: 41.15 degrees

Relative Flow Depth: 0.871877

Manning's n method: Bathurst

Manning's n: 0.522308

Channel Bottom Shear Results

V*: 1.06832

Reynold's Number: 43891.6

Shield's Parameter: 0.0495052

shear stress on channel bottom: 2.21173 lb/ft^2

Permissible shear stress for channel bottom: 2.53962 lb/ft^2

channel bottom is stable

Stable D50: 0.440809 ft

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: LWC-4

Channel Lining Analysis: LWC-5

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 0.25 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.00016

Lining Results

Angle of Repose: 40.7 degrees

Relative Flow Depth: 1.32427

Manning's n method: Bathurst

Manning's n: 0.116863

Channel Bottom Shear Results

V*: 0.756705

Reynold's Number: 15544.5

Shield's Parameter: 0.047

shear stress on channel bottom: 1.10964 lb/ft^2

Permissible shear stress for channel bottom: 1.20555 lb/ft^2

channel bottom is stable

Stable D50: 0.230147 ft

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: LWC-5

Channel Analysis: LWC-1

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	543.98	0.0780
0.42	543.97	0.0780
0.85	543.96	0.0780
1.28	543.95	0.0780
3.72	543.95	0.0780
4.13	543.94	0.0780
4.54	543.93	0.0780
7.02	543.91	0.0780
7.41	543.90	0.0780
7.80	543.89	0.0780
10.32	543.81	0.0780
10.69	543.80	0.0780
11.05	543.79	0.0780
13.61	543.73	0.0780
13.97	543.72	0.0780
14.31	543.71	0.0780
16.91	543.70	0.0780
17.24	543.70	0.0780
17.57	543.70	0.0780
20.21	543.72	0.0780
20.52	543.72	0.0780
20.83	543.72	0.0780
23.51	543.72	0.0780
23.80	543.71	0.0780
24.09	543.71	0.0780
26.81	543.69	0.0780
27.08	543.69	0.0780
27.35	543.69	0.0780
30.11	543.65	0.0780
30.36	543.65	0.0780
30.61	543.65	0.0780
33.41	543.57	0.0780
33.64	543.57	0.0780
33.86	543.56	0.0780
36.71	543.51	0.0780
36.92	543.51	0.0780
37.12	543.51	0.0780
40.01	543.47	0.0780
40.19	543.47	0.0780
40.38	543.47	0.0780
43.30	543.48	0.0780
43.47	543.47	0.0780
43.64	543.47	0.0780
46.60	543.51	0.0780
46.75	543.51	0.0780
46.90	543.51	0.0780
49.90	543.45	0.0780
50.03	543.45	0.0780
50.16	543.45	0.0780
53.20	543.37	0.0780
53.31	543.36	0.0780

53.41	543.36	0.0780
56.50	543.32	0.0780
56.59	543.32	0.0780
56.67	543.32	0.0780
59.80	543.32	0.0780
59.86	543.32	0.0780
59.93	543.32	0.0780
63.10	543.33	0.0780
63.14	543.33	0.0780
63.19	543.33	0.0780
66.40	543.31	0.0780
66.42	543.31	0.0780
66.45	543.31	0.0780
69.69	543.27	0.0780
69.71	543.27	0.0780
70.58	543.26	0.0780
72.96	543.23	0.0780
72.98	543.23	0.0780
72.99	543.23	0.0780
76.22	543.22	0.0780
76.26	543.22	0.0780
76.29	543.22	0.0780
79.48	543.23	0.0780
79.54	543.23	0.0780
79.59	543.23	0.0780
82.74	543.22	0.0780
82.81	543.22	0.0780
82.89	543.22	0.0780
86.00	543.16	0.0780
86.09	543.16	0.0780
86.19	543.16	0.0780
89.26	543.11	0.0780
89.37	543.11	0.0780
89.49	543.11	0.0780
92.51	543.08	0.0780
92.65	543.08	0.0780
92.79	543.08	0.0780
95.77	543.08	0.0780
95.93	543.08	0.0780
96.09	543.07	0.0780
99.03	543.07	0.0780
99.21	543.07	0.0780
99.38	543.06	0.0780
102.29	543.03	0.0780
102.49	543.03	0.0780
102.68	543.03	0.0780
105.55	543.01	0.0780
105.76	543.01	0.0780
105.98	543.00	0.0780
108.81	542.96	0.0780
109.04	542.96	0.0780
109.28	542.96	0.0780
112.06	542.92	0.0780
112.32	542.92	0.0780
112.58	542.92	0.0780
115.32	542.90	0.0780
115.60	542.90	0.0780

115.88	542.90	0.0780
118.58	542.90	0.0780
118.88	542.90	0.0780
119.18	542.90	0.0780
121.84	542.91	0.0780
122.16	542.92	0.0780
122.48	542.91	0.0780
125.10	542.92	0.0780
125.43	542.92	0.0780
125.78	542.91	0.0780
128.36	542.87	0.0780
128.71	542.87	0.0780
129.07	542.86	0.0780
131.62	542.80	0.0780
131.99	542.79	0.0780
132.37	542.79	0.0780
134.87	542.76	0.0780
135.27	542.75	0.0780
135.67	542.75	0.0780
138.13	542.74	0.0780
138.55	542.74	0.0780
138.97	542.75	0.0780
141.39	542.75	0.0780
141.83	542.76	0.0780
142.27	542.76	0.0780
144.65	542.74	0.0780
145.11	542.74	0.0780
145.57	542.72	0.0780
147.91	542.65	0.0780
148.38	542.64	0.0780
148.87	542.62	0.0780
151.17	542.57	0.0780
151.66	542.56	0.0780
152.17	542.55	0.0780
154.42	542.54	0.0780
154.94	542.54	0.0780
155.47	542.54	0.0780
157.68	542.52	0.0780
158.22	542.53	0.0780
158.76	542.52	0.0780
160.94	542.52	0.0780
161.50	542.51	0.0780
162.06	542.50	0.0780
164.20	542.49	0.0780
164.78	542.48	0.0780
165.36	542.47	0.0780
167.46	542.45	0.0780
168.06	542.44	0.0780
168.66	542.44	0.0780
170.72	542.42	0.0780
171.33	542.42	0.0780
171.96	542.41	0.0780
173.97	542.38	0.0780
174.61	542.38	0.0780
175.26	542.37	0.0780
177.23	542.35	0.0780
177.89	542.35	0.0780

178.56	542.35	0.0780
180.49	542.36	0.0780
181.17	542.36	0.0780
181.86	542.36	0.0780
183.75	542.37	0.0780
184.45	542.37	0.0780
185.16	542.36	0.0780
187.01	542.36	0.0780
187.73	542.35	0.0780
188.45	542.33	0.0780
190.27	542.29	0.0780
191.01	542.28	0.0780
191.75	542.26	0.0780
193.52	542.20	0.0780
194.28	542.18	0.0780
195.05	542.17	0.0780
196.78	542.15	0.0780
197.56	542.14	0.0780
198.35	542.14	0.0780
200.04	542.13	0.0780
200.84	542.13	0.0780
201.65	542.13	0.0780
203.30	542.13	0.0780
203.78	542.13	0.0780
204.13	542.13	0.0780
205.31	542.13	0.0780
206.12	542.11	0.0780
207.49	542.10	0.0780
208.87	542.06	0.0780
209.63	542.03	0.0780
210.84	542.00	0.0780
211.62	541.99	0.0780
213.94	541.94	0.0780
214.20	541.93	0.0780
214.37	541.93	0.0780
215.11	541.92	0.0780
217.11	541.90	0.0780
217.56	541.89	0.0780
218.26	541.88	0.0780
219.86	541.86	0.0780
220.92	541.85	0.0780
222.58	541.84	0.0780
222.61	541.83	0.0780
224.28	541.82	0.0780
225.36	541.80	0.0780
226.90	541.78	0.0780
227.64	541.77	0.0780
228.11	541.76	0.0780
230.22	541.73	0.0780
230.99	541.71	0.0780
231.22	541.71	0.0780
233.60	541.65	0.0780
234.35	541.63	0.0780
235.53	541.61	0.0780
236.35	541.58	0.0780
237.71	541.55	0.0780
238.57	541.53	0.0780

239.02	541.53	0.0780
240.32	541.52	0.0780
241.39	541.52	0.0780
243.03	541.51	0.0780
243.76	541.51	0.0780
244.24	541.51	0.0780
246.13	541.50	0.0780
246.50	541.51	0.0780
248.15	541.51	0.0780
248.50	541.51	0.0780
249.04	541.52	0.0780
250.87	541.53	0.0780
252.07	541.56	0.0780
253.24	541.58	0.0780
255.04	541.62	0.0780
255.61	541.62	0.0780
255.98	541.62	0.0780
257.75	541.59	0.0780
257.98	541.59	0.0780
259.89	541.56	0.0780
261.04	541.53	0.0780
262.72	541.46	0.0780
263.81	541.41	0.0780
265.08	541.34	0.0780
267.04	541.24	0.0780
267.45	541.21	0.0780
267.72	541.20	0.0780
269.00	541.10	0.0780
269.82	541.04	0.0780
271.64	540.91	0.0780
273.04	540.82	0.0780
273.11	540.81	0.0780
274.89	540.73	0.0780
275.17	540.72	0.0780
275.55	540.71	0.0780
277.79	540.64	0.0780
278.48	540.62	0.0780
279.40	540.60	0.0780
280.70	540.58	0.0780
281.79	540.55	0.0780
283.25	540.51	0.0780
283.60	540.51	0.0780
285.10	540.46	0.0780
286.51	540.41	0.0780
287.09	540.39	0.0780
288.41	540.35	0.0780
289.42	540.31	0.0780
290.94	540.26	0.0780
291.72	540.23	0.0780
292.32	540.21	0.0780
294.78	540.14	0.0780
295.03	540.13	0.0780
295.23	540.12	0.0780
296.60	540.07	0.0780
298.13	540.00	0.0780
298.35	539.99	0.0780
298.63	539.98	0.0780

301.04	539.86	0.0780
301.66	539.83	0.0780
302.47	539.81	0.0780
303.94	539.74	0.0780
304.97	539.71	0.0780
306.32	539.66	0.0780
306.85	539.63	0.0780
308.28	539.58	0.0780
309.75	539.51	0.0780
310.16	539.50	0.0780
311.59	539.44	0.0780
312.66	539.40	0.0780
314.01	539.37	0.0780
314.90	539.34	0.0780
315.56	539.33	0.0780
317.86	539.29	0.0780
318.21	539.28	0.0780
318.47	539.28	0.0780
320.37	539.23	0.0780
321.38	539.20	0.0780
321.52	539.20	0.0780
321.70	539.19	0.0780
324.28	539.11	0.0780
324.83	539.10	0.0780
325.55	539.08	0.0780
327.19	539.03	0.0780
328.14	539.01	0.0780
329.39	539.00	0.0780
330.09	538.95	0.0780
331.45	538.94	0.0780
333.00	538.92	0.0780
333.24	538.94	0.0780
334.76	538.92	0.0780
335.90	538.91	0.0780
337.08	538.89	0.0780
338.07	538.88	0.0780
338.81	538.88	0.0780
340.93	538.89	0.0780
341.38	538.89	0.0780
341.71	538.89	0.0780
344.14	538.92	0.0780
344.62	538.93	0.0780
344.69	538.93	0.0780
344.77	538.93	0.0780
347.53	538.98	0.0780
348.00	538.99	0.0780
348.62	539.00	0.0780
350.43	539.01	0.0780
351.31	539.03	0.0780
352.46	539.04	0.0780
353.34	539.03	0.0780
354.62	539.04	0.0780
356.24	539.04	0.0780
356.31	539.05	0.0780
357.93	539.04	0.0780
359.15	539.03	0.0780
360.16	539.04	0.0780

361.24	539.03	0.0780
362.05	539.01	0.0780
364.00	538.95	0.0780
364.55	538.93	0.0780
364.96	538.92	0.0780
367.85	538.79	0.0780
367.86	538.79	0.0780
367.92	538.79	0.0780
370.77	538.61	0.0780
371.17	538.58	0.0780
371.69	538.55	0.0780
373.45	538.45	0.0780
373.63	538.44	0.0780
374.79	538.37	0.0780
375.95	538.30	0.0780
377.31	538.22	0.0780
378.28	538.17	0.0780
379.11	538.12	0.0780
380.60	538.01	0.0780
382.35	537.85	0.0780
382.93	537.80	0.0780
383.43	537.76	0.0780
385.25	537.62	0.0780
387.39	537.43	0.0780
387.58	537.41	0.0780
387.74	537.40	0.0780
389.88	537.23	0.0780
389.90	537.23	0.0780
392.06	537.06	0.0780
392.43	537.03	0.0780
394.55	536.84	0.0780
396.38	536.68	0.0780
396.64	536.66	0.0780
396.88	536.64	0.0780
397.35	536.59	0.0780
399.20	536.42	0.0780
401.34	536.20	0.0780
401.69	536.17	0.0780
403.85	535.98	0.0780
404.05	535.98	0.0780
406.04	535.82	0.0780
406.18	535.81	0.0780
406.34	535.80	0.0780
408.50	535.69	0.0780
410.38	535.62	0.0780
410.82	535.61	0.0780
411.33	535.59	0.0780
413.15	535.56	0.0780
414.72	535.54	0.0780
415.47	535.52	0.0780
416.33	535.51	0.0780
419.06	535.47	0.0780
420.12	535.45	0.0780
421.33	535.41	0.0780
422.44	535.37	0.0780
423.41	535.32	0.0780
424.77	535.25	0.0780

426.33	535.10	0.0780
427.75	534.94	0.0780
429.41	534.69	0.0780
431.33	534.17	0.0780
432.09	534.01	0.0780
434.06	533.71	0.0780
436.33	533.75	0.0780
436.44	533.76	0.0780
437.16	533.90	0.0780
438.71	534.25	0.0780
440.78	534.62	0.0780
441.03	534.66	0.0780
441.33	534.69	0.0780
443.36	534.91	0.0780
445.12	534.99	0.0780
445.68	535.02	0.0780
446.32	535.03	0.0780
448.01	535.05	0.0780
449.47	535.05	0.0780
450.33	535.05	0.0780
451.32	535.05	0.0780
452.65	535.04	0.0780
453.81	535.04	0.0780
454.98	535.03	0.0780
456.32	535.06	0.0780
458.15	535.11	0.0780
459.63	535.18	0.0780
461.32	535.26	0.0780
461.95	535.29	0.0780
462.50	535.32	0.0780
464.27	535.43	0.0780
466.32	535.53	0.0780
466.84	535.56	0.0780
468.92	535.63	0.0780
470.28	535.67	0.0780
471.18	535.70	0.0780
471.24	535.70	0.0780
471.32	535.70	0.0780
473.57	535.72	0.0780
475.52	535.71	0.0780
475.89	535.71	0.0780
476.32	535.71	0.0780
478.22	535.72	0.0780
479.87	535.74	0.0780
480.54	535.76	0.0780
481.32	535.80	0.0780
482.86	535.87	0.0780
484.21	535.94	0.0780
485.19	535.99	0.0780
486.31	536.07	0.0780
487.51	536.14	0.0780
488.55	536.20	0.0780
489.84	536.25	0.0780
491.31	536.31	0.0780
492.16	536.33	0.0780
492.90	536.35	0.0780
494.48	536.38	0.0780

496.31	536.44	0.0780
497.24	536.46	0.0780
498.29	536.47	0.0780
498.84	536.48	0.0780
499.39	536.48	0.0780
500.78	536.49	0.0780
502.43	536.51	0.0780
502.43	536.50	0.0780
504.07	536.53	0.0780
505.46	536.56	0.0780
506.02	536.58	0.0780
507.36	536.61	0.0780
508.50	536.62	0.0780
509.61	536.64	0.0780
510.65	536.64	0.0780
511.54	536.65	0.0780
513.20	536.68	0.0780
513.94	536.69	0.0780
514.57	536.70	0.0780
516.79	536.74	0.0780
517.23	536.74	0.0780
517.61	536.75	0.0780
520.38	536.79	0.0780
520.52	536.79	0.0780
520.65	536.79	0.0780
522.14	536.83	0.0780
523.81	536.87	0.0780
523.96	536.88	0.0780
526.72	536.99	0.0780
527.10	537.00	0.0780
527.55	537.02	0.0780
528.58	537.04	0.0780
529.78	537.07	0.0780
530.33	537.08	0.0780
530.60	537.09	0.0780
531.42	537.10	0.0780
532.77	537.10	0.0780
534.26	537.13	0.0780
535.21	537.13	0.0780
537.11	537.13	0.0780
537.66	537.13	0.0780
537.93	537.14	0.0780
538.75	537.14	0.0780
540.10	537.13	0.0780
541.60	537.14	0.0780
542.54	537.14	0.0780
544.44	537.13	0.0780
544.99	537.13	0.0780
545.26	537.13	0.0780
546.08	537.14	0.0780
547.43	537.17	0.0780
548.93	537.18	0.0780
549.87	537.20	0.0780
551.77	537.22	0.0780
552.32	537.23	0.0780
552.59	537.23	0.0780
553.41	537.24	0.0780

554.76	537.26	0.0780
556.26	537.28	0.0780
557.21	537.32	0.0780
559.10	537.41	0.0780
559.65	537.44	0.0780
559.92	537.46	0.0780
560.74	537.52	0.0780
562.09	537.64	0.0780
563.59	537.73	0.0780
564.54	537.82	0.0780
566.43	537.95	0.0780
566.98	537.99	0.0780
567.25	538.01	0.0780
568.07	538.07	0.0780
569.42	538.16	0.0780
570.77	538.24	0.0780
570.94	538.25	0.0780
571.81	538.28	0.0780
572.82	538.33	0.0780
574.14	538.37	0.0780
575.28	538.40	0.0780
576.46	538.40	0.0780
577.83	538.42	0.0780
578.79	538.44	0.0780
579.62	538.46	0.0780
581.11	538.49	0.0780
582.84	538.56	0.0780
583.44	538.59	0.0780
583.95	538.60	0.0780
585.76	538.67	0.0780
587.85	538.77	0.0780
588.08	538.78	0.0780
588.29	538.79	0.0780
590.41	538.90	0.0780
591.11	538.94	0.0780
592.62	539.01	0.0780
592.73	539.02	0.0780
592.86	539.02	0.0780
595.06	539.10	0.0780
596.96	539.17	0.0780
597.38	539.18	0.0780
597.87	539.19	0.0780
599.70	539.26	0.0780
601.29	539.31	0.0780
602.03	539.33	0.0780
602.88	539.35	0.0780
604.35	539.40	0.0780
605.63	539.44	0.0780
606.68	539.48	0.0780
607.89	539.52	0.0780
609.00	539.57	0.0780
609.97	539.59	0.0780
611.33	539.64	0.0780
612.90	539.66	0.0780
613.65	539.68	0.0780
614.30	539.69	0.0780
615.97	539.72	0.0780

617.91	539.78	0.0780
618.30	539.79	0.0780
618.64	539.80	0.0780
620.62	539.87	0.0780
622.92	539.95	0.0780
622.95	539.95	0.0780
622.97	539.95	0.0780
623.31	539.96	0.0780
625.27	539.97	0.0780
627.31	540.04	0.0780
627.60	540.04	0.0780
627.93	540.05	0.0780
629.92	540.06	0.0780
631.64	540.09	0.0780
632.24	540.08	0.0780
632.94	540.08	0.0780
634.57	540.05	0.0780
635.98	540.07	0.0780
636.89	540.06	0.0780
637.95	540.07	0.0780
639.22	540.07	0.0780
640.31	540.10	0.0780
641.54	540.11	0.0780
642.96	540.12	0.0780
643.87	540.12	0.0780
644.65	540.13	0.0780
646.19	540.16	0.0780
647.97	540.17	0.0780
648.51	540.17	0.0780
648.99	540.16	0.0780
650.84	540.18	0.0780
652.98	540.14	0.0780
653.16	540.13	0.0780
653.32	540.13	0.0780
655.49	540.17	0.0780
655.52	540.18	0.0780
657.28	540.22	0.0780
657.61	540.23	0.0780
657.83	540.24	0.0780
658.22	540.25	0.0780
660.23	540.32	0.0780
661.38	540.36	0.0780
662.63	540.38	0.0780
664.82	540.40	0.0780
665.04	540.40	0.0780
665.16	540.40	0.0780
665.61	540.41	0.0780
667.44	540.45	0.0780
668.94	540.48	0.0780
669.84	540.50	0.0780
671.43	540.54	0.0780
672.25	540.56	0.0780
672.71	540.56	0.0780
674.42	540.59	0.0780
674.65	540.61	0.0780
676.49	540.63	0.0780
677.05	540.63	0.0780

678.04	540.64	0.0780
679.45	540.66	0.0780
680.26	540.68	0.0780
681.86	540.71	0.0780
683.23	540.75	0.0780
684.04	540.77	0.0780
684.26	540.77	0.0780
684.65	540.78	0.0780
686.66	540.83	0.0780
687.70	540.87	0.0780
687.80	540.87	0.0780
689.32	540.92	0.0780
689.56	540.92	0.0780
691.08	540.98	0.0780
692.61	541.01	0.0780
692.82	541.01	0.0780
694.36	541.04	0.0780
695.90	541.05	0.0780
696.09	541.05	0.0780
697.64	541.06	0.0780
699.19	541.07	0.0780
699.36	541.07	0.0780
700.91	541.08	0.0780
702.48	541.08	0.0780
702.63	541.08	0.0780
704.19	541.08	0.0780
705.77	541.07	0.0780
705.89	541.07	0.0780
707.47	541.06	0.0780
709.06	541.02	0.0780
709.16	541.03	0.0780
710.75	540.99	0.0780
712.35	541.00	0.0780
712.43	541.02	0.0780
714.03	541.03	0.0780
715.64	541.08	0.0780
715.70	541.07	0.0780
717.31	541.11	0.0780
718.93	541.12	0.0780
718.96	541.10	0.0780
720.58	541.11	0.0780
722.22	541.10	0.0780
722.23	541.09	0.0780
723.86	541.09	0.0780
725.50	541.07	0.0780
725.51	541.08	0.0780
727.14	541.06	0.0780
728.77	541.06	0.0780
728.80	541.06	0.0780
730.42	541.05	0.0780
732.03	541.06	0.0780
732.09	541.05	0.0780
733.70	541.06	0.0780
735.30	541.07	0.0780
735.38	541.06	0.0780
736.98	541.08	0.0780
738.57	541.09	0.0780

738.66	541.09	0.0780
740.26	541.09	0.0780
741.84	541.09	0.0780
741.95	541.10	0.0780
743.53	541.10	0.0780
745.10	541.09	0.0780
745.24	541.10	0.0780
746.81	541.09	0.0780
748.37	541.08	0.0780
748.53	541.08	0.0780
750.09	541.08	0.0780
751.64	541.09	0.0780
751.82	541.09	0.0780
753.37	541.11	0.0780
754.91	541.13	0.0780
755.11	541.13	0.0780
756.65	541.14	0.0780
758.17	541.15	0.0780
758.40	541.15	0.0780
759.93	541.16	0.0780
761.44	541.17	0.0780
761.69	541.16	0.0780
763.20	541.17	0.0780
764.71	541.20	0.0780
764.98	541.19	0.0780
766.48	541.21	0.0780
767.98	541.23	0.0780
768.27	541.24	0.0780
769.76	541.25	0.0780
771.24	541.25	0.0780
771.56	541.27	0.0780
773.04	541.27	0.0780
774.51	541.27	0.0780
774.85	541.27	0.0780
776.32	541.27	0.0780
777.78	541.30	0.0780
778.14	541.28	0.0780
779.60	541.30	0.0780
781.05	541.33	0.0780
781.43	541.31	0.0780
782.88	541.34	0.0780
784.31	541.34	0.0780
784.72	541.34	0.0780
786.15	541.34	0.0780
787.58	541.33	0.0780
788.01	541.33	0.0780
789.43	541.31	0.0780
790.85	541.32	0.0780
791.30	541.32	0.0780
792.71	541.32	0.0780
794.11	541.34	0.0780
794.59	541.36	0.0780
795.99	541.37	0.0780
797.38	541.37	0.0780
797.88	541.39	0.0780
799.27	541.39	0.0780
800.65	541.39	0.0780

801.17	541.39	0.0780
802.55	541.39	0.0780
803.92	541.42	0.0780
804.46	541.42	0.0780
805.82	541.45	0.0780
807.18	541.46	0.0780
807.75	541.47	0.0780
809.10	541.48	0.0780
810.45	541.48	0.0780
811.04	541.48	0.0780
812.38	541.48	0.0780
813.72	541.48	0.0780
814.32	541.47	0.0780
815.66	541.47	0.0780
816.99	541.46	0.0780
817.61	541.45	0.0780
818.94	541.44	0.0780
820.25	541.42	0.0780
820.90	541.42	0.0780
822.22	541.40	0.0780
823.52	541.38	0.0780
824.19	541.40	0.0780
825.50	541.39	0.0780
826.79	541.39	0.0780
827.48	541.39	0.0780
828.77	541.39	0.0780
830.06	541.39	0.0780
830.77	541.35	0.0780
832.05	541.35	0.0780
833.32	541.34	0.0780
834.06	541.34	0.0780
835.33	541.32	0.0780
836.59	541.31	0.0780
837.35	541.33	0.0780
838.61	541.32	0.0780
839.86	541.32	0.0780
840.64	541.33	0.0780
841.89	541.33	0.0780
843.13	541.34	0.0780
843.93	541.32	0.0780
845.17	541.33	0.0780
846.39	541.32	0.0780
847.22	541.29	0.0780
848.44	541.29	0.0780
849.66	541.28	0.0780
850.51	541.28	0.0780
851.72	541.28	0.0780
852.93	541.28	0.0780
853.80	541.29	0.0780
855.00	541.30	0.0780
856.20	541.31	0.0780
857.09	541.30	0.0780
858.28	541.31	0.0780
859.46	541.30	0.0780
860.38	541.30	0.0780
861.56	541.30	0.0780
862.73	541.29	0.0780

863.67	541.29	0.0780
864.84	541.29	0.0780
866.00	541.30	0.0780
866.96	541.30	0.0780
868.12	541.31	0.0780
869.27	541.32	0.0780
870.25	541.33	0.0780
871.39	541.34	0.0780
872.53	541.35	0.0780
873.54	541.36	0.0780
874.67	541.36	0.0780
875.80	541.37	0.0780
876.83	541.38	0.0780
877.95	541.39	0.0780
879.07	541.40	0.0780
880.12	541.42	0.0780
881.23	541.43	0.0780
882.34	541.45	0.0780
883.41	541.45	0.0780
884.51	541.47	0.0780
885.60	541.47	0.0780
886.70	541.47	0.0780
887.79	541.47	0.0780
888.87	541.47	0.0780
889.99	541.48	0.0780
891.06	541.48	0.0780
892.14	541.47	0.0780
893.27	541.49	0.0780
894.34	541.48	0.0780
895.40	541.48	0.0780
896.56	541.48	0.0780
897.62	541.48	0.0780
898.67	541.49	0.0780
899.85	541.49	0.0780
900.90	541.50	0.0780
901.94	541.50	0.0780
903.14	541.50	0.0780
904.18	541.50	0.0780
905.21	541.49	0.0780
906.43	541.48	0.0780
907.46	541.48	0.0780
908.47	541.48	0.0780
909.72	541.49	0.0780
910.74	541.49	0.0780
911.74	541.51	0.0780
913.01	541.51	0.0780
914.01	541.52	0.0780
915.01	541.54	0.0780
916.30	541.54	0.0780
917.29	541.56	0.0780
918.28	541.57	0.0780
919.59	541.59	0.0780
920.57	541.60	0.0780
921.54	541.62	0.0780
922.88	541.64	0.0780
923.85	541.66	0.0780
924.81	541.68	0.0780

926.17	541.71	0.0780
927.13	541.73	0.0780
928.08	541.74	0.0780
929.46	541.77	0.0780
930.41	541.78	0.0780
931.35	541.78	0.0780
932.75	541.82	0.0780
933.68	541.82	0.0780
934.61	541.82	0.0780
936.04	541.82	0.0780
936.96	541.83	0.0780
937.88	541.83	0.0780
939.33	541.81	0.0780
940.24	541.81	0.0780
941.15	541.82	0.0780
942.62	541.84	0.0780
943.52	541.84	0.0780
944.42	541.84	0.0780
945.91	541.88	0.0780
946.80	541.89	0.0780
947.68	541.89	0.0780
949.20	541.92	0.0780
950.08	541.93	0.0780
950.95	541.93	0.0780
952.49	541.96	0.0780
953.36	541.96	0.0780
954.22	541.96	0.0780
955.78	541.95	0.0780
956.63	541.95	0.0780
957.49	541.95	0.0780
959.07	541.93	0.0780
959.91	541.93	0.0780
960.75	541.94	0.0780
962.36	541.95	0.0780
963.19	541.95	0.0780
964.02	541.95	0.0780
965.65	541.94	0.0780
966.47	541.94	0.0780
967.29	541.95	0.0780
968.93	541.94	0.0780
969.75	541.94	0.0780
970.56	541.95	0.0780
972.22	541.98	0.0780
973.03	542.00	0.0780
973.82	542.00	0.0780
975.51	542.03	0.0780
976.30	542.03	0.0780
977.09	542.03	0.0780
978.80	542.04	0.0780
979.58	542.04	0.0780
980.36	542.04	0.0780
982.09	542.06	0.0780
982.86	542.06	0.0780
983.63	542.07	0.0780
985.38	542.08	0.0780
986.14	542.09	0.0780
986.89	542.09	0.0780

988.67	542.09	0.0780
989.42	542.09	0.0780
990.16	542.10	0.0780
991.96	542.10	0.0780
992.70	542.10	0.0780
993.43	542.11	0.0780
995.25	542.12	0.0780
995.98	542.13	0.0780
996.70	542.13	0.0780
998.54	542.15	0.0780
999.25	542.15	0.0780
999.96	542.15	0.0780
1001.83	542.16	0.0780
1002.53	542.16	0.0780
1003.23	542.17	0.0780
1005.12	542.17	0.0780
1005.81	542.17	0.0780
1006.50	542.18	0.0780
1008.41	542.18	0.0780
1009.09	542.19	0.0780
1009.76	542.19	0.0780
1011.70	542.20	0.0780
1012.37	542.21	0.0780
1013.03	542.21	0.0780
1014.99	542.22	0.0780
1015.65	542.23	0.0780
1016.30	542.23	0.0780
1018.28	542.24	0.0780
1018.92	542.25	0.0780
1019.57	542.25	0.0780
1021.57	542.25	0.0780
1022.20	542.26	0.0780
1022.83	542.26	0.0780
1024.86	542.26	0.0780
1025.48	542.26	0.0780
1026.10	542.26	0.0780
1028.15	542.27	0.0780
1028.76	542.27	0.0780
1029.37	542.28	0.0780
1031.44	542.29	0.0780
1032.04	542.29	0.0780
1032.64	542.29	0.0780
1034.73	542.31	0.0780
1035.32	542.32	0.0780
1035.90	542.32	0.0780
1038.02	542.35	0.0780
1038.60	542.35	0.0780
1039.17	542.36	0.0780
1041.31	542.37	0.0780
1041.87	542.37	0.0780
1042.44	542.37	0.0780
1044.60	542.39	0.0780
1045.15	542.39	0.0780
1045.71	542.39	0.0780
1047.88	542.42	0.0780
1048.43	542.42	0.0780
1048.97	542.42	0.0780

1051.17	542.43	0.0780
1051.71	542.44	0.0780
1052.24	542.44	0.0780
1054.46	542.45	0.0780
1054.99	542.45	0.0780
1055.51	542.45	0.0780
1057.75	542.44	0.0780
1058.27	542.44	0.0780
1058.78	542.44	0.0780
1060.04	542.43	-----

Longitudinal Slope: 0.0170 ft/ft

Lining Type: User Defined

Flow: 127.9000 cfs

Result Parameters

Depth: 2.2668 ft

Area of Flow: 61.7489 ft^2

Wetted Perimeter: 81.1303 ft

Hydraulic Radius: 0.7611 ft

Average Velocity: 2.0713 ft/s

Top Width: 80.8430 ft

Froude Number: 0.4177

Critical Depth: 1.7780 ft

Critical Velocity: 4.4221 ft/s

Critical Slope: 0.1055 ft/ft

Critical Top Width: 47.63 ft

Calculated Max Shear Stress: 2.4047 lb/ft^2

Calculated Avg Shear Stress: 0.8074 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0780

Channel Analysis: LWC-2

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	524.63	0.0721
0.55	524.64	0.0721
1.26	524.67	0.0721
3.14	524.76	0.0721
3.83	524.79	0.0721
4.51	524.81	0.0721
6.44	524.90	0.0721
7.11	524.92	0.0721
7.77	524.90	0.0721
9.74	524.92	0.0721
10.39	524.90	0.0721
11.02	524.88	0.0721
13.04	524.85	0.0721
13.67	524.83	0.0721
14.28	524.82	0.0721
16.34	524.78	0.0721
16.94	524.78	0.0721
17.54	524.77	0.0721
19.64	524.71	0.0721
20.22	524.70	0.0721
20.79	524.69	0.0721
22.94	524.67	0.0721
23.50	524.67	0.0721
24.05	524.66	0.0721
26.24	524.62	0.0721
26.78	524.61	0.0721
27.31	524.59	0.0721
29.55	524.60	0.0721
30.06	524.58	0.0721
30.56	524.58	0.0721
32.85	524.57	0.0721
33.34	524.57	0.0721
33.82	524.58	0.0721
36.15	524.59	0.0721
36.62	524.60	0.0721
37.08	524.60	0.0721
39.45	524.59	0.0721
39.89	524.59	0.0721
40.33	524.60	0.0721
42.75	524.63	0.0721
43.17	524.63	0.0721
43.59	524.64	0.0721
46.05	524.69	0.0721
46.45	524.70	0.0721
46.85	524.70	0.0721
49.35	524.73	0.0721
49.73	524.73	0.0721
50.10	524.73	0.0721
52.65	524.72	0.0721
53.01	524.72	0.0721
53.36	524.70	0.0721

55.95	524.64	0.0721
56.29	524.63	0.0721
56.61	524.62	0.0721
59.25	524.57	0.0721
59.56	524.56	0.0721
59.87	524.57	0.0721
62.55	524.59	0.0721
62.84	524.59	0.0721
63.13	524.58	0.0721
65.86	524.53	0.0721
66.12	524.51	0.0721
66.38	524.51	0.0721
69.16	524.53	0.0721
69.40	524.53	0.0721
69.64	524.52	0.0721
72.46	524.36	0.0721
72.68	524.35	0.0721
72.90	524.35	0.0721
75.76	524.36	0.0721
75.96	524.36	0.0721
76.15	524.35	0.0721
79.06	524.32	0.0721
79.24	524.32	0.0721
79.41	524.32	0.0721
82.36	524.25	0.0721
82.51	524.24	0.0721
82.67	524.24	0.0721
85.66	524.15	0.0721
85.79	524.15	0.0721
85.92	524.15	0.0721
88.96	524.10	0.0721
89.07	524.09	0.0721
89.18	524.09	0.0721
92.26	524.08	0.0721
92.35	524.08	0.0721
92.44	524.08	0.0721
95.56	523.97	0.0721
95.63	523.97	0.0721
95.69	523.96	0.0721
98.86	523.89	0.0721
98.91	523.89	0.0721
98.95	523.89	0.0721
99.83	523.85	0.0721
101.66	523.76	0.0721
102.31	523.73	0.0721
103.61	523.68	0.0721
104.26	523.64	0.0721
105.77	523.60	0.0721
106.85	523.55	0.0721
108.79	523.49	0.0721
109.22	523.47	0.0721
109.44	523.46	0.0721
110.08	523.41	0.0721
112.68	523.19	0.0721
113.98	523.11	0.0721
114.62	523.05	0.0721
116.14	522.96	0.0721

117.21	522.89	0.0721
119.16	522.76	0.0721
119.59	522.73	0.0721
119.81	522.72	0.0721
120.45	522.69	0.0721
122.40	522.61	0.0721
123.05	522.58	0.0721
124.35	522.53	0.0721
124.99	522.50	0.0721
126.50	522.45	0.0721
127.58	522.38	0.0721
129.53	522.19	0.0721
129.96	522.16	0.0721
130.17	522.13	0.0721
130.82	522.07	0.0721
132.77	521.87	0.0721
133.41	521.82	0.0721
134.71	521.71	0.0721
135.36	521.64	0.0721
136.87	521.52	0.0721
137.95	521.42	0.0721
139.90	521.38	0.0721
140.33	521.35	0.0721
140.54	521.35	0.0721
141.19	521.38	0.0721
143.13	521.49	0.0721
143.78	521.52	0.0721
145.08	521.57	0.0721
145.72	521.62	0.0721
147.24	521.67	0.0721
148.32	521.71	0.0721
150.26	521.72	0.0721
150.69	521.73	0.0721
150.91	521.73	0.0721
151.55	521.74	0.0721
153.50	521.77	0.0721
154.15	521.78	0.0721
155.45	521.82	0.0721
156.09	521.86	0.0721
157.61	521.89	0.0721
158.68	521.92	0.0721
160.63	521.91	0.0721
161.06	521.92	0.0721
161.28	521.91	0.0721
161.92	521.91	0.0721
163.87	521.89	0.0721
164.52	521.89	0.0721
165.82	521.91	0.0721
166.46	521.92	0.0721
167.97	521.94	0.0721
169.05	521.97	0.0721
171.00	522.05	0.0721
171.43	522.06	0.0721
171.64	522.07	0.0721
172.29	522.10	0.0721
174.88	522.24	0.0721
175.81	522.28	0.0721

176.04	522.30	0.0721
177.10	522.33	0.0721
178.21	522.37	0.0721
179.31	522.40	0.0721
180.40	522.42	0.0721
181.49	522.45	0.0721
182.57	522.46	0.0721
183.69	522.49	0.0721
184.77	522.50	0.0721
185.83	522.51	0.0721
186.99	522.50	0.0721
188.05	522.51	0.0721
189.10	522.50	0.0721
190.28	522.50	0.0721
191.32	522.49	0.0721
192.36	522.49	0.0721
193.57	522.48	0.0721
194.60	522.48	0.0721
195.62	522.48	0.0721
196.87	522.49	0.0721
197.88	522.49	0.0721
198.88	522.48	0.0721
200.16	522.47	0.0721
201.16	522.46	0.0721
202.15	522.43	0.0721
203.46	522.40	0.0721
204.44	522.37	0.0721
205.41	522.34	0.0721
206.75	522.33	0.0721
207.72	522.30	0.0721
208.67	522.29	0.0721
210.04	522.27	0.0721
210.99	522.25	0.0721
211.94	522.25	0.0721
213.34	522.24	0.0721
214.27	522.24	0.0721
215.20	522.26	0.0721
216.63	522.28	0.0721
217.55	522.30	0.0721
218.46	522.35	0.0721
219.93	522.44	0.0721
220.83	522.49	0.0721
221.73	522.56	0.0721
223.22	522.68	0.0721
224.11	522.74	0.0721
224.99	522.80	0.0721
226.51	522.91	0.0721
227.39	522.97	0.0721
228.25	523.02	0.0721
229.81	523.11	0.0721
230.67	523.16	0.0721
231.52	523.19	0.0721
233.10	523.25	0.0721
233.94	523.28	0.0721
234.78	523.31	0.0721
236.40	523.38	0.0721
237.22	523.41	0.0721

238.04	523.44	0.0721
239.69	523.51	0.0721
240.50	523.54	0.0721
241.30	523.56	0.0721
242.98	523.64	0.0721
243.78	523.66	0.0721
244.57	523.68	0.0721
246.28	523.75	0.0721
247.06	523.77	0.0721
247.83	523.79	0.0721
249.57	523.84	0.0721
250.34	523.86	0.0721
251.09	523.88	0.0721
252.87	523.92	0.0721
253.62	523.94	0.0721
254.36	523.97	0.0721
256.16	524.01	0.0721
256.89	524.04	0.0721
257.62	524.07	0.0721
259.45	524.12	0.0721
260.17	524.14	0.0721
260.88	524.17	0.0721
262.75	524.24	0.0721
263.45	524.27	0.0721
264.15	524.30	0.0721
266.04	524.35	0.0721
266.73	524.38	0.0721
267.41	524.41	0.0721
269.34	524.47	0.0721
270.01	524.49	0.0721
270.67	524.52	0.0721
272.63	524.60	0.0721
273.29	524.63	0.0721
273.94	524.65	0.0721
275.92	524.75	0.0721
276.56	524.78	0.0721
277.20	524.80	0.0721
279.22	524.88	0.0721
279.84	524.90	0.0721
280.46	524.92	0.0721
282.51	524.99	0.0721
283.12	525.01	0.0721
283.72	525.02	0.0721
285.81	525.05	0.0721
286.40	525.06	0.0721
286.99	525.07	0.0721
289.10	525.10	0.0721
289.68	525.10	0.0721
290.25	525.11	0.0721
292.39	525.10	0.0721
292.96	525.10	0.0721
293.51	525.11	0.0721
295.69	525.13	0.0721
296.24	525.13	0.0721
296.78	525.15	0.0721
298.98	525.18	0.0721
299.51	525.20	0.0721

300.04	525.21	0.0721
302.28	525.26	0.0721
302.79	525.28	0.0721
303.30	525.29	0.0721
305.57	525.35	0.0721
306.07	525.37	0.0721
306.57	525.39	0.0721
308.86	525.44	0.0721
309.35	525.46	0.0721
309.83	525.48	0.0721
312.16	525.52	0.0721
312.63	525.54	0.0721
313.09	525.55	0.0721
315.45	525.61	0.0721
315.91	525.63	0.0721
316.36	525.63	0.0721
318.75	525.69	0.0721
319.18	525.69	0.0721
319.29	525.69	-----

Longitudinal Slope: 0.0260 ft/ft

Lining Type: User Defined

Flow: 318.7000 cfs

Result Parameters

Depth: 1.7736 ft

Area of Flow: 103.6560 ft^2

Wetted Perimeter: 116.4072 ft

Hydraulic Radius: 0.8905 ft

Average Velocity: 3.0746 ft/s

Top Width: 116.2836 ft

Froude Number: 0.5739

Critical Depth: 1.4684 ft

Critical Velocity: 4.5780 ft/s

Critical Slope: 0.0877 ft/ft

Critical Top Width: 106.96 ft

Calculated Max Shear Stress: 2.8774 lb/ft^2

Calculated Avg Shear Stress: 1.4447 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0721

Channel Lining Analysis: LWC-1

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 0.5 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.01817

Lining Results

Angle of Repose: 41.15 degrees

Relative Flow Depth: 1.52763

Manning's n method: Blodgett

Manning's n: 0.0779773

Channel Bottom Shear Results

V*: 1.11395

Reynold's Number: 45766

Shield's Parameter: 0.0507119

shear stress on channel bottom: 2.40467 lb/ft^2

Permissible shear stress for channel bottom: 2.60152 lb/ft^2

channel bottom is stable

Stable D50: 0.470567 ft

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: LWC-1

Channel Lining Analysis: LWC-2

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 0.5 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.0316

Lining Results

Angle of Repose: 41.15 degrees

Relative Flow Depth: 1.78282

Manning's n method: Blodgett

Manning's n: 0.0721323

Channel Bottom Shear Results

V*: 1.21853

Reynold's Number: 50063

Shield's Parameter: 0.0534781

shear stress on channel bottom: 2.87743 lb/ft^2

Permissible shear stress for channel bottom: 2.74343 lb/ft^2

channel bottom is NOT stable

Stable D50: 0.540995 ft

Channel Lining Stability Results

the channel is NOT stable

Channel Summary

Name of Selected Channel: LWC-2

Channel Analysis: VF-1

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
854.15	537.29	0.1399
856.94	537.25	0.1399
857.18	537.25	0.1399
857.43	537.24	0.1399
860.22	537.21	0.1399
860.47	537.20	0.1399
860.71	537.20	0.1399
863.50	537.16	0.1399
863.75	537.16	0.1399
863.99	537.16	0.1399
866.78	537.12	0.1399
867.03	537.12	0.1399
867.27	537.11	0.1399
870.06	537.08	0.1399
870.31	537.07	0.1399
870.55	537.07	0.1399
873.34	537.03	0.1399
873.59	537.03	0.1399
873.83	537.02	0.1399
876.62	536.99	0.1399
876.87	536.98	0.1399
877.11	536.98	0.1399
879.91	536.94	0.1399
880.15	536.94	0.1399
880.39	536.94	0.1399
883.19	536.90	0.1399
883.43	536.90	0.1399
883.68	536.89	0.1399
886.47	536.86	0.1399
886.71	536.85	0.1399
886.96	536.85	0.1399
889.75	536.81	0.1399
889.99	536.81	0.1399
890.24	536.81	0.1399
893.03	536.77	0.1399
893.27	536.77	0.1399
893.52	536.77	0.1399
896.31	536.73	0.1399
896.55	536.73	0.1399
896.80	536.72	0.1399
899.59	536.69	0.1399
899.83	536.68	0.1399
900.08	536.68	0.1399
902.87	536.64	0.1399
903.12	536.64	0.1399
903.36	536.64	0.1399
906.15	536.60	0.1399
906.40	536.60	0.1399
906.64	536.59	0.1399
909.43	536.56	0.1399
909.68	536.55	0.1399

909.92	536.55	0.1399
912.71	536.51	0.1399
912.96	536.51	0.1399
913.20	536.51	0.1399
915.99	536.47	0.1399
916.24	536.47	0.1399
916.48	536.46	0.1399
919.27	536.43	0.1399
919.52	536.42	0.1399
919.76	536.42	0.1399
922.56	536.38	0.1399
922.80	536.38	0.1399
923.05	536.38	0.1399
925.84	536.34	0.1399
926.08	536.34	0.1399
926.33	536.34	0.1399
929.12	536.30	0.1399
929.36	536.30	0.1399
929.61	536.29	0.1399
932.40	536.26	0.1399
932.64	536.25	0.1399
932.89	536.25	0.1399
935.68	536.21	0.1399
935.92	536.21	0.1399
936.17	536.21	0.1399
938.96	536.17	0.1399
939.20	536.17	0.1399
939.45	536.16	0.1399
942.24	536.13	0.1399
942.49	536.12	0.1399
942.73	536.12	0.1399
945.52	536.08	0.1399
945.77	536.08	0.1399
946.01	536.08	0.1399
948.80	536.04	0.1399
949.05	536.04	0.1399
949.29	536.03	0.1399
952.08	536.00	0.1399
952.33	535.99	0.1399
952.57	535.99	0.1399
955.36	535.95	0.1399
955.61	535.95	0.1399
955.85	535.95	0.1399
958.64	535.91	0.1399
958.89	535.91	0.1399
959.13	535.90	0.1399
961.93	535.87	0.1399
962.17	535.86	0.1399
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965.21	535.82	0.1399
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965.70	535.82	0.1399
968.49	535.78	0.1399
968.73	535.78	0.1399
968.98	535.77	0.1399
971.77	535.74	0.1399
972.01	535.73	0.1399

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975.05	535.69	0.1399
975.29	535.69	0.1399
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978.33	535.65	0.1399
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978.82	535.64	0.1399
981.61	535.61	0.1399
981.85	535.60	0.1399
982.10	535.60	0.1399
984.89	535.56	0.1399
985.14	535.56	0.1399
985.38	535.56	0.1399
988.17	535.52	0.1399
988.42	535.52	0.1399
988.66	535.51	0.1399
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994.73	535.43	0.1399
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998.01	535.39	0.1399
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1004.58	535.32	0.1399
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1007.86	535.30	0.1399
1008.10	535.30	0.1399
1008.35	535.30	0.1399
1011.14	535.29	0.1399
1011.38	535.29	0.1399
1011.63	535.28	0.1399
1014.42	535.27	0.1399
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1014.91	535.27	0.1399
1017.70	535.26	0.1399
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1018.19	535.26	0.1399
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1021.22	535.24	0.1399
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1028.03	535.22	0.1399
1030.82	535.20	0.1399
1031.07	535.20	0.1399
1031.31	535.20	0.1399
1034.10	535.19	0.1399
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1037.38	535.18	0.1399
1037.63	535.17	0.1399
1037.87	535.17	0.1399
1040.66	535.16	0.1399
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1041.15	535.16	0.1399
1043.95	535.15	0.1399
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1047.23	535.13	0.1399
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1057.07	535.09	0.1399
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1089.88	534.96	0.1399
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1093.65	534.95	0.1399
1096.44	534.93	0.1399
1096.68	534.93	0.1399

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1174.31	534.13	0.1399
1176.24	534.10	0.1399
1176.88	534.09	0.1399
1178.35	534.07	0.1399
1178.59	534.07	0.1399
1178.92	534.06	0.1399
1180.94	534.04	0.1399
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1185.64	533.97	0.1399
1186.44	533.96	0.1399
1187.99	533.94	0.1399
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1191.32	533.89	0.1399
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1194.52	533.84	0.1399
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1197.39	533.80	0.1399
1198.56	533.78	0.1399
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1209.14	533.63	0.1399
1210.69	533.61	0.1399
1212.61	533.58	0.1399
1213.84	533.56	0.1399
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1214.73	533.54	0.1399
1216.20	533.52	0.1399
1216.22	533.52	0.1399
1217.88	533.50	0.1399
1218.46	533.49	0.1399
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1218.65	533.49	0.1399
1218.94	533.48	0.1399
1219.55	533.48	0.1399
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1222.39	533.43	0.1399
1222.88	533.42	0.1399
1223.43	533.42	0.1399
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1225.75	533.38	0.1399
1225.92	533.38	0.1399
1225.99	533.38	0.1399
1226.17	533.37	0.1399
1226.20	533.37	0.1399
1227.87	533.35	0.1399
1228.47	533.34	0.1399
1229.49	533.33	0.1399
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1231.08	533.30	0.1399
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1232.86	533.28	0.1399
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1233.78	533.26	0.1399
1234.52	533.26	0.1399
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1237.85	533.22	0.1399
1238.83	533.21	0.1399
1239.48	533.20	0.1399
1239.52	533.20	0.1399
1239.56	533.20	0.1399
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1241.18	533.19	0.1399
1242.55	533.18	0.1399
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1243.17	533.18	0.1399
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1249.07	533.16	0.1399
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1255.63	533.14	0.1399
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1265.48	533.12	0.1399
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1268.76	533.11	0.1399
1269.10	533.11	0.1399
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1281.88	533.08	0.1399
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1285.16	533.07	0.1399
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1288.44	533.07	0.1399
1288.78	533.07	0.1399
1289.13	533.06	0.1399
1291.72	533.06	0.1399
1292.06	533.06	0.1399
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1295.00	533.05	0.1399
1295.35	533.05	0.1399
1295.69	533.05	0.1399
1298.28	533.04	0.1399
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1304.85	533.03	0.1399
1305.19	533.03	0.1399
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1308.13	533.02	0.1399
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1314.69	533.00	0.1399
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1324.53	532.98	0.1399
1324.87	532.97	0.1399
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1327.81	532.96	0.1399
1328.15	532.96	0.1399
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1331.09	532.94	0.1399
1331.43	532.93	0.1399
1331.78	532.93	0.1399
1334.37	532.91	0.1399
1334.71	532.90	0.1399
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1337.65	532.87	0.1399
1338.00	532.87	0.1399
1338.34	532.87	0.1399
1340.93	532.84	0.1399
1341.28	532.84	0.1399
1341.62	532.84	0.1399
1344.22	532.81	0.1399
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1357.34	532.69	0.1399
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1358.02	532.68	0.1399
1360.62	532.66	0.1399
1360.96	532.65	0.1399
1361.30	532.65	0.1399
1363.90	532.62	0.1399
1364.24	532.62	0.1399
1364.58	532.62	0.1399
1367.18	532.59	0.1399
1367.52	532.59	0.1399
1367.87	532.59	0.1399
1370.46	532.56	0.1399
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1371.15	532.55	0.1399
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1377.02	532.50	0.1399
1377.37	532.49	0.1399
1377.71	532.49	0.1399
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1386.87	532.40	0.1399
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1396.71	532.31	0.1399
1397.05	532.30	0.1399
1397.39	532.29	0.1399
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1403.27	532.24	0.1399
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1407.23	532.20	0.1399
1409.83	532.17	0.1399
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1416.39	532.11	0.1399
1416.73	532.11	0.1399
1417.08	532.11	0.1399
1419.67	532.09	0.1399
1420.02	532.09	0.1399
1420.36	532.08	0.1399
1422.95	532.06	0.1399
1423.30	532.06	0.1399
1423.64	532.06	0.1399
1426.24	532.04	0.1399
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1429.52	532.03	0.1399
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1439.36	531.99	0.1399
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1442.64	531.98	0.1399
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1452.48	531.95	0.1399
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1459.04	531.93	0.1399
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1462.32	531.92	0.1399
1462.67	531.92	0.1399
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1465.60	531.91	0.1399
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1466.29	531.90	0.1399
1468.89	531.90	0.1399
1469.23	531.89	0.1399
1469.57	531.89	0.1399
1472.17	531.88	0.1399
1472.51	531.88	0.1399
1472.85	531.88	0.1399
1475.45	531.87	0.1399
1475.79	531.87	0.1399
1476.13	531.86	0.1399
1478.73	531.86	0.1399
1479.07	531.85	0.1399
1479.41	531.85	0.1399
1482.01	531.84	0.1399
1482.35	531.84	0.1399
1482.69	531.83	0.1399
1485.29	531.81	0.1399
1485.63	531.81	0.1399
1485.97	531.81	0.1399
1488.57	531.78	0.1399
1488.91	531.78	0.1399
1489.25	531.77	0.1399
1491.85	531.74	0.1399
1492.19	531.74	0.1399
1492.54	531.73	0.1399
1495.13	531.70	0.1399
1495.47	531.69	0.1399

1495.82	531.69	0.1399
1498.41	531.65	0.1399
1498.75	531.65	0.1399
1499.10	531.64	0.1399
1501.69	531.61	0.1399
1502.04	531.60	0.1399
1502.38	531.60	0.1399
1504.97	531.56	0.1399
1505.32	531.56	0.1399
1505.66	531.55	0.1399
1508.26	531.52	0.1399
1508.60	531.51	0.1399
1508.94	531.51	0.1399
1511.54	531.47	0.1399
1511.88	531.47	0.1399
1512.22	531.46	0.1399
1514.82	531.43	0.1399
1515.16	531.42	0.1399
1515.50	531.42	0.1399
1518.10	531.38	0.1399
1518.44	531.38	0.1399
1518.78	531.37	0.1399
1521.38	531.34	0.1399
1521.72	531.33	0.1399
1522.06	531.33	0.1399
1524.66	531.29	0.1399
1525.00	531.29	0.1399
1525.34	531.28	0.1399
1527.94	531.25	0.1399
1528.28	531.24	0.1399
1528.62	531.24	0.1399
1531.22	531.20	0.1399
1531.56	531.20	0.1399
1531.91	531.19	0.1399
1534.50	531.16	0.1399
1534.84	531.15	0.1399
1535.19	531.15	0.1399
1537.78	531.11	0.1399
1538.12	531.11	0.1399
1538.47	531.10	0.1399
1541.06	531.07	0.1399
1541.41	531.06	0.1399
1541.75	531.06	0.1399
1544.34	531.02	0.1399
1544.69	531.02	0.1399
1545.03	531.01	0.1399
1547.62	530.98	0.1399
1547.97	530.97	0.1399
1548.31	530.97	0.1399
1550.91	530.93	0.1399
1551.25	530.93	0.1399
1551.59	530.93	0.1399
1554.19	530.89	0.1399
1554.53	530.89	0.1399
1554.87	530.88	0.1399
1557.47	530.85	0.1399
1557.81	530.84	0.1399

1558.15	530.84	0.1399
1560.75	530.80	0.1399
1561.09	530.80	0.1399
1561.43	530.79	0.1399
1564.03	530.76	0.1399
1564.37	530.75	0.1399
1564.71	530.75	0.1399
1567.31	530.71	0.1399
1567.65	530.71	0.1399
1567.99	530.70	0.1399
1570.59	530.67	0.1399
1570.93	530.66	0.1399
1571.27	530.66	0.1399
1573.87	530.62	0.1399
1574.21	530.62	0.1399
1574.56	530.61	0.1399
1577.15	530.58	0.1399
1577.49	530.57	0.1399
1577.84	530.57	0.1399
1580.43	530.53	0.1399
1580.77	530.53	0.1399
1581.12	530.52	0.1399
1583.71	530.49	0.1399
1584.06	530.48	0.1399
1584.40	530.48	0.1399
1586.99	530.44	0.1399
1587.34	530.44	0.1399
1587.68	530.43	0.1399
1590.28	530.40	0.1399
1590.62	530.39	0.1399
1590.96	530.39	0.1399
1593.56	530.35	0.1399
1593.90	530.35	0.1399
1594.24	530.35	0.1399
1596.84	530.31	0.1399
1597.18	530.31	0.1399
1597.52	530.31	0.1399
1600.12	530.28	0.1399
1600.46	530.27	0.1399
1600.80	530.27	0.1399
1603.40	530.23	0.1399
1603.74	530.23	0.1399
1604.08	530.22	0.1399
1606.68	530.19	0.1399
1607.02	530.18	0.1399
1607.36	530.18	0.1399
1609.96	530.14	0.1399
1610.30	530.14	0.1399
1610.64	530.13	0.1399
1613.24	530.10	0.1399
1613.58	530.09	0.1399
1613.93	530.09	0.1399
1616.52	530.05	0.1399
1616.86	530.05	0.1399
1617.21	530.04	0.1399
1619.80	530.01	0.1399
1620.14	530.00	0.1399

1620.49	530.00	0.1399
1623.08	529.96	0.1399
1623.43	529.96	0.1399
1623.77	529.95	0.1399
1626.36	529.92	0.1399
1626.71	529.91	0.1399
1627.05	529.90	0.1399
1629.64	529.87	0.1399
1629.99	529.86	0.1399
1630.33	529.86	0.1399
1632.93	529.82	0.1399
1633.27	529.82	0.1399
1633.61	529.83	0.1399
1636.21	529.78	0.1399
1636.55	529.79	0.1399
1636.89	529.82	0.1399
1639.49	529.75	0.1399
1639.83	529.78	0.1399
1640.17	529.76	0.1399
1642.77	529.74	0.1399
1643.11	529.72	0.1399
1643.45	529.70	0.1399
1646.05	529.68	0.1399
1646.39	529.66	0.1399
1646.73	529.64	0.1399
1649.33	529.62	0.1399
1649.67	529.60	0.1399
1650.01	529.60	0.1399
1652.61	529.56	0.1399
1652.95	529.56	0.1399
1653.29	529.55	0.1399
1655.89	529.52	0.1399
1656.23	529.51	0.1399
1656.58	529.51	0.1399
1659.17	529.47	0.1399
1659.51	529.47	0.1399
1659.86	529.46	0.1399
1662.45	529.43	0.1399
1662.79	529.42	0.1399
1663.14	529.42	0.1399
1665.73	529.38	0.1399
1666.08	529.38	0.1399
1666.42	529.37	0.1399
1669.01	529.34	0.1399
1669.36	529.33	0.1399
1669.70	529.32	0.1399
1672.30	529.29	0.1399
1672.64	529.28	0.1399
1672.98	529.27	0.1399
1675.58	529.24	0.1399
1675.92	529.23	0.1399
1676.26	529.23	0.1399
1678.86	529.19	0.1399
1679.20	529.19	0.1399
1679.54	529.18	0.1399
1682.14	529.15	0.1399
1682.48	529.14	0.1399

1682.82	529.14	0.1399
1685.42	529.10	0.1399
1685.76	529.10	0.1399
1686.10	529.09	0.1399
1688.70	529.06	0.1399
1689.04	529.05	0.1399
1689.38	529.05	0.1399
1691.98	529.01	0.1399
1692.32	529.01	0.1399
1692.66	529.00	0.1399
1695.26	528.97	0.1399
1695.60	528.96	0.1399
1695.95	528.95	0.1399
1698.54	528.92	0.1399
1698.88	528.91	0.1399
1699.23	528.91	0.1399
1701.82	528.87	0.1399
1702.16	528.87	0.1399
1702.51	528.86	0.1399
1705.10	528.83	0.1399
1705.45	528.82	0.1399
1705.79	528.82	0.1399
1708.38	528.78	0.1399
1708.73	528.78	0.1399
1709.07	528.78	0.1399
1711.66	528.74	0.1399
1712.01	528.74	0.1399
1712.35	528.73	0.1399
1714.95	528.70	0.1399
1715.29	528.70	0.1399
1715.63	528.69	0.1399
1718.23	528.66	0.1399
1718.57	528.66	0.1399
1718.91	528.66	0.1399
1721.51	528.64	0.1399
1721.85	528.64	0.1399
1722.19	528.63	0.1399
1724.79	528.62	0.1399
1725.13	528.62	0.1399
1725.47	528.62	0.1399
1728.07	528.61	0.1399
1728.41	528.61	0.1399
1728.75	528.61	0.1399
1731.35	528.61	0.1399
1731.69	528.61	0.1399
1732.03	528.62	0.1399
1734.63	528.62	0.1399
1734.97	528.63	0.1399
1735.31	528.63	0.1399
1737.91	528.64	0.1399
1738.25	528.65	0.1399
1738.60	528.65	0.1399
1741.19	528.67	0.1399
1741.53	528.67	0.1399
1741.88	528.68	0.1399
1744.47	528.71	0.1399
1744.81	528.71	0.1399

1745.16	528.72	0.1399
1747.75	528.75	0.1399
1748.10	528.76	0.1399
1748.44	528.76	0.1399
1751.03	528.81	0.1399
1751.38	528.81	0.1399
1751.72	528.82	0.1399
1754.32	528.87	0.1399
1754.66	528.88	0.1399
1755.00	528.88	0.1399
1757.60	528.94	0.1399
1757.94	528.94	0.1399
1758.28	528.95	0.1399
1760.88	529.02	0.1399
1761.22	529.03	0.1399
1761.56	529.03	0.1399
1764.16	529.11	0.1399
1764.50	529.11	0.1399
1764.84	529.12	0.1399
1767.44	529.20	0.1399
1767.78	529.21	0.1399
1768.12	529.22	0.1399
1770.72	529.31	0.1399
1771.06	529.32	0.1399
1771.40	529.33	0.1399
1774.00	529.42	0.1399
1774.34	529.43	0.1399
1774.68	529.45	0.1399
1777.28	529.54	0.1399
1777.62	529.56	0.1399
1777.97	529.57	0.1399
1778.61	529.60	0.1399
1780.28	529.66	0.1399
1780.61	529.68	0.1399
1780.90	529.69	0.1399
1781.17	529.70	0.1399
1781.95	529.73	0.1399
1783.63	529.80	0.1399
1784.19	529.83	0.1399
1784.20	529.83	0.1399
1784.21	529.83	0.1399
1784.28	529.83	0.1399
1785.30	529.87	0.1399
1786.97	529.95	0.1399
1787.10	529.95	0.1399
1787.52	529.97	0.1399
1788.14	530.00	0.1399
1788.65	530.02	0.1399
1789.87	530.07	0.1399
1790.32	530.09	0.1399
1790.88	530.11	0.1399
1792.00	530.15	0.1399
1792.55	530.17	0.1399
1792.65	530.18	0.1399
1793.67	530.22	0.1399
1794.31	530.24	0.1399
1795.15	530.28	0.1399

1795.34	530.29	0.1399
1797.02	530.35	0.1399
1797.36	530.36	0.1399
1797.68	530.38	0.1399
1797.82	530.38	0.1399
1798.15	530.39	0.1399
1798.69	530.41	0.1399
1800.17	530.47	0.1399
1800.36	530.48	0.1399
1801.44	530.52	0.1399
1802.04	530.54	0.1399
1802.60	530.56	0.1399
1803.71	530.60	0.1399
1804.66	530.64	0.1399
1805.00	530.65	0.1399
1805.21	530.66	0.1399
1805.39	530.67	0.1399
1806.15	530.69	0.1399
1807.06	530.73	0.1399
1807.38	530.74	0.1399
1808.73	530.78	0.1399
1809.18	530.80	0.1399
1809.73	530.82	0.1399
1810.41	530.84	0.1399
1810.45	530.85	0.1399
1812.06	530.90	0.1399
1812.08	530.90	0.1399
1813.40	530.94	0.1399
1813.75	530.96	0.1399
1814.39	530.98	0.1399
1815.43	531.01	0.1399
1815.46	531.01	0.1399
1816.71	531.05	0.1399
1817.10	531.07	0.1399
1817.99	531.09	0.1399
1818.78	531.12	0.1399
1819.03	531.13	0.1399
1819.96	531.15	0.1399
1820.45	531.17	0.1399
1821.36	531.20	0.1399
1822.12	531.22	0.1399
1823.10	531.25	0.1399
1823.70	531.27	0.1399
1823.80	531.27	0.1399
1824.14	531.28	0.1399
1825.47	531.31	0.1399
1826.05	531.32	0.1399
1826.45	531.34	0.1399
1827.14	531.35	0.1399
1828.06	531.38	0.1399
1828.44	531.39	0.1399
1828.82	531.40	0.1399
1829.07	531.40	0.1399
1830.49	531.43	0.1399
1830.85	531.44	0.1399
1831.80	531.46	0.1399
1832.17	531.47	0.1399

1833.29	531.49	0.1399
1834.63	531.52	0.1399
1835.46	531.54	0.1399
1835.75	531.55	0.1399
1836.33	531.56	0.1399
1838.20	531.60	0.1399
1839.11	531.61	0.1399
1840.65	531.64	0.1399
1841.78	531.67	0.1399
1842.76	531.69	0.1399
1843.10	531.69	0.1399
1843.80	531.70	0.1399
1845.56	531.73	0.1399
1846.42	531.74	0.1399
1848.01	531.77	0.1399
1848.93	531.78	0.1399
1850.07	531.80	0.1399
1850.46	531.80	0.1399
1851.26	531.81	0.1399
1852.91	531.84	0.1399
1853.72	531.85	0.1399
1855.37	531.88	0.1399
1856.07	531.88	0.1399
1857.37	531.90	0.1399
1857.82	531.91	0.1399
1858.73	531.93	0.1399
1860.27	531.96	0.1399
1861.03	531.97	0.1399
1862.72	531.99	0.1399
1863.22	532.00	0.1399
1864.68	532.03	0.1399
1865.18	532.03	0.1399
1866.20	532.05	0.1399
1867.63	532.08	0.1399
1868.33	532.09	0.1399
1870.08	532.12	0.1399
1870.37	532.12	0.1399
1871.98	532.15	0.1399
1872.54	532.16	0.1399
1873.66	532.18	0.1399
1874.99	532.20	0.1399
1875.63	532.21	0.1399
1877.44	532.25	0.1399
1877.52	532.25	0.1399
1879.29	532.28	0.1399
1879.89	532.29	0.1399
1881.13	532.31	0.1399
1882.35	532.33	0.1399
1882.94	532.34	0.1399
1884.67	532.37	0.1399
1884.80	532.37	0.1399
1886.59	532.40	0.1399
1887.25	532.41	0.1399
1888.60	532.43	0.1399
1889.70	532.45	0.1399
1890.24	532.46	0.1399
1891.82	532.49	0.1399

1892.16	532.50	0.1399
1893.90	532.53	0.1399
1894.61	532.54	0.1399
1896.07	532.56	0.1399
1897.06	532.58	0.1399
1897.55	532.59	0.1399
1898.97	532.61	0.1399
1899.51	532.62	0.1399
1901.20	532.65	0.1399
1901.97	532.66	0.1399
1903.53	532.69	0.1399
1904.42	532.70	0.1399
1904.85	532.71	0.1399
1906.12	532.73	0.1399
1906.87	532.75	0.1399
1908.51	532.77	0.1399
1909.32	532.79	0.1399
1911.00	532.82	0.1399
1911.78	532.83	0.1399
1912.16	532.84	0.1399
1913.27	532.85	0.1399
1914.23	532.87	0.1399
1915.81	532.90	0.1399
1916.68	532.91	0.1399
1918.47	532.94	0.1399
1919.13	532.95	0.1399
1919.46	532.96	0.1399
1920.42	532.98	0.1399
1921.59	533.00	0.1399
1923.11	533.02	0.1399
1924.04	533.04	0.1399
1925.93	533.07	0.1399
1926.49	533.08	0.1399
1926.77	533.08	0.1399
1927.56	533.10	0.1399
1928.94	533.12	0.1399
1930.42	533.15	0.1399
1931.40	533.16	0.1399
1933.40	533.20	0.1399
1933.85	533.21	0.1399
1934.07	533.21	0.1399
1934.71	533.22	0.1399
1936.30	533.25	0.1399
1937.72	533.27	0.1399
1938.76	533.29	0.1399
1940.87	533.32	0.1399
1941.21	533.33	0.1399
1941.38	533.33	0.1399
1941.86	533.34	0.1399
1943.66	533.37	0.1399
1945.03	533.40	0.1399
1946.11	533.41	0.1399
1948.33	533.45	0.1399
1948.57	533.46	0.1399
1948.68	533.46	0.1399
1949.01	533.46	0.1399
1951.02	533.49	0.1399

1952.33	533.51	0.1399
1953.47	533.53	0.1399
1955.80	533.56	0.1399
1955.92	533.56	0.1399
1955.98	533.56	0.1399
1956.16	533.57	0.1399
1958.38	533.59	0.1399
1959.64	533.60	0.1399
1960.83	533.61	0.1399
1963.27	533.63	0.1399
1963.28	533.63	0.1399
1963.31	533.63	0.1399
1965.73	533.64	0.1399
1966.94	533.65	0.1399
1968.19	533.66	0.1399
1970.46	533.67	0.1399
1970.59	533.67	0.1399
1970.64	533.67	0.1399
1970.73	533.67	0.1399
1973.09	533.68	0.1399
1974.25	533.69	0.1399
1975.54	533.69	0.1399
1977.61	533.71	0.1399
1977.90	533.71	0.1399
1978.00	533.71	0.1399
1978.20	533.71	0.1399
1980.45	533.72	0.1399
1981.55	533.73	0.1399
1982.90	533.73	0.1399
1984.76	533.74	0.1399
1985.20	533.74	0.1399
1985.35	533.74	0.1399
1985.67	533.75	0.1399
1987.81	533.76	0.1399
1988.85	533.77	0.1399
1989.91	533.77	0.1399
1990.26	533.78	0.1399
1991.59	533.78	0.1399
1992.06	533.79	0.1399
1992.55	533.79	0.1399
1992.68	533.79	0.1399
1992.93	533.79	0.1399
1993.26	533.79	0.1399
1994.93	533.80	0.1399
1995.08	533.81	0.1399
1996.39	533.82	0.1399
1996.61	533.82	0.1399
1997.44	533.82	0.1399
1998.28	533.83	0.1399
1998.92	533.83	0.1399
1999.79	533.83	0.1399
1999.96	533.83	0.1399
2000.46	533.84	0.1399
2001.63	533.84	0.1399
2002.12	533.85	0.1399
2003.30	533.85	0.1399
2004.04	533.86	0.1399

2004.45	533.86	0.1399
2004.83	533.86	0.1399
2004.98	533.86	0.1399
2006.65	533.87	0.1399
2006.77	533.87	0.1399
2008.32	533.88	0.1399
2008.63	533.88	0.1399
2009.09	533.89	0.1399
2009.62	533.89	0.1399
2010.00	533.89	0.1399
2011.42	533.90	0.1399
2011.67	533.90	0.1399
2012.86	533.91	0.1399
2013.35	533.91	0.1399
2013.76	533.91	0.1399
2015.02	533.92	0.1399
2015.05	533.92	0.1399
2016.13	533.92	0.1399
2016.69	533.93	0.1399
2016.83	533.93	0.1399
2018.37	533.94	0.1399
2018.52	533.94	0.1399
2019.48	533.94	0.1399
2020.04	533.95	0.1399
2020.60	533.95	0.1399
2020.94	533.95	0.1399
2021.61	533.96	0.1399
2021.71	533.96	0.1399
2023.39	533.97	0.1399
2023.40	533.97	0.1399
2024.22	533.97	0.1399
2025.06	533.98	0.1399
2025.91	533.98	0.1399
2026.16	533.98	0.1399
2026.74	533.99	0.1399
2027.73	533.99	0.1399
2028.41	534.00	0.1399
2028.48	534.00	0.1399
2030.08	534.01	0.1399
2031.02	534.01	0.1399
2031.13	534.01	0.1399
2031.16	534.01	0.1399
2031.21	534.01	0.1399
2031.76	534.02	0.1399
2033.43	534.03	0.1399
2033.86	534.03	0.1399
2034.52	534.03	0.1399
2035.10	534.04	0.1399
2035.49	534.04	0.1399
2036.70	534.05	0.1399
2036.78	534.05	0.1399
2037.84	534.05	0.1399
2038.45	534.06	0.1399
2039.28	534.06	0.1399
2039.68	534.06	0.1399
2040.13	534.07	0.1399
2041.14	534.07	0.1399

2041.80	534.07	0.1399
2042.74	534.07	0.1399
2042.82	534.07	0.1399
2043.47	534.08	0.1399
2044.42	534.08	0.1399
2046.03	534.08	0.1399
2046.09	534.08	0.1399
2047.70	534.08	0.1399
2049.31	534.07	0.1399
2049.37	534.07	0.1399
2050.98	534.06	0.1399
2052.60	534.05	0.1399
2052.65	534.05	0.1399
2054.26	534.04	0.1399
2055.88	534.03	0.1399
2055.93	534.03	0.1399
2057.54	534.02	0.1399
2059.16	534.00	0.1399
2059.21	534.00	0.1399
2060.82	533.98	0.1399
2062.44	533.96	0.1399
2062.49	533.96	0.1399
2064.10	533.93	0.1399
2065.72	533.91	0.1399
2065.77	533.91	0.1399
2067.39	533.88	0.1399
2069.00	533.85	0.1399
2069.05	533.85	0.1399
2070.67	533.82	0.1399
2072.28	533.79	0.1399
2072.33	533.79	0.1399
2073.95	533.76	0.1399
2075.56	533.74	0.1399
2075.61	533.74	0.1399
2077.23	533.72	0.1399
2078.84	533.69	0.1399
2078.89	533.69	0.1399
2080.51	533.67	0.1399
2082.12	533.65	0.1399
2082.18	533.65	0.1399
2083.79	533.62	0.1399
2085.40	533.59	0.1399
2085.46	533.60	0.1399
2087.07	533.57	0.1399
2088.68	533.52	0.1399
2088.74	533.54	0.1399
2090.35	533.49	0.1399
2091.97	533.45	0.1399
2092.02	533.45	0.1399
2093.63	533.42	0.1399
2095.25	533.38	0.1399
2095.30	533.38	0.1399
2096.91	533.35	0.1399
2098.53	533.32	0.1399
2098.58	533.31	0.1399
2100.19	533.28	0.1399
2101.81	533.25	0.1399

2101.86	533.24	0.1399
2103.47	533.21	0.1399
2105.09	533.18	0.1399
2105.14	533.18	0.1399
2106.75	533.15	0.1399
2108.37	533.11	0.1399
2108.42	533.11	0.1399
2110.04	533.08	0.1399
2111.65	533.05	0.1399
2111.70	533.05	0.1399
2113.32	533.02	0.1399
2114.93	532.99	0.1399
2114.98	532.99	0.1399
2116.60	532.96	0.1399
2118.21	532.91	0.1399
2118.26	532.91	0.1399
2119.88	532.86	0.1399
2121.49	532.81	0.1399
2121.54	532.79	0.1399
2123.16	532.74	0.1399
2124.77	532.71	0.1399
2124.83	532.70	0.1399
2126.44	532.68	0.1399
2128.05	532.66	0.1399
2128.11	532.64	0.1399
2129.72	532.62	0.1399
2131.33	532.61	0.1399
2131.39	532.59	0.1399
2133.00	532.57	0.1399
2134.62	532.54	0.1399
2134.67	532.54	0.1399
2136.28	532.51	0.1399
2137.90	532.47	0.1399
2137.95	532.47	0.1399
2139.56	532.44	0.1399
2141.18	532.40	0.1399
2141.23	532.40	0.1399
2142.84	532.37	0.1399
2144.46	532.34	0.1399
2144.51	532.36	0.1399
2146.12	532.32	0.1399
2147.74	532.35	0.1399
2147.79	532.39	0.1399
2149.41	532.42	0.1399
2151.02	532.37	0.1399
2151.07	532.37	0.1399
2152.69	532.33	0.1399
2154.30	532.28	0.1399
2154.35	532.28	0.1399
2155.97	532.24	0.1399
2157.58	532.19	0.1399
2157.63	532.19	0.1399
2159.25	532.15	0.1399
2160.86	532.10	0.1399
2160.91	532.10	0.1399
2162.53	532.06	0.1399
2164.14	532.01	0.1399

2164.20	532.01	0.1399
2165.81	531.97	0.1399
2167.42	531.93	0.1399
2167.48	531.93	0.1399
2169.09	531.88	0.1399
2170.70	531.78	0.1399
2170.76	531.79	0.1399
2172.37	531.68	0.1399
2173.99	531.61	0.1399
2174.04	531.63	0.1399
2175.65	531.55	0.1399
2177.27	531.50	0.1399
2177.32	531.49	0.1399
2178.93	531.44	0.1399
2180.55	531.38	0.1399
2180.60	531.38	0.1399
2182.21	531.32	0.1399
2183.83	531.25	0.1399
2183.88	531.25	0.1399
2185.49	531.19	0.1399
2187.11	531.12	0.1399
2187.16	531.08	0.1399
2188.77	531.01	0.1399
2190.39	530.94	0.1399
2190.44	530.94	0.1399
2192.06	530.86	0.1399
2193.67	530.79	0.1399
2193.72	530.79	0.1399
2195.34	530.72	0.1399
2196.95	530.65	0.1399
2197.00	530.64	0.1399
2198.62	530.57	0.1399
2200.23	530.50	0.1399
2200.28	530.50	0.1399
2201.90	530.43	0.1399
2203.51	530.36	0.1399
2203.56	530.36	0.1399
2205.18	530.28	0.1399
2206.79	530.21	0.1399
2206.85	530.21	0.1399
2208.46	530.14	0.1399
2210.07	530.07	0.1399
2210.13	530.06	0.1399
2211.74	529.99	0.1399
2213.35	529.92	0.1399
2213.41	529.92	0.1399
2215.02	529.85	0.1399
2216.64	529.78	0.1399
2216.69	529.77	0.1399
2218.30	529.70	0.1399
2219.92	529.63	0.1399
2219.97	529.62	0.1399
2221.58	529.56	0.1399
2223.20	529.30	0.1399
2223.25	529.30	0.1399
2224.86	529.04	0.1399
2226.48	529.04	0.1399

2226.53	529.04	0.1399
2228.14	529.04	0.1399
2229.76	529.05	0.1399
2229.81	529.04	0.1399
2231.43	529.05	0.1399
2233.04	529.05	0.1399
2233.09	529.05	0.1399
2234.71	529.06	0.1399
2236.32	529.06	0.1399
2236.37	529.05	0.1399
2237.99	529.05	0.1399
2239.60	528.99	0.1399
2239.65	528.99	0.1399
2241.27	528.93	0.1399
2242.88	528.90	0.1399
2242.93	528.88	0.1399
2244.55	528.85	0.1399
2246.16	528.84	0.1399
2246.22	528.84	0.1399
2247.83	528.82	0.1399
2249.44	528.81	0.1399
2249.50	528.81	0.1399
2251.11	528.79	0.1399
2252.72	528.78	0.1399
2252.78	528.78	0.1399
2254.39	528.76	0.1399
2256.01	528.73	0.1399
2256.06	528.72	0.1399
2257.67	528.69	0.1399
2259.29	528.64	0.1399
2259.34	528.64	0.1399
2260.95	528.59	0.1399
2262.57	528.59	0.1399
2262.62	528.58	0.1399
2264.23	528.57	0.1399
2265.85	528.56	0.1399
2265.90	528.56	0.1399
2267.51	528.55	0.1399
2269.13	528.54	0.1399
2269.18	528.53	0.1399
2270.79	528.51	0.1399
2272.41	528.50	0.1399
2272.46	528.49	0.1399
2274.08	528.47	0.1399
2275.69	528.46	0.1399
2275.74	528.45	0.1399
2277.36	528.43	0.1399
2278.97	528.42	0.1399
2279.02	528.41	0.1399
2280.64	528.39	0.1399
2282.25	528.41	0.1399
2282.30	528.37	0.1399
2283.92	528.39	0.1399
2285.53	528.38	0.1399
2285.58	528.41	0.1399
2287.20	528.39	0.1399
2288.81	528.42	0.1399

2288.87	528.42	0.1399
2290.48	528.45	0.1399
2292.09	528.48	0.1399
2292.15	528.48	0.1399
2293.76	528.51	0.1399
2295.37	528.53	0.1399
2295.43	528.55	0.1399
2297.04	528.58	0.1399
2298.66	528.59	0.1399
2298.71	528.60	0.1399
2300.32	528.61	0.1399
2301.94	528.62	0.1399
2301.99	528.62	0.1399
2303.60	528.63	0.1399
2305.22	528.64	0.1399
2305.27	528.64	0.1399
2306.88	528.65	0.1399
2308.50	528.66	0.1399
2308.55	528.66	0.1399
2310.16	528.67	0.1399
2311.78	528.68	0.1399
2311.83	528.68	0.1399
2313.45	528.68	0.1399
2315.06	528.69	0.1399
2315.11	528.69	0.1399
2316.73	528.69	0.1399
2318.34	528.69	0.1399
2318.39	528.69	0.1399
2320.01	528.69	0.1399
2321.62	528.69	0.1399
2321.67	528.69	0.1399
2323.29	528.69	0.1399
2324.90	528.69	0.1399
2324.95	528.73	0.1399
2326.57	528.72	0.1399
2328.18	528.72	0.1399
2328.24	528.75	0.1399
2329.85	528.75	0.1399
2331.46	528.74	0.1399
2331.52	528.78	0.1399
2333.13	528.78	0.1399
2334.74	528.77	0.1399
2334.80	528.77	0.1399
2336.41	528.77	0.1399
2338.03	528.76	0.1399
2338.08	528.75	0.1399
2339.69	528.75	0.1399
2341.31	528.74	0.1399
2341.36	528.73	0.1399
2342.97	528.73	0.1399
2344.59	528.73	0.1399
2344.64	528.72	0.1399
2346.25	528.72	0.1399
2347.87	528.72	0.1399
2347.92	528.70	0.1399
2349.53	528.69	0.1399
2351.15	528.69	0.1399

2351.20	528.67	0.1399
2352.81	528.67	0.1399
2354.43	528.66	0.1399
2354.48	528.67	0.1399
2356.10	528.66	0.1399
2357.71	528.66	0.1399
2357.76	528.66	0.1399
2359.38	528.65	0.1399
2360.99	528.65	0.1399
2361.04	528.65	0.1399
2362.66	528.64	0.1399
2364.27	528.64	0.1399
2364.32	528.65	0.1399
2365.94	528.64	0.1399
2367.55	528.64	0.1399
2367.60	528.61	0.1399
2369.22	528.61	0.1399
2370.83	528.60	0.1399
2370.89	528.58	0.1399
2372.50	528.58	0.1399
2374.11	528.57	0.1399
2374.17	528.58	0.1399
2375.78	528.57	0.1399
2377.39	528.56	0.1399
2377.45	528.56	0.1399
2379.06	528.56	0.1399
2380.68	528.56	0.1399
2380.73	528.56	0.1399
2382.34	528.55	0.1399
2383.96	528.55	0.1399
2384.01	528.56	0.1399
2385.62	528.56	0.1399
2387.24	528.55	0.1399
2387.29	528.58	0.1399
2388.90	528.57	0.1399
2390.52	528.56	0.1399
2390.57	528.53	0.1399
2392.18	528.52	0.1399
2393.80	528.50	0.1399
2393.85	528.47	0.1399
2395.47	528.45	0.1399
2397.08	528.43	0.1399
2397.13	528.43	0.1399
2398.75	528.41	0.1399
2400.36	528.39	0.1399
2400.41	528.39	0.1399
2402.03	528.36	0.1399
2403.64	528.34	0.1399
2403.69	528.33	0.1399
2405.31	528.31	0.1399
2406.92	528.27	0.1399
2406.97	528.27	0.1399
2408.59	528.24	0.1399
2410.20	528.20	0.1399
2410.26	528.20	0.1399
2411.87	528.16	0.1399
2413.48	528.12	0.1399

2413.54	528.12	0.1399
2415.15	528.08	0.1399
2416.76	528.03	0.1399
2416.82	528.03	0.1399
2418.43	527.99	0.1399
2420.05	527.94	0.1399
2420.10	527.93	0.1399
2421.71	527.88	0.1399
2423.33	527.83	0.1399
2423.38	527.83	0.1399
2424.99	527.78	0.1399
2426.61	527.73	0.1399
2426.66	527.73	0.1399
2428.27	527.68	0.1399
2429.89	527.63	0.1399
2429.94	527.63	0.1399
2431.55	527.57	0.1399
2433.17	527.52	0.1399
2433.22	527.52	0.1399
2434.83	527.47	0.1399
2436.45	527.42	0.1399
2436.50	527.42	0.1399
2438.12	527.37	0.1399
2439.73	527.32	0.1399
2439.78	527.32	0.1399
2441.40	527.27	0.1399
2443.01	527.21	0.1399
2443.06	527.21	0.1399
2444.68	527.16	0.1399
2446.29	527.11	0.1399
2446.34	527.11	0.1399
2447.96	527.06	0.1399
2449.57	527.01	0.1399
2449.62	527.01	0.1399
2451.24	526.96	0.1399
2452.85	526.90	0.1399
2452.91	526.90	0.1399
2454.52	526.85	0.1399
2456.13	526.80	0.1399
2456.19	526.80	0.1399
2457.80	526.75	0.1399
2459.41	526.70	0.1399
2459.47	526.70	0.1399
2461.08	526.65	0.1399
2462.70	526.60	0.1399
2462.75	526.59	0.1399
2464.36	526.54	0.1399
2465.98	526.49	0.1399
2466.03	526.49	0.1399
2467.64	526.44	0.1399
2469.26	526.39	0.1399
2469.31	526.39	0.1399
2470.92	526.34	0.1399
2472.54	526.29	0.1399
2472.59	526.28	0.1399
2474.20	526.23	0.1399
2475.82	526.18	0.1399

2475.87	526.18	0.1399
2477.49	526.13	0.1399
2479.10	526.08	0.1399
2479.15	526.08	0.1399
2480.77	526.03	0.1399
2482.38	525.98	0.1399
2482.43	525.97	0.1399
2484.05	525.92	0.1399
2485.66	525.87	0.1399
2485.71	525.87	0.1399
2487.33	525.82	0.1399
2488.94	525.77	0.1399
2488.99	525.77	0.1399
2490.61	525.72	0.1399
2492.22	525.67	0.1399
2492.28	525.66	0.1399
2493.89	525.61	0.1399
2495.50	525.56	0.1399
2495.56	525.56	0.1399
2497.17	525.50	0.1399
2498.78	525.44	0.1399
2498.84	525.44	0.1399
2500.45	525.38	0.1399
2502.07	525.32	0.1399
2502.12	525.32	0.1399
2503.73	525.26	0.1399
2505.35	525.20	0.1399
2505.40	525.20	0.1399
2507.01	525.14	0.1399
2508.63	525.08	0.1399
2508.68	525.08	0.1399
2510.29	525.02	0.1399
2511.91	524.96	0.1399
2511.96	524.95	0.1399
2513.57	524.89	0.1399
2515.19	524.83	0.1399
2515.24	524.83	0.1399
2516.85	524.77	0.1399
2518.47	524.71	0.1399
2518.52	524.71	0.1399
2520.14	524.65	0.1399
2521.75	524.59	0.1399
2521.80	524.59	0.1399
2523.42	524.53	0.1399
2525.03	524.47	0.1399
2525.08	524.46	0.1399
2526.70	524.40	0.1399
2528.31	524.34	0.1399
2528.36	524.34	0.1399
2529.98	524.34	0.1399
2531.59	524.34	0.1399
2531.64	524.34	0.1399
2533.26	524.34	0.1399
2534.87	524.34	0.1399
2534.93	524.34	0.1399
2536.54	524.34	0.1399
2538.15	524.34	0.1399

2538.21	524.34	0.1399
2539.82	524.34	0.1399
2541.43	524.34	0.1399
2541.49	524.34	0.1399
2543.10	524.34	0.1399
2544.72	524.34	0.1399
2544.77	524.34	0.1399
2546.38	524.34	0.1399
2548.00	524.34	0.1399
2548.05	524.34	0.1399
2549.66	524.34	0.1399
2551.28	524.34	0.1399
2551.33	524.34	0.1399
2552.94	524.34	0.1399
2554.56	524.34	0.1399
2554.61	524.34	0.1399
2556.22	524.34	0.1399
2557.84	524.34	0.1399
2557.89	524.34	0.1399
2559.51	524.34	0.1399
2561.12	524.34	0.1399
2561.17	524.34	0.1399
2562.79	524.34	0.1399
2564.40	524.34	0.1399
2564.45	524.34	0.1399
2566.07	524.34	0.1399
2567.68	524.34	0.1399
2567.73	524.34	0.1399
2569.35	524.34	0.1399
2570.96	524.34	0.1399
2571.01	524.34	0.1399
2572.63	524.34	0.1399
2574.24	524.34	0.1399
2574.30	524.34	0.1399
2575.91	524.34	0.1399
2577.52	524.34	0.1399
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2579.19	524.34	0.1399
2580.80	524.34	0.1399
2580.86	524.34	0.1399
2582.47	524.34	0.1399
2584.09	524.34	0.1399
2584.14	524.34	0.1399
2585.75	524.34	0.1399
2587.37	524.34	0.1399
2587.42	524.34	0.1399
2589.03	524.34	0.1399
2590.65	524.34	0.1399
2590.70	524.34	0.1399
2592.31	524.34	0.1399
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2595.59	524.34	0.1399
2597.21	524.34	0.1399
2597.26	524.34	0.1399
2598.87	524.34	0.1399
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2605.44	524.34	0.1399
2606.61	524.34	0.1399
2606.91	524.34	0.1399
2607.28	524.34	0.1399
2608.29	524.34	0.1399
2608.73	524.34	0.1399
2609.89	524.34	0.1399
2609.97	524.34	0.1399
2611.06	524.34	0.1399
2611.65	524.34	0.1399
2612.05	524.34	0.1399
2612.74	524.34	0.1399
2613.32	524.34	0.1399
2615.00	524.34	0.1399
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2615.41	524.34	0.1399
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2616.68	524.34	0.1399
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2618.35	524.34	0.1399
2618.83	524.34	0.1399
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2622.28	524.34	0.1399
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2630.44	524.34	0.1399
2631.14	524.34	0.1399
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2637.17	524.34	0.1399
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2639.53	524.34	0.1399
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2645.78	524.34	0.1399
2646.43	524.34	0.1399
2647.78	524.34	0.1399
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2649.88	524.34	0.1399
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2703.85	524.34	0.1399
2704.17	524.34	0.1399

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2716.97	524.34	0.1399
2717.30	524.34	0.1399
2717.62	524.34	0.1399
2720.25	524.34	0.1399
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2723.53	524.34	0.1399
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2726.81	524.34	0.1399
2727.14	524.34	0.1399
2727.47	524.34	0.1399
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2736.65	524.34	0.1399
2736.98	524.34	0.1399
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2739.93	524.34	0.1399
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2740.59	524.34	0.1399
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2746.82	524.34	0.1399
2747.15	524.34	0.1399
2749.78	524.34	0.1399
2750.10	524.34	0.1399
2750.43	524.34	0.1399
2753.06	524.34	0.1399
2753.38	524.34	0.1399
2753.71	524.34	0.1399
2756.34	524.34	0.1399
2756.67	524.35	0.1399
2756.99	524.36	0.1399
2759.62	524.46	0.1399
2759.95	524.47	0.1399
2760.27	524.48	0.1399
2762.90	524.58	0.1399
2763.23	524.59	0.1399
2763.55	524.61	0.1399
2766.18	524.70	0.1399
2766.51	524.72	0.1399

2766.84	524.73	0.1399
2769.46	524.83	0.1399
2769.79	524.84	0.1399
2770.12	524.85	0.1399
2772.74	524.94	0.1399
2773.07	524.95	0.1399
2773.40	524.96	0.1399
2776.02	525.06	0.1399
2776.35	525.07	0.1399
2776.68	525.08	0.1399
2779.30	525.18	0.1399
2779.63	525.19	0.1399
2779.96	525.20	0.1399
2782.58	525.30	0.1399
2782.91	525.31	0.1399
2783.24	525.33	0.1399
2785.87	525.42	0.1399
2786.19	525.44	0.1399
2786.52	525.45	0.1399
2789.15	525.55	0.1399
2789.47	525.56	0.1399
2789.80	525.57	0.1399
2792.43	525.67	0.1399
2792.75	525.68	0.1399
2793.08	525.70	0.1399
2795.71	525.80	0.1399
2796.03	525.81	0.1399
2796.36	525.82	0.1399
2798.99	525.94	0.1399
2799.32	525.95	0.1399
2799.64	525.97	0.1399
2802.27	526.07	0.1399
2802.60	526.08	0.1399
2802.92	526.09	0.1399
2805.55	526.19	0.1399
2805.88	526.21	0.1399
2806.20	526.22	0.1399
2808.83	526.32	0.1399
2809.16	526.33	0.1399
2809.49	526.34	0.1399
2812.11	526.44	0.1399
2812.44	526.45	0.1399
2812.77	526.47	0.1399
2815.39	526.56	0.1399
2815.72	526.58	0.1399
2816.05	526.59	0.1399
2818.67	526.68	0.1399
2819.00	526.69	0.1399
2819.33	526.70	0.1399
2821.95	526.79	0.1399
2822.28	526.80	0.1399
2822.61	526.81	0.1399
2825.23	526.90	0.1399
2825.56	526.91	0.1399
2825.89	526.92	0.1399
2828.52	527.01	0.1399
2828.84	527.02	0.1399

2829.17	527.03	0.1399
2831.80	527.10	0.1399
2832.12	527.11	0.1399
2832.45	527.12	0.1399
2835.08	527.19	0.1399
2835.40	527.20	0.1399
2835.73	527.21	0.1399
2838.36	527.27	0.1399
2838.69	527.28	0.1399
2839.01	527.29	0.1399
2841.64	527.34	0.1399
2841.97	527.35	0.1399
2842.29	527.36	0.1399
2844.92	527.41	0.1399
2845.25	527.41	0.1399
2845.57	527.42	0.1399
2848.20	527.46	0.1399
2848.53	527.47	0.1399
2848.86	527.47	0.1399
2851.48	527.51	0.1399
2851.81	527.52	0.1399
2852.14	527.52	0.1399
2854.76	527.56	0.1399
2855.09	527.56	0.1399
2855.42	527.56	0.1399
2858.04	527.60	0.1399
2858.37	527.61	0.1399
2858.70	527.61	0.1399
2861.32	527.65	0.1399
2861.65	527.65	0.1399
2861.98	527.66	0.1399
2864.60	527.70	0.1399
2864.93	527.70	0.1399
2865.26	527.70	0.1399
2867.89	527.74	0.1399
2868.21	527.75	0.1399
2868.54	527.75	0.1399
2871.17	527.79	0.1399
2871.49	527.80	0.1399
2871.82	527.80	0.1399
2874.45	527.85	0.1399
2874.77	527.85	0.1399
2875.10	527.86	0.1399
2877.73	527.90	0.1399
2878.05	527.90	0.1399
2878.38	527.90	0.1399
2881.01	527.94	0.1399
2881.34	527.95	0.1399
2881.66	527.95	0.1399
2884.29	527.99	0.1399
2884.62	527.99	0.1399
2884.94	528.00	0.1399
2887.57	528.04	0.1399
2887.90	528.04	0.1399
2888.22	528.05	0.1399
2890.85	528.08	0.1399
2891.18	528.09	0.1399

2891.51	528.09	0.1399
2894.13	528.13	0.1399
2894.46	528.13	0.1399
2894.79	528.14	0.1399
2897.41	528.18	0.1399
2897.74	528.18	0.1399
2898.07	528.19	0.1399
2900.69	528.22	0.1399
2901.02	528.23	0.1399
2901.35	528.23	0.1399
2903.97	528.27	0.1399
2904.30	528.28	0.1399
2904.63	528.28	0.1399
2907.25	528.32	0.1399
2907.58	528.32	0.1399
2907.91	528.33	0.1399
2910.54	528.36	0.1399
2910.86	528.37	0.1399
2911.19	528.37	0.1399
2913.82	528.41	0.1399
2914.14	528.42	0.1399
2914.47	528.42	0.1399
2917.10	528.46	0.1399
2917.42	528.46	0.1399
2917.75	528.47	0.1399
2920.38	528.51	0.1399
2920.71	528.51	0.1399
2921.03	528.52	0.1399
2923.66	528.55	0.1399
2923.99	528.56	0.1399
2924.31	528.56	0.1399
2926.94	528.60	0.1399
2927.27	528.60	0.1399
2927.59	528.61	0.1399
2930.22	528.65	0.1399
2930.55	528.65	0.1399
2930.88	528.66	0.1399
2933.50	528.69	0.1399
2933.83	528.70	0.1399
2934.16	528.70	0.1399
2936.78	528.74	0.1399
2937.11	528.75	0.1399
2937.44	528.75	0.1399
2940.06	528.79	0.1399
2940.39	528.79	0.1399
2940.72	528.80	0.1399
2943.34	528.83	0.1399
2943.67	528.84	0.1399
2944.00	528.84	0.1399
2946.62	528.88	0.1399
2946.95	528.89	0.1399
2947.28	528.89	0.1399
2949.91	528.93	0.1399
2950.23	528.93	0.1399
2950.56	528.94	0.1399
2953.19	528.98	0.1399
2953.51	528.98	0.1399

2953.84	528.99	0.1399
2956.47	529.03	0.1399
2956.79	529.03	0.1399
2957.12	529.04	0.1399
2959.75	529.07	0.1399
2960.07	529.08	0.1399
2960.40	529.08	0.1399
2963.03	529.12	0.1399
2963.36	529.13	0.1399
2963.68	529.13	0.1399
2966.31	529.17	0.1399
2966.64	529.17	0.1399
2966.96	529.18	0.1399
2969.59	529.22	0.1399
2969.92	529.22	0.1399
2970.24	529.22	0.1399
2972.87	529.25	0.1399
2973.20	529.25	0.1399
2973.53	529.25	0.1399
2976.15	529.30	0.1399
2976.48	529.30	0.1399
2976.81	529.30	0.1399
2979.43	529.34	0.1399
2979.76	529.34	0.1399
2980.09	529.35	0.1399
2982.71	529.38	0.1399
2983.04	529.39	0.1399
2983.37	529.39	0.1399
2985.99	529.43	0.1399
2986.32	529.44	0.1399
2986.65	529.44	0.1399
2989.27	529.48	0.1399
2989.60	529.48	0.1399
2989.93	529.49	0.1399
2992.56	529.52	0.1399
2992.88	529.53	0.1399
2993.21	529.53	0.1399
2995.84	529.57	0.1399
2996.16	529.58	0.1399
2996.49	529.58	0.1399
2999.12	529.63	0.1399
2999.44	529.64	0.1399
2999.77	529.65	0.1399
3002.40	529.68	0.1399
3002.73	529.69	0.1399
3003.05	529.69	0.1399
3005.68	529.73	0.1399
3006.01	529.74	0.1399
3006.33	529.74	0.1399
3008.96	529.78	0.1399
3009.29	529.78	0.1399
3009.61	529.79	0.1399
3012.24	529.83	0.1399
3012.57	529.83	0.1399
3012.90	529.84	0.1399
3015.52	529.87	0.1399
3015.85	529.88	0.1399

3016.18	529.88	0.1399
3018.80	529.92	0.1399
3019.13	529.92	0.1399
3019.46	529.93	0.1399
3022.08	529.96	0.1399
3022.41	529.96	0.1399
3022.74	529.96	0.1399
3025.36	530.00	0.1399
3025.69	530.00	0.1399
3026.02	530.00	0.1399
3028.64	530.04	0.1399
3028.97	530.05	0.1399
3029.30	530.05	0.1399
3031.93	530.09	0.1399
3032.25	530.09	0.1399
3032.58	530.10	0.1399
3035.21	530.14	0.1399
3035.53	530.14	0.1399
3035.86	530.14	0.1399
3038.49	530.18	0.1399
3038.81	530.19	0.1399
3039.14	530.19	0.1399
3041.77	530.23	0.1399
3042.09	530.23	0.1399
3042.42	530.24	0.1399
3045.05	530.28	0.1399
3045.38	530.28	0.1399
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3048.33	530.34	0.1399
3048.66	530.34	0.1399
3048.98	530.35	0.1399
3051.61	530.38	0.1399
3051.94	530.39	0.1399
3052.26	530.40	0.1399
3054.89	530.43	0.1399
3055.22	530.44	0.1399
3055.55	530.45	0.1399
3058.17	530.48	0.1399
3058.50	530.49	0.1399
3058.83	530.49	0.1399
3061.45	530.53	0.1399
3061.78	530.53	0.1399
3062.11	530.54	0.1399
3064.73	530.58	0.1399
3065.06	530.58	0.1399
3065.39	530.59	0.1399
3068.01	530.62	0.1399
3068.34	530.63	0.1399
3068.67	530.63	0.1399
3071.29	530.67	0.1399
3071.62	530.67	0.1399
3071.95	530.67	0.1399
3074.58	530.70	0.1399
3074.90	530.71	0.1399
3075.23	530.71	0.1399
3077.86	530.75	0.1399
3078.18	530.75	0.1399

3078.51	530.76	0.1399
3081.14	530.79	0.1399
3081.46	530.80	0.1399
3081.79	530.80	0.1399
3084.42	530.84	0.1399
3084.75	530.84	0.1399
3085.07	530.85	0.1399
3087.70	530.89	0.1399
3088.03	530.89	0.1399
3088.35	530.90	0.1399
3090.98	530.93	0.1399
3091.31	530.94	0.1399
3091.63	530.94	0.1399
3094.26	530.98	0.1399
3094.59	530.99	0.1399
3094.92	530.99	0.1399
3097.54	531.04	0.1399
3097.87	531.05	0.1399
3098.20	531.05	0.1399
3100.82	531.09	0.1399
3101.15	531.09	0.1399
3101.48	531.10	0.1399
3104.10	531.13	0.1399
3104.43	531.14	0.1399
3104.76	531.14	0.1399
3107.38	531.18	0.1399
3107.71	531.19	0.1399
3108.04	531.19	0.1399
3110.66	531.23	0.1399
3110.99	531.23	0.1399
3111.32	531.24	0.1399
3113.95	531.28	0.1399
3114.27	531.28	0.1399
3114.60	531.28	0.1399
3117.23	531.32	0.1399
3117.55	531.33	0.1399
3117.88	531.33	0.1399
3120.51	531.37	0.1399
3120.83	531.37	0.1399
3121.16	531.38	0.1399
3123.79	531.42	0.1399
3124.11	531.42	0.1399
3124.44	531.43	0.1399
3127.07	531.46	0.1399
3127.40	531.47	0.1399
3127.72	531.47	0.1399
3130.35	531.52	0.1399
3130.68	531.52	0.1399
3131.00	531.53	0.1399
3133.63	531.58	0.1399
3133.96	531.59	0.1399
3134.28	531.59	0.1399
3136.91	531.65	0.1399
3137.24	531.66	0.1399
3137.57	531.67	0.1399
3140.19	531.73	0.1399
3140.52	531.74	0.1399

3140.85	531.75	0.1399
3143.47	531.82	0.1399
3143.80	531.83	0.1399
3144.13	531.84	0.1399
3146.75	531.92	0.1399
3147.08	531.93	0.1399
3147.41	531.94	0.1399
3150.03	532.02	0.1399
3150.36	532.03	0.1399
3150.69	532.04	0.1399
3153.31	532.14	0.1399
3153.64	532.15	0.1399
3153.97	532.16	0.1399
3156.60	532.26	0.1399
3156.92	532.27	0.1399
3157.25	532.28	0.1399
3159.88	532.39	0.1399
3160.20	532.40	0.1399
3160.53	532.41	0.1399
3163.16	532.52	0.1399
3163.48	532.53	0.1399
3163.81	532.55	0.1399
3166.44	532.65	0.1399
3166.77	532.67	0.1399
3167.09	532.68	0.1399
3169.72	532.79	0.1399
3170.05	532.80	0.1399
3170.37	532.81	0.1399
3173.00	532.91	0.1399
3173.33	532.93	0.1399
3173.65	532.94	0.1399
3176.28	533.03	0.1399
3176.61	533.04	0.1399
3176.94	533.07	0.1399
3179.56	533.23	0.1399
3179.89	533.26	0.1399
3180.22	533.27	0.1399
3182.84	533.49	0.1399
3183.17	533.50	0.1399
3183.50	533.52	0.1399
3186.12	533.43	0.1399
3186.45	533.44	0.1399
3186.78	533.43	0.1399
3189.40	533.45	0.1399
3189.73	533.43	0.1399
3190.06	533.44	0.1399
3192.68	533.50	0.1399
3193.01	533.51	0.1399
3193.34	533.52	0.1399
3195.97	533.57	0.1399
3196.29	533.57	0.1399
3196.62	533.58	0.1399
3199.25	533.62	0.1399
3199.57	533.63	0.1399
3199.90	533.63	0.1399
3202.53	533.67	0.1399
3202.85	533.68	0.1399

3203.18	533.68	0.1399
3205.81	533.71	0.1399
3206.13	533.72	0.1399
3206.46	533.72	0.1399
3209.09	533.75	0.1399
3209.42	533.75	0.1399
3209.74	533.75	0.1399
3212.37	533.78	0.1399
3212.70	533.78	0.1399
3213.02	533.78	0.1399
3215.65	533.81	0.1399
3215.98	533.81	0.1399
3216.30	533.82	0.1399
3218.93	533.84	0.1399
3219.26	533.84	0.1399
3219.59	533.85	0.1399
3222.21	533.87	0.1399
3222.54	533.88	0.1399
3222.87	533.88	0.1399
3225.49	533.90	0.1399
3225.82	533.91	0.1399
3226.15	533.91	0.1399
3228.77	533.93	0.1399
3229.10	533.94	0.1399
3229.43	533.94	0.1399
3232.05	533.97	0.1399
3232.38	533.97	0.1399
3232.71	533.97	0.1399
3235.33	534.00	0.1399
3235.66	534.00	0.1399
3235.99	534.00	0.1399
3238.62	534.03	0.1399
3238.94	534.03	0.1399
3239.27	534.04	0.1399
3241.90	534.06	0.1399
3242.22	534.06	0.1399
3242.55	534.07	0.1399
3245.18	534.09	0.1399
3245.50	534.09	0.1399
3245.83	534.10	0.1399
3248.46	534.12	0.1399
3248.79	534.13	0.1399
3249.11	534.13	0.1399
3251.74	534.15	0.1399
3252.07	534.16	0.1399
3252.39	534.16	0.1399
3255.02	534.19	0.1399
3255.35	534.19	0.1399
3255.67	534.19	0.1399
3258.30	534.22	0.1399
3258.63	534.22	0.1399
3258.96	534.22	0.1399
3261.58	534.25	0.1399
3261.91	534.25	0.1399
3262.24	534.25	0.1399
3264.86	534.28	0.1399
3265.19	534.28	0.1399

3265.52	534.29	0.1399
3268.14	534.31	0.1399
3268.47	534.31	0.1399
3268.80	534.32	0.1399
3271.42	534.34	0.1399
3271.75	534.34	0.1399
3272.08	534.35	0.1399
3274.70	534.37	0.1399
3275.03	534.38	0.1399
3275.36	534.38	0.1399
3277.99	534.40	0.1399
3278.31	534.41	0.1399
3278.64	534.41	0.1399
3281.27	534.43	0.1399
3281.59	534.44	0.1399
3281.92	534.44	0.1399
3284.55	534.46	0.1399
3284.87	534.47	0.1399
3285.20	534.47	0.1399
3287.83	534.50	0.1399
3288.15	534.50	0.1399
3288.48	534.50	0.1399
3291.11	534.53	0.1399
3291.44	534.53	0.1399
3291.76	534.53	0.1399
3294.39	534.56	0.1399
3294.72	534.56	0.1399
3295.04	534.56	0.1399
3297.67	534.59	0.1399
3298.00	534.60	0.1399
3298.32	534.60	0.1399
3300.95	534.63	0.1399
3301.28	534.63	0.1399
3301.61	534.63	0.1399
3304.23	534.66	0.1399
3304.56	534.66	0.1399
3304.89	534.66	0.1399
3307.51	534.69	0.1399
3307.84	534.69	0.1399
3308.17	534.69	0.1399
3310.79	534.72	0.1399
3311.12	534.72	0.1399
3311.45	534.73	0.1399
3314.07	534.75	0.1399
3314.40	534.75	0.1399
3314.73	534.76	0.1399
3317.35	534.78	0.1399
3317.68	534.78	0.1399
3318.01	534.79	0.1399
3320.64	534.81	0.1399
3320.96	534.82	0.1399
3321.29	534.82	0.1399
3323.92	534.85	0.1399
3324.24	534.85	0.1399
3324.57	534.85	0.1399
3327.20	534.88	0.1399
3327.52	534.88	0.1399

3327.85	534.88	0.1399
3330.48	534.91	0.1399
3330.81	534.91	0.1399
3331.13	534.92	0.1399
3333.76	534.94	0.1399
3334.09	534.94	0.1399
3334.41	534.95	0.1399
3337.04	534.97	0.1399
3337.37	534.98	0.1399
3337.69	534.98	0.1399
3340.32	535.00	0.1399
3340.65	535.01	0.1399
3340.98	535.01	0.1399
3343.60	535.03	0.1399
3343.93	535.04	0.1399
3344.26	535.04	0.1399
3346.88	535.06	0.1399
3347.21	535.06	0.1399
3347.54	535.06	0.1399
3350.16	535.04	0.1399
3350.49	535.04	0.1399
3350.82	535.04	0.1399
3353.44	535.11	0.1399
3353.77	535.11	0.1399
3354.10	535.12	0.1399
3356.72	535.19	0.1399
3357.05	535.20	0.1399
3357.38	535.21	0.1399
3360.01	535.28	0.1399
3360.33	535.29	0.1399
3360.66	535.29	0.1399
3363.29	535.36	0.1399
3363.61	535.37	0.1399
3363.94	535.38	0.1399
3366.57	535.44	0.1399
3366.89	535.45	0.1399
3367.22	535.46	0.1399
3369.85	535.52	0.1399
3370.17	535.52	0.1399
3370.50	535.53	0.1399
3373.13	535.59	0.1399
3373.46	535.60	0.1399
3373.78	535.60	0.1399
3376.41	535.66	0.1399
3376.74	535.67	0.1399
3377.06	535.68	0.1399
3379.69	535.74	0.1399
3380.02	535.74	0.1399
3380.34	535.75	0.1399
3382.97	535.81	0.1399
3383.30	535.82	0.1399
3383.63	535.83	0.1399
3386.25	535.88	0.1399
3386.58	535.89	0.1399
3386.91	535.90	0.1399
3389.53	535.96	0.1399
3389.86	535.97	0.1399

3390.19	535.98	0.1399
3392.81	536.04	0.1399
3393.14	536.05	0.1399
3393.47	536.06	0.1399
3396.09	536.13	0.1399
3396.42	536.14	0.1399
3396.75	536.14	0.1399
3399.37	536.21	0.1399
3399.70	536.22	0.1399
3400.03	536.22	0.1399
3402.66	536.30	0.1399
3402.98	536.31	0.1399
3403.31	536.32	0.1399
3405.94	536.37	0.1399
3406.26	536.38	0.1399
3406.59	536.38	0.1399
3409.22	536.44	0.1399
3409.54	536.44	0.1399
3409.87	536.45	0.1399
3412.50	536.50	0.1399
3412.83	536.51	0.1399
3413.15	536.52	0.1399
3415.78	536.60	0.1399
3416.11	536.61	0.1399
3416.43	536.62	0.1399
3419.06	536.71	0.1399
3419.39	536.72	0.1399
3419.71	536.73	0.1399
3422.34	536.81	0.1399
3422.67	536.82	0.1399
3423.00	536.83	0.1399
3425.62	536.88	0.1399
3425.95	536.89	0.1399
3426.28	536.90	0.1399
3428.90	536.93	0.1399
3429.23	536.94	0.1399
3429.56	536.95	0.1399
3432.18	536.98	0.1399
3432.51	536.99	0.1399
3432.84	536.99	0.1399
3435.46	537.06	0.1399
3435.79	537.06	0.1399
3436.12	537.07	0.1399
3438.74	537.14	0.1399
3439.07	537.14	0.1399
3439.40	537.15	0.1399
3442.03	537.22	0.1399
3442.35	537.23	0.1399
3442.68	537.24	0.1399
3445.31	537.31	0.1399
3445.63	537.32	0.1399
3445.96	537.33	0.1399
3448.59	537.41	0.1399
3448.91	537.42	0.1399
3449.24	537.43	0.1399
3451.87	537.50	0.1399
3452.19	537.51	0.1399

3452.52	537.52	0.1399
3455.15	537.59	0.1399
3455.48	537.60	0.1399
3455.80	537.61	-----

Longitudinal Slope: 0.0400 ft/ft

Lining Type: User Defined

Flow: 303.5000 cfs

Result Parameters

Depth: 0.7411 ft

Area of Flow: 183.7557 ft^2

Wetted Perimeter: 268.1371 ft

Hydraulic Radius: 0.6853 ft

Average Velocity: 1.6516 ft/s

Top Width: 268.1079 ft

Froude Number: 0.3516

Critical Depth: 0.3747 ft

Critical Velocity: 3.4026 ft/s

Critical Slope: 0.4012 ft/ft

Critical Top Width: 248.08 ft

Calculated Max Shear Stress: 1.8498 lb/ft^2

Calculated Avg Shear Stress: 1.7105 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.1399

Channel Lining Analysis: VF-1

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 1 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.13531

Lining Results

Angle of Repose: 41.7 degrees

Relative Flow Depth: 0.733437

Manning's n method: Bathurst

Manning's n: 0.276504

Channel Bottom Shear Results

V*: 1.01316

Reynold's Number: 83250.7

Shield's Parameter: 0.0748426

shear stress on channel bottom: 1.98923 lb/ft^2

Permissible shear stress for channel bottom: 7.67885 lb/ft^2

channel bottom is stable

Stable D50: 0.294107 ft

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: VF-1

Attachment B- 4: NOAA Atlas 14 Print Out

NOAA Atlas 14, Volume 11, Version 2
Location name: Point, Texas, USA*
Latitude: 32.9567°, Longitude: -95.9021°
Elevation: 532 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.443** (0.336-0.585)	**0.506** (0.388-0.665)	**0.612** (0.467-0.805)	**0.698** (0.524-0.928)	**0.815** (0.592-1.11)	**0.902** (0.638-1.26)	**0.989** (0.682-1.41)	**1.08** (0.725-1.57)	**1.20** (0.778-1.80)	**1.29** (0.815-1.98)
10-min	**0.708** (0.536-0.934)	**0.810** (0.620-1.06)	**0.980** (0.747-1.29)	**1.12** (0.840-1.49)	**1.31** (0.950-1.78)	**1.45** (1.03-2.02)	**1.59** (1.10-2.26)	**1.72** (1.16-2.52)	**1.90** (1.24-2.86)	**2.03** (1.29-3.12)
15-min	**0.885** (0.671-1.17)	**1.01** (0.774-1.33)	**1.22** (0.930-1.60)	**1.39** (1.04-1.85)	**1.62** (1.18-2.20)	**1.79** (1.27-2.50)	**1.96** (1.35-2.80)	**2.14** (1.44-3.12)	**2.37** (1.54-3.56)	**2.55** (1.61-3.92)
30-min	**1.24** (0.938-1.63)	**1.41** (1.08-1.85)	**1.70** (1.30-2.23)	**1.93** (1.45-2.57)	**2.24** (1.63-3.05)	**2.48** (1.75-3.45)	**2.71** (1.87-3.87)	**2.96** (1.99-4.32)	**3.30** (2.14-4.96)	**3.56** (2.25-5.46)
60-min	**1.62** (1.23-2.14)	**1.85** (1.42-2.43)	**2.24** (1.71-2.94)	**2.55** (1.92-3.39)	**2.98** (2.16-4.05)	**3.29** (2.33-4.58)	**3.61** (2.49-5.16)	**3.96** (2.66-5.78)	**4.44** (2.88-6.68)	**4.82** (3.05-7.40)
2-hr	**1.99** (1.52-2.60)	**2.32** (1.79-3.00)	**2.84** (2.18-3.70)	**3.28** (2.48-4.31)	**3.88** (2.84-5.22)	**4.34** (3.10-5.98)	**4.82** (3.35-6.79)	**5.33** (3.61-7.68)	**6.03** (3.95-8.95)	**6.60** (4.20-9.99)
3-hr	**2.22** (1.70-2.88)	**2.60** (2.02-3.34)	**3.22** (2.49-4.16)	**3.75** (2.86-4.90)	**4.48** (3.30-5.99)	**5.05** (3.62-6.91)	**5.64** (3.94-7.89)	**6.27** (4.26-8.97)	**7.15** (4.69-10.5)	**7.84** (5.01-11.8)
6-hr	**2.63** (2.04-3.38)	**3.12** (2.43-3.96)	**3.90** (3.04-4.99)	**4.57** (3.52-5.92)	**5.52** (4.11-7.31)	**6.26** (4.53-8.48)	**7.05** (4.96-9.74)	**7.89** (5.40-11.1)	**9.06** (5.98-13.1)	**9.99** (6.42-14.8)
12-hr	**3.09** (2.42-3.93)	**3.68** (2.89-4.61)	**4.61** (3.63-5.83)	**5.41** (4.20-6.93)	**6.55** (4.92-8.58)	**7.46** (5.44-9.97)	**8.41** (5.96-11.5)	**9.44** (6.51-13.1)	**10.9** (7.24-15.6)	**12.0** (7.79-17.6)
24-hr	**3.60** (2.85-4.54)	**4.29** (3.41-5.32)	**5.37** (4.27-6.72)	**6.30** (4.94-7.98)	**7.62** (5.76-9.86)	**8.65** (6.36-11.4)	**9.75** (6.97-13.1)	**11.0** (7.62-15.1)	**12.7** (8.49-17.9)	**14.1** (9.16-20.2)
2-day	**4.19** (3.35-5.22)	**4.95** (3.98-6.10)	**6.18** (4.97-7.66)	**7.22** (5.71-9.05)	**8.67** (6.60-11.1)	**9.79** (7.24-12.7)	**11.0** (7.91-14.6)	**12.3** (8.64-16.7)	**14.3** (9.66-19.9)	**16.0** (10.5-22.6)
3-day	**4.57** (3.68-5.66)	**5.39** (4.37-6.62)	**6.72** (5.43-8.28)	**7.82** (6.23-9.74)	**9.37** (7.17-11.9)	**10.5** (7.83-13.6)	**11.8** (8.54-15.6)	**13.2** (9.32-17.8)	**15.4** (10.4-21.2)	**17.1** (11.3-24.0)
4-day	**4.85** (3.92-5.98)	**5.72** (4.65-6.98)	**7.12** (5.78-8.73)	**8.29** (6.62-10.3)	**9.92** (7.62-12.5)	**11.2** (8.32-14.3)	**12.5** (9.07-16.4)	**14.0** (9.88-18.7)	**16.2** (11.0-22.2)	**18.0** (11.9-25.1)
7-day	**5.45** (4.43-6.65)	**6.42** (5.26-7.77)	**7.99** (6.54-9.71)	**9.31** (7.50-11.4)	**11.2** (8.65-13.9)	**12.6** (9.46-16.0)	**14.1** (10.3-18.3)	**15.7** (11.2-20.8)	**18.1** (12.3-24.5)	**20.0** (13.2-27.5)
10-day	**5.97** (4.88-7.26)	**7.03** (5.79-8.46)	**8.73** (7.18-10.6)	**10.2** (8.22-12.4)	**12.1** (9.46-15.1)	**13.7** (10.3-17.3)	**15.3** (11.2-19.7)	**17.0** (12.1-22.3)	**19.4** (13.3-26.1)	**21.3** (14.2-29.1)
20-day	**7.89** (6.52-9.48)	**9.09** (7.61-10.9)	**11.1** (9.22-13.3)	**12.7** (10.4-15.3)	**14.9** (11.7-18.3)	**16.5** (12.6-20.6)	**18.2** (13.4-23.1)	**19.9** (14.3-25.8)	**22.3** (15.4-29.6)	**24.2** (16.2-32.6)
30-day	**9.52** (7.91-11.4)	**10.8** (9.14-12.9)	**13.0** (10.9-15.6)	**14.8** (12.2-17.8)	**17.2** (13.5-20.9)	**18.9** (14.4-23.4)	**20.5** (15.3-25.9)	**22.3** (16.1-28.6)	**24.7** (17.1-32.4)	**26.5** (17.8-35.3)
45-day	**11.7** (9.82-13.9)	**13.3** (11.3-15.8)	**15.9** (13.4-18.8)	**17.9** (14.8-21.3)	**20.6** (16.3-24.9)	**22.5** (17.3-27.6)	**24.3** (18.1-30.4)	**26.1** (18.9-33.3)	**28.6** (19.9-37.1)	**30.4** (20.5-40.0)
60-day	**13.7** (11.5-16.2)	**15.4** (13.2-18.3)	**18.4** (15.6-21.7)	**20.7** (17.2-24.5)	**23.7** (18.9-28.5)	**25.8** (19.9-31.5)	**27.7** (20.8-34.5)	**29.7** (21.6-37.5)	**32.2** (22.5-41.5)	**33.9** (23.0-44.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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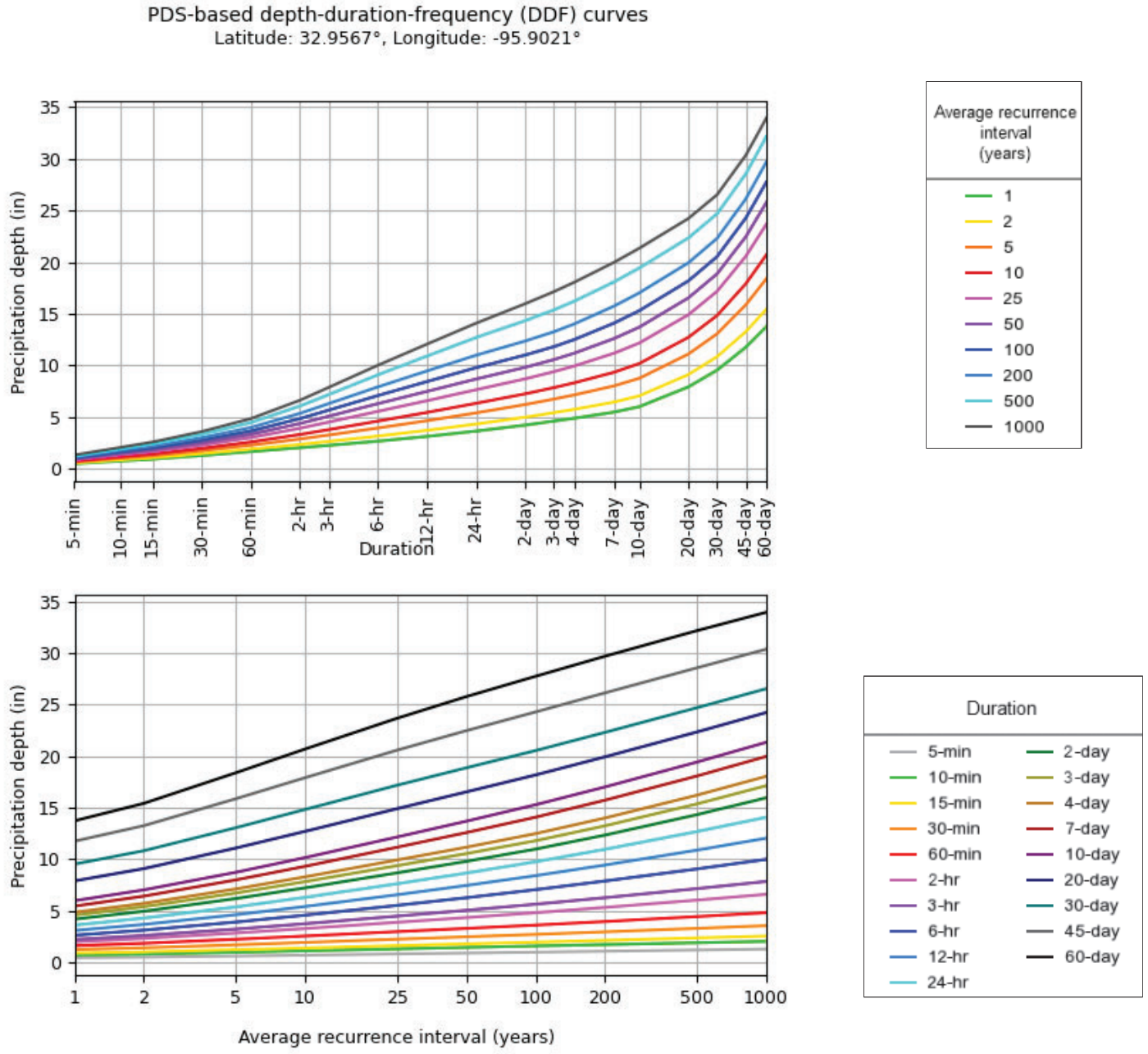
PF graphical



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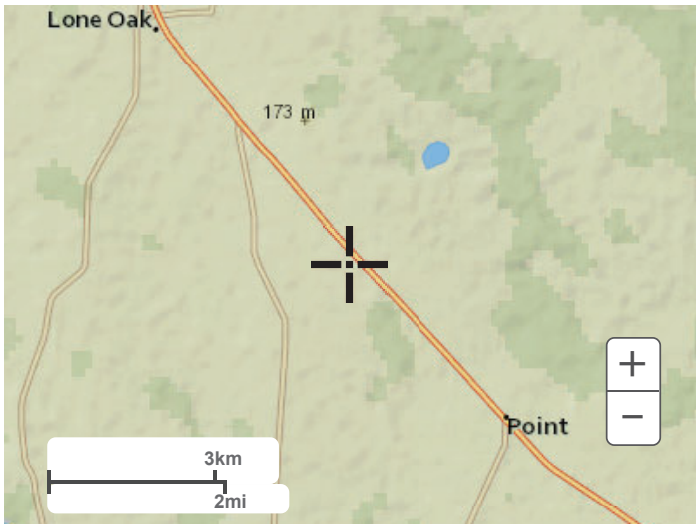
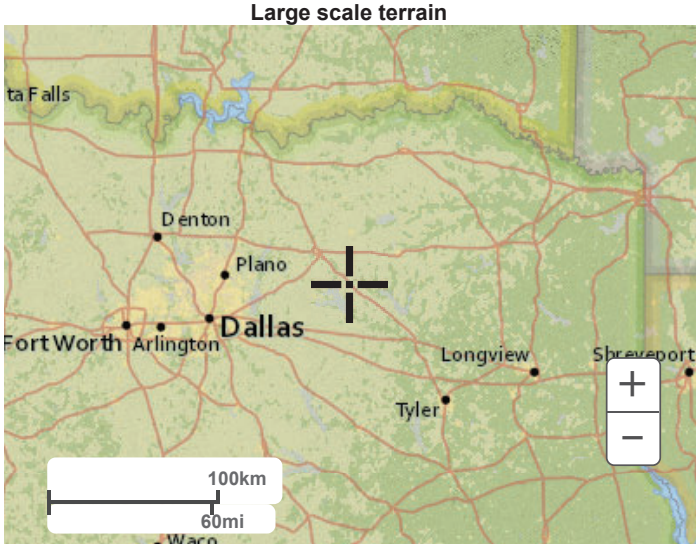
Maps & aerials

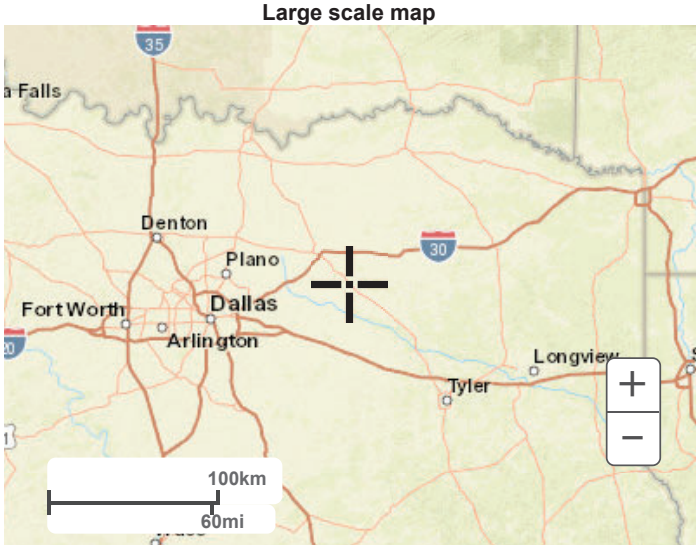
Small scale terrain



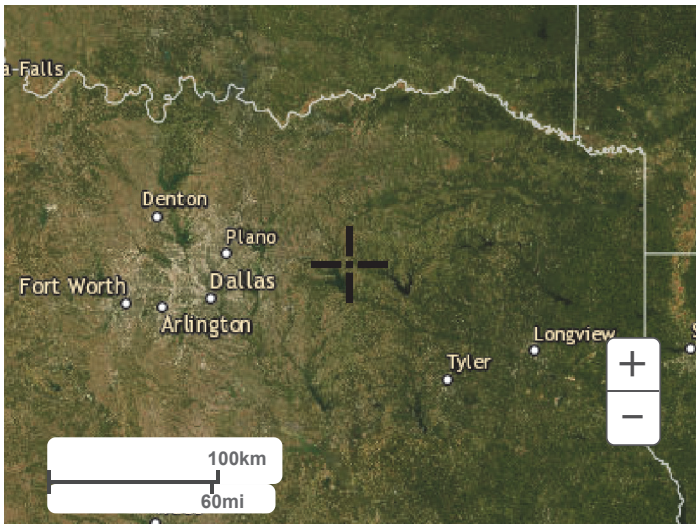
Large scale terrain



Large scale map



Large scale aerial



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Attachment B- 5: Barrett 60% Erosion and Sediment Control Plan